INTERDISCIPLINARY STUDY
OF
TELECOMMUNICATIONS

"THE APPLICATION OF DYNAMIC MODELLING TO THE STUDY OF TELECOMMUNICATIONS DEVELOPMENT IN CANADA"

FINAL REPORT
1 JULY, 1976

QUEEN'S UNIVERSITY
KINGSTON, ONTARIO, CANADA

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Co-Investigators:

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Chercheurs:

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RÉSUMÉ

"QUIST" (Etude interdisciplinaire de l'Université Queen's sur les Télécommunications) est seulement le sigle qui a été employé de 1972 à 1976 pour désigner une équipe multidisciplinaire établie à l'Université Queen's, Canada; cette équipe a étudié la possibilité d'utiliser un modelage dynamique pour évaluer l'impact des télécommunications sur une région ou sur une communauté. Ce rapport final résume tout le travail qui a été accompli pendant les quatre années comprises entre 1972 et 1976, et qui a été effectué au cours des 4 contrats annuels successifs entre l'Université Queen's et le Ministère des Approvisionnements et Services/Communications Canada.

Le nord-ouest de l'Ontario a été étudié comme type de région en voie de développement; un modèle détaillé a été construit et testé selon la technique dénommée "Dynamique de système". De surcroît, les modèles de deux communautés très différentes contenues dans cette région ont été construits jusqu'à divers degrés d'achèvement. Ces modèles ont été bâtis d'après un travail extensif effectué sur place; des sommaires détaillés de leurs conclusions sur le plan sociologique et psychologique sont inclus dans ce rapport. Une description complète du Modèle régional y est également jointe, ainsi qu'un commentaire su la nature de la coopération multidisciplinaire dans une université. D'autres sections de ce rapport comprennent un examen de la "Dynamique de système", des détails sur les programmes d'ordination, quelques autres études fondamentales ainsi qu'une discussion du projet dans son ensemble.

Les conclusions présentées soulignent la nature expérimentale du travail, et attirent l'attention sur l'utilité potentielle du modelage dynamique comme instrument de projection. Cependant, il faut être très prudent avant d'associer de simples chiffres avec des phénomènes socio-économiques très complexes et souvent mal compris. Pour qu'éventuellement une telle utilité se révèle, il est suggéré que ces modèles soient employés dans un milieu où les utilisateurs eux-mêmes comprendront la structure des modèles et les combinaisons de données et d'hypothèses sur lesquelles ils sont fondés; les utilisateurs devront également être capables de modifier leur structure à la lumière de l'expérience. C'est seulement à ce moment là qu'on pourra envisager que ce genre de modèle devienne réellement utile en tant qu'instrument multidisciplinaire permettant de former des projections pour le développement des télécommunications ou, d'une manière générale, des systèmes socio-économiques.

SUMMARY

"QUIST" is the informal acronym ("Queen's University Interdisciplinary Study of Telecommunications") used over the years 1972 to 1976 as the name of a multidisciplinary team located at Queen's University, Canada, studying the feasibility of dynamic modelling as a possible tool in the evaluation of the impact of telecommunications on a region or community. This Final Report summarizes the entire work of the four-year period, 1972-76, carried out during four successive annual contracts between Queen's University and D.S.S./Communications Canada.

Northwest Ontario has been studied as a representative developing region and a detailed model has been built and tested based on the technique known as "System Dynamics". In addition, models of two very different communities within the region have been constructed to varying degrees of completion. These models were based on substantial field work and detailed summaries of their sociological and psychological findings are included in this report. A full description of the Regional Model is also included, as well as a commentary on the nature of multidisciplinary cooperation in a university. Other sections of this report include a review of System Dynamics, details of the computer programs, some other background papers, and a discussion of the overall project.

The conclusions presented emphasize the experimental nature of the work but draw attention to the potential usefulness of dynamic modelling as a planning tool. However, much caution must always be shown in the implied association of simple numbers with very complex and often ill-understood socio-economic phenomena. For such possible usefulness to arise it is suggested that these models must be employed in an environment where the users themselves understand the structure of the models and the combinations of data and hypothesis on which they are based, as well as retain the ability to modify their structure in the light of experience. Only then does it seem likely that this type of model could become really useful as a multidisciplinary focus for planning considerations in telecommunications development, or in socio-economic systems generally.

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The opinions expressed in this report are those of the co-investigators and do not necessarily represent those of Communications Canada.

The co-investigators gratefully acknowledge the interest and cooperation shown by the staff of Communications Canada in the work described here. They would particularly like to express their appreciation of the sustained enthusiasm and helpful guidance and support throughout the entire project of Mr. W.L. Hatton of Communications Canada, who acted as Scientific Adviser from the first beginnings to the final completion.

A multidisciplinary project of this nature requires a friendly and informal environment in which to develop and the co-investigators are most grateful to the senior administrative staff of Queen's University for their understanding and helpful assistance.

Whatever has been achieved in this project is, to a very considerable extent, the fruit of the many students and research assistants from various disciplines who worked with great enthusiasm and effectiveness both during the field work and in the associated work at the University. A full list of these students and research assistants is given in Appendix A.13.

Lastly, we were fortunate indeed to have as our secretary throughout the project Mrs. Gertrude Kennedy who, among many other duties, typed all the reports including this one, and generally helped to hold together the activities of the multidisciplinary team.

1. INTRODUCTION

1.1 Background

System Dynamics, as described in Section 2 of this report, is a computer-simulation technique that has received much attention in recent years particularly with reference to its use as an aid to the understanding of large and complex socio-economic systems. So far it appears that little effort has been made to assess its potential usefulness in the planning of telecommunications development. The only available study known to the authors of this report appeared in print after the completion of this work (Batchman and Wearing, 1976). Their study used system dynamics as a tool in an investigation of the social effects of developing telecommunications technology in a modern, largely urban, society (Australia). They concentrated almost entirely on certain postulated large-scale social effects. In the work described in this report, an attempt has been made to relate telecommunications development to economic, political, demographic, environmental, and social aspects, including education and health services as well as more general sociological and psycho-cultural considerations.

While the project was first instigated within the Department of Electrical Engineering at Queen's University, it was almost immediately recognised that only a multidisciplinary team could make a useful attack on the problem which by its very nature involved aspects dependent upon a wide variety of disciplinary viewpoints. Accordingly, a multidisciplinary team was formed in early 1972 consisting of members drawn from Electrical Engineering, Political Studies, Psychology, the School of Business, Sociology, and later, Biology. More will be said on the nature of multidisciplinary cooperation in the next Section.

With the project being conducted in an Ontario University, it became appropriate to select northwest Ontario as a typical developing region. This area is dominated in statistical terms by its local metropolis of Thunder Bay but also contains a large hinterland of sparsely populated land rich in natural resources. In the outlying parts of the region there are numerous small settlements including many with native Indian populations. While not strictly an arctic area, it does exhibit many of the features of the sub-arctic, with its economy based largely on the exploitation of natural resources (mining, forestry, and tourism). This region has recently been experiencing an introduction of major new developments in telecommunications technology: ANIK, the Canadian domestic communications satellite; new local broadcasting outlets that provide for generation of local programming; and a novel intercommunity HF radiotelephone network linking some 25 small native settlements with each other.

At an early stage in the work it was decided that it would be useful to attempt to build a model of this region as a whole, as well as models of two small communities within the region, whose characteristics were different both from each other and from those of the region treated as an entity. All these models were based on substantial field work, including extended visits by team members to each of the two communities during the summers of 1973 and 1974. The entire project lasted four years during 1972-76 and a detailed knowledge was obtained of the application of dynamic modelling to areas of this nature. A model of northwest Ontario as a region has been completed and investigated in depth. For one of the communities (Sioux Lookout) a model has been constructed and taken to a substantial degree of completion, including some test runs. That for the second community (Aroland - a small native settlement) has been constructed but not programmed due to difficulty with the sufficiency of the data. Both these community studies and their attempted models were particularly valuable in drawing attention to the dangers of associating simple numbers with the complex and difficult to quantify behaviour of often ill-understood socio-economic phenomena. This point is amplified later in this report.

It is perhaps important here to stress that the whole subject of socio-economic modelling should be considered to be still at an early and experimental stage in its development. The essence of these models is not that they yield exact predictions of the future; at best they should be considered only as forecasters of possible alternative futures, subject to all the assumptions and hypotheses included in them by their builders. Nevertheless, it can be said that dynamic models do appear to have the potential to act as a useful focus for the efforts of a multidisciplinary planning team aimed at a common goal, with a capability of integrating the various viewpoints of widely different disciplines in a manner that can be clearly understood.

1.2 Multidisciplinary Cooperation

Universities seem at first sight to be uniquely well suited to multidisciplinary research. Yet this is seldom achieved, or even attempted, in practice. The departmental disciplinary structure often seems to be designed expressly to inhibit such cooperation across the convenient boundaries of management that render easy the judgment of apparent academic excellence. In the project being outlined here, its small scale, which never exceeded eight coinvestigators and an approximately equal number of students and research assistants, made possible a very informal structure in which coordination rather than direction became the more appropriate procedure. This was particularly true in a study in which no one person could possibly

be an expert in all the relevant fields and in which each of the coinvestigators was already well established in his or her basic discipline.

It was realized from the first that active involvement required some kind of inducement. This took the form of financial support for work by a research assistant from each discipline, to work directly with the appropriate team member on an area of study that overlapped adequately with the main goals of the project, while providing an opportunity to investigate a subject central to his or her professional interests. An obvious example of this was the sociological study of particular communities, which uncovered a wide range of data on which subsequently to construct models, while simultaneously being within the direct professional interests of the sociologists concerned.

The concepts of "direction" and "control" by some central "director" were not really appropriate to the management of the project. Instead, a much more informal persuasive approach was adopted in the full knowledge that if the inducements outlined above were not maintained there was no possible way to coerce the team members into cooperation. They were in a position where their professional interest and conscientiousness were the only reasons for their continued involvement, with negligible penalties should they have opted at any time to leave the team.

"Coordination" became, then, the key word rather than "direction", and in the course of the first few months a kind of dual coordination evolved which lasted throughout the project. The original coordinator remained in that position by informal consent and fulfilled the formal requirements of the sponsors and the University for a principal investigator who could clearly be seen to bear the overall responsibility for the project. In this role the main functions were administrative (always to be kept subservient to the research goals), persuasive, and, very occasionally, adjudicative. The vitally important bringing together of the detailed knowledge and experience of the various disciplinary members gradually became the province of a second person, who in this case proved to be the systems analyst.

Initially, a series of informal seminars were held to acquaint each other with the broad outlines of the various disciplines and how they might relate to the intended work of the project. These then changed into broad planning sessions, in which, for instance, the decision was taken to study both the region as a whole and individual communities within it. Thenceforward, much of the work was done by small sub-groups with the systems analyst taking the major role in linking their work and relating it to

the construction, first, of the regional model and, subsequently, of two community models.

As many as possible of those working on the project were given the opportunity to spend at least some time getting first-hand knowledge of the area being studied, which is about 800 miles distant from the University. In addition, many interviews were conducted with personnel in government and the relevant telephone company, Bell Canada.

During two successive summers substantial field work was conducted by sociologists and psychologists in several small communities, two of which were subsequently incorporated into initial attempts at community models. In each case the appropriate professorial coinvestigators, including the central coordinator, visited the area first to make contact with community leaders, explain the purpose of the project, and gain their cooperation. The subsequent detailed field work was then performed by the research assistants who resided in the area for many weeks and got to know the people living there, with continued ultimate supervision by the professorial members. This worked well and enabled the latter to continue with their other work; in all cases this project was only one of their continuing research and general academic pursuits.

The involvement of sociologists and psychologists became much more active in the construction of community models. A biologist with a particular interest in population dynamics and environmental interaction was then added to the team, together with an associated research assistant. The first summer of field work took place in a small native community within the region and valuable lessons were learned during the subsequent attempt at model construction. These lead to a more carefully planned survey study for the following summer in a larger Euro-Canadian community, in which the information sought was to be more closely linked to the concepts to be built into the subsequent model structure.

In both these cases model construction grew out of round-table discussions, after completion of the field work, with the systems analyst playing the key role. A tentative model structure would be drawn on a large sheet of paper with great care being taken to explain the meaning of this system flow diagram to the nonengineers. Gradually, individual parts of the structure would be modified and related as closely as possible both to the numerical data collected by the field workers and to their subjective impressions, where appropriate. At the same time these field workers were working directly with their professorial team members on the more specialized aspects of their field studies, while getting continued guidance on the interpretation of their data and impressions. It was probably during this construction of community models

that the project reached its greatest degree of interdisciplinary endeavor.

It is useful at this point to summarize the main features of multidisciplinary work that were revealed in the course of this project.

1) This was a small project in a university setting in which very informal arrangements as to control were feasible. The lessons learned are clearly not generally applicable to larger projects where more formal institutional arrangements become unavoidable, but may be helpful in similar settings.

2) Many full-time administrators would be horrified at any collective task conducted without very clearly defined internal and external reporting procedures. Yet it is highly doubtful whether such management techniques are appropriate or efficient for a highly experimental project in a small-scale university environment. This project was particularly fortunate in having sponsors who were happy to have a substantial publishable report every six months, rather than the apparently tighter control of detailed reports at much more frequent intervals.

3) University colleagues cannot be coerced into cooperative projects; professionally, rather than financially, satisfying inducements must be used, such as the opportunity to work on a topic of current interest within the discipline as well as contribute to the overall cooperative goal.

4) Any full-time academic is normally engaged in many different activities and can work most effectively when provided with an assistant, who may be a student or recent graduate, responsible directly to him, within the project as a whole.

5) Where relatively youthful assistants are employed, their enthusiasm and adaptability to other disciplinary outlooks more than makes up for their lack of experience, always provided that they work under the direct guidance of an established member of their own discipline.

6) Dual coordination of a project can be a useful technique. In this approach there is both an overall coordinator bearing the ultimate responsibility for the project, and a day-to-day research coordinator who concentrates on a true integration of disciplinary viewpoints in an informal and interpersonal manner. In a system modelling project it is very valuable if this latter person can be a systems analyst.

7) Ultimately, any such cooperative project in a

university depends on human relationships and it is most important to ensure that these are well maintained, by persuasion and inducement rather than by administrative fiat.

1.3 Outline of this Report

This report consists of eight main sections followed by fifteen appendices that give further information on various aspects of the work.

Section 2 is an introduction to System Dynamics together with a brief review of past applications by other workers and some of the more well-known critical appraisals.

Section 3 gives a complete description of the regional model of northwest Ontario and its associated data collection. Section 3.7 includes a representative set of graphs from the computer output which also takes the form of an introduction to the "verification" of this model. The question of "validation" is considerably more difficult and is discussed further in Section 7. Further to the process of "verification", a detailed sensitivity analysis of parts of the regional model is given in Section 3.8.

Section 4 includes detailed descriptions of the structures of the models of two communities within northwest Ontario, namely Aroland and Sioux Lookout. While that for Aroland was not taken to the stage of a computer program, the model of Sioux Lookout was programmed in part and some preliminary simulation runs are given in Section 4.3.13.

Section 5 summarizes the sociological studies conducted in several communities and includes discussions of the implications for telecommunication policies in these communities. The material in Section 5 is amplified in much greater detail in appendices A.5 and A.6.

Section 6 gives a complete description of the psychological work conducted in relation to the socio-cultural aspects of telecommunications. Section 6.10 includes a discussion of the conclusions that may be drawn from these studies with respect to telecommunications policy.

Section 7 is a general discussion of the project. Section 7.1 includes a detailed survey of the principles of modelling, including the topics of "verification" and "validation". Section 7.2 gives the comments of a political scientist on the project as a whole, tracing the developments in some of the thinking of the team during the course of the project and outlining some of the limitations of models and modelling. Section 7.3 similarly gives the view of a sociologist and looks at some of the fundamental differences in viewpoint between "soft" social

scientists and "hard" physical scientists and engineers.

Section 8 is a brief set of conclusions about the project and the lessons learned.

Appendices A.1, A.2, and A.3 give summary information on the regional model and its associated multiplier functions and software.

Appendix A.4 summarizes the demographic data used in the regional model.

Appendix A.5 is a complete and detailed description of the field work conducted in Aroland and a nearby Indian Reserve (Longlake 58), while Appendix A.6 gives a similarly complete discussion of the field work in Sioux Lookout.

Appendix A.7 summarizes the data obtained on telephones in northwest Ontario.

Appendices A.8 and A.9 are two of the many working papers developed during the course of the work as aids to model construction.

Appendices A.10 and A.11 give additional information on the computer model of Sioux Lookout, while A.12 gives the Interview Schedule used in the field work conducted in that community.

Appendices A.13 and A.14 list the personnel involved in the project at Queen's University and some publications that have been presented by team members.

Finally, Appendix A.15 lists all the references quoted in various parts of the report and adds a short selected bibliography of other closely related works on modelling and on telecommunications.

2. SYSTEM DYNAMICS MODELLING TECHNIQUES

2.1 Introduction

This section will present a review of the simulation modelling techniques known as "system dynamics" (Forrester, 1968a) together with a summary of the history of their application to the study of socioeconomic and ecological systems. As will be discussed in Section 7, system dynamics techniques represent an attempt to refine the modelling process. In their actual implementation, they borrow concepts from traditional servomechanism theory of systems engineering but more importantly, they attempt to unify three concepts used in analyzing and simulating systems. These are:

(1) The case study concept - here, attention is focused on a particular system (social, biological etc.) with the hope of developing an understanding of how that system behaves under certain conditions.

(2) The feedback concept - here, the dynamic behaviour of a system is attributed to the response to a stimulus feeding back to alter that stimulus.

(3) The digital computer simulation concept - here, a numerical method for solving the equations which define the feedback structure is used to obtain the model's response to various stimuli.

The result of combining these concepts is an attempt to model directly the dynamics of social, economic and biological systems in a manner that yields more information on the structure of a system than can the statistical time series regression analysis approach. It should be emphasized that the nature of social systems is such that the form of the relationships that make up the structure of the system will be controversial. In other words, if we consider the model structure to represent a hypothesis as to the operation of the system, then for systems that are as yet poorly understood, a large component of the formulation of that hypothesis will be of a deductive rather than inductive nature. (For a complete discussion of the role of the modelling process in science see Section 7). This fact should not imply a limited usefulness of such models in understanding the nature of socioeconomic and ecological systems. As will be discussed later, if the nature of these models is well understood, then they can play an important role in advancing the state of knowledge of the system.

2.2 System Variables

There are two classes of variables that yield information as to the state of the system being modelled:

(1) "Level" variables, which are quantities of fundamental importance in the system. They can be thought of as accumulations as a result of input and output flows of the quantity that the level represents over time.

(2) "Auxiliary" variables, which are descriptive of the state of the system and can be derived from a knowledge of the "levels" at any time.

The input and output flows associated with the levels are governed by flow rates which can be thought of as "valves" that can be continuously adjusted. The settings of the input and output "valves" determine the net flow rate of each level. That is, the instantaneous time rate of change of a level variable is the net flow rate associated with that level.

The level variables are diagrammatically represented as suitably labelled rectangles and the flow rates as valves. A level with one input and one output flow rate is shown in Figure 2.1. Flows of the level are drawn as solid lines and visualized to originate from an infinite source and terminate at an infinite sink, with both diagrammed as cloud symbols.

If we desire to trace the changes in the values of level variables with respect to time, it is necessary to specify the initial value of each level. This is shown in Figure 2.1 as a dotted line representing a flow of information about the initial value into the level rectangle. Information flow is distinct from the flow of a level in that no change in quantity results - only information is transferred.

2.3 Model Equations

This section has so far dealt with representation of levels, auxiliary variables (functions of levels) and flow rates. At this point, it is useful to introduce some simple mathematical notation:

Let $x_1, x_2, \ldots, x_n$ be the n level variables.

Let $y_1, y_2, \ldots, y_m$ be the m auxiliary variables.

Then as we have defined the y's to be functions of the x's, we write in mathematical notation for some

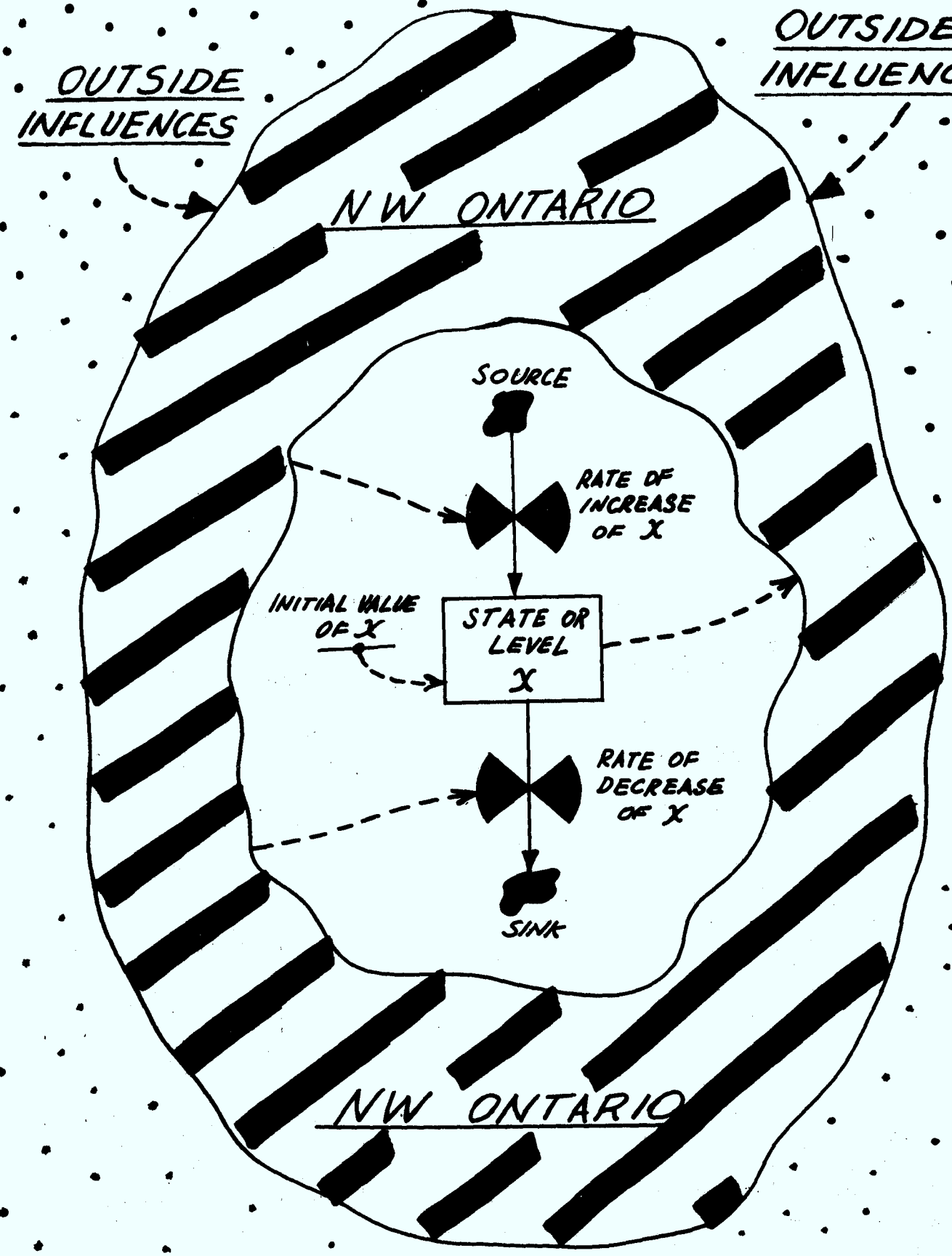

OUTSIDE INFLUENCES
OUTSIDE INFLUENCES
NW ONTARIO
SOURCE
RATE OF INCREASE OF X
INITIAL VALUE OF X
STATE OR LEVEL X
RATE OF DECREASE OF X
SINK
NW ONTARIO

Fig. 2.1

auxiliary variable y_i,

$$y_i = f(x_1, x_2..., x_n) \tag{2.1}$$

Equation (2.1) is general and does not specify the functional relationship between y_i and the x's, nor does it imply that y_i depends on <u>all</u> the x's.

Mathematically we denote the net flow rate of level x_i by

$$\text{net flow rate} = \frac{d\,x_i}{dt} = r_i \tag{2.2}$$

This rate can be broken down into a positive and negative rate denoted as

$$r_i = r_{i+} - r_{i-} \tag{2.3}$$

The model hypotheses are written mathematically as the relationships between the two components of the flow rate and the other system levels. The system dynamics methodology is to describe the effect of each level on a particular flow rate by a graphical multiplier function which multiplies the nominal values of the flow rate components.

Let M_{ij+} be the multiplier function multiplying the nominal positive flow rate of level x_i depending on level x_j. In other words

$$M_{ij} = f(x_j) \tag{2.4}$$

Multipliers can also be functions of auxiliary variables but we shall omit this from the present discussion for the sake of simplicity.

Similarly, M_{ij-} is a function of level x_j which multiplies the nominal negative flow rate of level x_i. That is,

$$M_{ij-} = f(x_j) \tag{2.5}$$

These two multipliers can be nonlinear, or even zero if there is no relation between rates r_{i+} or r_{i-} and x_j. In this respect, they can be thought of as providing the coupling between the various levels and auxiliary variables.

Multipliers are drawn as small circles and are combined with the levels and rates shown in Figure 2.1 to produce a flow diagram such as that of Figure 2.2.

Here, the system is comprised of two levels x_1 and x_2. The nominal flow rates are given by r_{1+n}, r_{1-n}, r_{2+n} and r_{2-n}. The initial level values are denoted by x_1I and x_2I. No auxiliary variables are shown for this system. They are represented by circles larger than those used for the multiplier functions. The rate equations for the system follow from the flow diagram and are given by:

$$r_{1+} = r_{1+n}\, M_{12+}\, M_{11+} \tag{2.6}$$

$$r_{1-} = r_{1-n}\, M_{12-}\, M_{11-} \tag{2.7}$$

$$r_{2+} = r_{2+n}\, M_{21+}\, M_{22+} \tag{2.8}$$

$$r_{2-} = r_{2-n}\, M_{21-}\, M_{22-} \tag{2.9}$$

where the various multiplier functions are specified.

As was mentioned earlier, the level variables are accumulations due to the net flow rates over time. Mathematically, the process of accumulation is represented by integration. The value at time T of level x_i is given as

$$x_i(T) = \int_{t_{initial}}^{T} (r_{i+} - r_{i-})\,dt + x_iI \tag{2.10}$$

The rate components r_{i+} and r_{i-} are themselves functions of time t. We will discuss a method of evaluating equations in the next section.

Some Practical Considerations: The equations (2.6) to (2.10) are sufficient to define the structure and dynamic behaviour of the modelled system as a function of time. There are, however, some simplifications that can be used in arriving at these equations.

(1) The nominal rates are often expressed most conveniently as percentage increases in their respective levels. For example,

$$r_{in+} = (pc_i)x_i, \qquad pc = \text{percentage} \tag{2.11}$$

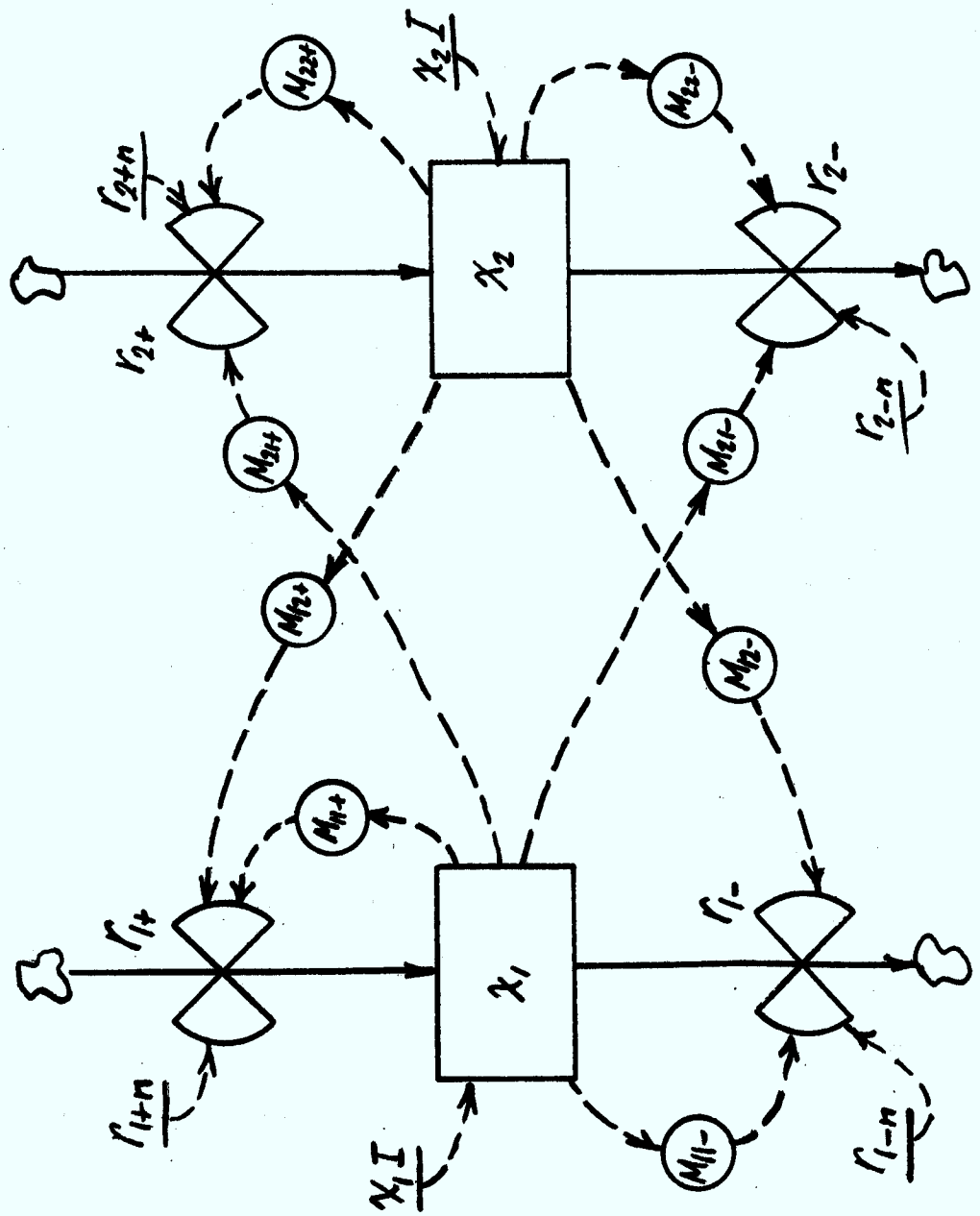

M_{22+}
$\chi_2 I$
M_{22-}
r_{2+n}
r_{2-}
χ_2
r_{2+}
r_{2-n}
M_{21+}
M_{21-}
M_{12+}
M_{12-}
M_{11+}
r_{1+}
r_{1-}
χ_1
r_{1+n}
$\chi_1 I$
M_{11-}
r_{1-n}

Fig. 2.2

This could be easily done for the case of a birth rate where (pc) would be the number of births per 100 population, per unit time.

(2) An auxiliary variable in the form of a ratio of a level x_i to its initial value is often a more useful starting point to define a multiplier function. Thus, instead of

$$M_{ij+} = f(x_j) \ , \tag{2.12}$$

we would have

$$M_{ij+} = f(x_j/x_jI) \tag{2.13}$$

In this way, large numbers are reduced to manageable proportions and it becomes easier to relate the change in a rate to the change in a level. This is the primary function of auxiliary variables.

2.4 Computer Simulation

The process of continuous integration necessary to evaluate the level variables (see equation (2.10) can be accomplished by use of an analogue computer. Here, voltages are used to represent the level values. Use of an analogue computer as a simulation tool for a system dynamics model has two distinct disadvantages:

(1) Usually, engineers are familiar with the operation and use of an analogue computer but those in other disciplines find it difficult to relate voltages to system variables.

(2) The nonlinear multiplier functions are very difficult to represent accurately on an analogue computer unless it is a very large, expensive one, or a hybrid computer (analogue combined with digital).

We shall now look at a method for integrating the level equations and representing the multiplier functions in a discrete manner suitable for programming on a digital computer. Consider the net flow rate r_i plotted vs. time in Figure 2.3. The two scales represent arbitrary time and flow units.

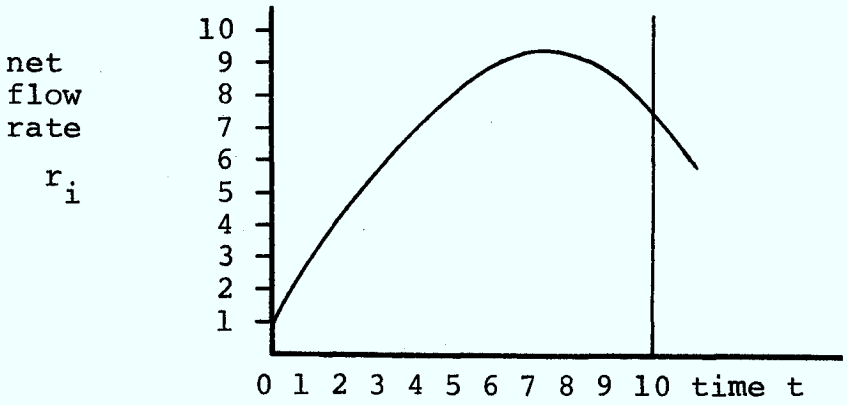


Figure 2.3

If we start our simulation at t=0, the value of the level x_i at t = 10 is given by

$$x_i(10) = x_i(0) + \int_0^{10} \{r_i(t)\}dt \qquad (2.14)$$

This value is equivalent to the area under the rate curve from time =0 to time = 10. Thus to evaluate equation (2.14) we need only develop a method of finding the area under the rate curve. A first-order approximation to this area can be obtained by representing the rate to be constant over a series of small time increments. This is illustrated in Figure 2.4 for an increment of one time unit. The area under the "staircase" approximation to the actual curve will approach the area under the actual curve as the time increment is made smaller and smaller.

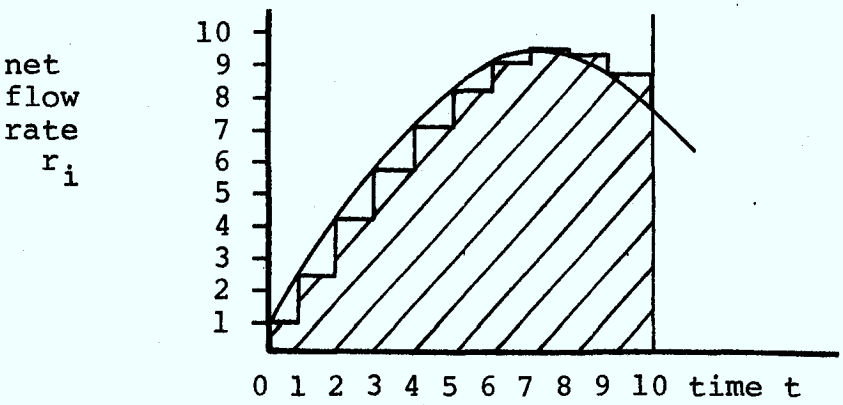


Figure 2.4

In general, if we represent the time interval by ΔT,

then the value of level x_i at time T + ΔT is simply

$$x_i(T+\Delta T) = x_i(T) + r_i(T)\Delta T \qquad (2.15)$$

which is obtained by adding to the previous level value the increase in the area under the rate curve during the increment ΔT in time. By taking successive time increments it is possible to generate the behaviour of x_i as a function of time using equation (2.15). A similar equation is used for each of the n level variables.

It remains to discuss the form in which the multiplier functions can be written so as to be entered in the digital computer programme. There are basically two ways of expressing a multiplier function once it has been graphically drawn to reflect a model hypothesis.

(1) A mathematical function which approximates the graphical function can be chosen. This may be difficult for certain graphical functions but does enable efficient programming and lends itself to analytical analysis of the system model.

(2) A series of straight line segments can be used to approximate the graphical function as shown in Figure 2.5. Then, if x_j has the value x_{j2}, the

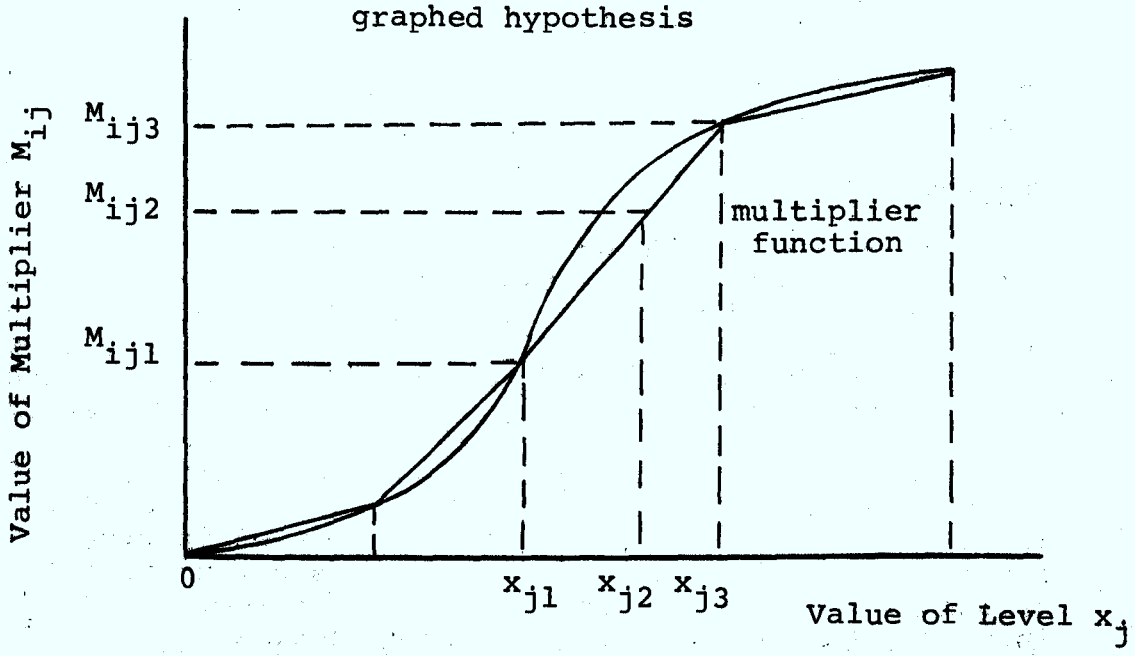


Figure 2.5

value of the multiplier, M_{ij2}, is found by interpolation. That is,

$$M_{ij2} = M_{ij1} + (M_{ij3} - M_{ij1}) \frac{x_{j2} - x_{j1}}{x_{j3} - x_{j1}} \qquad (2.16)$$

A programme is written to accomplish the following:

(1) Calculate the initial values of the auxiliary variables based on the initial level values;

(2) Calculate the multiplier function values depending on the initial level and auxiliary variable values;

(3) Calculate the flow rates based on the multiplier values;

(4) Plot a point for each of the level and auxiliary variables corresponding to the present time;

(5) Calculate the level and auxiliary values for the present time plus a time increment using the present rates calculated in (3);

(6) Calculate new multiplier values based on these new level values;

(7) Go back to (3).

The programme "loops" between (3) and (6) until the desired number of points have been plotted.

2.5 The Feedback Concept

The concept of feedback, which was mentioned as one of the basic concepts of the system dynamics technique, has not been discussed in the foregoing development of flow diagrams, model equations and simulation programmes. It is, however, embodied in the assumption that the flow rates are functions of the system levels related by the multiplier functions.

When the electrical control engineer talks of feedback, he is referring to the concept that, given a change in one level of a system, changes will be produced in other system levels which, in turn, will feed back and tend to reinforce or cancel the original change. If the effect is one of reinforcement, the feedback is termed "positive", and if it is one of cancellation, the feedback is termed "negative".

In the type of model obtained using the procedure outlined in the previous section, both types of feedback can be present, depending on the form of the multiplier functions. As an example, consider the natural birth and death rates of a population under constant nominal conditions. The flow diagram is shown in Figure 2.6.

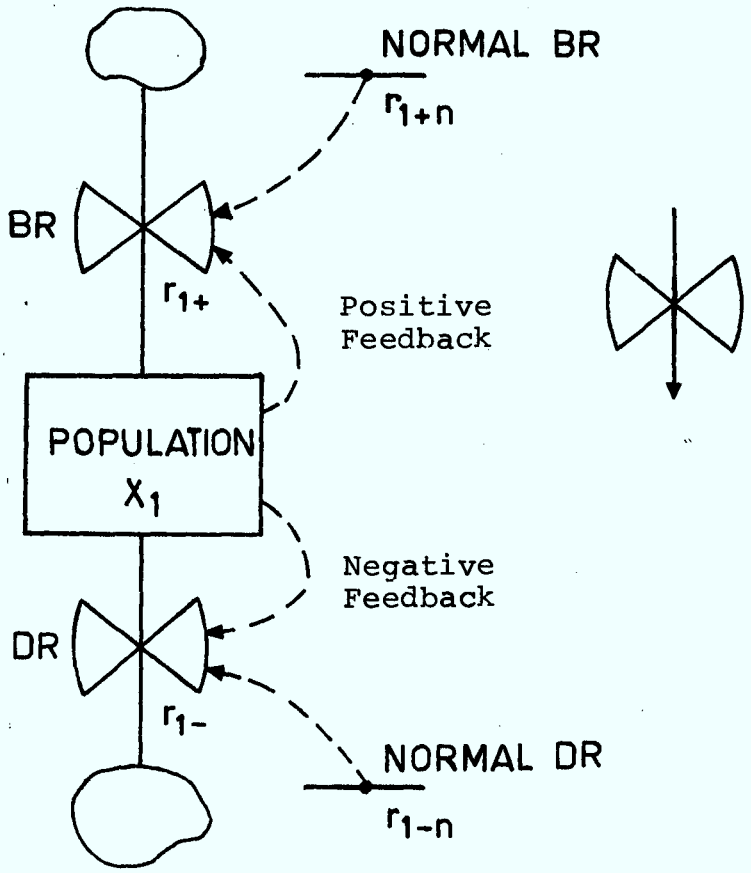


Figure 2.6

The birth rate is given by

$$r_{1+} = (r_{1+n})\ (x_1)\ \text{births/unit time} \qquad (2.17)$$

and the death rate by

$$r_{1-} = (r_{1-n})\ (x_1)\ \text{deaths/unit time} \qquad (2.18)$$

Notice that an increase in population causes an increase in the number of births per unit time and will result in an increased population, which will further increase the

number of births. This is the result of the positive feedback from population to birth rate. On the other hand the feedback effect of population on the death rate is negative since an increase in population results in an increase in the number of deaths/unit time.

2.6 A Concise History of System Dynamics Application

Although general in concept, system dynamics modelling techniques were developed for use in modelling social and economic systems for which comprehensive dynamic models were not available. The first reported application was to the modelling of business/industrial systems (Forrester, 1961), which was heralded as "a major breakthrough for decision makers" (Forrester, 1958). During the period from 1958 to 1968, "industrial dynamics" was further refined and application made to a wide variety of problems in management analysis. The state of the art at this time is given by Forrester (1968b).

Also during this time there was a growing body of literature providing a wide range of viewpoints on the nature and usefulness of the new techniques. A detailed critique of industrial dynamics was given by Ansoff and Sleven (1968a). While it was conceded that industrial dynamics was one way of looking at the behaviour of industrial firms by means of simulation, it was felt that the feedback structure might not be the most applicable or useful. Further, it was felt that there was little evidence of industrial dynamics' claim to the status of a "general systems theory". In response (Forrester, 1968c) it was argued that in many instances not reported in the open literature industrial dynamics had proven useful as a decision-making tool, especially where the modellers were experienced in the use of the techniques. In this regard, Ansoff and Sleven (1968b) agreed that industrial dynamics suggested a promise of advantages which would result from a better understanding of the nature of industrial systems.

In 1969, the application of system dynamics to the study of urban dynamics was reported by Forrester (1969). The urban model has since been the topic of numerous articles reflecting two distinct phases. The first was a series of critiques based on Forrester's results inspired by the fact that the response of the urban model to certain stimuli was contrary to popular belief among some urban specialists such as Kadanoff (1971). The second phase has been the result of further refinement of the urban model for particular urban areas for which validation could be undertaken. Work was carried out at the A.P. Sloan School of Management (Technology Review, 1972) and by others (Stonebraker, 1972; Chinitz et al., 1972; Sagner, 1972). It now appears that

validation attempts have to some extent justified the urban models' "counter-intuitive behaviour" (Porter et al., 1972; Whithead, 1972).

Since 1971, attention has been focused on the "world model" first proposed by Forrester (1971) and expanded somewhat by Meadows et al. (1972). Initial reaction to these models as reliable forcasters was generally critical (The Economist, 1972; Nature, 1972; New York Times, 1972). However, as Warfield (1972) pointed out, there are only a limited number of ways scientifically to attack the world model (or, indeed, any model): first, one may question whether the model is sufficiently inclusive (i.e. are there missing elements that directly affect those elements included in the model?); second, one may question the synthesized relations assumed in the model (e.g. the multiplier function); third, one may question the modellers' judgement of the desirability or undesirability of the state of the world predicted by the model as a result of certain policies.

In relation to the question of inclusiveness, the world model does not consider a variety of elements generally described as "social feedback". Oerlemans et al. (1972) have demonstrated the stabilizing effect of such feedback on the model's behaviour. Two facts tend to limit the ability of dynamic models to be totally inclusive: First, many relations which can be qualitatively expressed by social scientists are difficult to quantify and synthesize as structural elements; second, the present state of accepted theory in the social sciences may be such that models must include untested hypotheses concerning the behaviour of social systems.

On the question of the correctness of the synthesized relations, only appropriate experts are qualified to comment. It cannot be overemphasized that an appropriate multi-disciplinary approach to the model building task is of paramount importance in identifying these relations, (Young et al., 1972).

The question of model inference can be answered only if the model builders leave to experienced policy-makers the formation of value judgements based on the model's behaviour.

It should be pointed out that system dynamics techniques, often in a modified and extended form, have more recently been used in a wide variety of case studies in the social sciences and in biology. For example, see Hamilton et al. (1969) and Peppard (1975).

System dynamics is, of course, but one technique in the rapidly developing area of socio-economic modelling but

it is beyond the scope of this report to present a review of this entire subject. However, an additional bibliography of the literature relating to system dynamics, and to modelling in general, can be found in Appendix A.15.

3. THE REGIONAL MODEL FOR NORTHWEST ONTARIO

3.1 Introduction

The following discussion of the dynamic simulation model for the region of northwest Ontario will cover two aspects of the model's development and testing. First and most importantly, the model development will be outlined in terms of its evolution over a three-year period by a multidisciplinary team. Second, the model structure and parameters will be documented, the model interactions explained, several types of simulation ouput discussed and sensitivity experiments described. The first aspect covered will serve to relate the experience gained by the group in carrying out the modelling task; it will be clear that a number of the approaches taken would be modified in any future attempt at modelling on a regional level. The documentation and description of the model structure and its behaviour will serve as a starting point for those wishing to modify and improve the usefulness of the model (or a similar one) without starting from scratch. It should certainly provide a source of ideas and a guide to specific areas where further research is needed.

The formulation of the overall concept of the project and the subsequent formation of a multidisciplinary team have been discussed previously. What will concern us here is what was done by the team and how it was done.

3.1.1 Preliminary Steps

Soon after the team members were brought together in early 1972, a series of meetings was held at which project goals and objectives were formulated in more detail, seminars were given by each team member concerning his or her research relating in general to the project and several tutorials were presented on broad aspects of the disciplines involved, including techniques of dynamic modelling. As important as the transfer of information at these meetings was the chance for team members to become better acquainted with each other's background and way of thinking.

The most difficult task at this early stage was to ensure that the evolving research plan remained appropriate to the project goals concerning dynamic modelling. Thus, even those team members who were doubtful of the feasibility of modelling certain social phenomena were

asked to suspend their doubts so that the project could proceed. Despite the cooperation which ensued, it became evident that the actual model development would have to be directed by the systems analyst who would act as a filter for information received from the group. He would also have to provide continuous feedback to the group to ensure that their ideas were not misinterpreted or their data misused.

3.1.2 Conceptualization of the Regional Model

At an early stage, before the search for data had begun, work began on developing a preliminary outline of a possible structure for the regional model. If this work had been delayed, much of the data collected would have been wasted since at this time no agreement had been reached regarding appropriate levels of aggregation, possible features to be modelled, etc.

The project goals and objectives have already been discussed; they were the initial bases for conceptualizing the model. It was of prime importance to identify those social and economic features of the region which were likely to interact with communications services in general (i.e. transportation, telecommunications and written communications), and their use by the population. On this basis, a number of broad areas of the model structure were identified and overlapping sub-groups of team members (including student assistants) were assigned further to refine the model structure for the following areas:

1. Demography
2. Health and Education
3. Economy
4. Communications.

In the previous discussion on the modelling process, possible criteria for choosing model variables and the corresponding level of aggregation were discussed. Of prime importance in this project was the necessity of keeping the overall structure as simple as possible while maintaining sufficient detail to gain experience in interrelating a wide variety of variables describing Communications and the socioeconomic features of the region. A highly disaggregated model would require much more data than was apparently available for the region in question and would, in the long run, provide less insight into both multidisciplinary modelling and the role of telecommunications in the region.

We can now examine the structure of each of the

model components in a general way as a prelude to the more detailed documentation which will follow. These structures were developed during the first year of the project and were not altered significantly after that time, except for the detailed interactions between variables. They are all a result of team discussion and debate and as such represent compromises between a number of alternatives. It was as a result of such discussions that it was decided not to attempt to model the political process explicitly but to identify those structural elements which are political in nature and to pinpoint areas where political decisions would impinge on the system. For a more detailed consideration of politics in modelling see Section 7.2.

3.1.3 Documentation

While each component of the regional model will be discussed in some detail below, the reader is referred to various Appendices for documentation of the simulative program, the numerical tabulation of functions, initial conditions and symbol cross references. The following is a directory for this documentation.

Description	Appendix
Symbol dictionary	A1
Function plots and variable interactions	A2
Simulation model equations, initial conditions, numerical function data, and function and subroutine software	A3

In the descriptions which follow, both a block diagram and a system dynamics flow diagram will be presented. The former will be useful to the reader who wishes to know the concepts behind each component without the detail presented by the flow diagram.

3.1.4 Overall Structure

Figure 3.1 shows a block diagram of the major elements of the regional model. The economic component includes four areas of economic activity - tourism, mining, forestry, and other industries and services, which will be discussed later, as well as the generation of labour demand and personal income. Throughout this study the "Communications" component is defined very broadly and includes telephone communications, air and surface transportation, and radio, television and newspaper penetration. The main interactions between these components and the demographic and health and education components are indicated in Figure 3.1.

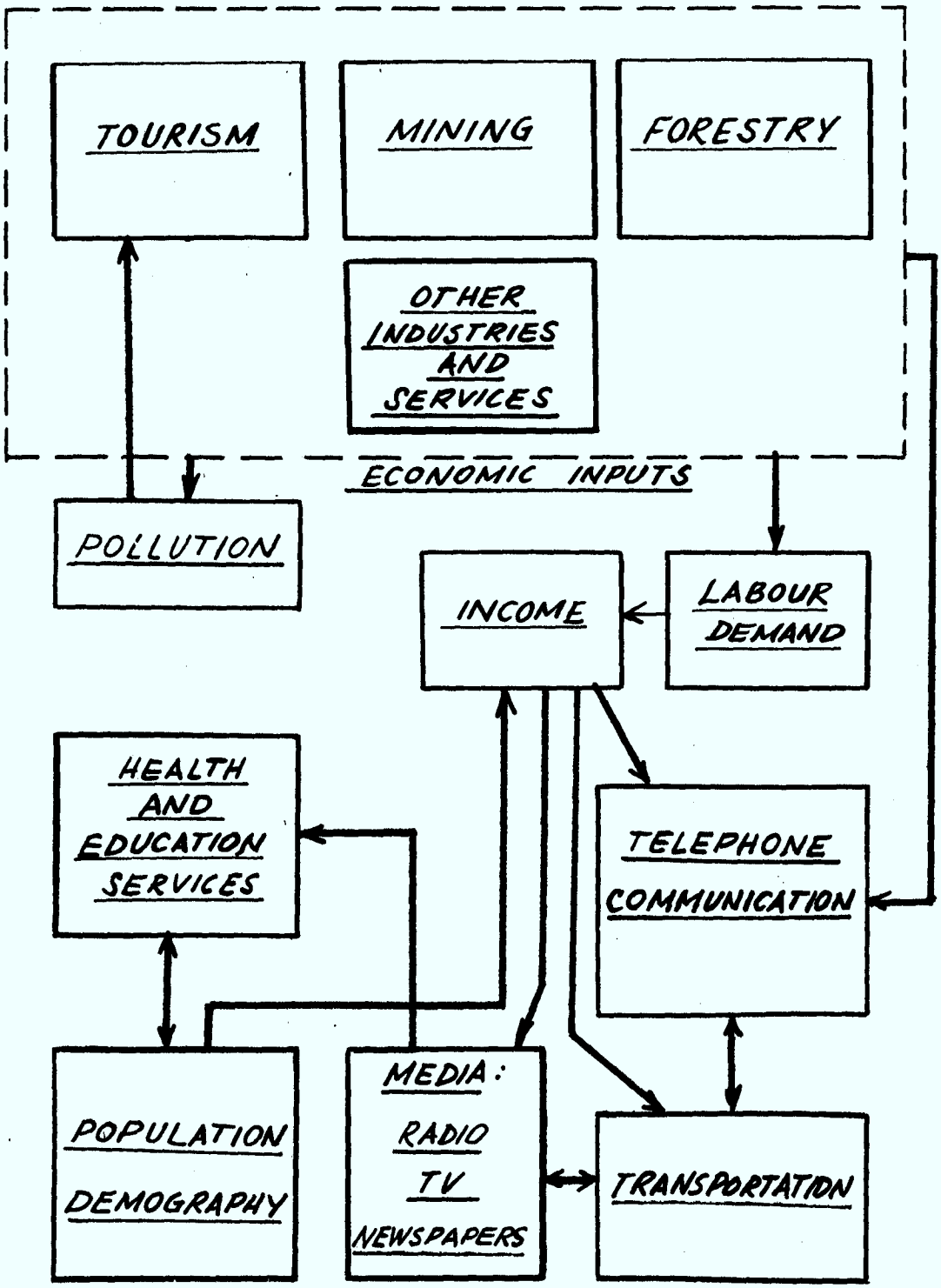

TOURISM
MINING
FORESTRY
OTHER INDUSTRIES AND SERVICES
ECONOMIC INPUTS
POLLUTION
INCOME
LABOUR DEMAND
HEALTH AND EDUCATION SERVICES
TELEPHONE COMMUNICATION
POPULATION DEMOGRAPHY
MEDIA: RADIO TV NEWSPAPERS
TRANSPORTATION

Fig. 3.1

Broadly speaking, the economic component is the main driving force of the model. It influences average income and migration, which are key factors in considerations of communication requirements. Some aspects of communications, such as radio and television penetration, are considered to affect directly levels of health service and education, which in turn affect birth and death rates within the region. Interactions between telecommunications and transportation are explored in the model and will be discussed later. After discussing each model component in detail it will be possible to present a system dynamics flow diagram corresponding to Figure 3.2.

3.2 The Demographic Component

The purpose of this component is to supply information on changes in the population of the region and their effects on communications requirements. It was felt that a breakdown of the population into four age groups would be useful in predicting future births as well as indicating the types of services likely to be required by future populations. Figure 3.3 shows a block diagram of the demographic component. The three modifying factors affecting the population are births, deaths and migration. The present birth and death rates for the region are somewhat higher than for Ontario as a whole and net migration for 1971, which is the starting year for the model simulation runs, is near zero. Migration is a function of many social and economic factors and, for simplicity, only the wage rate relative to Ontario as a whole was considered in the regional model. Other factors are explored in the community models to be discussed later. The birth rate is a function of the fertility rate (for the 15-44 year age group) and is modified by changes in levels of health service and education. The death rate is modified by changes in the level of health service.

A summary of historical demographic trends in the region is given in Appendix A.4. The main application of these data was to set the initial (1971) population levels, birth rate, death rates, migration rates, and fertility rate.

Figure 3.4 shows the system dynamics flow diagram for the demographic component. The population is divided into four age groups represented by levels L100 (0-14 years), L101 (15-44 years), L102 (45-64 years), and L103 (65 - years). Rates are defined as follows:

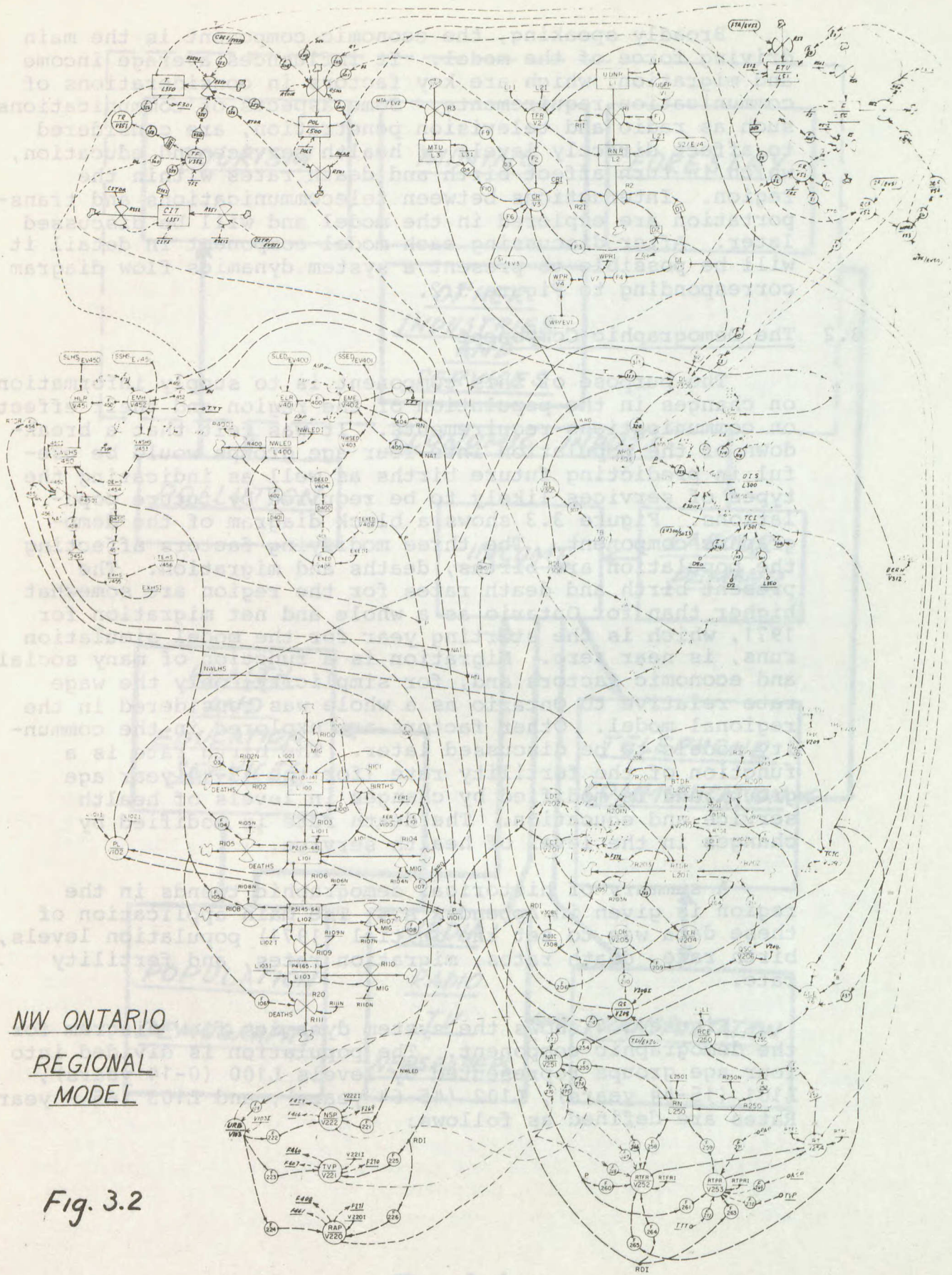


Fig. 3.2

Note: All the parts of this Figure are amplified in detailed in this Section.

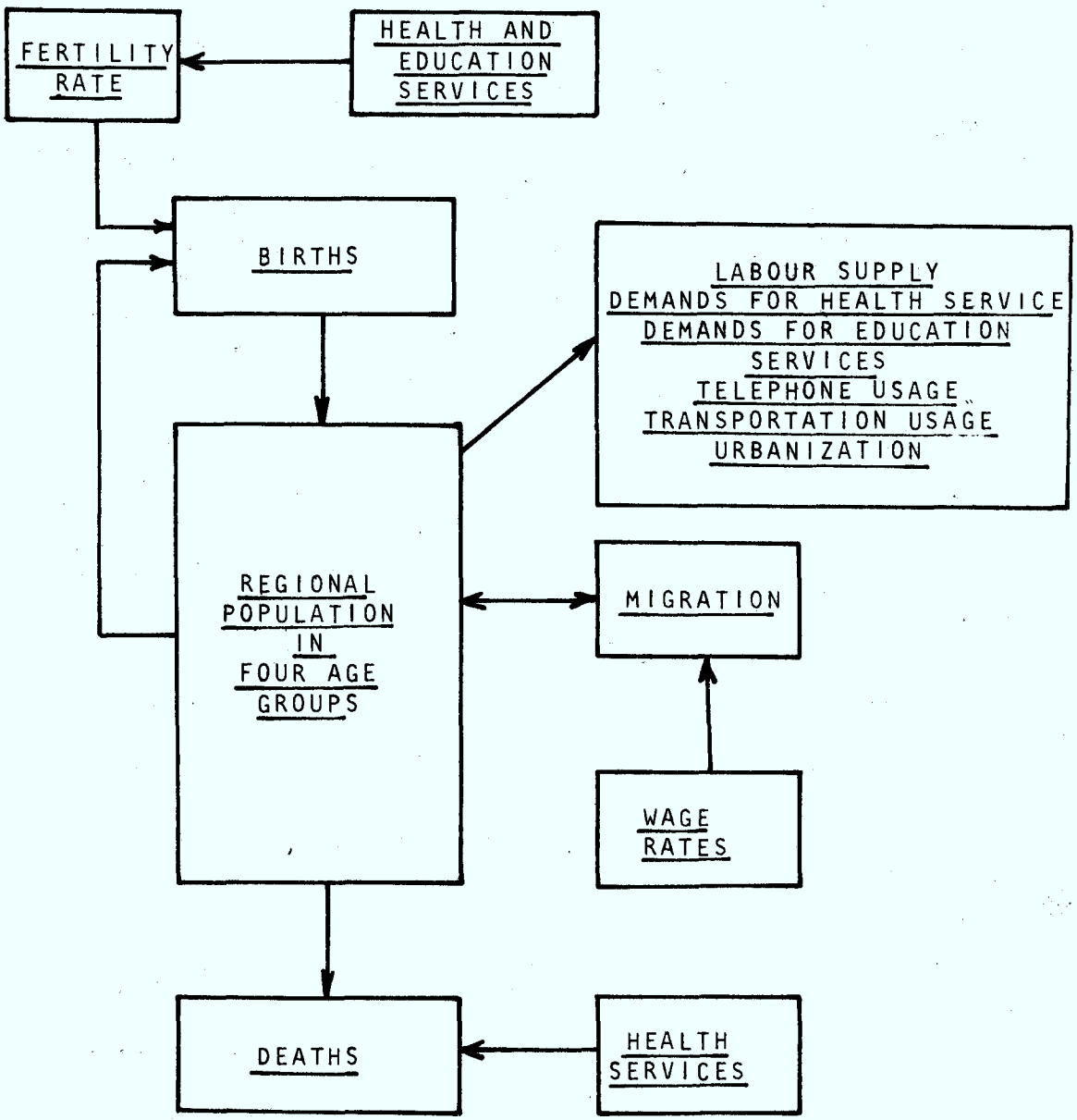

FERTILITY RATE
HEALTH AND EDUCATION SERVICES
BIRTHS
LABOUR SUPPLY
DEMANDS FOR HEALTH SERVICE
DEMANDS FOR EDUCATION SERVICES
TELEPHONE USAGE
TRANSPORTATION USAGE
URBANIZATION
REGIONAL POPULATION IN FOUR AGE GROUPS
MIGRATION
WAGE RATES
DEATHS
HEALTH SERVICES

Fig. 3.3

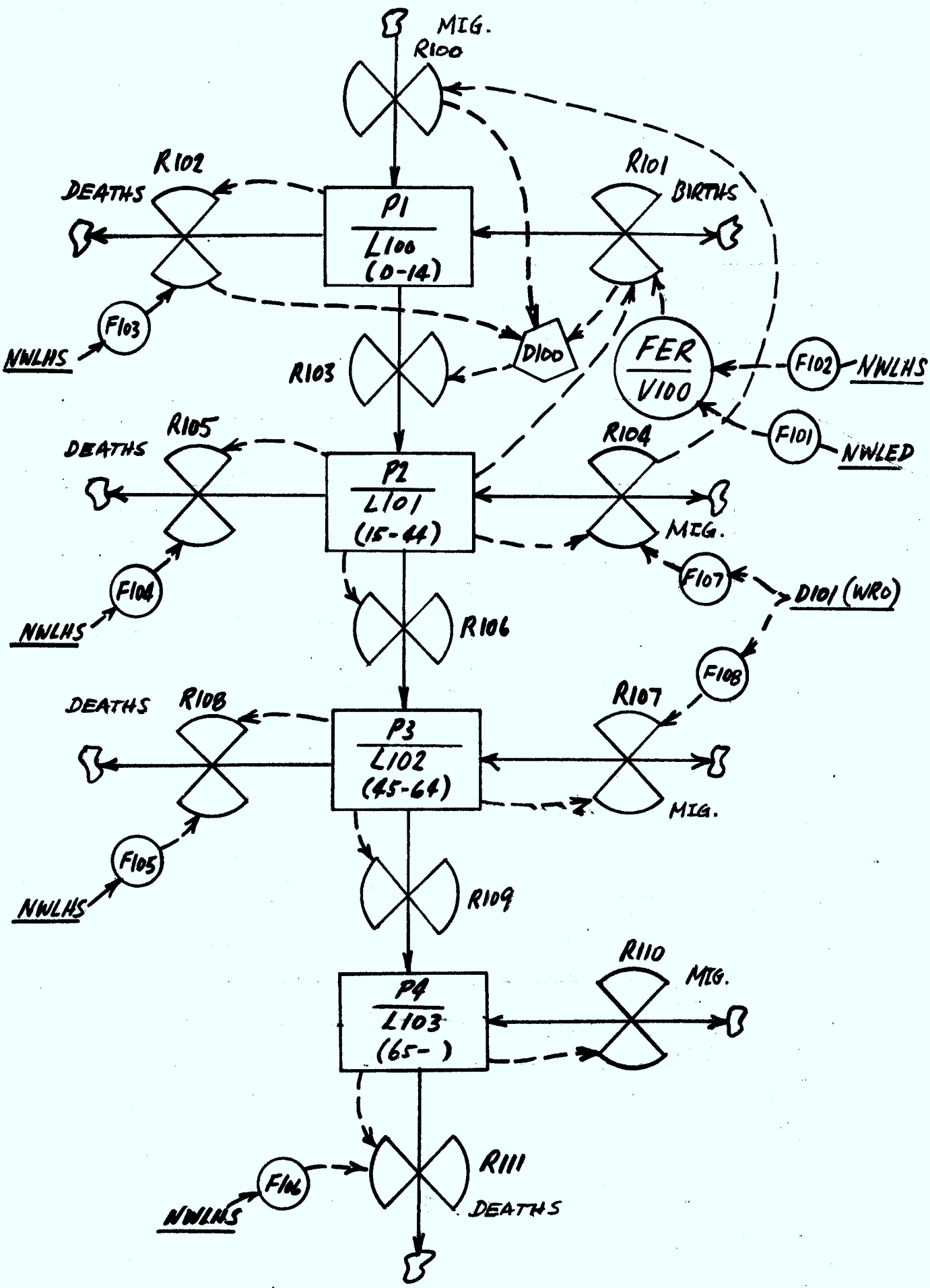

MIG.
R100
R102
DEATHS
R101
BIRTHS
P1
L100
(0-14)
F103
NWLHS
D100
FER
V100
F102
NWLHS
R103
F101
NWLED
R105
DEATHS
R104
P2
L101
(15-44)
MIG.
F104
NWLHS
F107
D101 (WRO)
R106
F108
DEATHS
R108
R107
P3
L102
(45-64)
MIG.
F105
NWLHS
R109
R110
MIG.
P4
L103
(65-)
R111
F106
NWLHS
DEATHS

Fig. 3.4

Birth Rate:	R101 = (V100) (L101)	(3.1)
Death rates:	R102 = (R102N) (F103) (L100)	(3.2)
	R105 = (R105N) (F104) (L101)	(3.3)
	R108 = (R108N) (F105) (L102)	(3.4)
	R111 = (R111N) (F106) (L103)	(3.5)
Migration rates:	R100 = R104	(3.6)
	R104 = (R104N) (F107) (L101)	(3.7)
	R107 = (R107N) (F108) (L102)	(3.8)
	R110 = (R110N) (L103)	(3.9)
Ageing rates:	R103 = R101 (t - 15)	(3.10)
	R106 = L101/30	(3.11)
	R109 = L102/20	(3.12)

The initial values for the rates and levels derived from census data (1971 is used as the base year) are as follows:

Fertility rate:	V100I = 0.0581 per individual (15-44 years) per year
Death rates:	R102N = 0.00808 per capita per year
	R105N = " " " " "
	R108N = " " " " "
	R111N = 0.20 (70 year life expectancy)
Population:	L100I = 74,900
	L101I = 93,800
	L102I = 43,500
	L103I = 17,500
Migration rates:	R104N = 1.0
	R107N = 1.0
	R110N =-0.05

The fertility rate (V100) is equal to 0.0581 initially and is modified by changing levels of health service (L450) and education (L400) through functions F102 and F101. As can be seen from the plot for F101 in Appendix A2, a maximum reduction in birth rate of 30% is assumed possible due to increasing education (20% if education level approaches that of southern Ontario in 1971). These figures were arrived at by comparing birth rates and education levels in northwest and southern Ontario allowing for some effect

of a differential in health services. Function F102 provides for a maximum of 20% reduction in birth rate due to improved family planning services and information distribution, which are reflected by the level of health services. It was felt that present levels of infant mortality in the region were sufficiently low to exclude the positive effect of improved health services on the birth rate. (The birth rate is the net rate of surviving babies and excludes infant mortality.) The fertility rate is then given by

$$V100 = (V100I)\ (F101)\ (F102) \qquad (3.13)$$

The death rates R102, R105, R108 and R111, are modified by changes in the level of health services (L450) through functions F103, F104, F105, and F106. These functions allow for 15%, 10%, 5% and 3%, reductions in death rates, respectively, for each of the four population groups as health services approach present (1971) southern Ontario levels.

The ageing rate between population levels L100 and L101 (the number of 15 year olds in any year) is a time delayed version of the birth rate with subsequent deaths and migration accounted for. The remaining ageing rates are approximated by assuming a uniform age distribution within groups L101 and L102 (see equations (3.11) and (3.12)).

The migration rates, R104 and R107, are taken to be functions of the average wage rate for the region (via a 5-year time lag). Functions F107 and F108 allow for a positive 7-1/2% migration for a doubling in wage rate (in terms of 1971 dollars). The migration rate for population level L100 (0-14 years) is taken to equal that for level L101 (15-44 years), with the assumption of a two-child average family size over the interval of the simulation runs. The migration rate for level L103 (65 years) is taken to be a constant negative 5%. (This figure is arbitrary but relatively unimportant as far as the remainder of the model is concerned).

3.3 Health and Education Components

A block diagram of the health services component is shown in Figure 3.5. "Level of health service" is measured in terms of the time required to obtain medical attention. Both proximity to hospitals and density of medical personnel were also considered as possible measures of health service but the time measure which was finally adopted has the advantage of allowing the effects of communications to be taken into account. Thus we can get closer to a measure of actual effective health service rather than merely to the potential service.

The level of health service can be changed in two ways. First, through demands expressed to the appropriate governments, expenditures may be made to raise the level of service. Second, improved transportation and telecommunications services can raise the level of health service without a direct expenditure. These two instruments of a rise in the level of service, increased expenditures, and increased communications services, can be seen in the block diagram. Demands for improved service arise from increased expectations brought about by a disparity between service in the region and that for southern Ontario. Expectations are further heightened by increased use of communications facilities since this is likely to reveal more clearly the existing disparity as well as aid the political process of making demands felt by government. The resulting increase in level of service due to increased expenditure is subject to a number of time delays both political and physical (construction time, etc.). The overall behaviour of this model component is slowly to bring the level of service in the region up to that for Ontario as a whole but allowing for the accelerating effect of communications.

The level of education is defined as the average years of formal education obtained by the regional population. It is thus assumed not to be affected directly by communications but only by rising expectations. The block diagram for the education component is shown in Figure 3.6. It is similar to that for health services without the direct effect of communications on level of education. Also, the time delays involved are greater since the measure of education is not directly related to the level of educational services. In other words, the total effect of a new high school in a northern community would not be felt in terms of average level of education for over ten years. Again, the characteristic behaviour of this component is to bring the regional level of education in line with the provincial level.

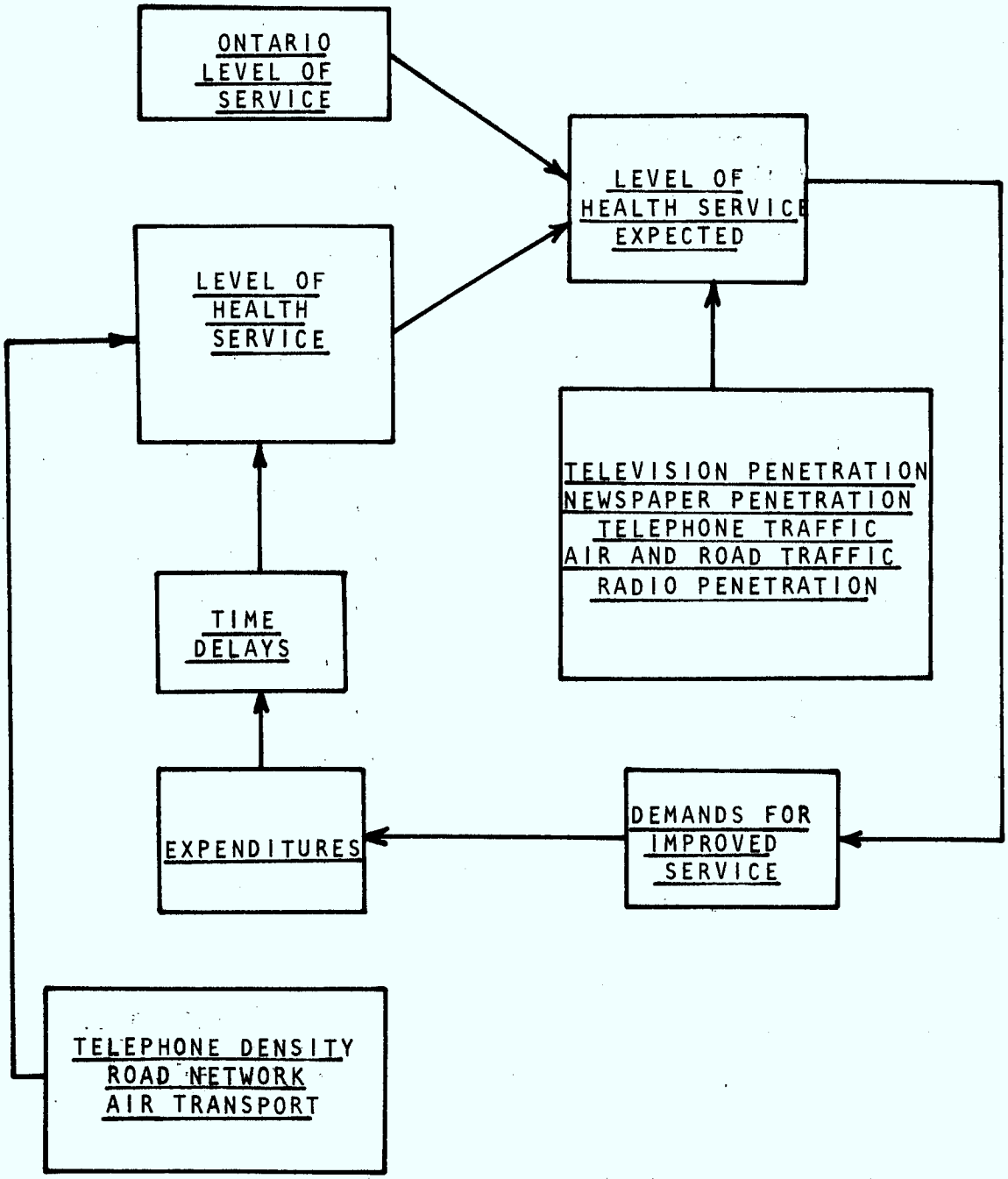

ONTARIO LEVEL OF SERVICE
LEVEL OF HEALTH SERVICE EXPECTED
LEVEL OF HEALTH SERVICE
TELEVISION PENETRATION
NEWSPAPER PENETRATION
TELEPHONE TRAFFIC
AIR AND ROAD TRAFFIC
RADIO PENETRATION
TIME DELAYS
EXPENDITURES
DEMANDS FOR IMPROVED SERVICE
TELEPHONE DENSITY
ROAD NETWORK
AIR TRANSPORT

Fig. 3.5

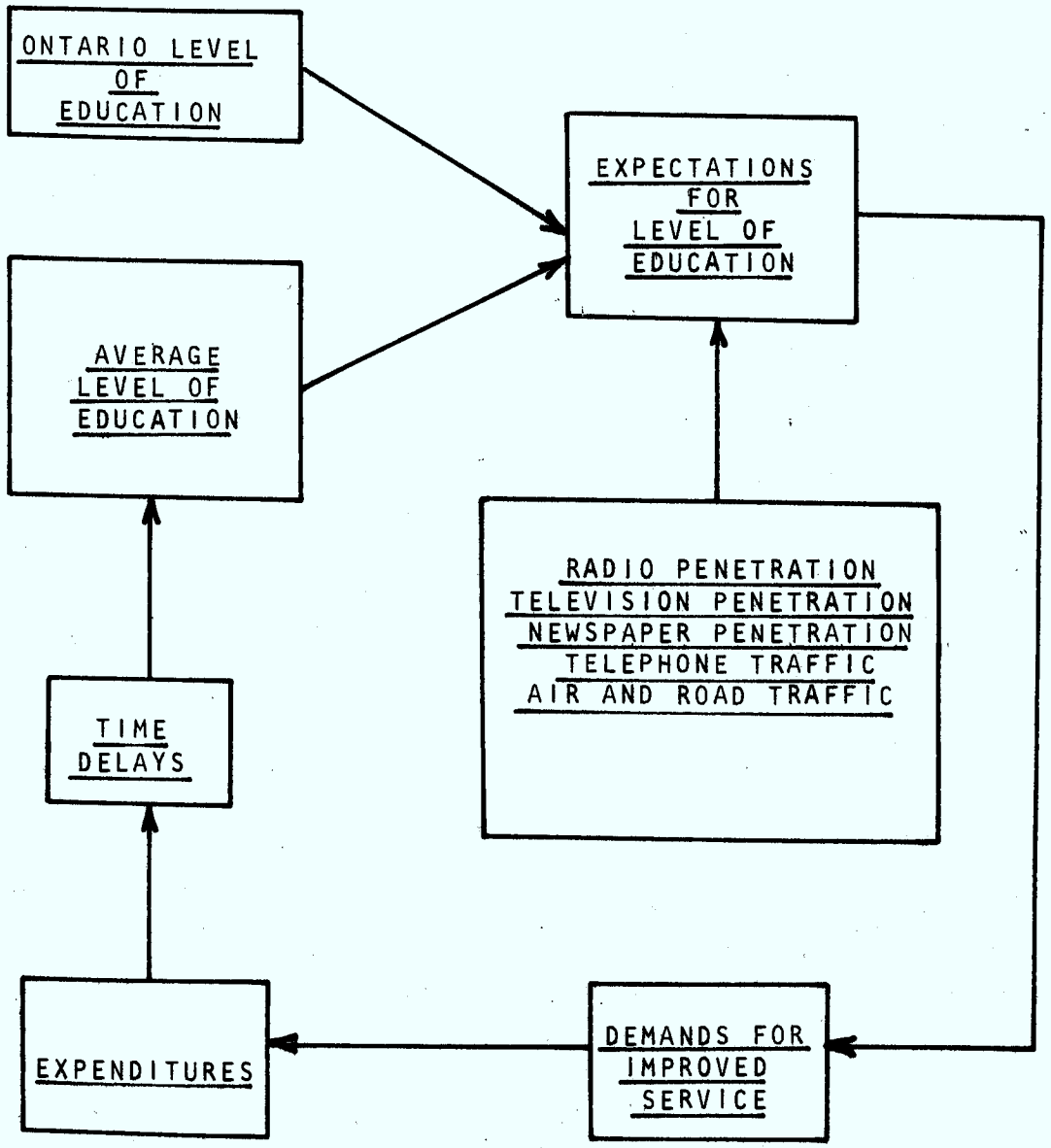

ONTARIO LEVEL OF EDUCATION
AVERAGE LEVEL OF EDUCATION
EXPECTATIONS FOR LEVEL OF EDUCATION
RADIO PENETRATION
TELEVISION PENETRATION
NEWSPAPER PENETRATION
TELEPHONE TRAFFIC
AIR AND ROAD TRAFFIC
TIME DELAYS
EXPENDITURES
DEMANDS FOR IMPROVED SERVICE

Fig. 3.6

A flow diagram for the health services component is shown in Figure 3.7. The level representing the state of health services in the region is L450 which is measured by the ratio:

$$\frac{\text{Average time required to receive urgent medical service in southern Ontario}}{\text{Average time required to receive same service in northwest Ontario in 1971}}$$

where the time required in southern Ontario is normalized to unity in 1971. The initial value for L450 was estimated to be 0.4. (No data were available to support this figure; it is based on the experience of the team regarding health services in northern regions.)

To allow for future (estimated) changes in the southern level, exogenous variable EV450 is included and has a 1971 value of 1.0. The ratio between the regional and southern levels is given by

$$V451 = L450/EV450 \qquad (3.14)$$

Since it was felt that communications is likely to affect expectations for service as much as the level of service itself, an expectation multiplier for health services (EMH) is defined by

$$V452 = (V452I)(F450)(F451)(F452)(F459)(F460)(F461)(F462) \qquad (3.15)$$

The function F450 defines the role of the existing level of health service in generating expectations. For an initial level of 0.4, F450 gives an expectation of 0.8 of the southern level. Thus, since the level is so much lower than for the south, expectations (or what is desired) are somewhat less than the southern level. The remaining function modifiers in equation (3.15) include the effects of changes in available air (F451) and road (F452) transport, newspaper (F459), television (F460), and radio (F461) penetration, and total telephone traffic (F462), on the expectations for improved services. As can be seen from the function plots, it is assumed that increased communications results in an increase in information concerning the level of service possible (namely, in southern Ontario) and hence increases expectations. The expectation multiplier (V452) is not allowed to become greater than unity.

Normally, the expected standard for regional health

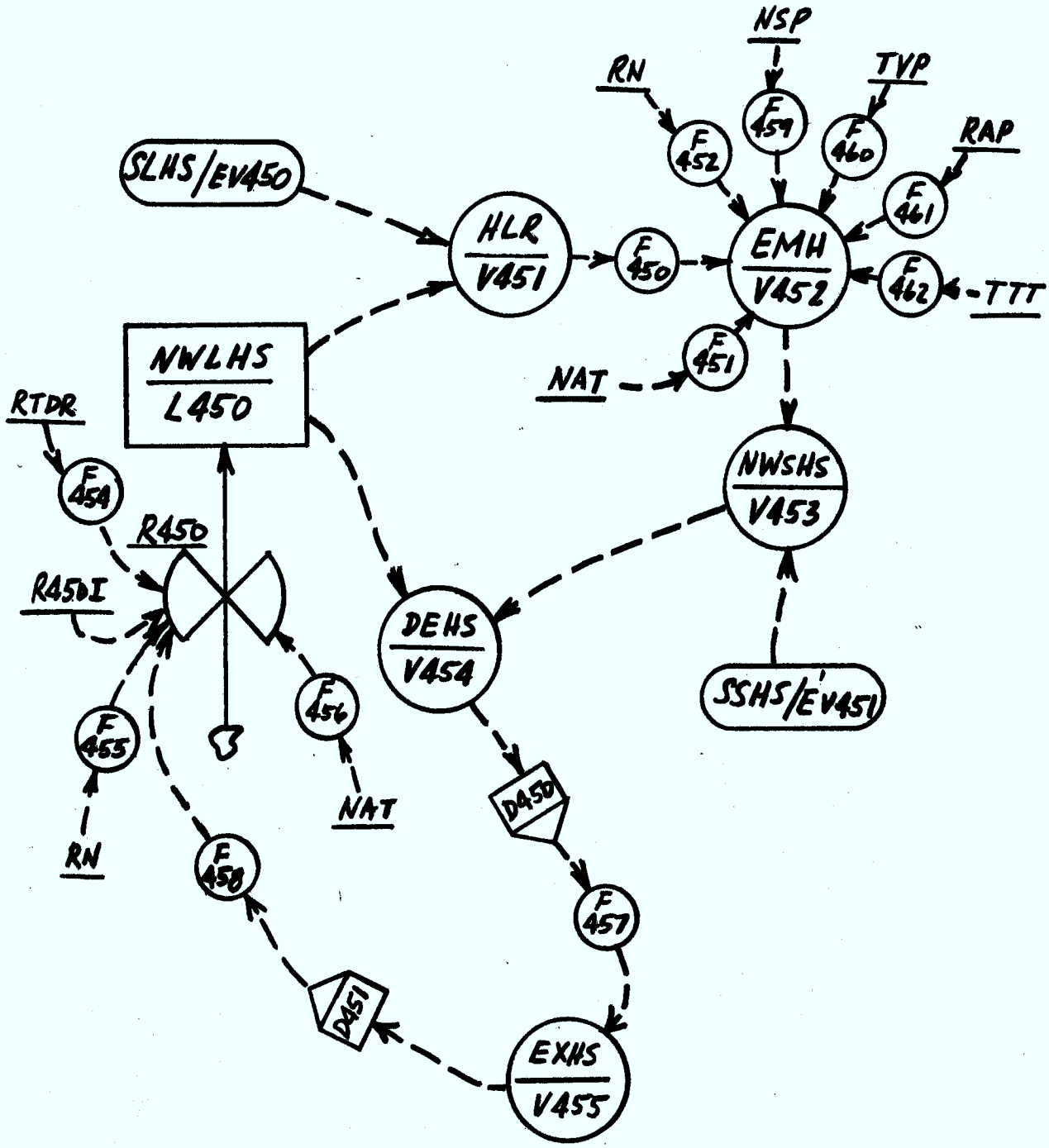

NSP
RN
TVP
RAP
F 459
F 452
F 460
F 461
SLHS/EV450
HLR
V451
F 450
EMH
V452
F 462
-TTT
NWLHS
L450
NAT
F 451
RTDR
F 454
NWSHS
V453
R450
R450I
DEHS
V454
SSHS/EV451
F 455
F 456
NAT
D450
RN
F 458
F 457
D451
EXHS
V455

Fig. 3.7

service (V453) is set equal to the expectation multiplier (V452). To allow for external changes in expectations (in the remainder of Ontario), the exogenous variable EV451 was added which multiplies V453. In all simulation runs to be discussed in this report, EV451 = 1.0 hence V453 = V452. The variable describing the regional "demand" for improved services is defined by

$$V454 = L450/V453 \qquad (3.16)$$

As discussed previously, an attempt was made to model the political process of relating demand for improved health service to increased expenditure by governments and then to an actual realized improvement in service. The nominal (1971) rate of increase in health services (R450) was taken to be 2% per year. As expenditures on health services (V455) increase, due to increased demand, the rate R450 is increased through function F458. Time lag D450 (4 years) models the political lag of turning demands into increased expenditures and lag D451 (4 years) models the physical process of turning expenditures into real improvements in services. Function F458 models the diminishing return of expenditures on improved service and function F457 models the receptiveness of government to varying degrees of demand.

The rate of increase in health services is also modified by available communications and transportation services (F454, F455 and F456). It should be noted that health service expenditures (V455) do not include expenditures on transportation or telecommunications services which are provided primarily for other purposes. Rate R450 is then given by

$$R450 = (R450I)(F458)(F454)(F455)(F456) \qquad (3.17)$$

The flow diagram for the education component is shown in Figure 3.8. As was the case for the block diagram, this figure is very similar to that for health services. Based on census data, the initial (1971) level of education was taken to be 0.8 relative to the southern Ontario level. The time lag D401 is 10 years which reflects the time taken for new educational facilities to have an impact on the average level of education.

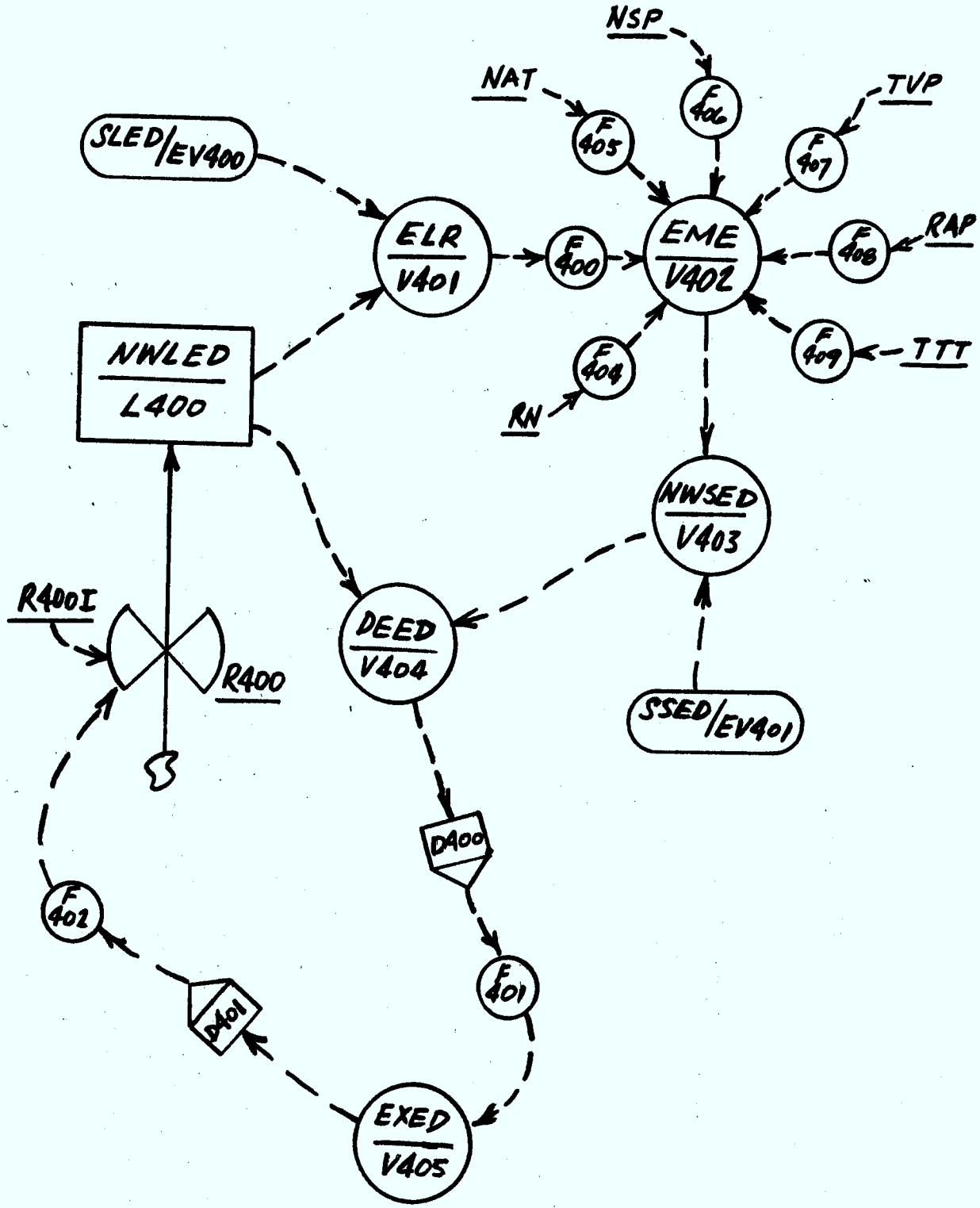

NSP
NAT
TVP
SLED/EV400
F406
F405
F407
ELR
V401
F400
EME
V402
F408
RAP
NWLED
L400
F404
F409
TTT
RN
NWSED
V403
R400I
DEED
V404
R400
SSED/EV401
DA00
F402
F401
EX01
EXED
V405

Fig. 3.8

3.4 Economic Component

3.4.1 Employment, Investment and Income

As described earlier, four classes of economic activity are included in the economic component: mining, forestry, tourism, and other industries and services (those retail, industrial, governmental, and other activities not directly included in the other three classes). While this classification is admittedly coarse, it does reflect the simplicity of the regional economy and its dependence on world demand for resources. During the modelling process, it became evident that economic development (specifically, resource development) influenced telecommunications and transportation development but in few instances did the latter independently precede the former. Thus the goal in modelling the economy was to provide measures of capital investment activity, disposable income and population migration. These measures were then related to telecommunications and transportation development. Thus the economic model may seem to lack the detail and rigour of, say, an econometric model; however its purpose is only to provide the necessary links to the outside world and to the remainder of the model. The block diagram of Figure 3.9 shows the outputs from the four areas of economic activity which are used to generate income and investment measures as well as to control the migration flow. The corresponding flow diagram is shown in Figure 3.10. First, consider the demand for labour (V300), which is a function of the mineral resource production rate (D2), the mining technology utilized (L3), the forest products production rate (D50), the forestry technology utilized (L51), the annual tourist-days spent in the region (L350) and the investment in other industries and services (L300). The slopes of the functions F312, F53, F357 and F324 indicate the relative degree of labour intensity exhibited by each economic area based on 1971 employment statistics. Since the labour intensity of both the mining and forestry industries is dependent on changes in mining, harvesting and processing technolgies, the labour demand is further modified by functions F317 (mining technology) and F60 (forestry technology), which allow for labour requirements to be reduced by a maximum of 70%-80% for large increases in technology. Labour demand is then given by

$$V300 = (F312)(F53)(F357)(F324)(F317)(F60) \qquad (3.18)$$

Labour supply is a function (F302) of the potential labour force (V102). This function has a slope greater

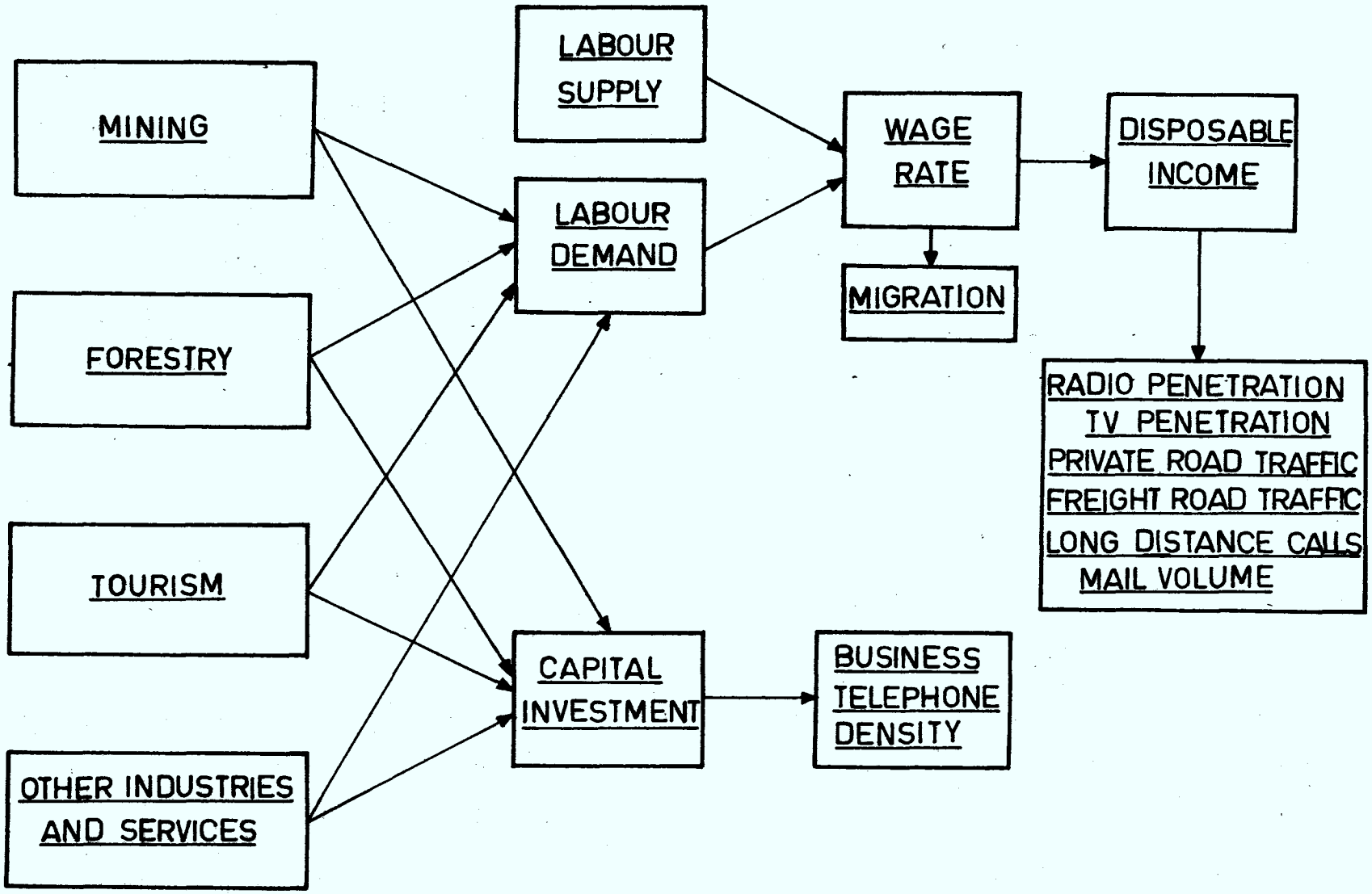

MINING
FORESTRY
TOURISM
OTHER INDUSTRIES AND SERVICES
LABOUR SUPPLY
LABOUR DEMAND
CAPITAL INVESTMENT
WAGE RATE
MIGRATION
DISPOSABLE INCOME
RADIO PENETRATION
TV PENETRATION
PRIVATE ROAD TRAFFIC
FREIGHT ROAD TRAFFIC
LONG DISTANCE CALLS
MAIL VOLUME
BUSINESS TELEPHONE DENSITY

Fig. 3.9

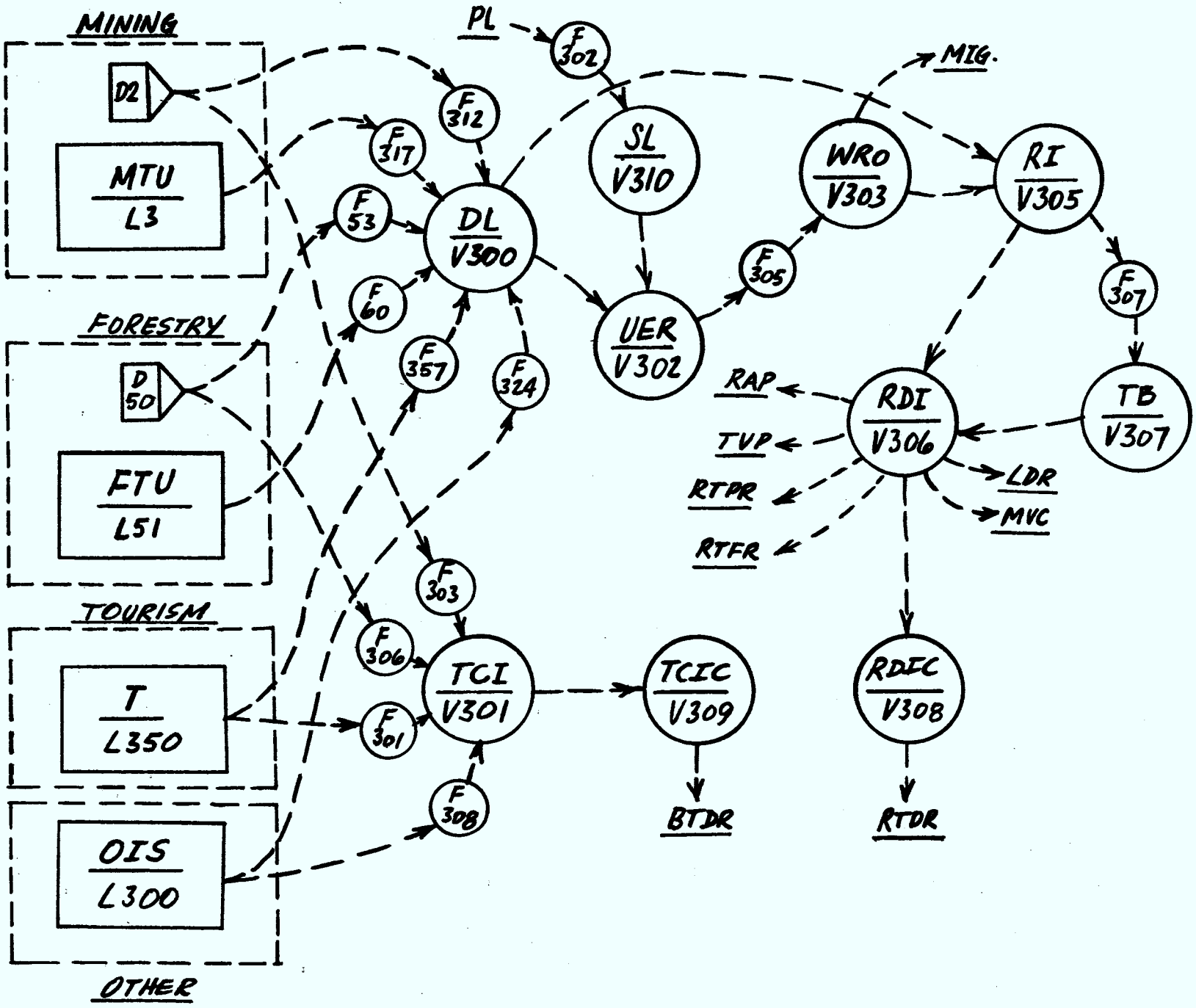

MINING
D2
MTU
L3
FORESTRY
D
50
FTU
L51
TOURISM
T
L350
OIS
L300
OTHER
PL
F 302
F 312
F 317
F 53
F 60
F 357
F 324
F 303
F 306
F 301
F 308
DL
V300
SL
V310
UER
V302
F 305
WRO
V303
MIG.
RI
V305
F 307
TB
V307
RDI
V306
RAP
TVP
RTPR
RTFR
LDR
MVC
TCI
V301
TCIC
V309
BTDR
RDIC
V308
RTDR

Fig. 3.10

than unity for a large potential labour force, which reflects the likely increase in unmarried workers attracted to the region when the labour demand is high. The unemployment ratio is given by

$$V302 = \frac{V300}{V310} = \frac{\text{labour demand}}{\text{labour supply}} \qquad (3.19)$$

The wage rate offered is modified by the unemployment ratio through function F305. For a 10% labour surplus, average wages are reduced by about 15% and for a 10% labour shortage, wages are increased by about 60%. Actually, the migration flow reacts quickly to labour shortages and large (i.e. greater than a few percent) shortages never occur. All dollar values, such as wage rates, are deinflated to 1971 values.

Since it is assumed that labour shortages are small, the regional income is set equal to the product of labour demand and wage rate; the disposable income is this value less taxes (V307). Regional disposable income (V306) is used as a measure of spending on personal communication and transportation services. Thus V306 modifies radio penetration (V220), television penetration (V221), long distance telephone calling rate (V205), mail volume per capita (V240), road traffic for private transport (V253), and road traffic for freight transport (V252). The actual density of residential telephones (L201) is a function of changes in disposable income (V308).

Total capital investment in the region (V301), which is closely related to total regional income, is a function of the four economic activity areas (functions F301, F303, F306 and F308). Changes in the level of investment (V309) are used as a measure of changes in business telephone density (L200).

3.4.2 Mining Sector

We are now ready to examine the four economic sectors individually. Figure 3.11 shows a block diagram for the mineral resource production sector. In order to emphasize both the discovery and production aspects of mineral resource development, the total potential aggregated mineral pool for the region is divided between proven (1971) resources and undiscovered (estimated) resources. Units of measurement for mineral resources are arbitrary and are set by the relative values of the undiscovered resource pool, the discovery rate, the proven resource pool, and the production rate in the base year, 1971.

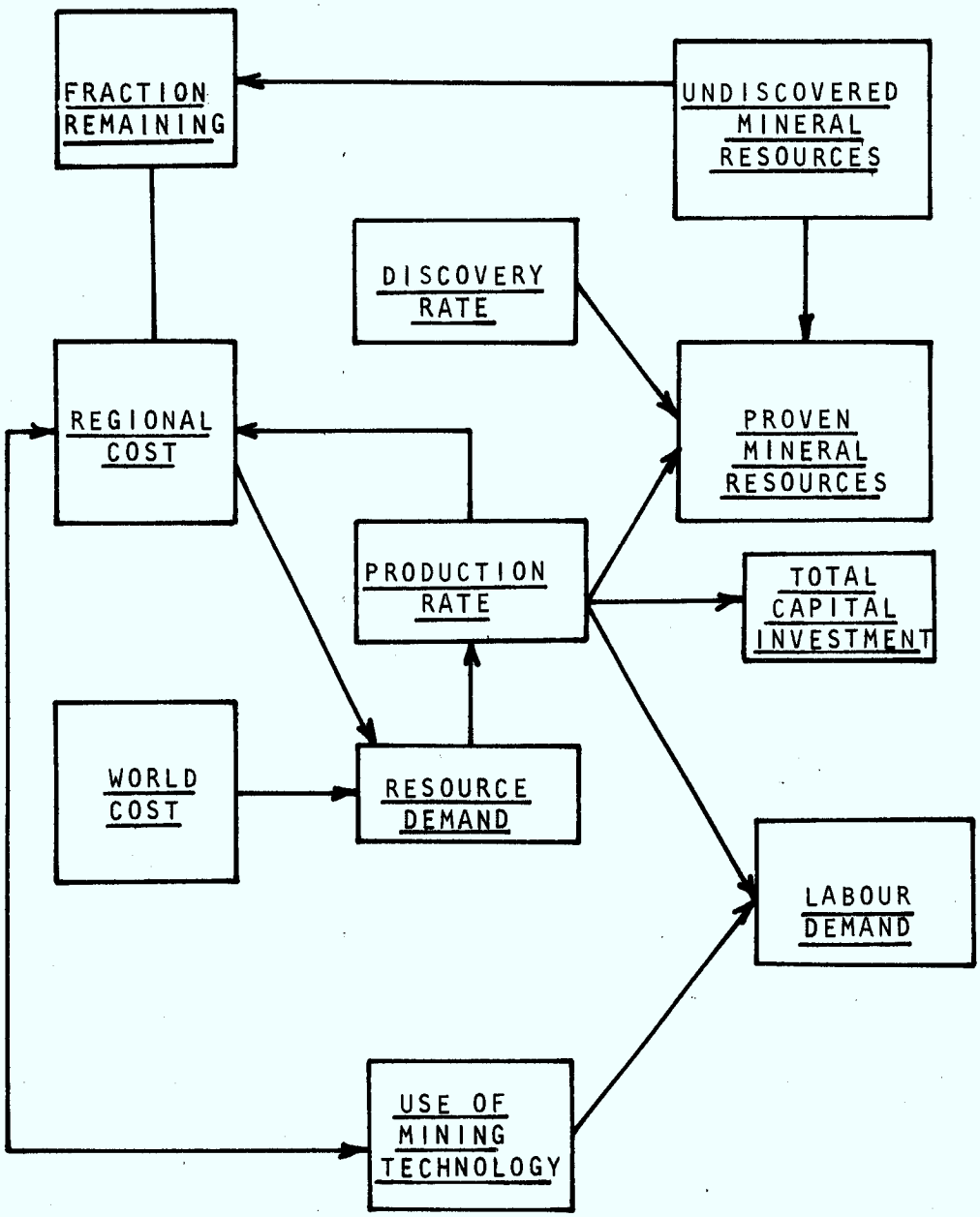

FRACTION REMAINING
UNDISCOVERED MINERAL RESOURCES
DISCOVERY RATE
REGIONAL COST
PROVEN MINERAL RESOURCES
PRODUCTION RATE
TOTAL CAPITAL INVESTMENT
WORLD COST
RESOURCE DEMAND
LABOUR DEMAND
USE OF MINING TECHNOLOGY

Fig. 3.11

The demand for regional mineral resources is modelled as a function of the ratio of world price and regional production cost. The world price for mineral resources is treated as an exogenous variable which can be estimated or generated by other models. Regional production cost is also affected by the production rate (reflecting long-run economy of scale), by the fraction of resources remaining (reflecting ore quality), and by the use of technology (reflecting the desire to increase productivity in the face of rising costs). The annual production rate is used as a measure of the contribution of the mineral resource sector to the overall regional capital investment and demand for labour.

The flow diagrams for the mining sector are shown in Figures 3.12 and 3.13. Figure 3.12 deals with the actual resource pool, production costs and world demand while Figure 3.13 deals with the effects of rising costs on the use of technology. In Figure 3.12 the undiscovered resource pool is represented by level L1 and proven regional resources by L2. The discovery rate, R1, is modified by the fraction of undiscovered resources remaining (relative to the 1971 level), V1, and subsidies (or government policies which have an effect on exploration) modelled by exogenous variable EV4. Thus,

$$R1 = (R1I)(F1)(EV4) \qquad (3.20)$$

The ratio of regional production cost, V3, to world price for resources, EV1, is given by V4. In order to reflect a profitable position for resource development in the base year, the initial production cost was set equal to 0.9 of the world price. Demand for resources, V5, is then a function of the normalized world price ratio, V7. The actual production rate, R2, is assumed equal to the demand, with production lags modelled by time lag D1 (5years). Function F3 relates the production rate to regional cost, assuming some economy of scale. Sudden annual changes in the production rate are smoothed by time lag D2 (2 years). The contribution of the mining sector to the regional demand for labour, V300, is given as a function (F312) of the smoothed production rate, D2.

It is useful to consider some data relevant to functions F2 and F3. These data concern the Cochenour-Willans gold mine in the Red Lake gold field in north-western Ontario, which was in operation for many years until around 1970.

Figure 3.14(a) shows the mine's production cost per ounce plotted against the fraction remaining (assuming

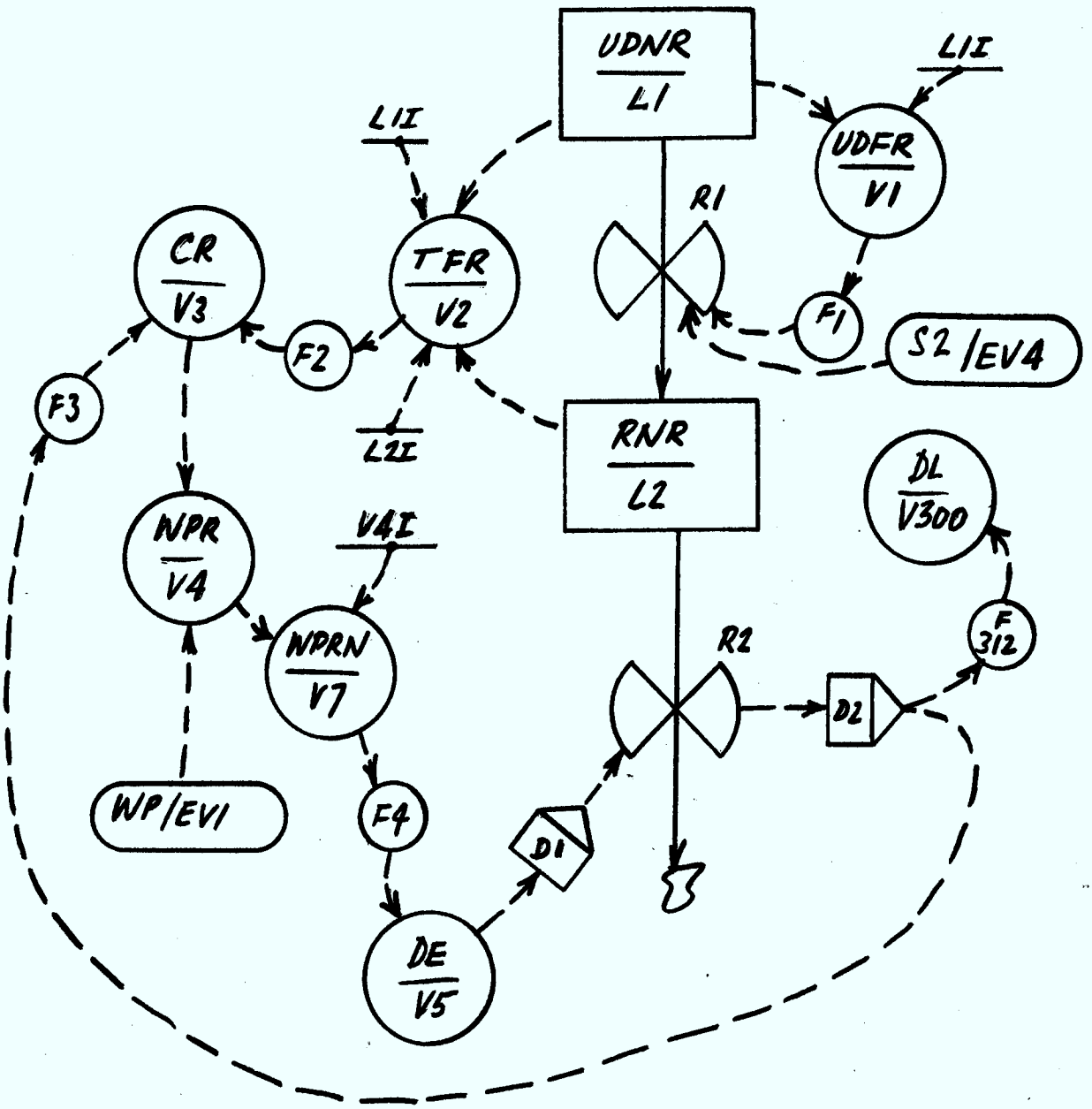

UDNR
L1
LII
UDFR
V1
LII
TFR
V2
R1
CR
V3
F1
S2/EV4
F2
F3
L2I
RNR
L2
DL
V300
NPR
V4
V4I
F
312
NPRN
V7
R2
D2
WP/EV1
F4
D1
DE
V5

Fig. 3.12

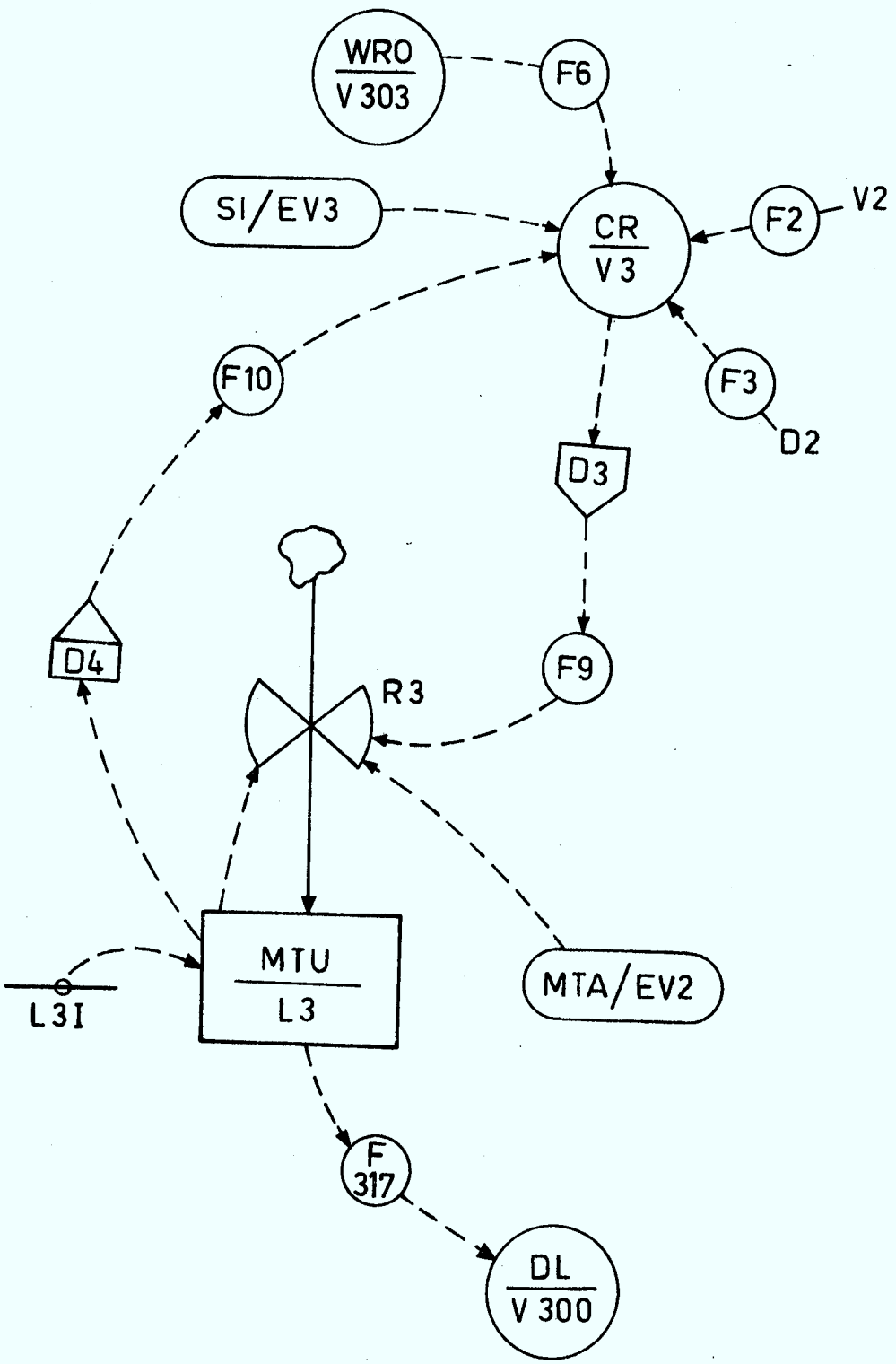

WRO
V 303
F6
SI/EV3
CR
V 3
F2
V2
F10
F3
D2
D3
D4
F9
R3
MTU
L 3
L3I
MTA/EV2
F
317
DL
V 300

Fig. 3.13

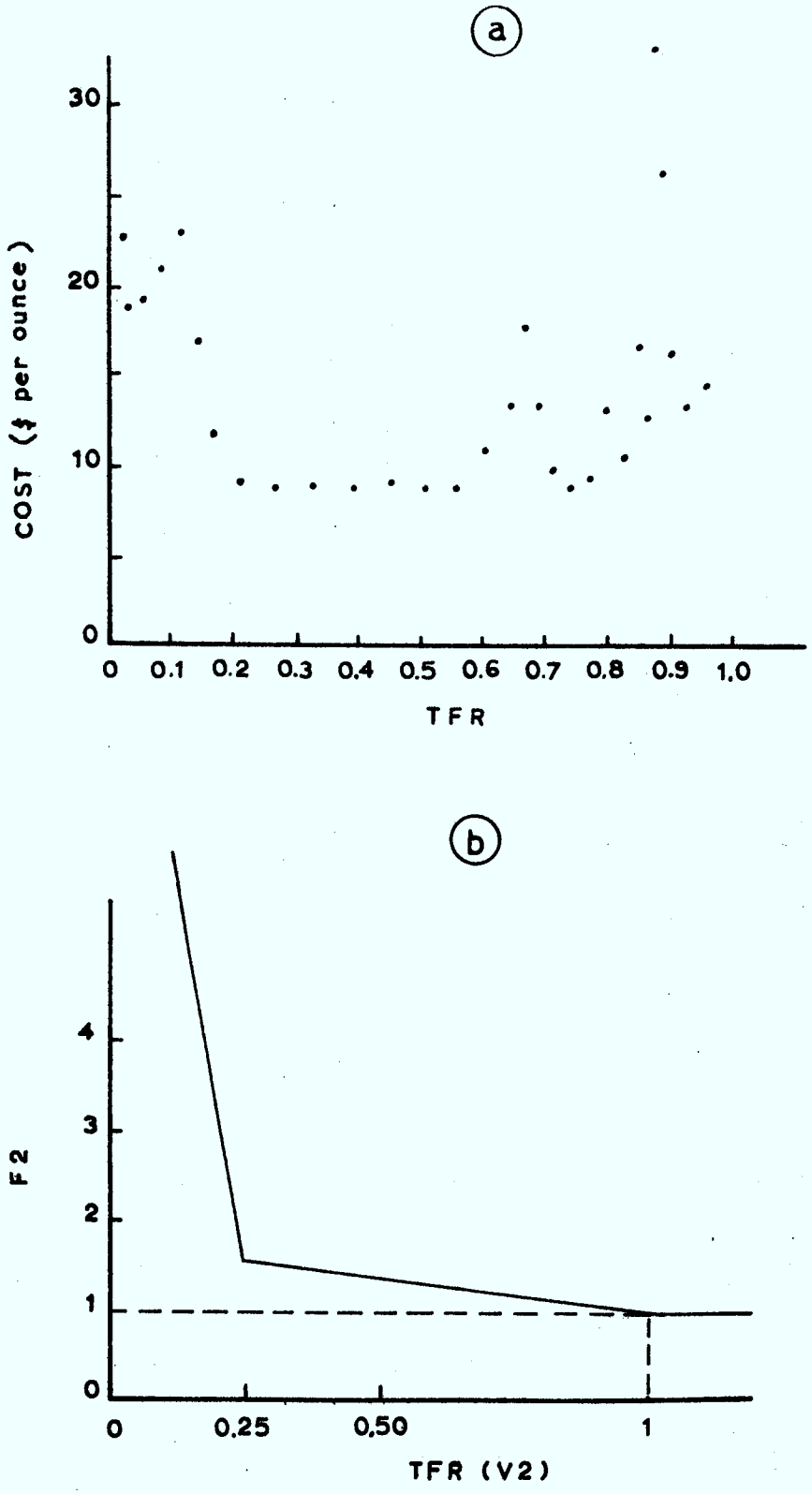

a
30
20
10
0
COST ($ per ounce)
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
TFR
b
4
3
2
1
0
F2
0 0.25 0.50 1
TFR (V2)

Fig. 3.14

complete exhaustion of the ore when the operation closed down). This figure illustrates some of the difficulties in using data in parameter identification. Clearly, the reduction in ore quality is not the sole factor resulting in increased production costs. This fact is recognized in the model (see Figures 3.12 and 3.13). Further, the use of data from a single mine to derive relationships pertaining to regional aggregate mineral depletion is questionable. Nevertheless, the plot of Figure 3.14(a) does show a sudden increase in production cost when the fraction remaining drops below 0.2. This increase is assumed to be largely a function of resource depletion but reduced production rates, increased labour costs, etc. could also contribute. The high costs experienced in the early years of production are not associated with resource depletion and so need not be considered here. Figure 3.14(b) shows function F2 based on the data of Figure 3.14(a). The important characteristic is the sudden rise in cost once depletion reaches a critical level, assumed here to be 0.25.

Figure 3.15(a) shows the mine's production cost plotted against production rate over the life of the mine. Any statistical analysis of these data would not produce a significant result despite the apparent rise in cost for low production rates. However, the function F3 shown in Figure 3.15(b) seems reasonable for the region as a whole given the fixed capital costs of equipment and transportation facilities required in isolated regions.

An important factor in combating rising production costs due to resource depletion is the application of mining technology to increase productivity. Figure 3.13 shows how technology is incorporated into the production cost, V3. Without any change in productivity due to technology, the cost is a fraction of the production rate, D2, the total fraction remaining, V2, the wage rate, V303 and any subsidies to the mining industry modelled by EV3. Level L3 models the fraction of the potential technology which is being used in the region. This fraction is initially assumed to be 0.8 of the mining technology available (modelled by exogenous variable EV2). The relationship between L3 and realizable reductions in cost due to increased productivity offered by technology is given by F10 and time lag D4 (2years). Function F10 attempts to reflect the increasing cost of technology required to achieve similar cost reductions as resource depletion occurs. Function F9 relates the propensity to use available technology as a function of cost increase. Delay D3 is a 5 year transport delay representing decision and acquisition time for the application of new

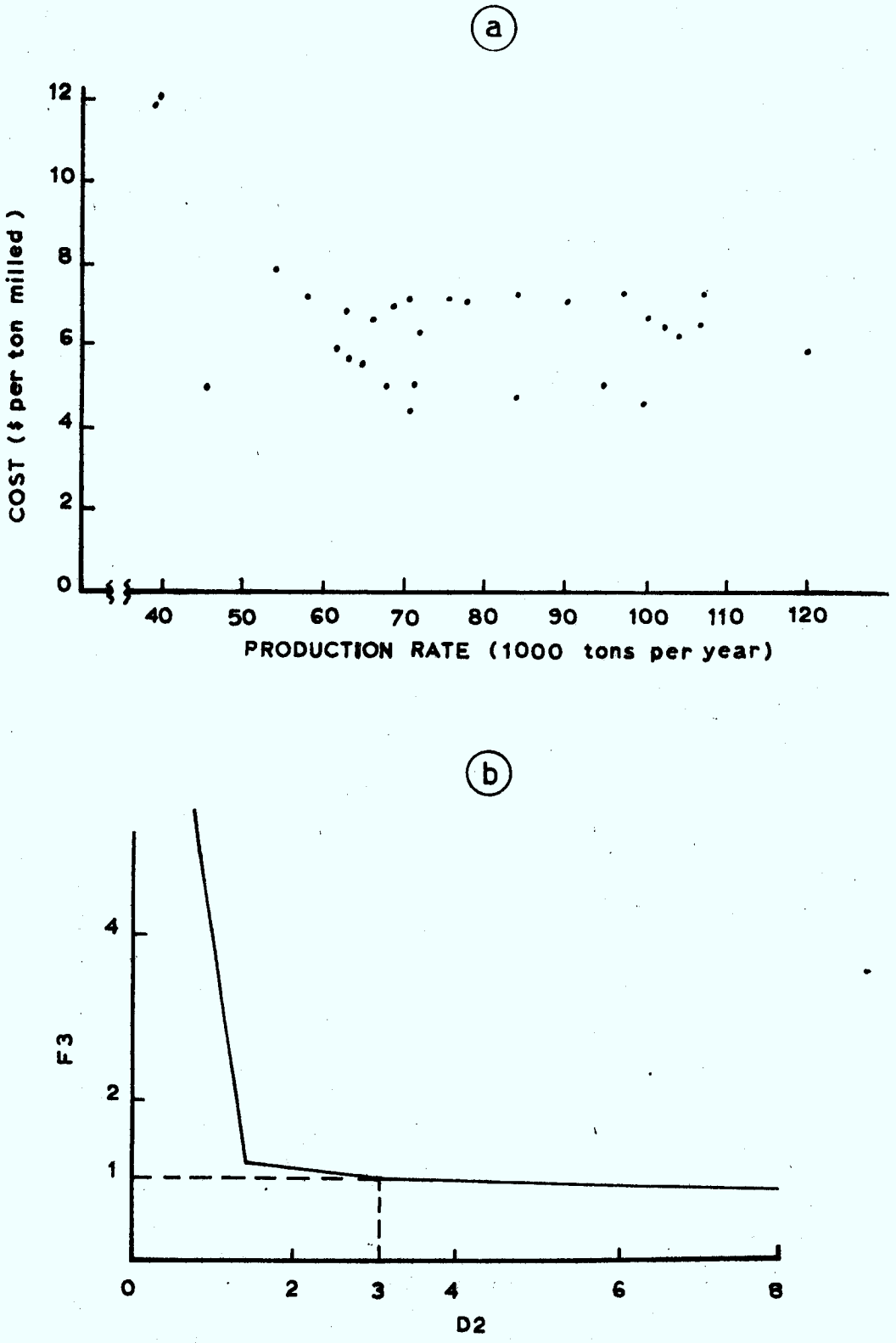

a
12
10
8
6
4
2
0
COST ($ per ton milled)
40
50
60
70
80
90
100
110
120
PRODUCTION RATE (1000 tons per year)
b
4
2
1
F3
0
2
3
4
6
8
D2

Fig. 3.15

technology. Thus the rate of increase in L3 is given by

$$R3 = (F9)(EV2-L3) \qquad (3.21)$$

The reduction in labour resulting from increased use of technology is described by function F317. It should be noted that for the moderate time span (30 years) used in the simulation runs to be discussed later, resource depletion (and hence mining technology) does not play a major role in affecting production costs.

3.4.3. Forestry

Timber resources are modelled in a similar manner to mineral resources as is evident from the block diagram of Figure 3.16. The principal differences lie in the renewable nature of the regional forest resources. Thus the potential timber resource (biomass) is reduced by fire loss (including with it natural decay) and harvesting but increased by natural and artificial reseeding and growth. As in the case of mineral resources, demand is a function of the regional production cost relative to the world price. Use of technology in the forestry industry is modelled in a similar manner to that of mining technology. The harvest rate is used as a measure of the industry's contribution to regional capital investment and labour demand.

The flow diagram for this sector is shown in Figure 3.17. The two levels are the biomass of forest standing at any time (L50), and the fraction of available harvesting/production technology used in the region (L51). The rates associated with L50 are the seeding/growth rate, R50, the fire loss and decay rate, R51, and the harvest rate, R52. The seeding/growth rate includes natural seeding as well as reforestation. The latter is assumed to be dependent on the apparent depletion of the standing biomass. The seeding/growth rate is given by

$$R50 = R50I + (1.05 - L50) \qquad (3.22)$$

where the natural seeding/growth rate is given by R50I = 0.04 and the reforestation/growth rate is given by 1.05 - L50 (= 0.05 in 1971). Thus, in the base year, the natural growth of the forest biomass (assuming no loss) is 9%. This figure is based on the experience of the team's ecologists; no data were available directly to derive such a parameter for the region.

The loss rate, R51, is comprised of losses due to fire, losses due to natural decay, and losses attributable to environmental alteration (pollution). The fire

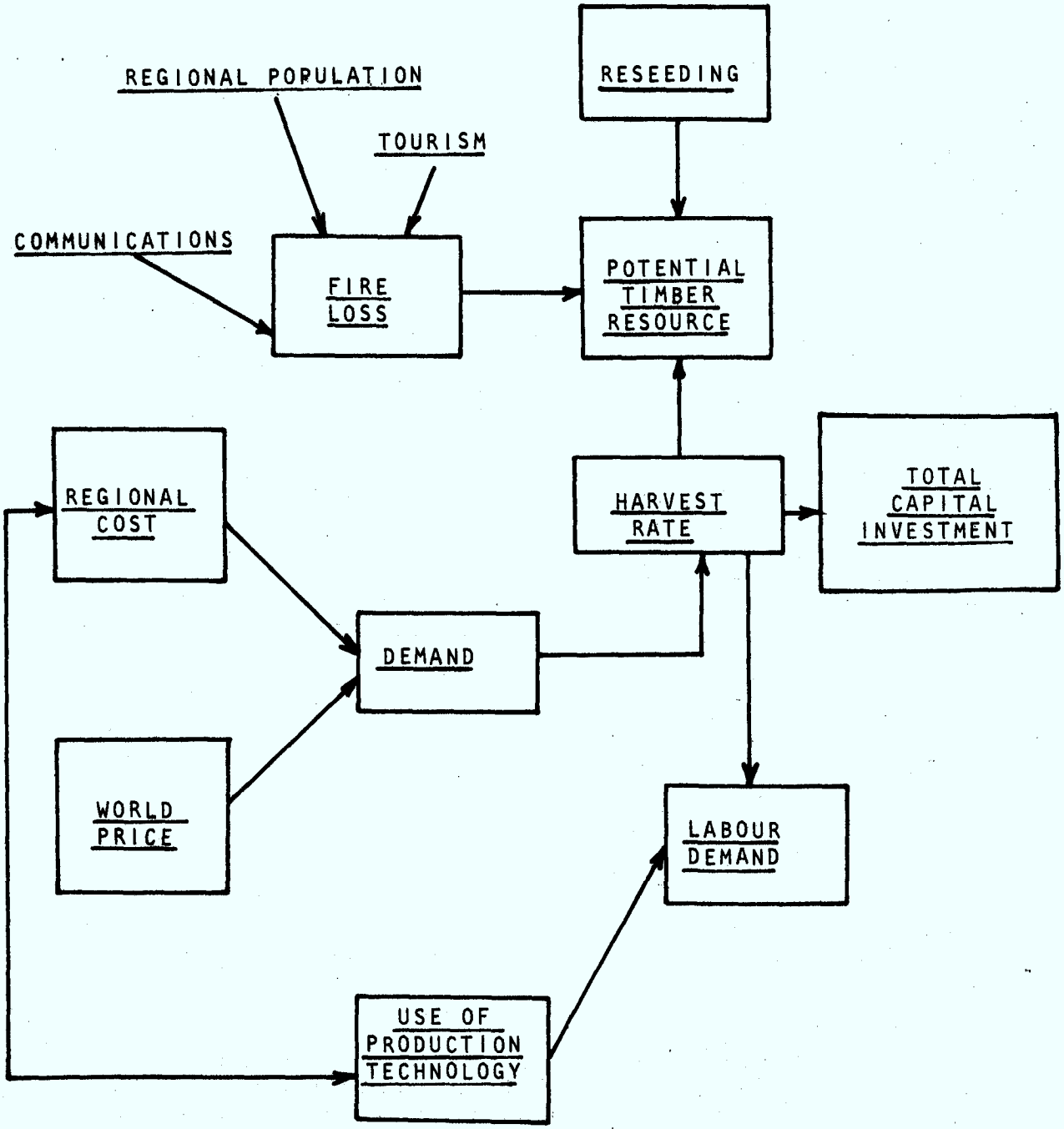

REGIONAL POPULATION
TOURISM
COMMUNICATIONS
FIRE LOSS
RESEEDING
POTENTIAL TIMBER RESOURCE
REGIONAL COST
HARVEST RATE
TOTAL CAPITAL INVESTMENT
DEMAND
WORLD PRICE
LABOUR DEMAND
USE OF PRODUCTION TECHNOLOGY

Fig. 3.16

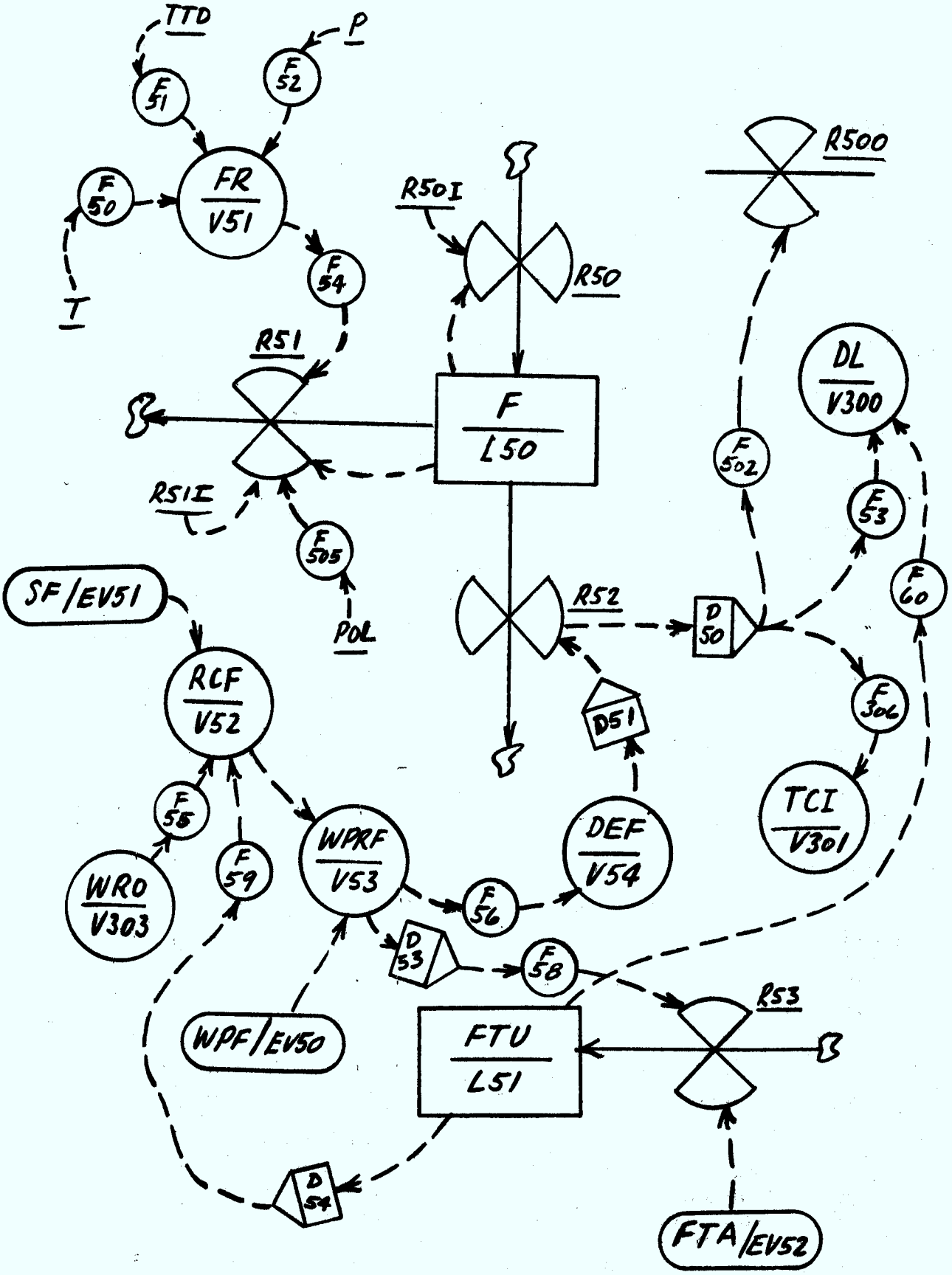

TTD
P
F51
F52
FR
V51
F50
T
F54
R50I
R50
R500
R51
F
L50
DL
V300
F502
F53
R51I
F505
POL
SF/EV51
R52
D50
F60
RCF
V52
D51
F306
F55
TCI
V301
WR0
V303
F59
WPRF
V53
DEF
V54
F56
D53
F58
WPF/EV50
FTU
L51
R53
D54
FTA/EV52

Fig. 3.17

rate (relative occurrence of forest fires) is affected by tourist-days spent in the region (L350), the regional population (V101) and the total telephone density for the region (V200). Thus naturally occurring fires are treated as a constant, which is increased by increasing human contact with the forests and reduced as a function of available communications in the region (as measured by V200). Thus R51 is given by

$$R51 = (R51I)(F505)(F54) \qquad (3.23)$$

where R51 = R51I = 0.1% in 1971

The harvest rate, R52, is a lagged version (D51 - 5 years) of the demand for regional forest products, V54. The production cost per unit of forest product (e.g. wood pulp), V52, is a function of the wage rate, V303, the degree to which technology is employed, L51, and a number of exogenous factors grouped together as a subsidy to forestry, EV51. The latter need not be a direct subsidy and in fact can be negative in its effect on cost. As in the case of mining, the demand for regional forest products is a function of the ratio of world price to regional cost (V53). This ratio is also used as a measure of the industry's propensity to increase the use of technology to reduce costs (increase productivity).

A smoothed version of the harvest rate (D50) is used as a measure of the industry's contribution to labour demand and to capital investment in the region, in much the same way as D2 is used in the case of the mining industry.

3.4.4 Tourism

The block diagram of Figure 3.18 shows the main features of the model for the tourism sector of the economy. A measure of tourist activity in the region is taken to be the number of persons visiting the region per year multiplied by the total days spent in the region by tourists that year. This measure is useful in predicting the economic value to the region since both the number of visitors and the average length of stay are highly relevant in evaluating the money spent in the region per year. It is this measure which is used to evaluate the tourist industry's contribution to regional labour demand and capital investment. The factors modelled which affect tourist-days are: investment in tourist facilities (including private recreational facilities, parks, etc.); and an exogenous variable, termed the continental disposable income index, which

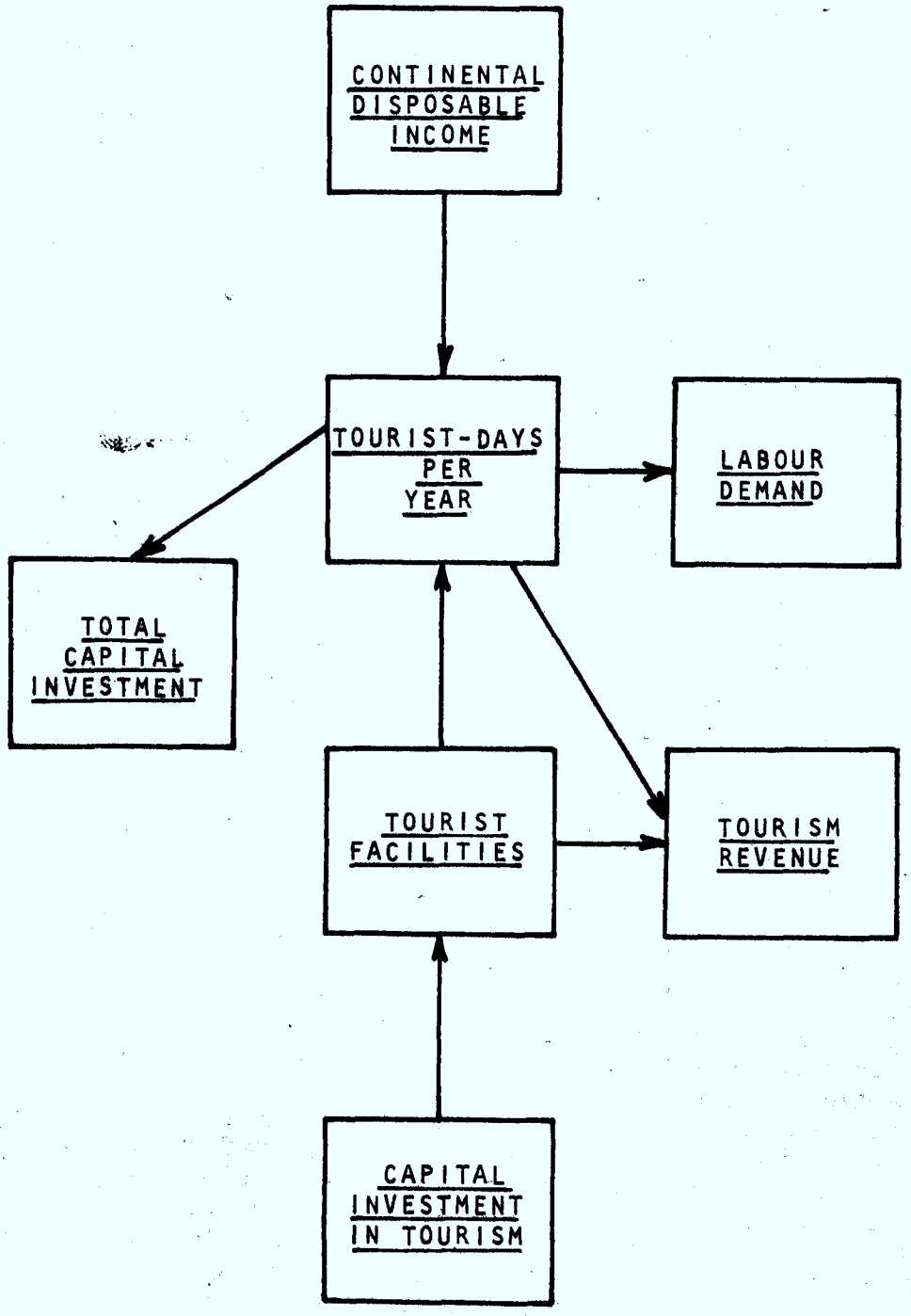

CONTINENTAL DISPOSABLE INCOME
TOURIST-DAYS PER YEAR
LABOUR DEMAND
TOTAL CAPITAL INVESTMENT
TOURIST FACILITIES
TOURISM REVENUE
CAPITAL INVESTMENT IN TOURISM

Fig. 3.18

is used as an indicator of the potential tourist market. Tourism revenue is both a function of tourist-days and of the state of tourist facilities since these influence the amount of money spent in a given period.

Figure 3.19 shows the flow diagram for the tourism sector and its links with the pollution component. Capital investment in tourism is generated by exogenous variable EV351 which multiplies the 1971 investment rate of 10% new investment per year. The depreciation rate, R352, is also 10% which yields zero growth for the base year. This does not imply zero growth in the tourist industry, but simply that no significant new capital investment in facilities was made. Changes in value of tourist facilities in the region, V352, are a 2-year time-lagged (D352) function (F359) of changes in capital investment in tourism. Changes in tourist activity, R350, are a further 2-year time-lagged (D350) function (F355) of tourist facilities. Given the present (1971) state of facilities, tourist-days (L350) are increasing by 5% per year (R350I = 0.05), due mainly to increased advertising and continental disposable income. Other factors producing a marginal effect on L350 are availability of communications as measured by the business telephone density, L200, and the general level of pollution, L500, in the region. Tourist revenue, V351, is a joint function of tourist facilities and tourist-days. The value of L350 in a given year is used as a measure of the tourist industry's contribution to labour demand and capital investment.

3.4.5 Other Industries and Services

This sector of the economy includes support services for the mining and forestry industries, including transportation, retail goods and services, secondary manufacturing, government services, private business, etc. A simplified block diagram is given in Figure 3.20. A nominal growth rate in income from this sector is assumed based on 1971 conditions and this figure is modified by changing population, disposable income, media penetration, and telephone traffic. Media penetration is used as a measure of consumer advertising effectiveness and telephone traffic as a measure of changing business activity. The yearly income from this sector is used as a measure of labour demand and capital investment not included in the other three sectors.

A flow diagram for other industries and services appears in Figure 3.21. To allow for possible negative effects on growth of this sector, R301, is included.

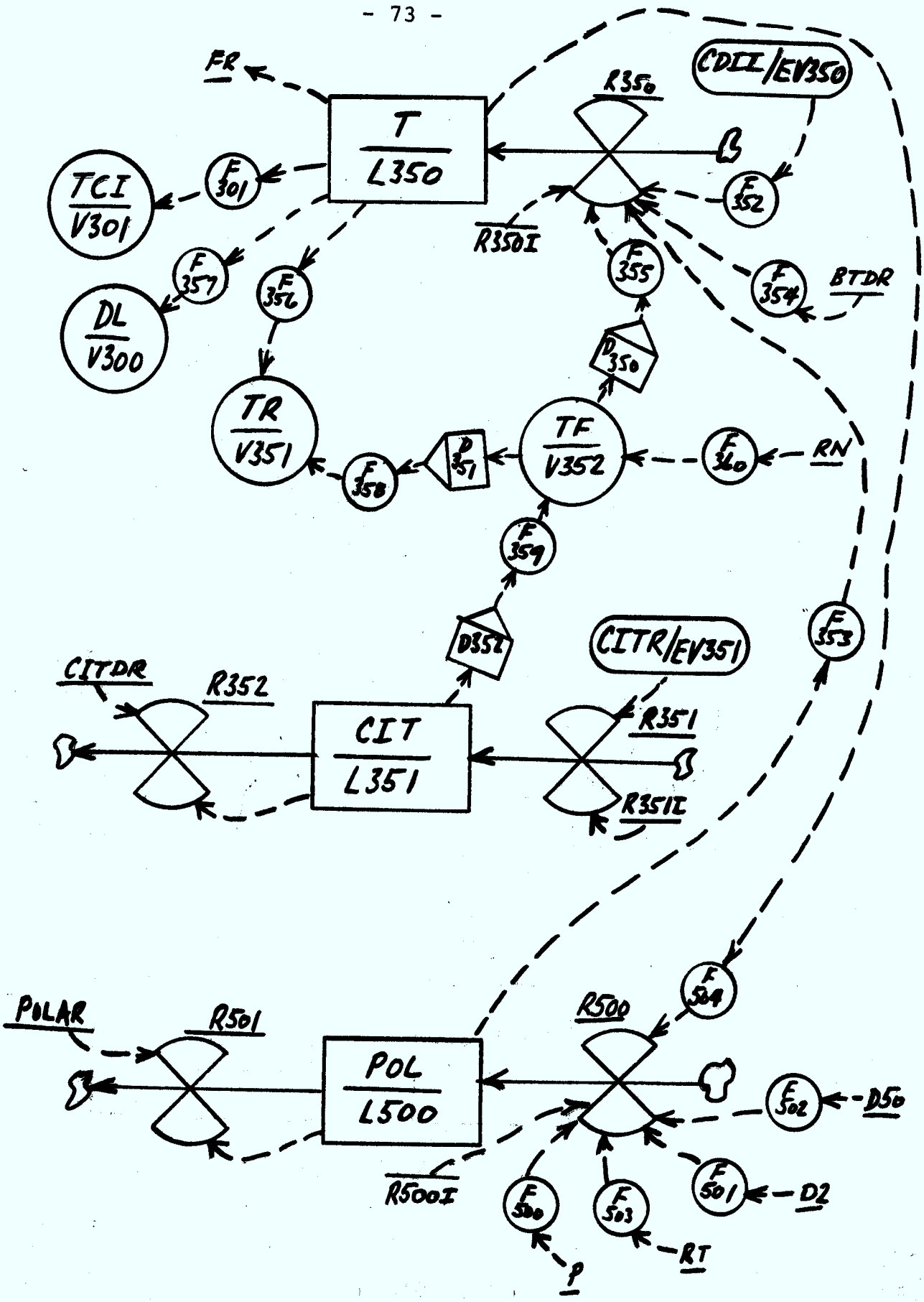

FR
T
L350
R350
CDII/EV350
TCI
V301
F301
F352
R350I
F357
F356
F355
F354
BTDR
DL
V300
D350
TR
V351
TF
V352
F358
D351
F350
RN
F359
D351
CITR/EV351
F353
CITDR
R352
CIT
L351
R351
R351I
POLAR
R501
POL
L500
R500
F504
F502
D50
R500I
F500
F503
F501
D2
RT
?

Fig. 3.19

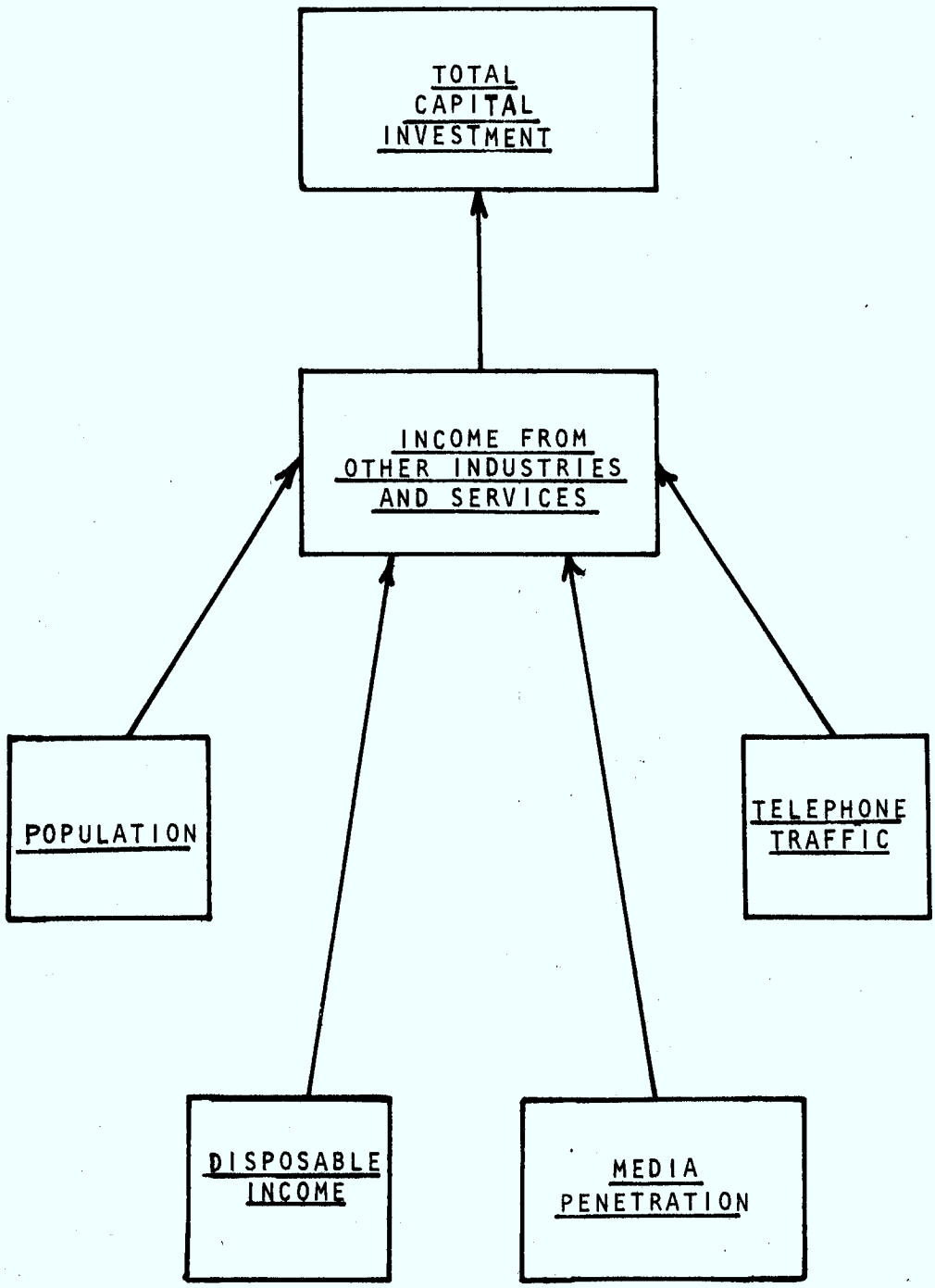

TOTAL CAPITAL INVESTMENT
INCOME FROM OTHER INDUSTRIES AND SERVICES
POPULATION
TELEPHONE TRAFFIC
DISPOSABLE INCOME
MEDIA PENETRATION

Fig. 3.20

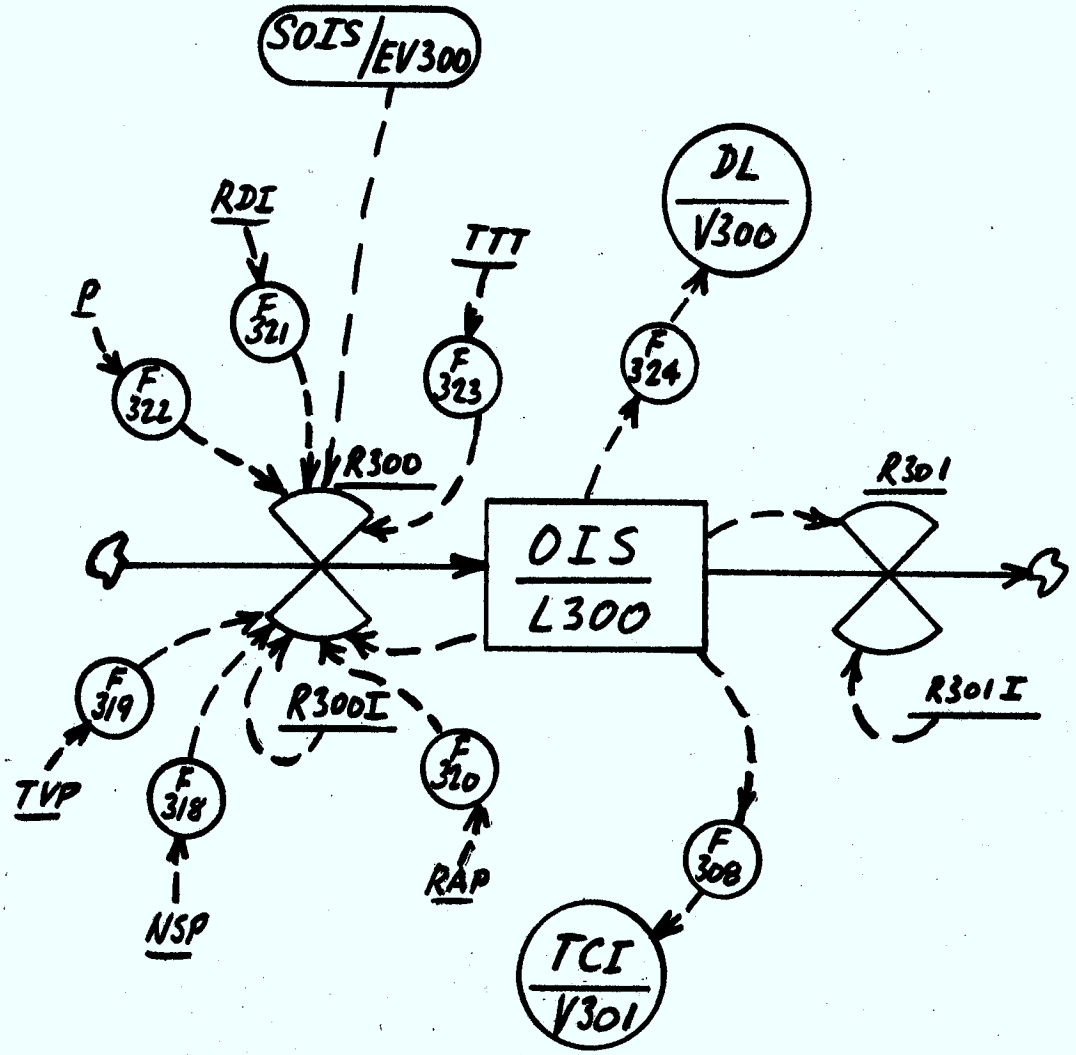

SOIS/EV300
RDI
TTT
DL/V300
P
F321
F322
F323
F324
R300
R301
OIS/L300
F319
R300I
R301I
TVP
F318
F310
F308
NSP
RAP
TCI/V301

Fig. 3.21

A nominal value of 4% for R301 represents the normal decline in income due to business failure and depreciation of capital investment. The rate of increasing income from this sector is initially 5%, yielding a 1% growth given all other factors are constant. As can be seen from Figure 3.21, other factors influencing R300 are newspaper, radio and television penetration (advertising effects), population, regional disposable income, and telephone traffic (business activity). The exogenous variable, EV300, describes outside influences (including subsidies) on the growth of this sector. Thus,

$$R300 = (R300I)(F318)(F319)(F320)(F321)(F322)(F323)(EV300). \quad (3.24)$$

3.5 Communications Component

The communications component includes three sectors: telephone communications, transportation, and media penetration. For ease of discussion each sector will be described individually.

3.5.1 Telephone Communications

If communications is defined as a two-way exchange of information then telephones represent the main communications technology in the region. Two aspects of telephone technology were modelled: the actual number (density) of installations and the number of calls made per unit of time. The former describes the potential for communicating while the latter describes the actual use of the available technology. A further division between residential and business aspects (installations and calls) was made since the two differ greatly in their characteristics.

Before summarizing data concerning telephones in the region, it will be helpful to refer to the block diagram of Figure 3.22. Business and residential telephone densities are measured in terms of telephones per unit of population. A limited amount of data was available from Bell Canada concerning growth of telephone density and traffic in the region and is included in Table A.7.1 in Appendix A.7. No breakdown of business and residential installations was available and the calling rates included only those calls originating within the region. Also, there was a discontinuity in 1969 due to the annexation of part of the Northern Telephone System by Bell Canada. For these reasons, and because of the short time span covered by the data, they were not used in data analysis for the telephone sector. As a substitute, data for

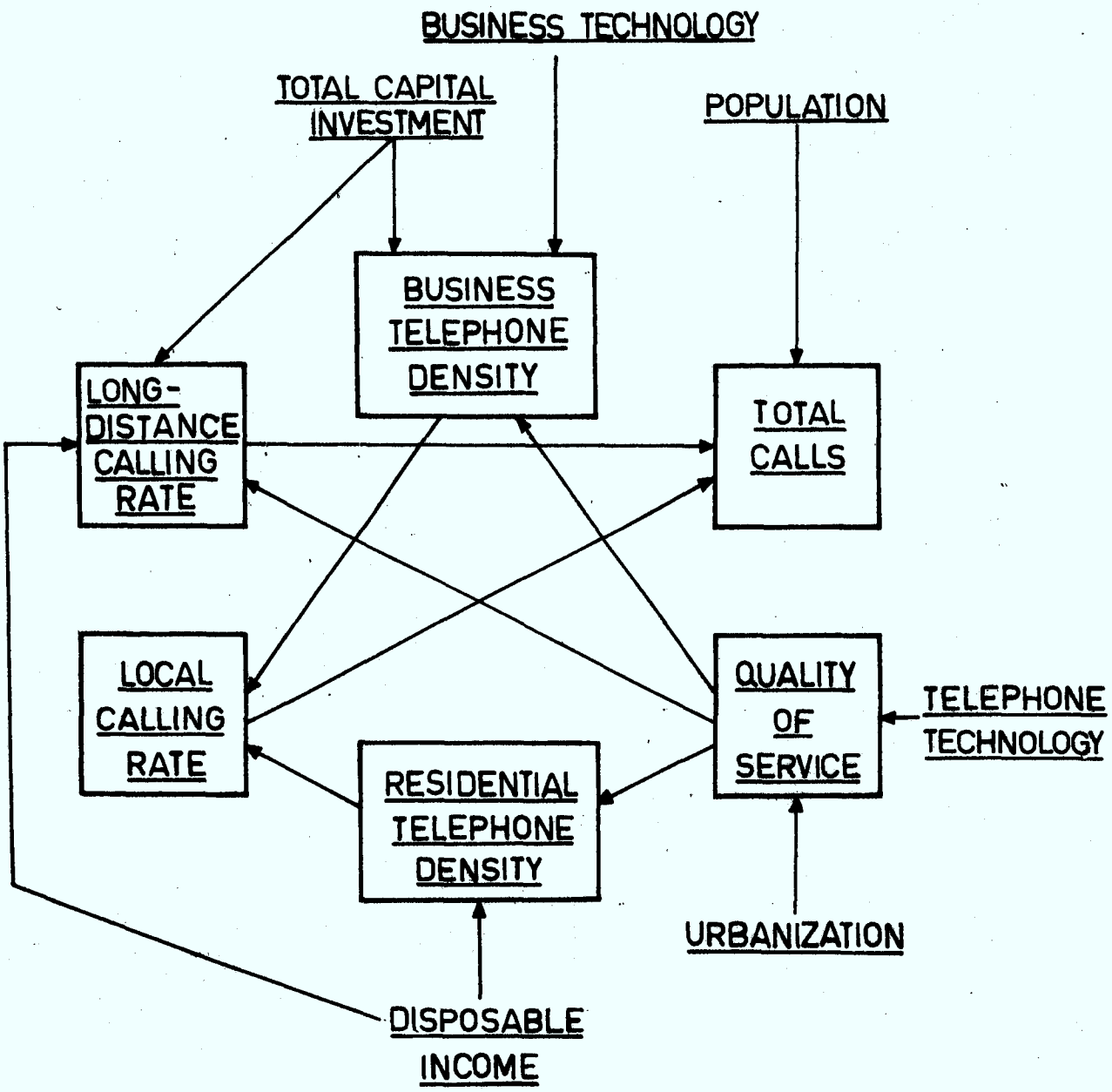

BUSINESS TECHNOLOGY
TOTAL CAPITAL INVESTMENT
POPULATION
BUSINESS TELEPHONE DENSITY
LONG-DISTANCE CALLING RATE
TOTAL CALLS
LOCAL CALLING RATE
QUALITY OF SERVICE
TELEPHONE TECHNOLOGY
RESIDENTIAL TELEPHONE DENSITY
URBANIZATION
DISPOSABLE INCOME

Fig. 3.22

Canada from 1941 to 1970 were used as reproduced in Table A.7.2. The analysis of these data is described in Appendix A.7. As a result of regression analysis of total telephone density and local calling rate (correlation coefficient = 0.9975), it was decided to model local calls per telephone per capita as a function of the total telephone density. It should be noted that this function is based on statistical analysis and not on any hypothesis concerning the nature of changing calling patterns for residential telephones. It is used in the model simply because such a hypothesis is not available. Long-distance calling rate is also highly correlated with total telephone density but since hypotheses concerning changes in long-distance traffic are available, a direct link from total telephone density to long-distance calling rate is not included. The above discussion is reflected in the structure of the block diagram in Figure 3.22. The long-distance calling rate is modelled as a function of total capital investment (representing business activity), disposable income (representing the propensity to make long-distance calls), and quality of service. The last factor is used to measure the usefulness and convenience of the telephone network. Two aspects of quality of service which are measurable are miles of wire in the system per telephone, and percentage of the telephones on an automatic switchboard. Data relating to quality of service are discussed in Appendix A.7. In general, there is a high correlation between calling rates and both telephone density and the percentage of telephones on an automatic switchboard. In the model, quality of service also includes other factors pertaining to usefulness and convenience which are believed, in turn, to be related to telephone density and calling rates. The links from quality of service to the telephone sector are shown in the block diagram.

For a more detailed discussion of this sector it is useful to refer to the flow diagram of Figure 3.23. The two levels are business telephone density (L200) and residential telephone density (L201). Both quantities are normalized with respect to their 1971 values. The total telephone density, V200, is calculated using the initial fractions of business and residential telephones. Thus,

$$V200 = (L200)(.05) + (L201)(.95) \qquad (3.25)$$

As discussed previously, the local calling rate (calls per telephone per capita per year) is a function (F203) of the total telephone density, V200. Function F203 is derived directly from the linear regression

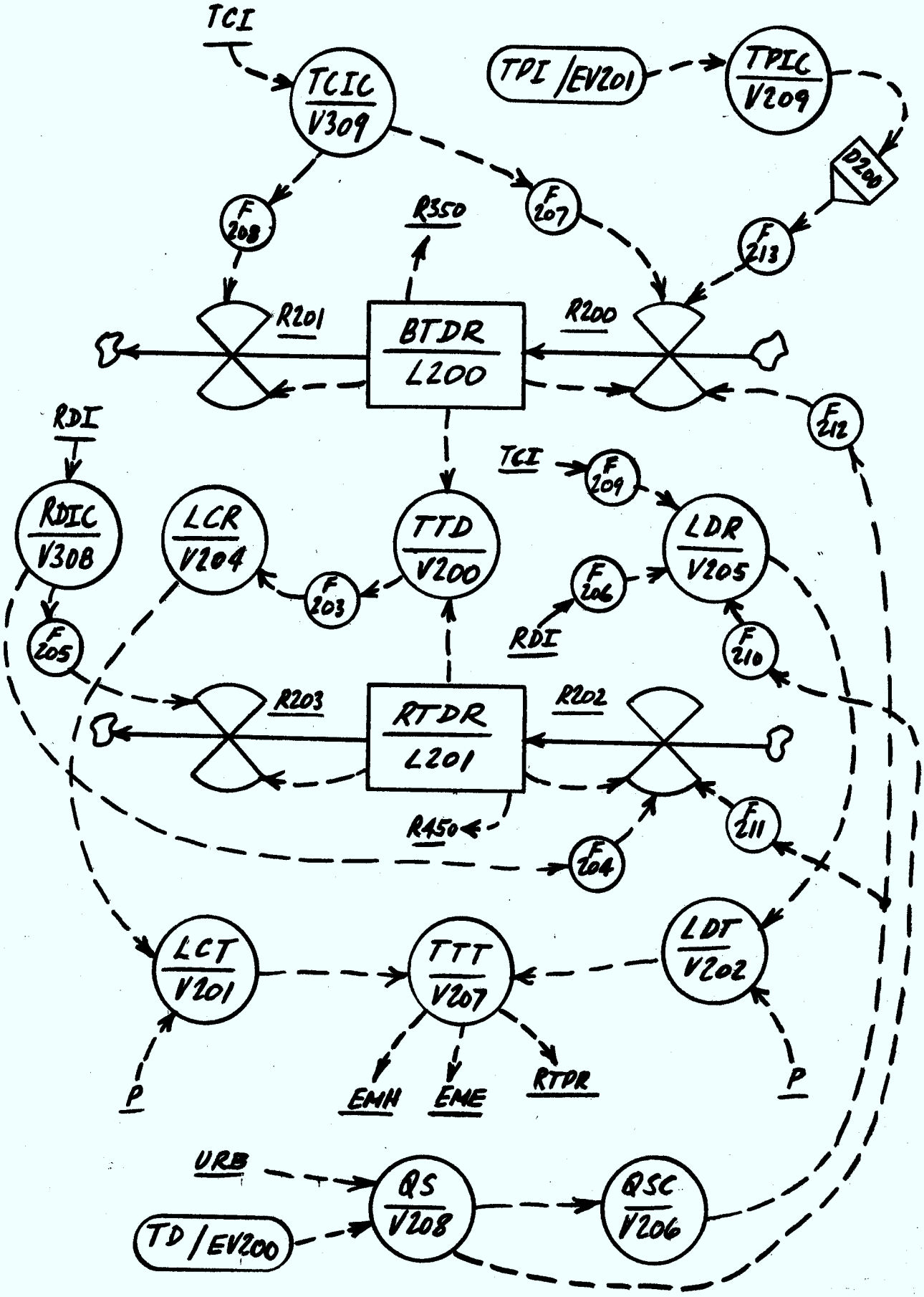

TCI
TCIC
V309
TDI /EV201
TPIC
V209
D200
F208
R350
F207
F213
R201
BTDR
L200
R200
F212
RDI
TCI
F209
RDIC
V308
LCR
V204
TTD
V200
LDR
V205
F206
F203
RDI
F210
F205
R203
RTDR
L201
R202
R450
F211
F204
LCT
V201
TTT
V207
LDT
V202
P
EMH
EME
RTDR
P
URB
QS
V208
QSC
V206
TD /EV200

Fig. 3.23

equation obtained from Canadian telephone statistics (see Appendix A.7). The long-distance calling rate, V205, is a function (F210) of quality of service, V208, (reflecting the connecting "power" of the system), a function (F209) of total capital investment, V301, (reflecting business activity), and a function (F206) of disposable income, V306, (reflecting the propensity to make toll calls).

Changes in the business telephone density are seen to arise from changes in total capital investment, V309, changes in quality of service, V206, and changes in the level of technology used in business, V209. The degree to which business methods rely on telephone circuits (for any purpose, including voice transmission) is indicated by an exogenous variable, EV201. Both positive and negative rates are shown for both business and residential telephone density in order to describe the process of removal of installations under depressed economic conditions. Changes in residential telephone density are seen to arise from changes in disposable income, V308, and changes in quality of service, V206.

Total telephone traffic per year (total calls placed within the region), V207, is calculated by

$$V207 = (V202)(.05) + (V201)(.95) \tag{3.26}$$

where the long distance calls per telephone, V202, are given by

$$V202 = (V205)(V101) \tag{3.27}$$

and the local calls per telephone, V201, are given by

$$V201 = (V204)(V101) \tag{3.28}$$

where V101 is the regional population.

Quality of service, V208, is a joint function of urbanization, V103, (reflecting possible improvements in service for urban areas) and of telephone technological development as indicated by an exogenous variable, EV200.

3.5.2 Media

As an experimental attempt to describe the growth of media (radio, television, newspapers) penetration in a developing region and its subsequent effects on the socio-economic structure, the model sector shown in block diagram form in Figure 3.24 was devised. No attempt was

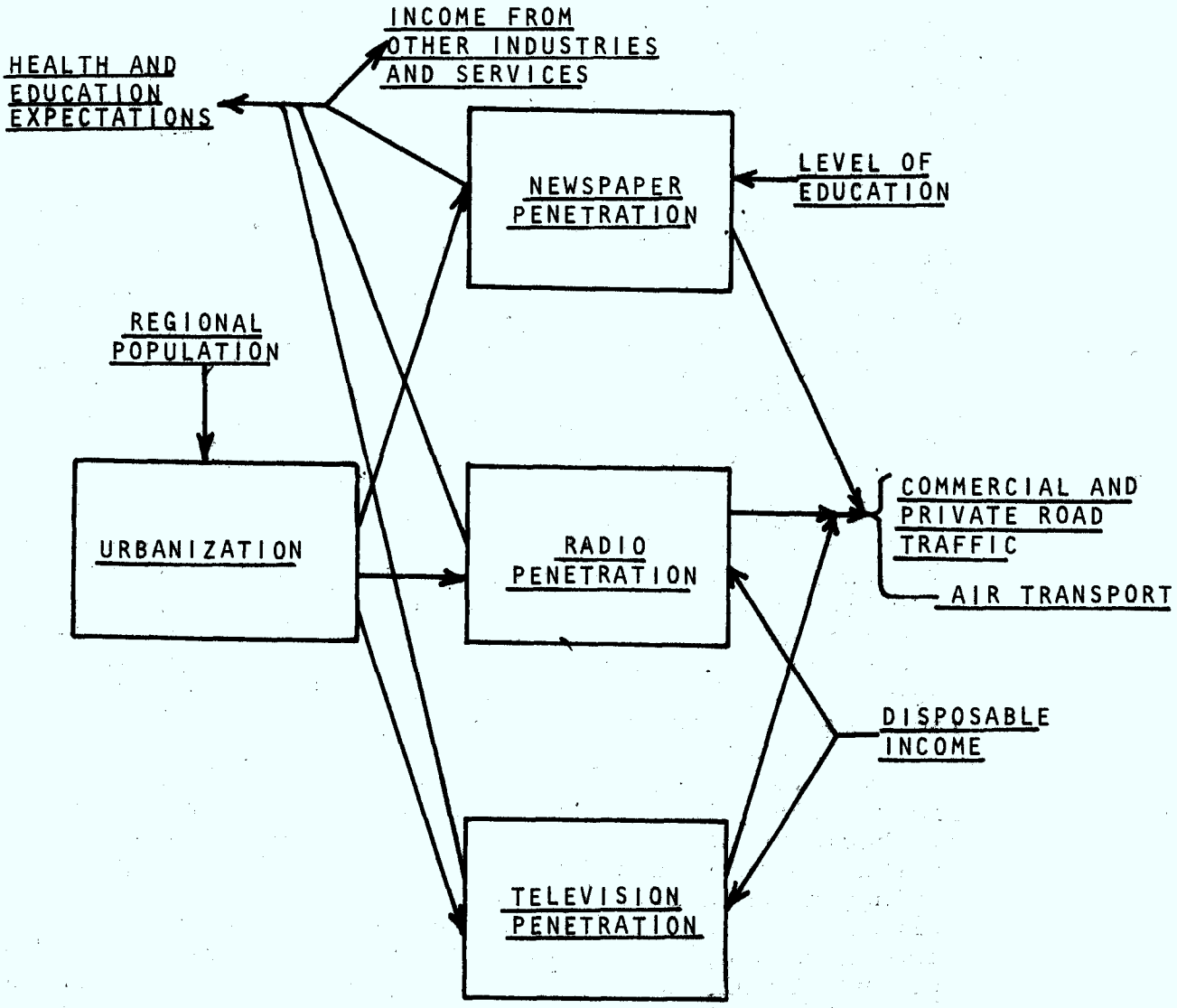

INCOME FROM
OTHER INDUSTRIES
AND SERVICES
HEALTH AND
EDUCATION
EXPECTATIONS
NEWSPAPER
PENETRATION
LEVEL OF
EDUCATION
REGIONAL
POPULATION
URBANIZATION
RADIO
PENETRATION
COMMERCIAL AND
PRIVATE ROAD
TRAFFIC
AIR TRANSPORT
DISPOSABLE
INCOME
TELEVISION
PENETRATION

Fig. 3.24

made directly to model the social and psychological effects of the media in this model of the region as a whole. These are explored in the community models to be discussed later.

Here, "penetration" means number of radios, television sets, or newspapers, circulated per capita. It is assumed that possession of such items implies their use and some basic links to the remainder of the model are postulated. A discussion of the socioeconomic effects of the media is given in Appendix A.8.

For a developing region such as northwest Ontario, the best authorities (see Appendix A.8) seem to agree that communications, including one-way systems, appears to reinforce a growing use of transportation facilities. In a highly industrialized society, it seems reasonable that communications can provide a substitute for transportation in some cases. In the regional model, it is assumed that both private and commercial road traffic are positively influenced by media penetration.

Newspaper circulation is assumed to be a function of the average level of education as well as the degree of urbanization in the region. The availability of radio and television channels, and hence the penetration of radio and television receivers, is also assumed to be a function of urbanization. In addition, disposable income is seen as a factor in increasing ownership of radio and television receivers.

The flow diagram for the media sector is shown in Figure 3.25. It follows the block diagram very closely. It should be noted that the initial level of urbanization in the region (defined as the fraction of the population living in communities of 3,000 or more) is presently quite high (0.8) due to the dominance of Thunder Bay. Also, levels of media penetration are not far below those for industrialized Canada. As a result, all the functions associated with the media sector are weak and produce only gradual changes in variables over the thirty year time span and for simulation tests. This is also in keeping with the hypothetical nature of this sector where it is desirable to avoid sensitive relationships. A discussion of sensitivity tests for this sector of the model will be discussed later.

3.5.3 Transportation Sector

There are a number of modes of transportation in use in the region: air, road, rail and water. Since air

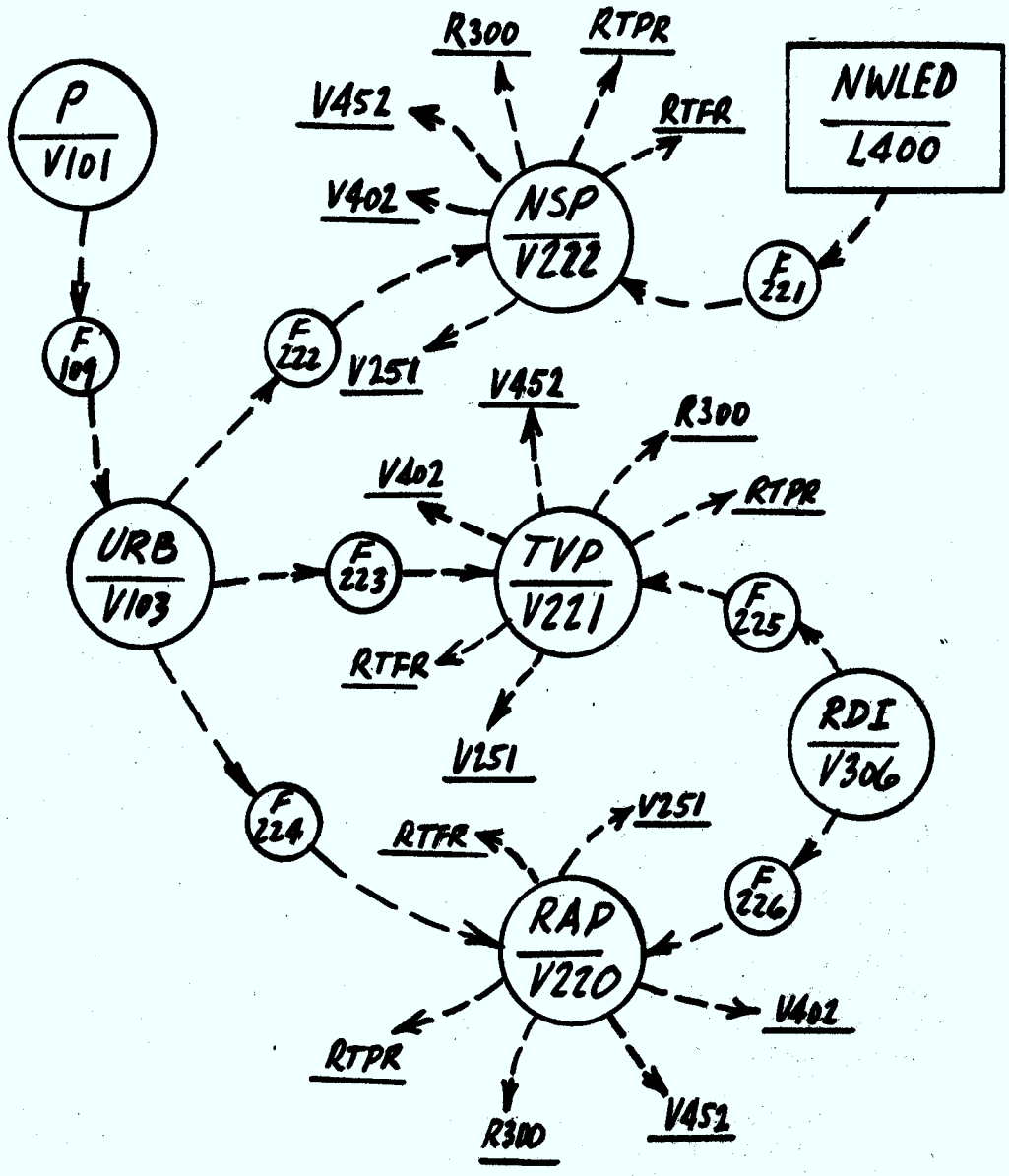

P
V101
F
109
URB
V103
F
222
F
223
F
224
NSP
V222
R300
RTPR
V452
RTFR
V402
V251
F
221
NWLED
L400
TVP
V221
V452
R300
V402
RTPR
RTFR
V251
F
225
RDI
V306
F
226
RAP
V220
V251
RTFR
V402
RTPR
R300
V452

Fig. 3.25

and road transportation are the least developed modes in the region and hence most susceptible to influence by socioeconomic changes, they alone were chosen to be included in the transportation sector. A block diagram is shown in Figure 3.26. Expenditures on new road construction are seen to arise mainly as a result of increased demand for natural resource exploration and development. The state of the road system in the region is given by the number of miles of road (all types except private) available. Figure 3.27 shows the data available concerning road expenditures and miles of road for the region since 1951, as obtained from Ontario Department of Highways Annual Reports. There appears to be little correlation between expenditures on construction and miles of road although the new classification of secondary highways begun in 1961 is not accounted for before that time. The growth of the road network in 1971 is about 0.5% for all types of roads.

In the block diagram of Figure 3.26, the number of miles of both private and freight traffic accumulated per year is dependent on the extent of the road network, the regional population, disposable income, and, to a lesser extent, media penetration (reflecting the reinforcing nature of communications with respect to transportation).

Passenger-miles accumulated by aircraft is used as a measure of the development of air transportation in the region. Under present economic conditions, increases in air traffic are seen to arise from increased demand for resource exploration and development and to a minor extent from increased ease of communications. A substitution factor is included in the link between the road network and air traffic: demand for high-cost air transportation can be reduced if the road system becomes highly developed.

The flow diagram for the transportation sector is shown in Figure 3.28. Level L250 gives the miles of road network. The 1971 growth rate, R250I, is equal to 0.5% as indicated by the data discussed earlier. Changes in R250 arise from changes in road construction expenditures, V250. Variable V6 describes the demand for resource exploration and production. It is a weighted function of the demand for mineral resources, V5, the demand for forest resources, V54, and the total fraction of mineral resources remaining, V2. The functions F7, F8 and F57 all have a slope of unity which weights the three components of demand equally:

$$V6 = (F7)(F8)(F57) \qquad (3.29)$$

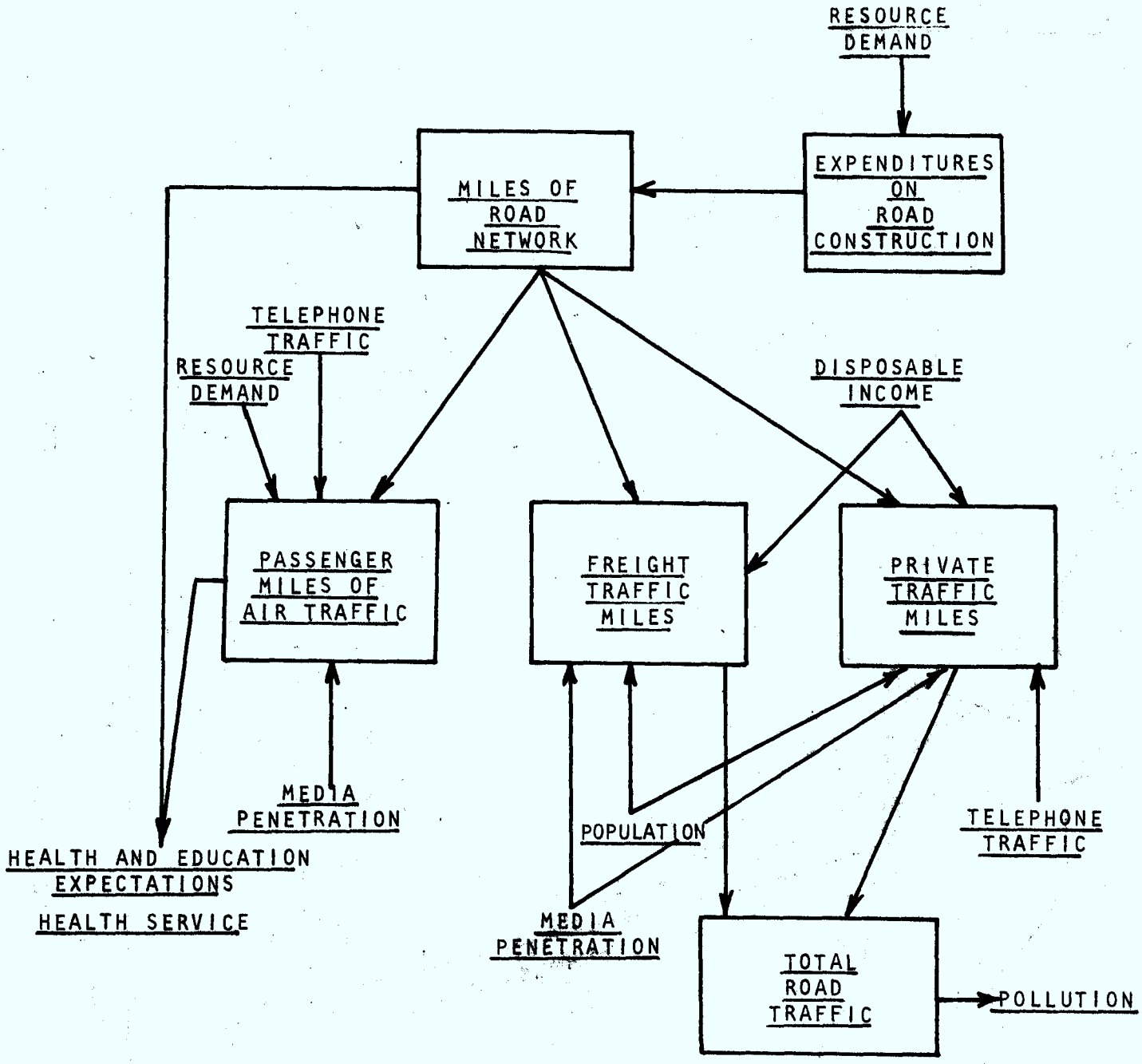

RESOURCE DEMAND
EXPENDITURES ON ROAD CONSTRUCTION
MILES OF ROAD NETWORK
TELEPHONE TRAFFIC
RESOURCE DEMAND
DISPOSABLE INCOME
PASSENGER MILES OF AIR TRAFFIC
FREIGHT TRAFFIC MILES
PRIVATE TRAFFIC MILES
MEDIA PENETRATION
POPULATION
TELEPHONE TRAFFIC
HEALTH AND EDUCATION EXPECTATIONS
HEALTH SERVICE
MEDIA PENETRATION
TOTAL ROAD TRAFFIC
POLLUTION

Fig. 3.26

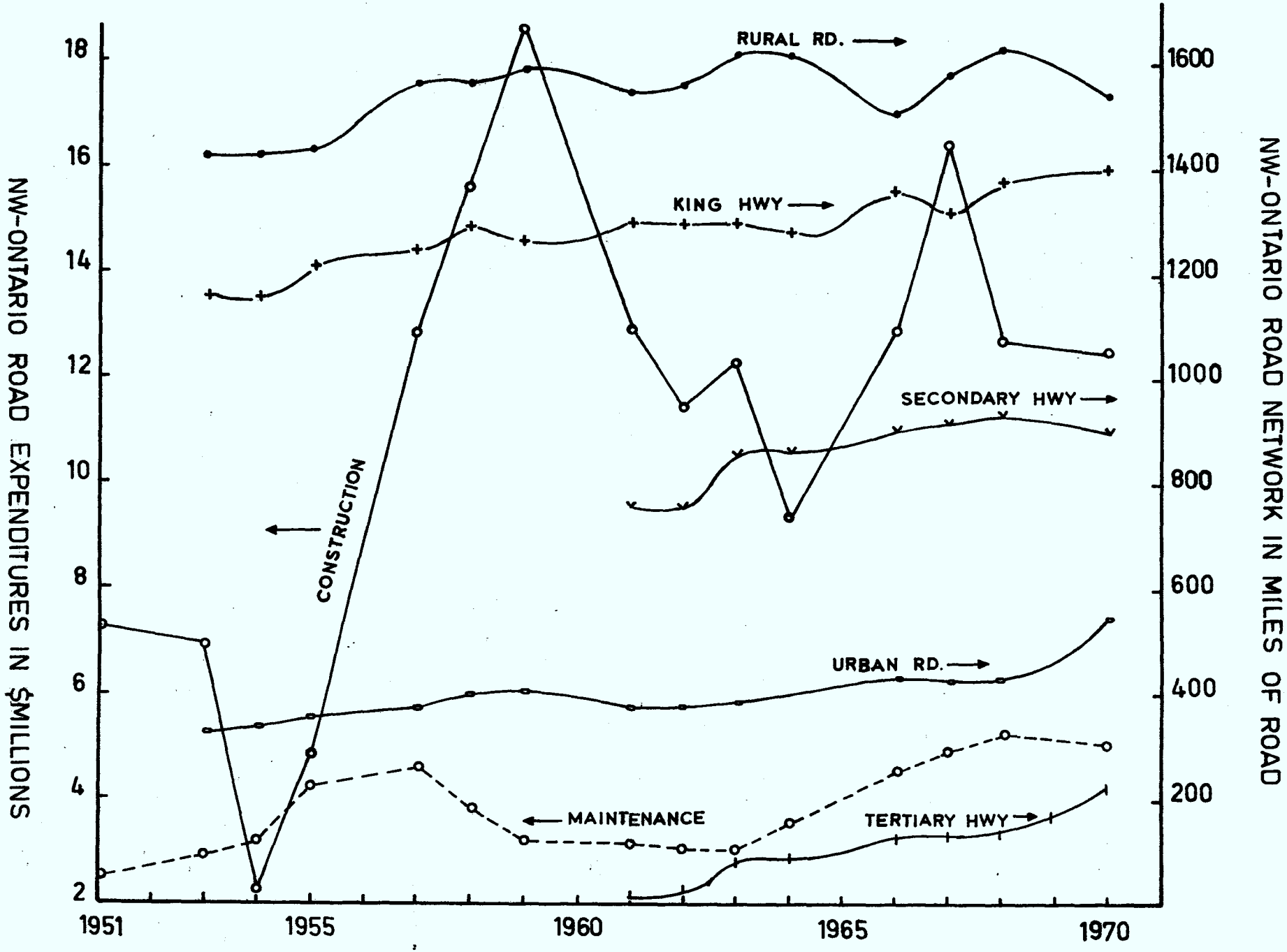


Fig. 3.27 ROAD DATA FOR NORTHWEST ONTARIO

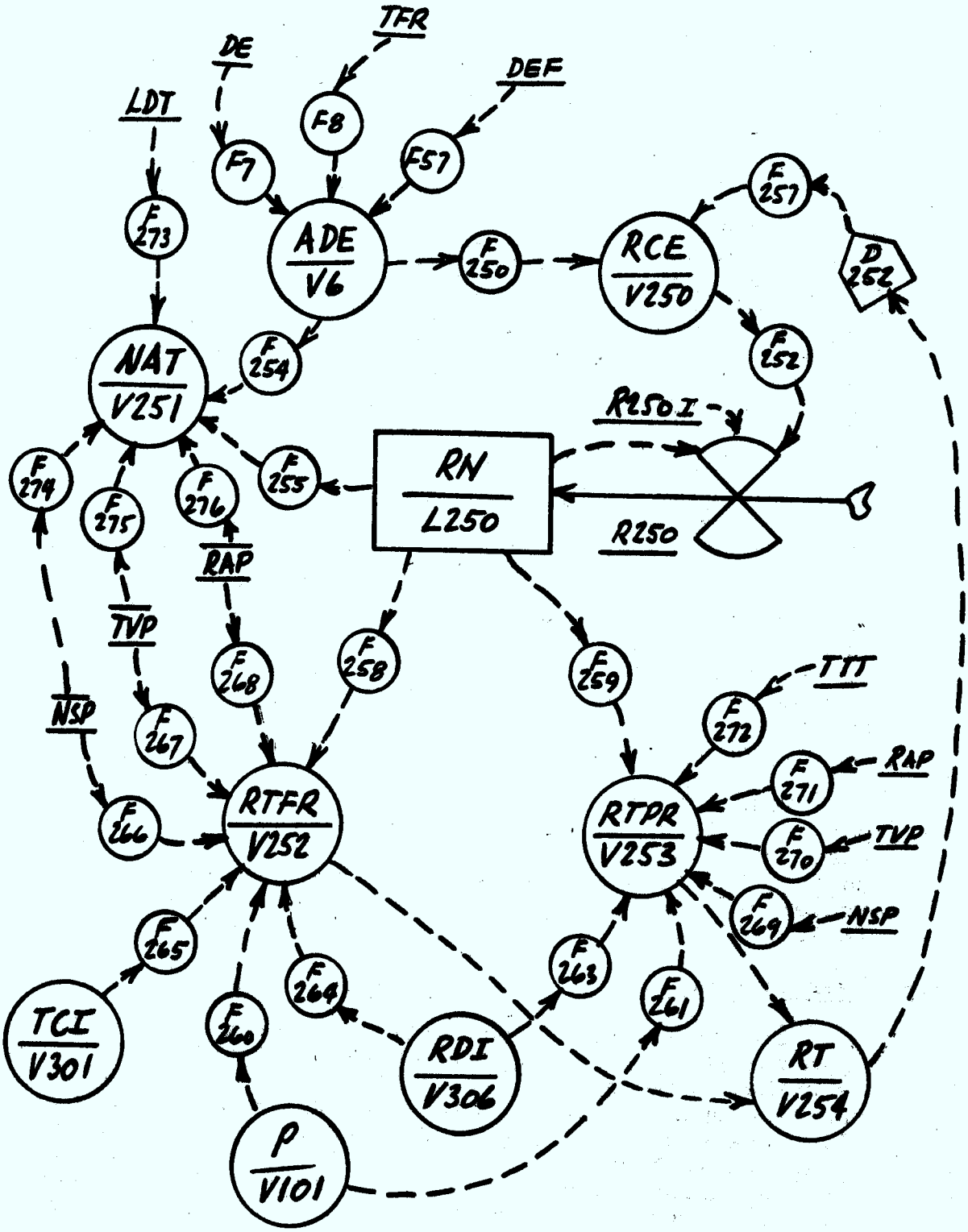

TFR
DE
DEF
LDT
F8
F7
F57
F273
ADE
V6
F250
RCE
V250
F257
D252
F254
F252
NAT
V251
R250I
RN
L250
F274
F255
F275
F276
R250
RAP
TVP
F268
F258
F259
TTT
NSP
F267
F272
RAP
F271
RTFR
V252
RTPR
V253
F266
F270
TVP
F269
NSP
F265
F263
F264
F261
TCI
V301
F260
RDI
V306
RT
V254
P
V101

Fig. 3.28

Road construction expenditures, V250, responds to increased resource demand through function F250, which allows a 20% increase in expenditures for a doubling of demand.

The predominant factors affecting private (V253) and commercial ("freight") traffic (V252) are the state of the road network (L250), the regional population (V101), and disposable income (V306). In the case of commercial traffic, total capital investment (V301) is used as an indicator of business activity. The links between the media and road traffic are weak (see Appendix A.2 for detailed function plots) and are included to allow hypotheses concerning the relationship between communications and transportation to be explored.

Total road traffic, V254 is given by

$$V254 = V252 + (0.3)(V253) \qquad (3.30)$$

where the factor 0.3 weights private road traffic according to the fraction 0.3/1.3 of the total traffic in 1971. Road traffic is used as a second input to road expenditures, V250, via a 5-year time delay representing political, planning and construction time. This link, together with those relating service demands to expenditures on health and education, represents an attempt to include basic political feedback in the model.

Passenger-miles of air traffic within the region per year are given by V251. The strongest link is from resource demand, V6, where function F254 has a slope of unity. Function F255 describes a substitution of air travel by road travel. The links from communications (F273-F276) are weak, as in the case of road traffic.

3.6 Overall Flow Diagram

Figure 3.2 (included earlier) shows the flow diagram for the entire regional model. The components described above are easily recognizable and appear in the same approximate locations as indicated in the overall block diagram of Figure 3.1. One variable (V240) appearing in Figure 3.2 is not mentioned in the above discussion and represents mail volume (number of items) per capita per year. It is a joint function of disposable income and quality of telephone service and is strictly an output variable that does not feed back to any other component.

It is useful to summarize the locations of the

exogenous variables in the regional model since these represent the controls, or inputs, that can be applied to alter the model's behaviour in the simulation runs. Figure 3.29 shows the sixteen exogenous variables together with the components with which they are associated. A description of each follows:

CDII/EV350 - Continental disposable income index - indicates relative changes in future disposable income for North America as a whole (a measure of the potential market for tourism in the region).

CITR/EV351 - Capital investment in tourism ratio - indicates relative future capital investment in the tourist industry.

MTA/EV2 - Mining technology available - indicates relative future increases in productivity in mineral production possible due to increasing technology.

S1/EV3 - Subsidy on mineral resource production - effectiveness of future government policy in reducing real cost of production in the region.

S2/EV4 - Subsidy on mineral resource exploration - indicates effectiveness of government incentives to increase discovery rate for resources.

WP/EV1 - World price for mineral resources - indicates relative changes in world demand for mineral resources.

FTA/EV52 - Forestry technology available - indicates relative future increases in productivity in forest harvesting and processing possible due to increasing technology.

WPF/EV50 - World price for forest products - indicates relative changes in world demand for forest products.

SF/EV51 - Subsidy on forestry - indicates effectiveness of future government policy in reducing real cost of production of forest products.

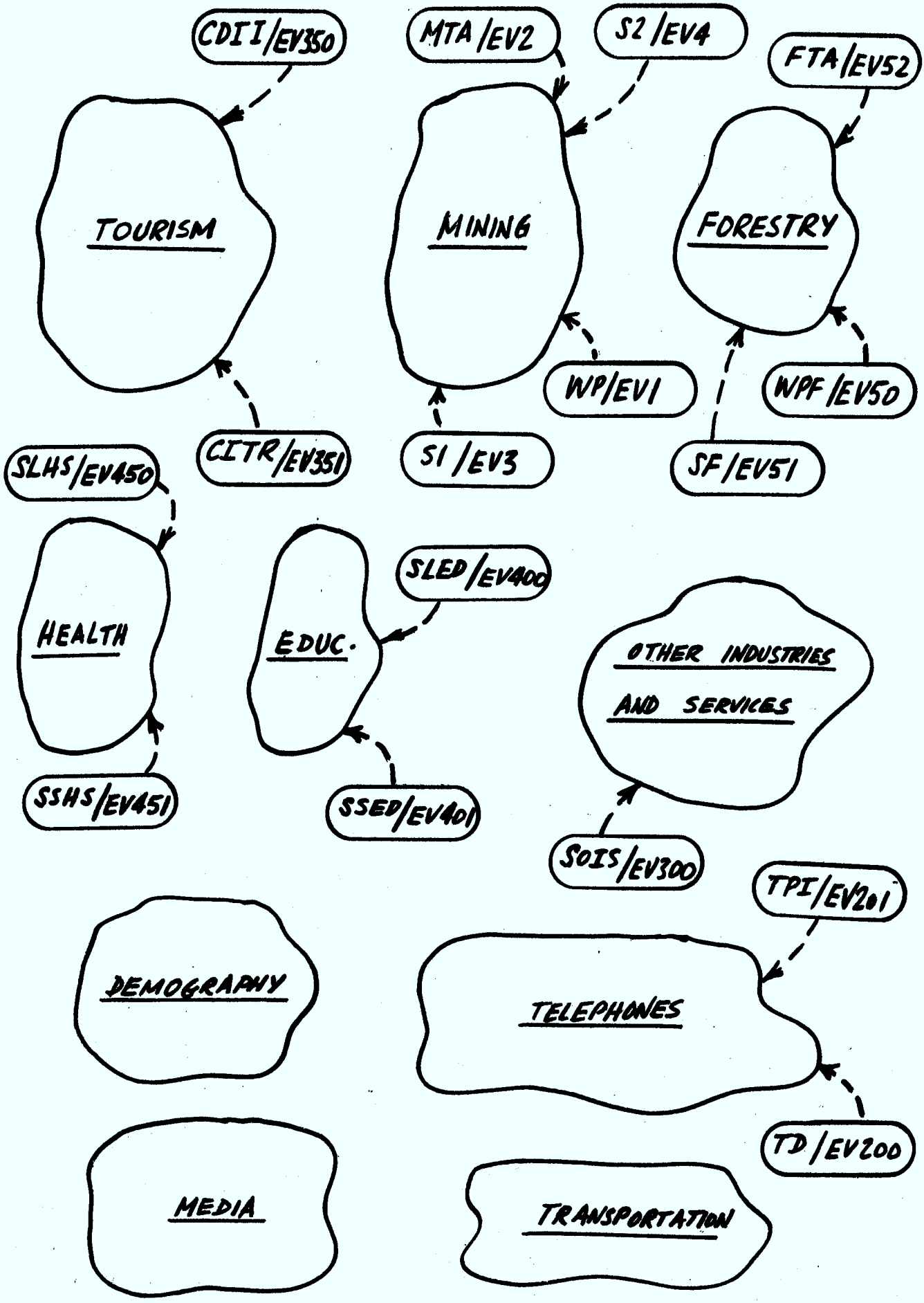

CDII/EV350
MTA/EV2
S2/EV4
FTA/EV52
TOURISM
MINING
FORESTRY
WP/EV1
WPF/EV50
CITR/EV351
SI/EV3
SF/EV51
SLHS/EV450
HEALTH
EDUC.
SLED/EV400
OTHER INDUSTRIES
AND SERVICES
SSHS/EV451
SSED/EV401
SOIS/EV300
TPI/EV201
DEMOGRAPHY
TELEPHONES
TD/EV200
MEDIA
TRANSPORTATION

Fig. 3.29

SLHS/EV450 - Southern level of health service - indicates future relative increases in the level of health service for southern Ontario.

SSHS/EV451 - Southern standard of health service - can be used to indicate changes in the desired level of health service for southern Ontario (set equal to unity for simulation runs reported here).

SLED/EV400 - Southern level of education - indicates future relative increases in the average level of education for southern Ontario.

SSED/EV401 - Southern standard of education - can be used to indicate changes in the desired level of education for southern Ontario (set equal to unity for simulation runs reported here).

SOIS/EV300 - Subsidy on other industries and services - indicates effectiveness of future government policy in stimulating the development of this sector of the economy.

TPI/EV201 - Technological progress index - indicates future use of technology (in particular, telecommunications) in business.

TD/EV200 - Telephone technology development - indicates future development of technology in the telephone industry, which produces an increase in quality of service.

3.77 Computer Output of the Regional Model

The sixteen exogenous variables are under the control of the model's user, who can set them at any one of a range of selected annual rates of increase or decrease, as well as "constant", or no change. A special console was designed to make the control of the model a task easy to understand by users not familiar with computers. After three short opening statements have been typed on the usual typewriter keyboard associated with the PDP-15 computer, this console takes over completely and a list of the 16 exogenous variables appears on the video screen of the computer terminal. The user can then postulate possible future conditions acting on the region from outside, such as the world price for products of the region, the possible presence of government subsidies to economic activity, the volume of capital investment in the tourist industry, and other similar quantities included among the exogenous variables. The user, by simple settings of rotary switches on the control console, can select a choice of annual growth or decay rates, in steps of $\pm$ 1 up to $\pm$ 6 per cent (in constant 1971 dollars, where appropriate) in the values of these exogenous variables. The consequent display on the video screen can then be selected to be a particular sub-set of the many levels and variables in the regional model.

With each of the 16 exogenous variables having any one of 13 possible settings, an extraordinarily large number of possible displays could be generated. There follows a representative set of displays from the many made during the course of a detailed investigation of the model's behaviour.

In all the following graphs (Figure 3.30 to 3.44), the box in the left-hand corner gives the key. Each Figure has five (in one case six) possible forms, labelled 1 to 5 (or 6), of the particular level or variable chosen as output and specified at the top of the box. These possible outputs are those indicated by the model for the 30-year period from 1971 to 2001, with all output quantities normalized to their 1971 values. Each vertical column in the box gives the setting of one of the 16 exogenous variables for each particular numbered graph, with all the remaining, unnamed, exogenous variables being left constant throughout.

The symbols in the box have the following meanings:

+6 = 6% per annum - annual growth rate (in constant 1971 dollars where appropriate).

+3 = 3% " " " " " " " " "

C = constant, or zero annual growth rate " " "

-3 = -3% per annum - annual decay rate " " " "

-6 = -6% " " " " " " " " "

Figure 3.30

output:	L2	RNR	Proven regional natural resources (mining).
Input:	EV1	WP	World price for natural resource (mining).
	EV2	MTA	Mining technology available.
	EV3	S1	Government subsidy on mineral resource production.
	EV4	S2	Government subsidy on mineral resource exploration.

Curves 1 to 3 show an increasingly rapid depletion of proven mineral resources as the increasing world price encourages mining operation, an effect which is further enhanced by the increasing availability of mining technology in curve 4. In curve 5 the assumed large rate of annual decrease in government subsidies offsets this tendency and the depletion of proven resources is slightly less rapid in later years when the profitability due to the high world price thereby becomes less effective.

Figure 3.31

Output:	V4	WPR	World price to regional production cost ratio.
Input:	EV1	WP	(as defined above)
	EV2	MTA	" " "
	EV3	S1	" " "
	EV4	S2	" " "

Curves 1, 2 and 3 show large increases in this world price ratio as both world price and mining technology increase. Note that the quasi-oscillation in curve 3 is occurring when proven resource depletion is increasing most rapidly and that the behaviour as indicated is indeed that of the model and not due to programming errors.

Figure 3.32

Output: L200 BTDR Number of telephones for business use per unit of population.

Input:

EV1	WP	(as defined above)
EV2	MTA	" " "
EV3	S1	" " "
EV4	S2	" " "
EV300	SOIS	Government subsidies on other industries and services (including support services for mining and forestry, comprising transportation, retail goods and services, secondary manufacturing, government services, private business, etc.)
EV351	CITR	Capital investment in tourism.
EV50	WPF	World price for forest products.
EV52	FTA	Forestry technology available.
EV51	SF	Government subsidy on forestry.

Curves 1 to 3 show moderate overall growth in the number of telephones installed for business purposes, coincident with the generally increased economic activity of the region associated with the mining industry. Partial removal of the subsidies on mining operation, even when offset by subsidies to other industries and services and increased capital investment in tourism, remove all this growth (see curve 4). This effect is not changed by the inclusion of growth in forestry activity when that is also accompanied by a decrease in forestry subsidy (curve 5).

Figure 3.33

Output: L201 RTDR Number of telephones for residential use per unit of population.

Input: Exactly as in the previous case for L200 - BTDR.

All five curves show only relatively minor changes in the density of residential telephone installations, despite the fairly large changes in economic activity. Presumably this is because the model effectively includes the hypothesis that in terms of density, the population is almost saturated with residential telephones already in 1971.

Figure 3.34

Output: V201 LCT Number of local calls originated in the region per telephone per annum.

Input:

EV1	WP	(as defined above)
EV2	MTA	" " "
EV3	S1	" " "
EV4	S2	" " "
EV300	SOIS	" " "
EV351	CITR	" " "

Curves 2 and 3 show large increases in the local call

volume coincident with the general prosperity associated with the increase in the mining world price and mining technology. Gradual removal of mining subsidies completely destroys these increases, despite the subsidy increase on other industries and services and increasing capital investment in tourism (curves 4 and 5).

Figure 3.35

Output: V202 LDT Number of long-distance calls originated in the region per telephone per annum.
Input: Exactly as in the previous case for V201-LCT.

The volume of long-distance calls originated per telephone in the region is indicated to be acutely sensitive to changes in the economic activity associated with mining operations and the constancy or decline of government subsidies to mining.

Figure 3.36

Output: V204 LCR Number of local calls originated in the region per telephone per annum per capita of population.
Input: Exactly as in the previous cases for V201-LCT and V202-LDT.

When V201-LCT in Figure 3.34 is normalized to the regional population, as is the case here with V204, the large changes disappear. This indicates that the growth in local calls per telephone is primarily related to the increased population and hence to the greater number of people reachable within local call areas.

Figure 3.37

Output: V205 LDR Number of long-distance calls originated in the region per telephone per annum per capita of population.
Input: Exactly as in the previous cases for V201-LCT, V202-LDT, and V204-LCR.

With long distance calls, normalization with respect to population does not simply remove the large changes in long-distance calls per telephone. This is because the model links this calling rate also to:

(i) quality of service (the connecting "power" of the system);
(ii) total capital investment in the region;
(iii) regional disposable income.

All these additional factors tend to increase with the general prosperity of the region as the mining activity prospers. When the mining subsidies (S1 and S2) are gradually removed, curves 4 and 5 show a consequent major fall in this long-distance calling rate.

Figure 3.38

Output: V202 LDT Number of long-distance calls originated in the region per telephone per annum.

Input:
EV 50 WPF World price for forest products.
EV 52 FTA Forest technology available.
EV 51 SF Subsidy on forestry.
EV300 SOIS (as defined above)
EV351 CITR " " "

Curves 1 to 4 show the model's indication of how the long-distance calls per telephone would vary with changes only in the forestry sector, with all other exogenous variables (including those connected with mining) held constant. A strong dependence is seen and gradual removal of the forestry subsidy greatly reduces the total (per telephone). If the subsidies to other industries and services and the capital investment in tourism are then allowed to increase gradually, an almost complete offset of the effect of forestry subsidy removal is noted in curve 5. Thus the model is indicating that in this case other industries and services, and tourism, are effectively replacing forestry in their effect on the long-distance call total.

Figure 3.39

Output: V254 RT Total road traffic, including passenger traffic and freight traffic.

Input:
EV1 WP (as defined above)
EV50 WPF " " "
EV52 FTA " " "
EV51 SF " " "
EV300 SOIS " " "
EV351 CITR " " "

Curve 1 is the reference curve when all exogenous variables remain constant. Curves 2 and 3 show similar large increases in total road traffic for increasingly prosperous mineral and forestry industries, respectively. Curve 4 simply includes an increasing amount of available forestry technology as well as an increasing price for forestry products, while curve 5 shows a very major fall in road traffic when the forestry subsidy is gradually removed. But in this case curve 6 shows that an increase in subsidies to other industries and services and in capital investment in tourism largely offsets the effect of forestry subsidy removal. (Note that the saturation effect here and elsewhere is an accident of the display technique and is not the true output of the model.)

Figure 3.40

Output: V300 DL Demand for labour.

Input: EV 1 WP (as defined above)
EV 2 MTA " " "
EV 3 S1 " " "
EV 4 S2 " " "
EV300 SOIS " " "
EV351 CITR " " "

As expected, the demand for labour rises significantly as the prosperity associated with mining increases due to the increase in the world price for mineral resources (curves 1 and 2) but increasing availability of mining technology offsets this somewhat. As before, gradual removal of mining subsidies seriously affects the general prosperity and consequently a significant decline in the demand for labour is indicated, with some offset to the decline when other industries and services and tourism are increased.

Figure 3.41

Output: V301 TCI Total capital investment.

Input: Exactly as in the previous case for V300-DL.

These five curves are broadly similar to those for V300, again reflecting the general economic activity of the region associated primarily with changes in the mineral industry.

Figure 3.42

Output: V306 RDI Regional Disposable Income.

Input: Exactly as in the previous cases for V300-DL and V301-TCI.

While, broadly speaking, the trends are the same as in the previous two cases, the detailed natures of curves 2 and 3 are much more prone to fluctuation in the later years. The detailed reasons for this are difficult to determine without many further tests on the model but it does appear that the effects seen are not simply due to programming errors but are truly the behaviour of the model.

Figure 3.43

Output: V351 TR Tourist revenue.

Input: As in the previous cases for V300-DL, V301-TCI, and V306 RDI, with some changes in the detailed rates of change.

Only curves 4 and 5 deviate significantly from the gradual growth in curves 1 to 3. Thus increased mining activity is not itself having a major effect on tourism. It is highly probable that increasing capital investment in tourism (CITR) is producing the large increases in curves 4 and 5.

Figure 3.44

Output: V300 DL Demand for labour.

Input:
EV50	WPF	(as	defined	above)
EV52	FTA	"	"	"
EV51	SF	"	"	"
EV300	SOIS	"	"	"
EV351	CITR	"	"	"

These curves, associated with forestry activity, are for comparison with those in Figure 3.40, associated similarly with mining activity. The effects are broadly comparable although increases in forestry activity show relatively smaller effects. Consequently, it is not surprising that the effect of increases in other industries and services and in capital investment in tourism are proportionately somewhat greater.

Among the many other curves investigated but not shown here are those for population (L100, L101, L102, L103 - four age groups). These showed large increases in the population, particularly those of working age, for even relatively small annual increases (2%) in the world prices for mineral and forestry products, when all other exogenous variables were held constant. This population increase reflected large migration into the region in times of prosperity and high wage rates as hinted at here by the curves showing the demand for labour.

It cannot be emphasized too strongly that all these graphs of computer output are simply illustrations of the behaviour of the regional model as constructed, including all the hypotheses postulated by the model's builders. Even though these hypotheses and the consequent structure were based as much as possible on actual historical data, there were many parts of the model where cruder methods had to be resorted to. These matters are discussed in more detail in Section 7.

What has in effect been illustrated here in this section is an introduction to the process of "verification" of the model; i.e. a detailed examination of the model's behaviour as constructed when subjected to various choices among the possible settings of the exogeneous variables. In all the

cases shown here, and in the many others investigated, the model's behaviour appears "reasonable", self-consistent and free of significantly detectable programming errors.

Finally, by way of emphasis, these curves are not, strictly, "predictions" of the future behaviour of the region known as northwest Ontario, they are at best indicators of aspects of the possible alternative future that might arise, subject to all the limitations inherent in the model, as discussed elsewhere in this report.

L2 REGIONAL NAT. RESOURCES				
CURVE	WP	MTA	S1	S2
1	C	C	C	C
2	+ 3	C	C	C
3	+ 6	C	C	C
4	+ 6	+ 6	C	C
5	+ 6	+ 6	- 6	- 6

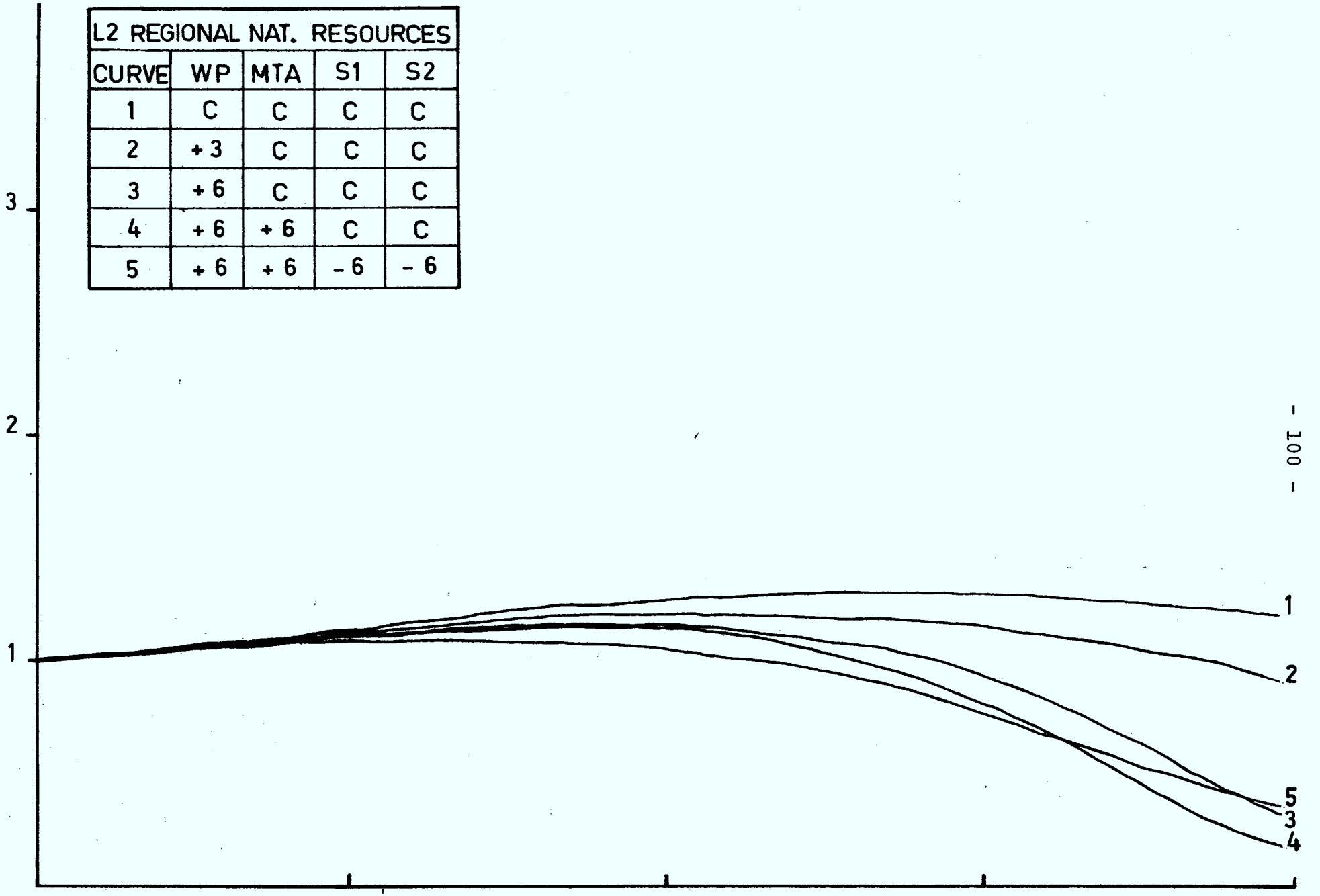


Fig. 3.30

V4 WORLD PRICE RATIO				
CURVE	WP	MTA	S1	S2
1	C	C	C	C
2	+3	+3	C	C
3	+6	+6	C	C
4	+3	+3	-3	-3
5	+6	+6	-6	-6

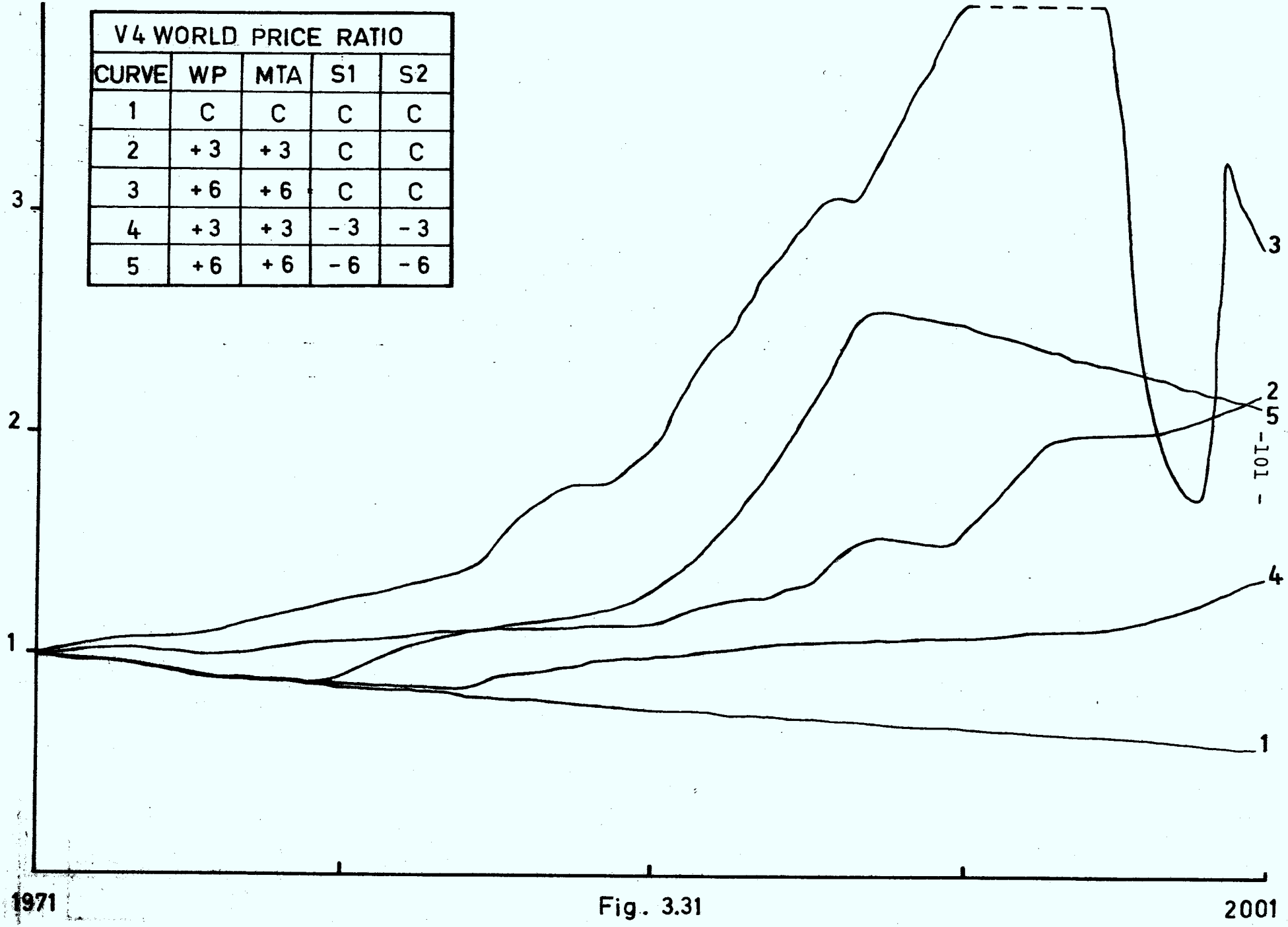


Fig. 3.31

L200 BUSINESS TELEPHONE DENSITY RATIO									
CURVE	WP	MTA	S1	S2	SOIS	CITR	WPF	FTA	SF
1	C	C	C	C	C	C	C	C	C
2	+3	C	C	C	C	C	C	C	C
3	+6	C	C	C	C	C	C	C	C
4	+6	+6	-6	-6	+6	+6	C	C	C
5	+6	+6	-6	-6	+6	+6	+6	+6	-6

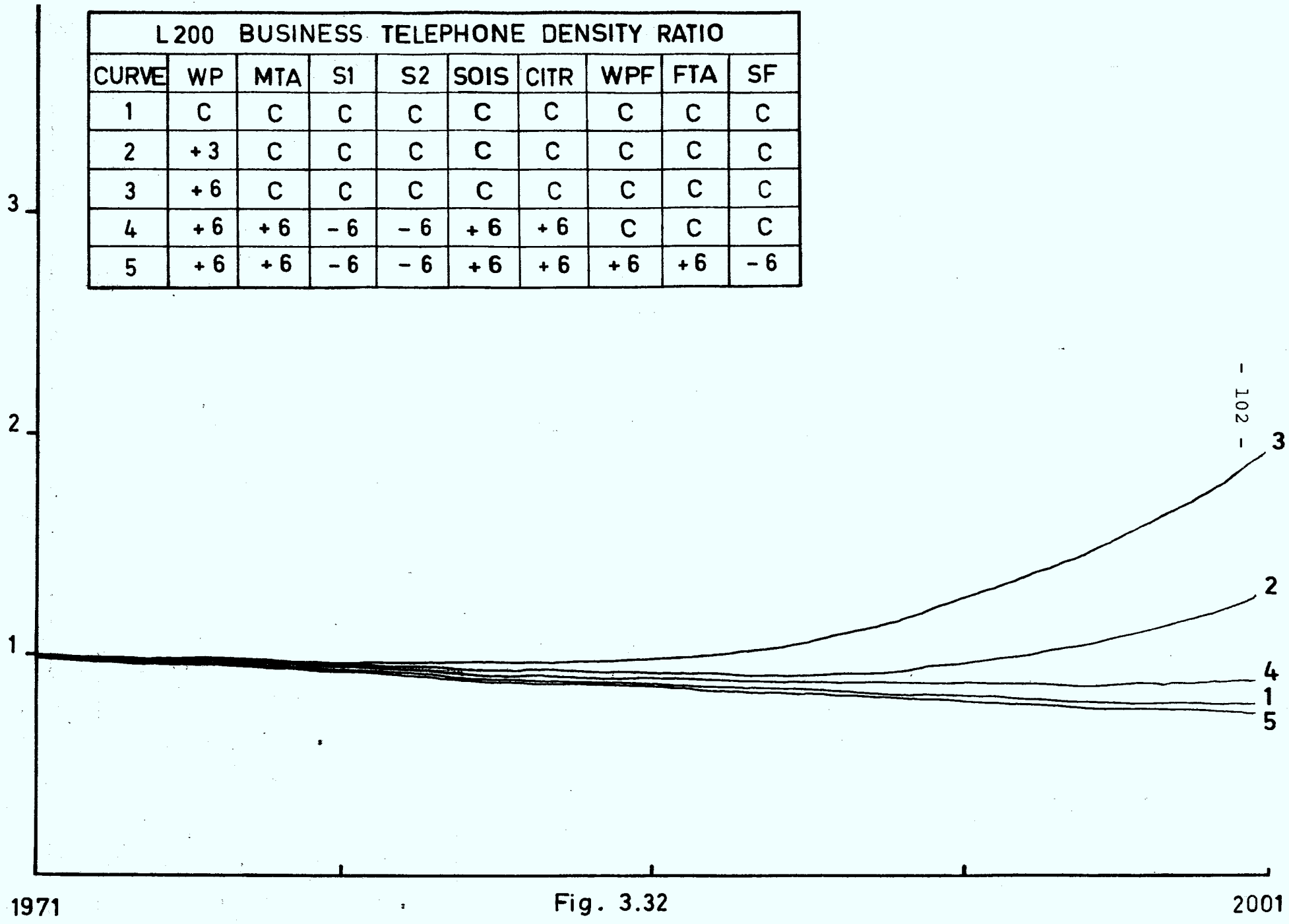


Fig. 3.32

L 201 RESIDENTIAL TELEPHONE DENSITY RATIO									
CURVE	WP	MTA	S1	S2	SOIS	CITR	WPF	FTA	SF
1	C	C	C	C	C	C	C	C	C
2	+3	C	C	C	C	C	C	C	C
3	+6	C	C	C	C	C	C	C	C
4	+6	+6	-6	-6	+6	+6	C	C	C
5	+6	+6	-6	-6	+6	+6	+6	+6	-6

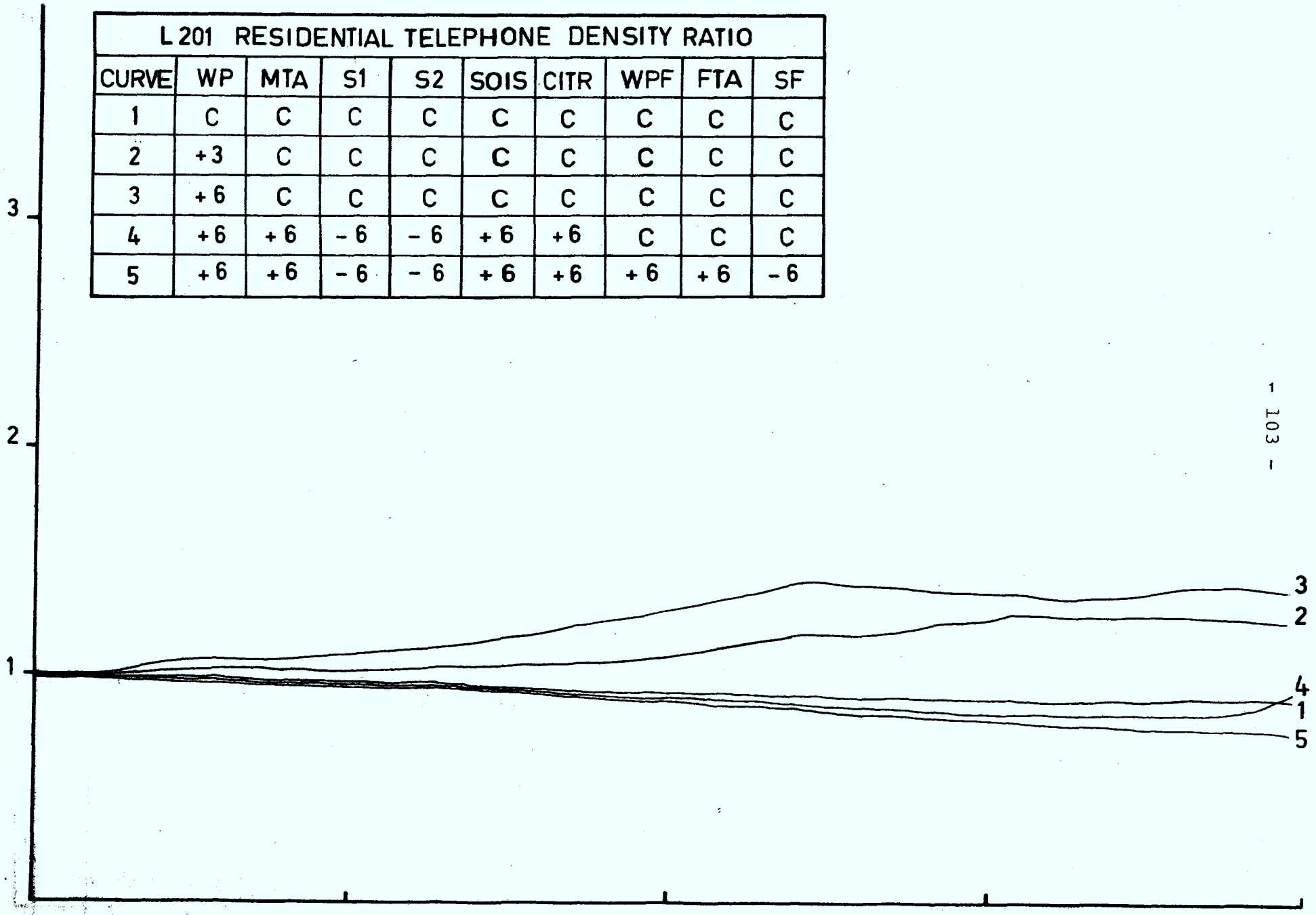


Fig. 3.33

V201 LOCAL CALL TOTAL						
CURVE	WP	MTA	S1	S2	SOIS	CITR
1	C	C	C	C	C	C
2	+ 3	C	C	C	C	C
3	+ 6	C	C	C	C	C
4	+ 3	+ 3	- 3	- 3	+ 3	+ 3
5	+ 6	+ 6	- 6	- 6	+ 6	+ 6

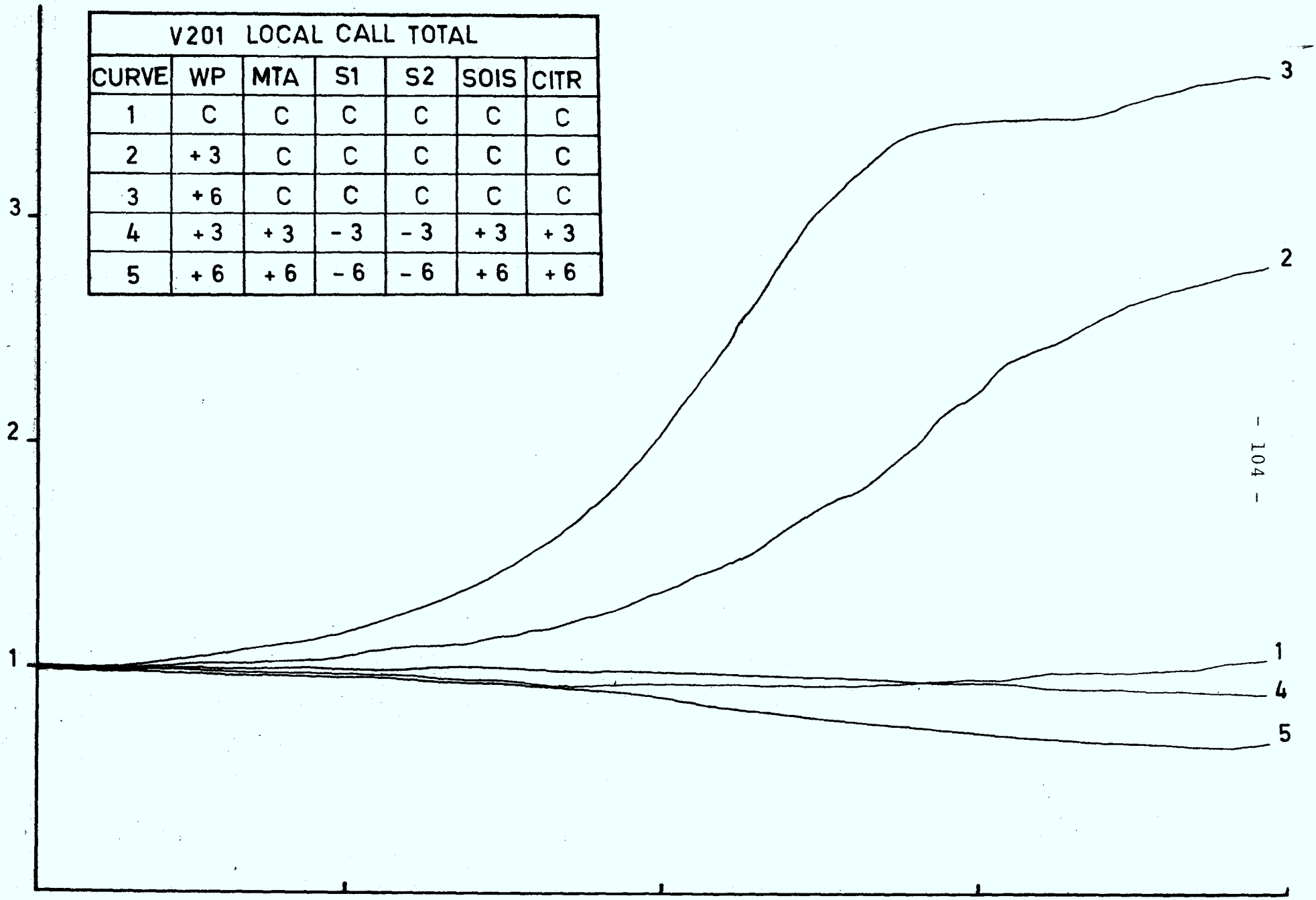


Fig. 3.34

V202 LONG DISTANCE CALL TOTAL						
CURVE	WP	MTA	S1	S2	SOIS	CITR
1	C	C	C	C	C	C
2	+3	C	C	C	C	C
3	+6	C	C	C	C	C
4	+3	+3	-3	-3	+3	+3
5	+6	+6	-6	-6	+6	+6

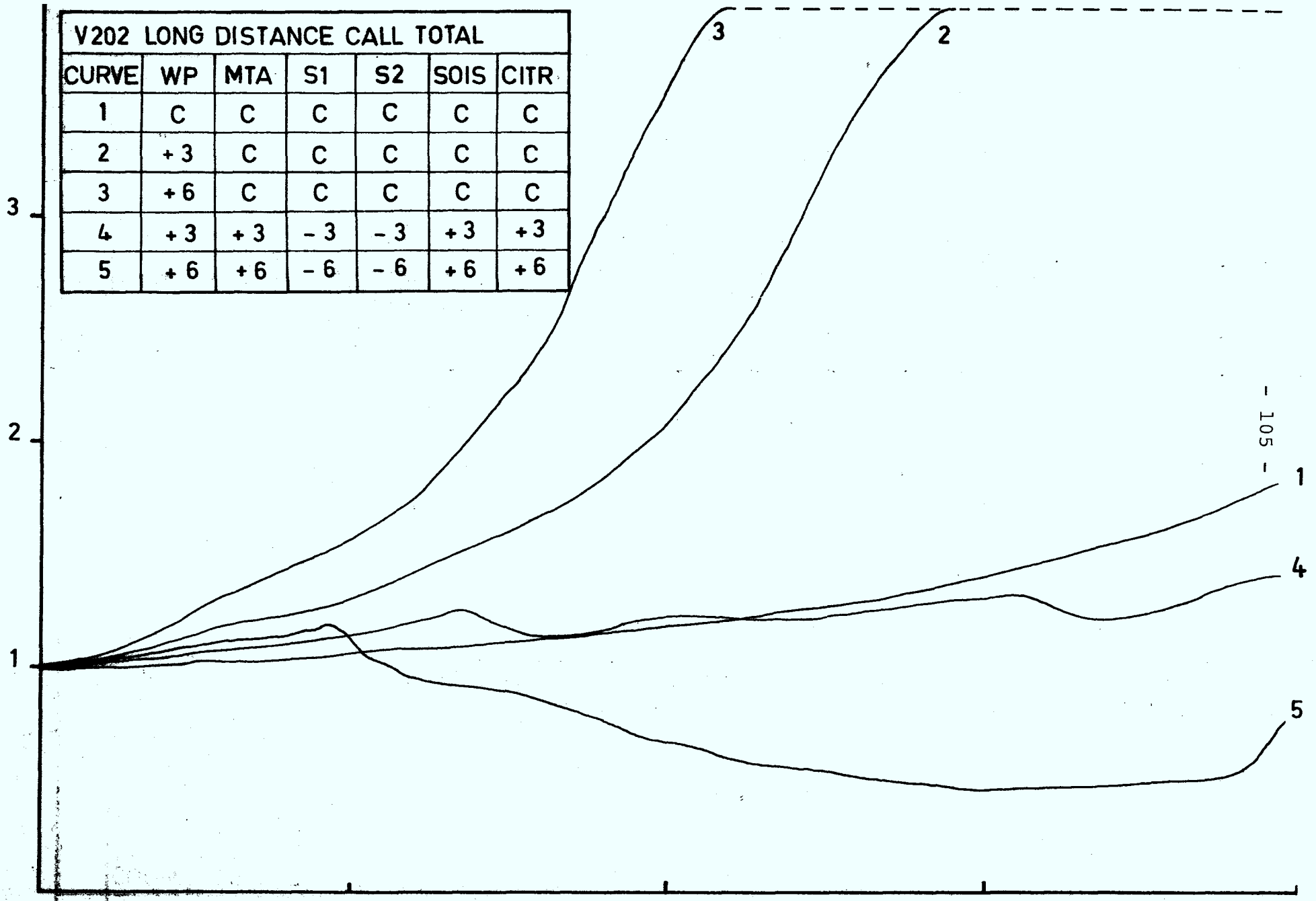


Fig. 3.35

V 204 LOCAL CALLING RATE						
CURVE	WP	MTA	S1	S2	SOIS	CITR
1	C	C	C	C	C	C
2	+ 3	C	C	C	C	C
3	+ 6	C	C	C	C	C
4	+ 3	+ 3	- 3	- 3	+ 3	+ 3
5	+ 6	+ 6	- 6	- 6	+ 6	+ 6

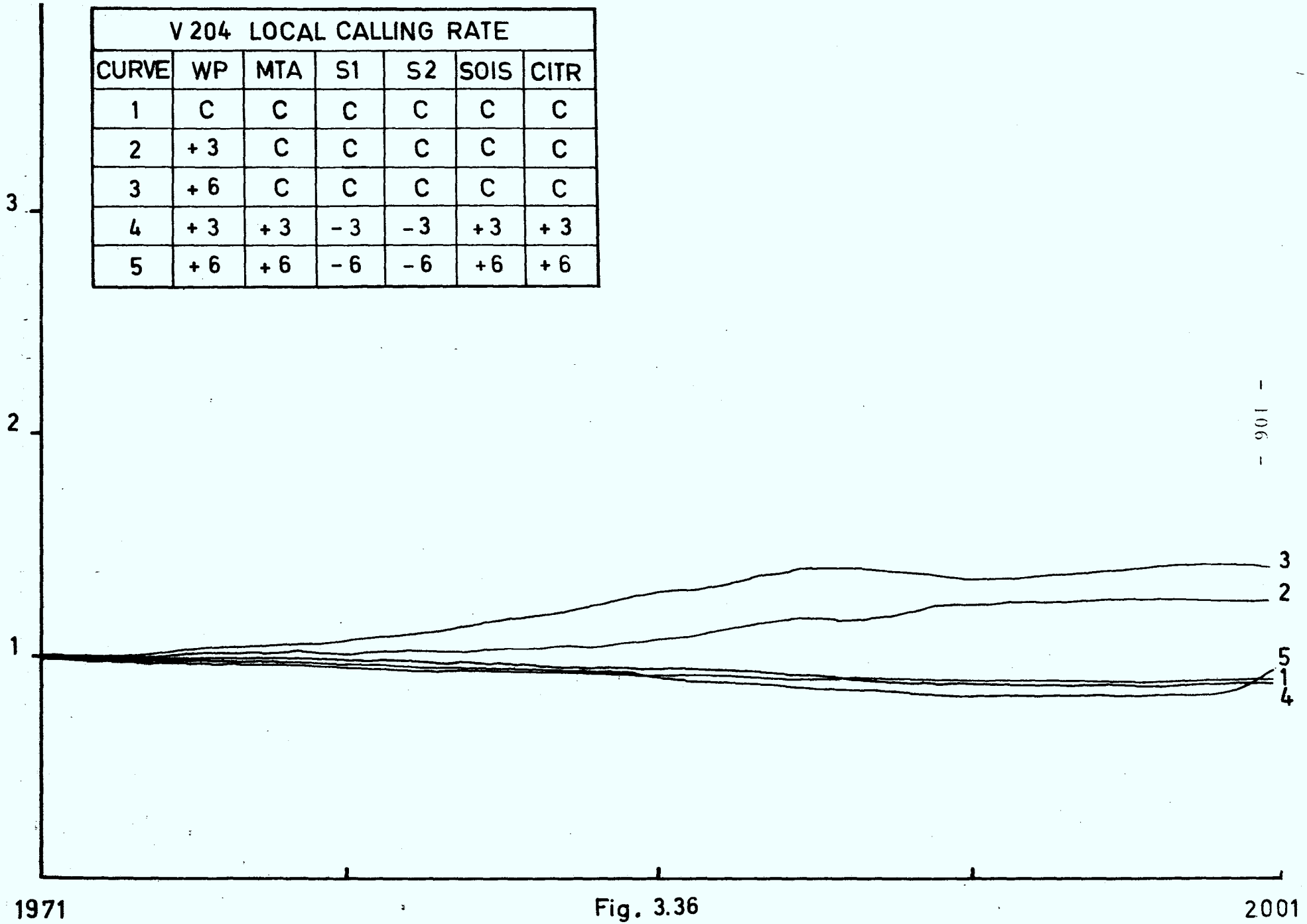


Fig. 3.36

V 205 LONG DISTANCE CALLING RATE						
CURVE	WP	MTA	S1	S2	SOIS	CITR
1	C	C	C	C	C	C
2	+ 3	C	C	C	C	C
3	+ 6	C	C	C	C	C
4	+ 3	+ 3	- 3	- 3	+ 3	+ 3
5	+ 6	+ 6	- 6	- 6	+ 6	+ 6

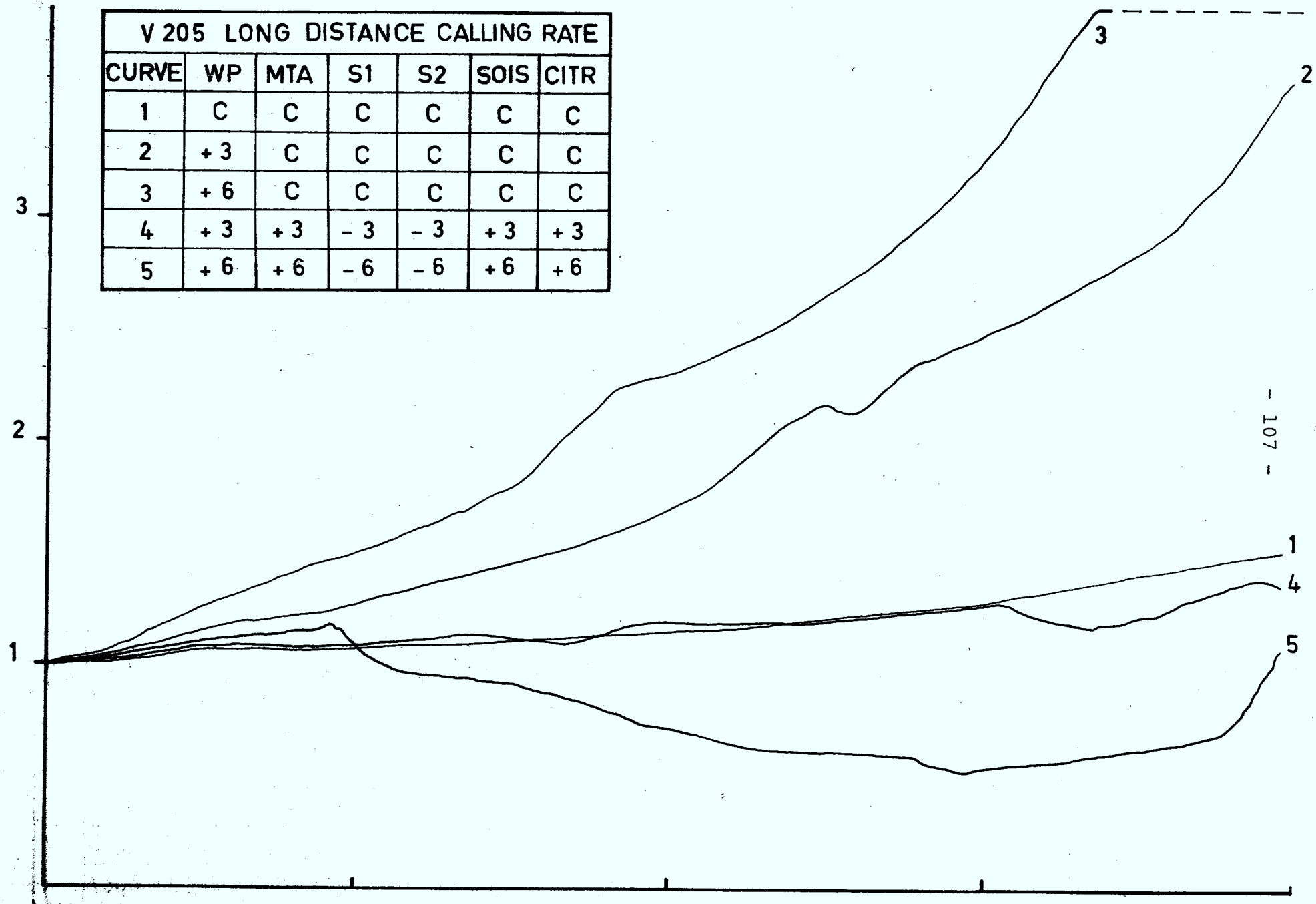


Fig. 3.37

V202 LONG DISTANCE CALL TOTAL					
CURVE	WPF	FTA	SF	SOIS	CITR
1	C	C	C	C	C
2	+ 3	C	C	C	C
3	+ 3	+ 3	C	C	C
4	+ 3	+ 3	- 3	C	C
5	+ 3	+ 3	- 3	+ 3	+ 3

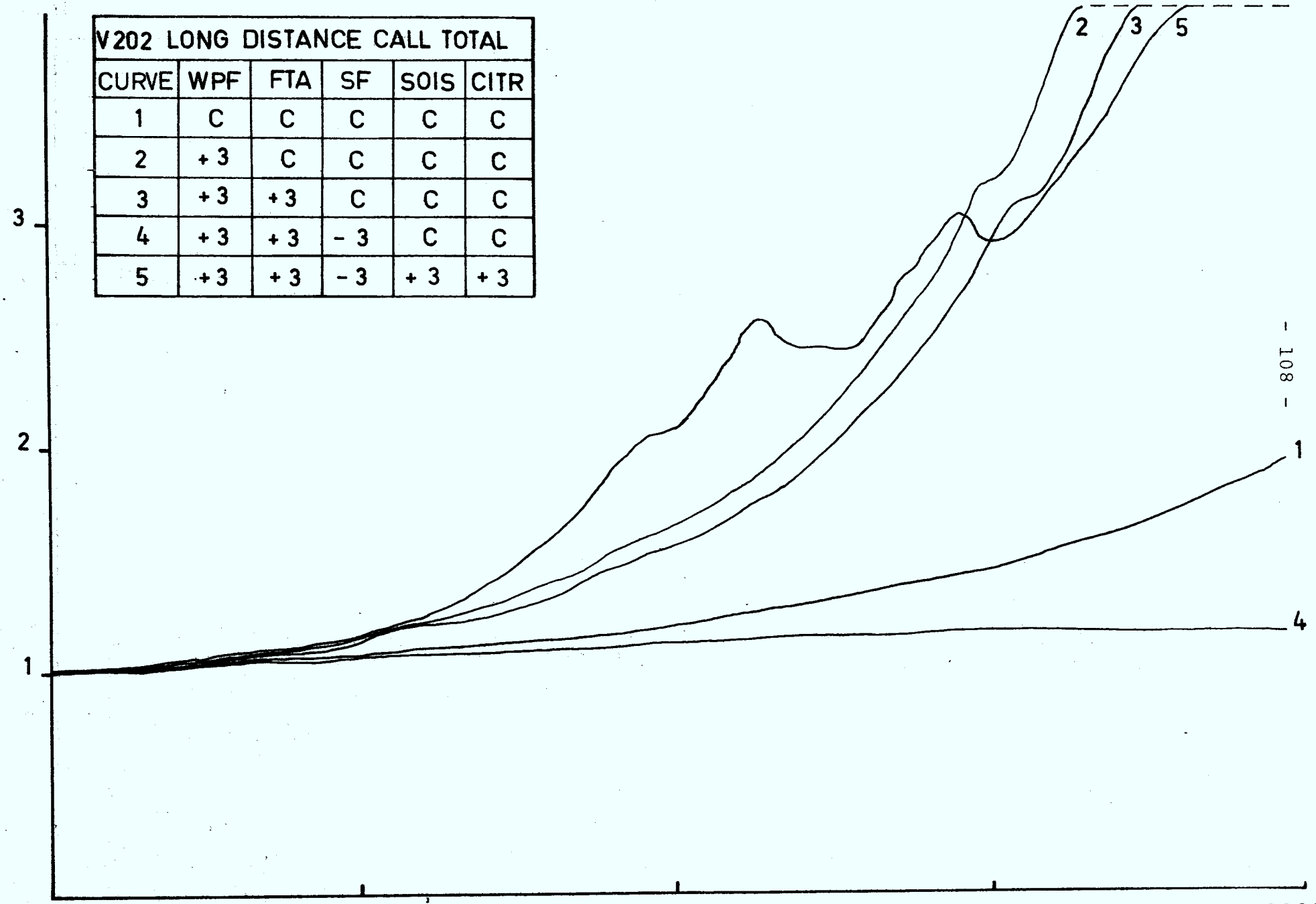


Fig. 3.38

V254 TOTAL ROAD TRAFFIC						
CURVE	WP	WPF	FTA	SF	SOIS	CITR
1	C	C	C	C	C	C
2	+3	C	C	C	C	C
3	C	+3	C	C	C	C
4	C	+3	+3	C	C	C
5	C	+3	+3	-3	C	C
6	C	+3	+3	-3	+3	+3

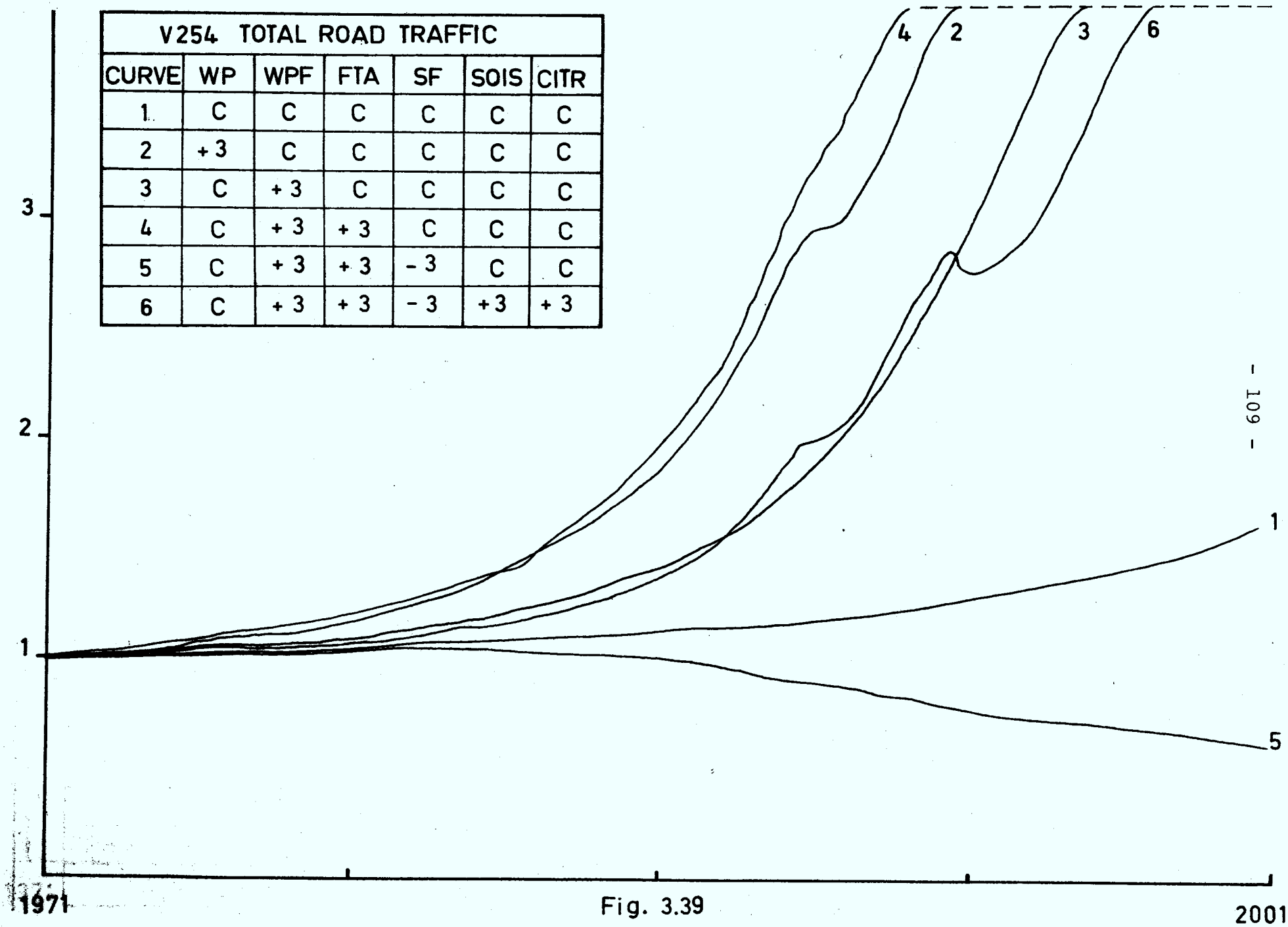


Fig. 3.39

V300 DEMAND FOR LABOUR						
CURVE	WP	MTA	S1	S2	SOIS	CITR
1	C	C	C	C	C	C
2	+ 3	C	C	C	C	C
3	+ 3	+ 3	C	C	C	C
4	+ 3	+ 3	- 3	- 3	C	C
5	+ 3	+ 3	- 3	- 3	+ 3	+ 3

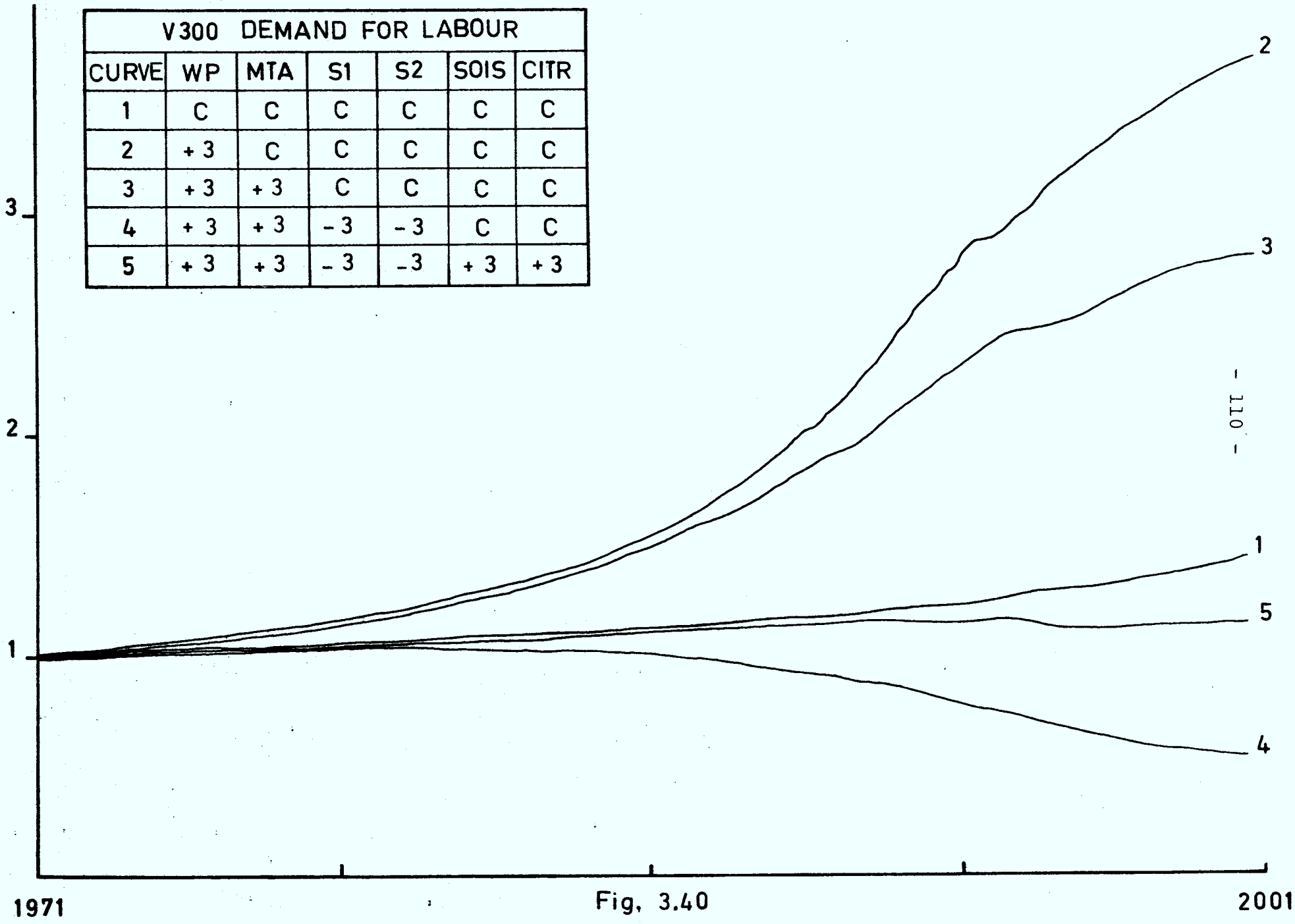


Fig. 3.40

V 301 TOTAL CAPITAL INVESTMENT						
CURVE	WP	MTA	S1	S2	SOIS	CITR
1	C	C	C	C	C	C
2	+3	C	C	C	C	C
3	+3	+3	C	C	C	C
4	+3	+3	-3	-3	C	C
5	+3	+3	-3	-3	+3	+3

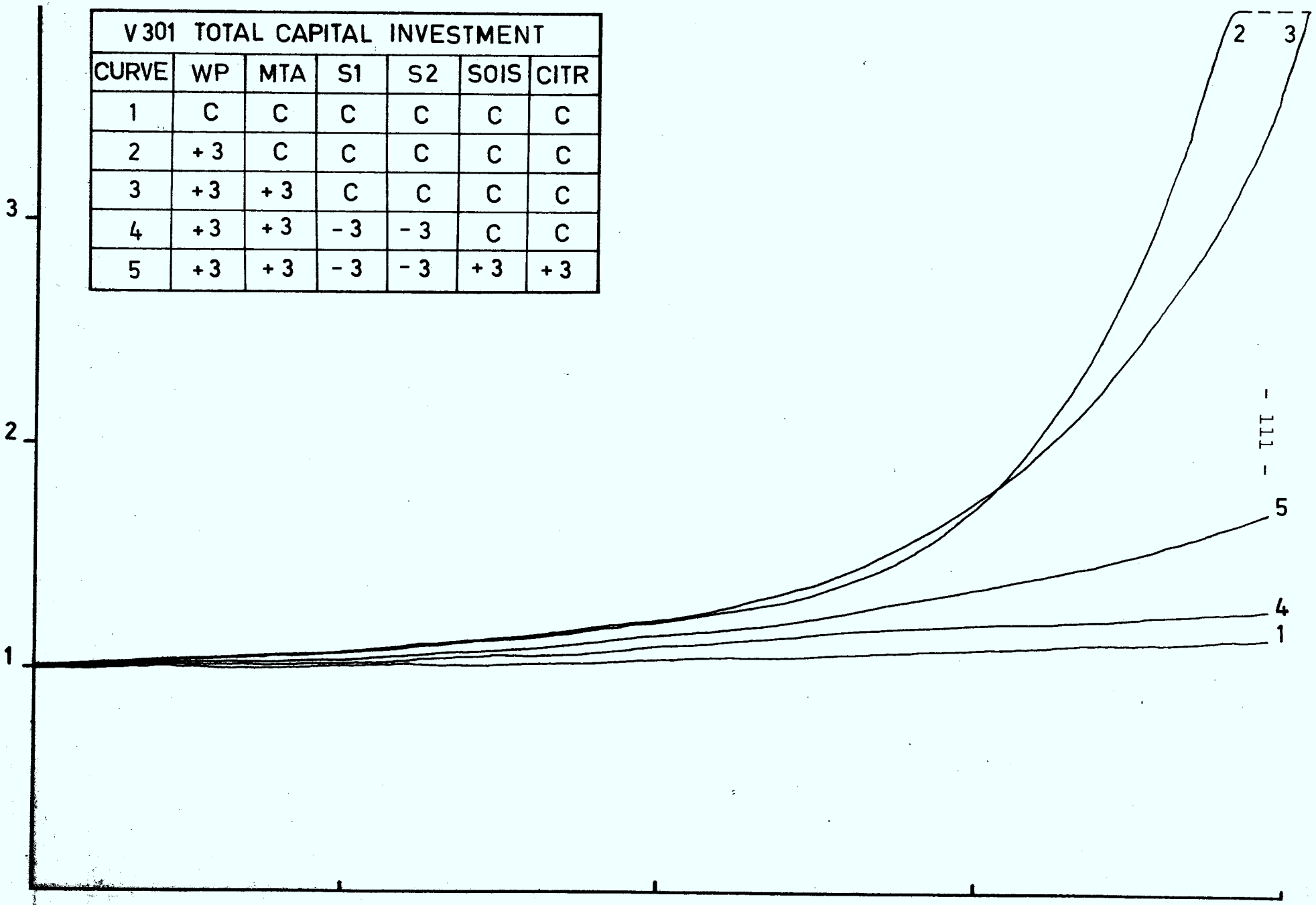


Fig. 3.41

V306 REGIONAL DISPOSABLE INCOME						
CURVE	WP	MTA	S1	S2	SOIS	CITR
1	C	C	C	C	C	C
2	+ 3	C	C	C	C	C
3	+ 3	+ 3	C	C	C	C
4	+ 3	+ 3	- 3	- 3	C	C
5	+ 3	+ 3	- 3	- 3	+ 3	+ 3

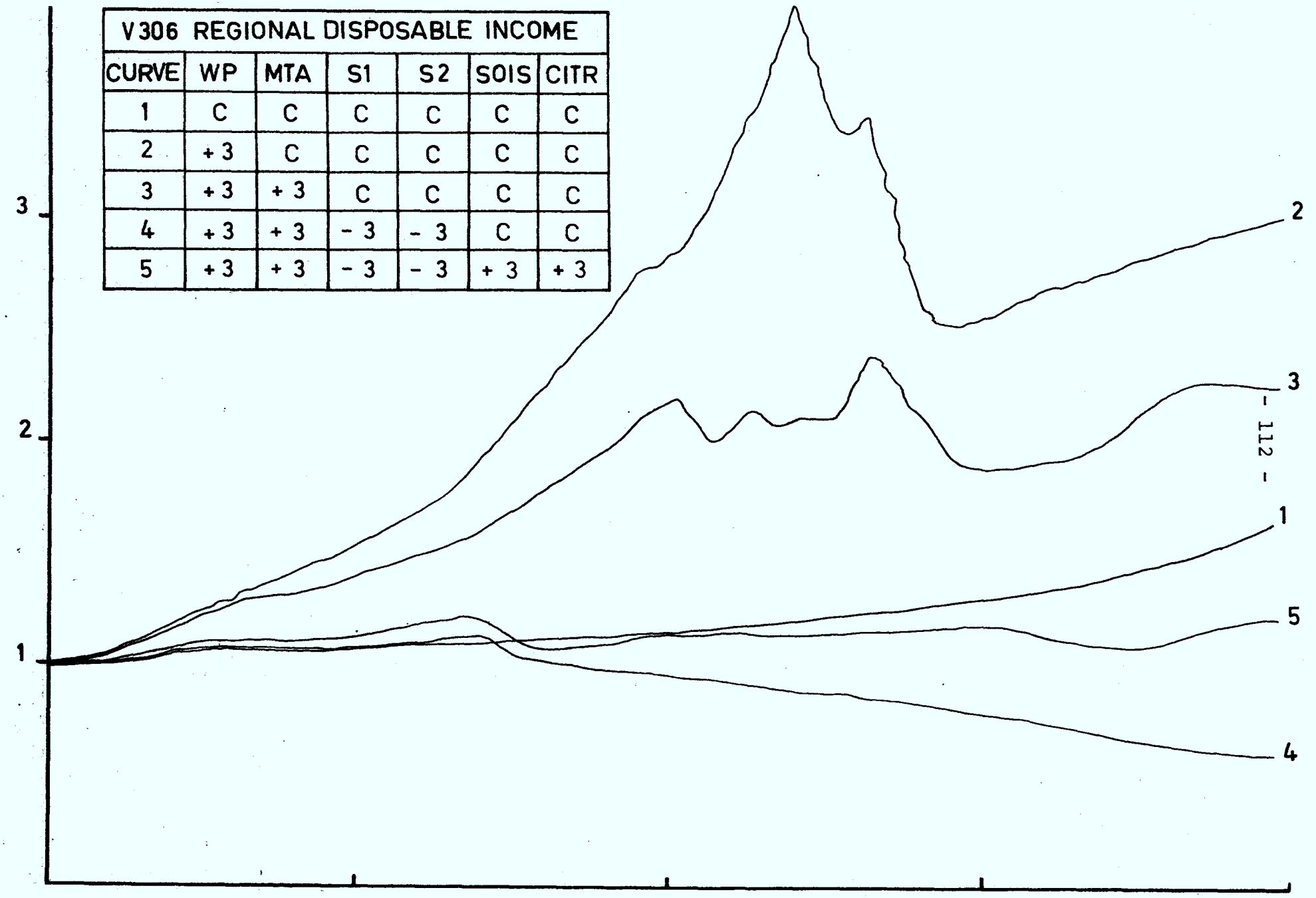


Fig. 3.42

V 351 TOURIST REVENUE						
CURVE	WP	MTA	S1	S2	SOIS	CITR
1	C	C	C	C	C	C
2	+ 3	C	C	C	C	C
3	+ 6	C	C	C	C	C
4	+ 3	+ 3	- 3	- 3	+ 3	+ 3
5	+ 6	+ 6	- 6	- 6	+ 6	+ 6

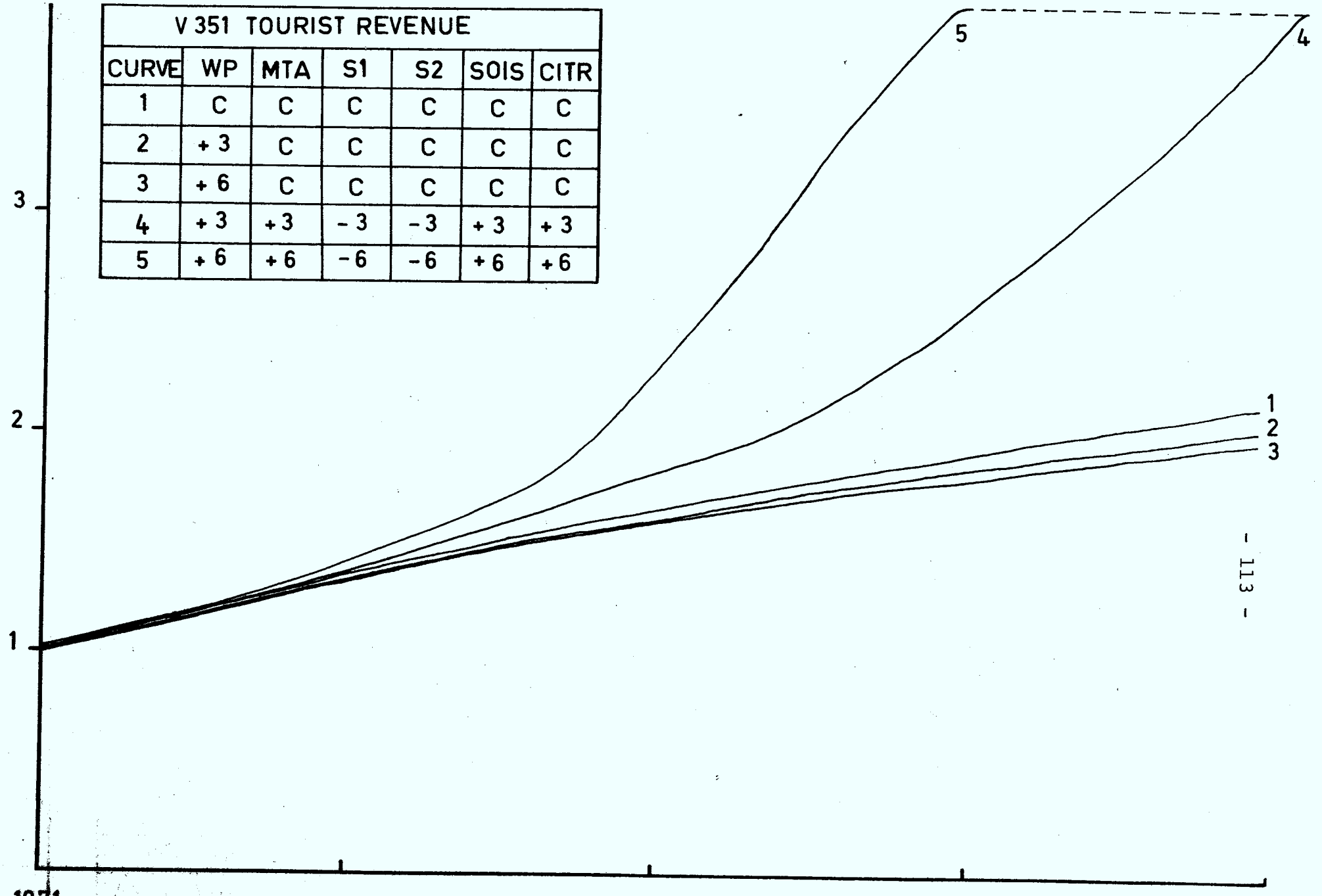


Fig. 3.43

V300 DEMAND FOR LABOR					
CURVE	WPF	FTA	SF	SOIS	CITR
1	C	C	C	C	C
2	+ 3	C	C	C	C
3	+ 3	+ 3	C	C	C
4	+ 3	+ 3	- 3	C	C
5	+ 3	+ 3	- 3	+ 3	+ 3

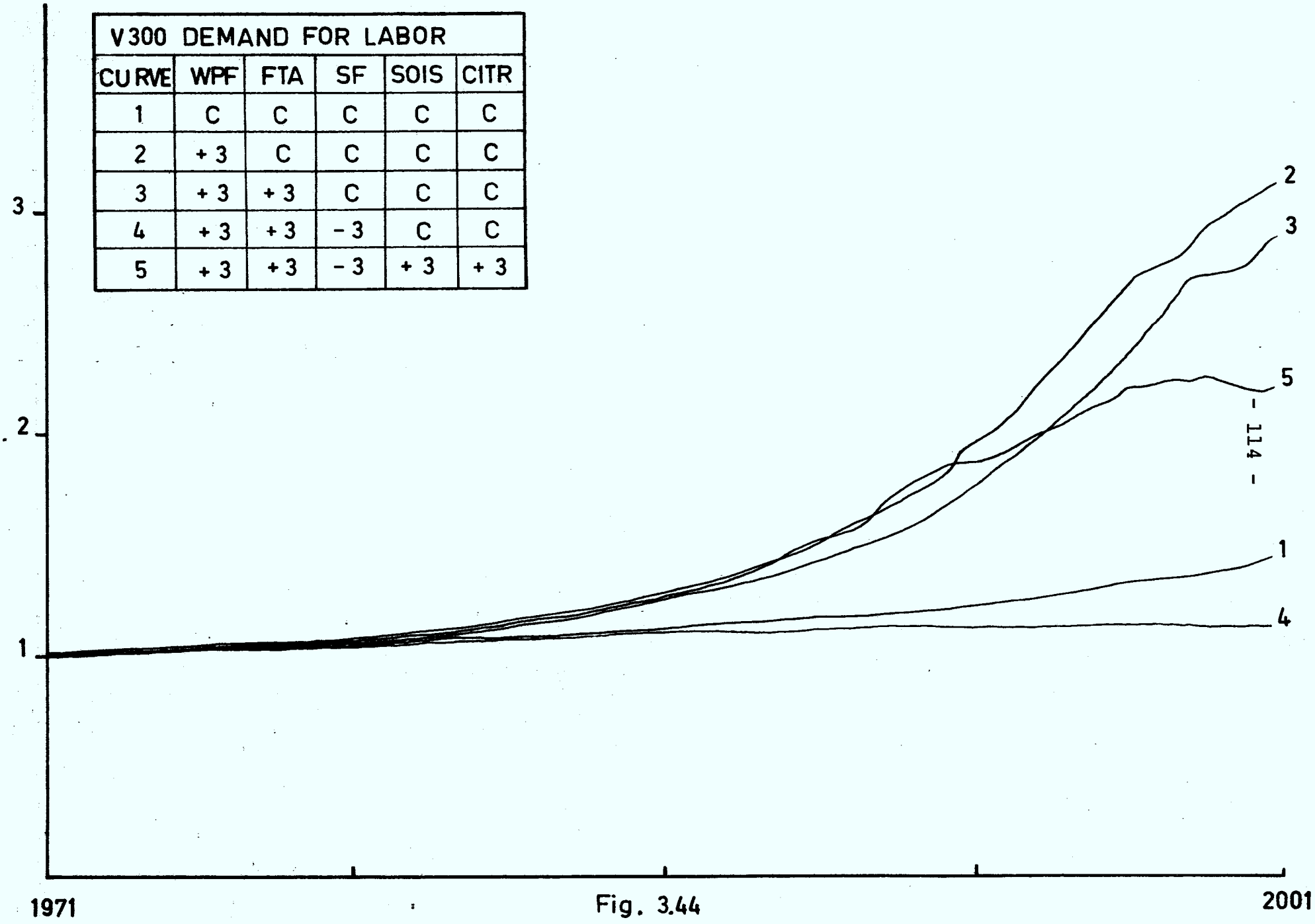


Fig. 3.44

3.8 Sensitivity Analysis of the Regional Model

3.8.1 Introduction

In the previous discussion, some trajectories for the nominal run and slight variations from it were presented. There is a limit to what can be gained in terms of increased understanding of the model or the real system by such runs. They serve the primary purpose of model verification discussed earlier. In this section we are concerned with learning more about how the model behaviour is dependent on the parameters chosen for the model, especially the shape of the modifier functions. The communications component will be the focus of attention since there exists in this sector a large number of hypothetical relationships which may effect model behaviour significantly. First, it will be useful to consider the subject of sensitivity analysis in a more general way.

Sensitivity analysis involves model perturbation over repeated simulation runs by parametric variation. Precise, widely accepted, definitions of sensitivity analysis are not available. However, the basic idea is model perturbation. Such perturbations are performed to net a greater understanding of the simulation results, and the model which produced those results, than is obtainable from the unperturbed, or nominal, simulation run.

The results of a sensitivity analysis may be used to fulfill several purposes: First, they may be taken to constitute a kind of internal validation, i.e. a system of validation that depends on on the model and not on empirical results (Miller, 1974); second, sensitivity analysis may indicate whether or not it is necessary to obtain more information about the nature of some model parameter (Kleijnen, 1974); third, sensitivity analysis provides a method of exploring the nature and consequences of a simulation model (Nooney, 1965; Lawless et al., 1971). In general, successful sensitivity experiments invariably assess the influence of model changes on simulation output.

A variety of approaches may be employed in the sensitivity analysis process itself. A modeller may be reasonably confident of the overall structure and the general shape of the associated functions. In such cases, the manipulation of individual parameters would be the

obvious approach to sensitivity analysis. Such parameter manipulation can be performed by the addition of "noise" (e.g., Miller, 1974) or by planned perturbation (e.g., Lawless et al., 1971). Here the choice will depend on the objectives the modeller wishes to accomplish via sensitivity analysis. Model exploration requires planned perturbation. Internal validation requires stochastic manipulation, or "noise". Assessment of data sufficiency may require both. Parametric sensitivity analysis may, in some cases, be performed in a statistically rigorous fashion. If a modeller has less confidence in his model functions and/or structure, function and structure perturbation may be useful. (Note that the element of "confidence" is, of course, subjective and prone to error.) Such manipulation is necessarily performed in a predetermined, rather than stochastic, fashion. The significance of output variation due to "noise" is unclear in such cases. Here again, the sensitivity analysis approach may vary with the aims of the modeller.

Perhaps the most important feature of a particular sensitivity analysis is whether or not it proceeds according to some objective, statistical design. In cases where such a design may be used, the sensitivity analysis process becomes more or less straightforward, in principle at least. Moreover, it becomes much easier to draw more general conclusions concerning models of the type tested. However, many models cannot undergo sensitivity analysis based on some rigorous framework. Usually this is because such models lack some property which is required by the statistical framework in question. In view of this essential dichotomy in sensitivity analysis, further discussion will be divided into a consideration of "rigorous" sensitivity analysis, where statistical objectivity is possible, and "fuzzy" sensitivity analysis, where it is not.

3.8.2 "Rigorous" Sensitivity Analysis

Over the last fifteen years there has been a steady proliferation of statistical techniques useful in simulation. (See Kleijnen, 1974, for examples.) In the case of sensitivity analysis, this development has perhaps been less rapid. Nonetheless, statistical methods for sensitivity analysis have been developed that seem to be of some use.

There are several criticisms to be made of the rigorous, statistical techniques available for sensitivity analysis. Too often the requirements models must meet, usually linearity and determinacy, restrict the application

of such techniques to a small set of relatively simple models. Further, should the modeller make all the simplifications necessary to use a given sensitivity analysis technique, it is all too likely that the technique will provide no guidance in crucial areas, such as the formula for a coefficient that represents the overall sensitivity of the model. The presently available techniques are a long way from handling all models or all stages of sensitivity analysis.

3.8.3 "Fuzzy" Sensitivity Analysis

In those cases where rigorous sensitivity analysis is not possible, "fuzzy", or qualitative, sensitivity analysis is necessary. Such sensitivity analyses may, it could be argued, provide spurious and, at best, sketchy information. However, attempting such an analysis must necessarily enhance the modeller's understanding of the inadequacies and limitations of the model. Too often, the basic, or standard, simulation run conceals more than it reveals.

But how is fuzzy sensitivity analysis to proceed? From three directions: (1) The modeller should explore the sensitivity of the simulated system behaviour to variations in parameters, functions and structures for which the modeller had meager data. This will inform the modeller of the need for further data-gathering, as well as providing some basic assessment of the importance of a certain parameter. (2) The sensitivity of system behaviour to variations in the most dynamically significant parameters, functions and structures should also be tested, (although the dynamic significance of the parameters, functions, and structures can only be assessed properly via sensitivity analysis). By an assessment of this aspect of sensitivity, an approximate picture of the dynamic stability of the model may be obtained. (3) Finally, sensitivity analysis should explore those parametric, functional, and structural modifications which, in view of the real-world system being modelled, may be important variations on the basic model. Such a sensitivity analysis constitutes an approach to model exploration. While the above three "directions for fuzzy sensitivity analysis" may use the same sensitivity runs for basic data, they should be considered as separate approaches to the design and interpretation of sensitivity analysis experiments.

In the execution of a "fuzzy" sensitivity analysis, several problems occur which are not of concern in rigorous sensitivity analysis. Particularly important is the question of whether or not functional and structural

perturbations are to be employed. In rigorous sensitivity analysis the experiments that can be analyzed are those that are performed. Generally, this restricts the investigation to parametric perturbations. Quantitative approaches to the assessment of model sensitivity to functional and structural perturbations are generally lacking. But in fuzzy sensitivity analysis no such limitations exist. Instead, the question of how best to use the modeller's time and resources is paramount. For most complex models, exhaustive sensitivity analysis can be endless (Herman, 1967). The actual sensitivity analysis performed will depend on the modeller's perceived priorities. In general, the extent of a fuzzy sensitivity analysis will depend on pragmatic, rather than statistical, constraints.

Another problem in fuzzy sensitivity analysis is the interpretation of results. It could be contended that sensitivity experiments performed without a statistical design vitiate any possible conclusions. Strictly speaking, this is correct. However, one can reason from such sensitivity results provided disclaimers are inserted to the effect that: "other conclusions could be obtained"; and "the ultimate conclusions are of no necessary validity". Thus, fuzzy sensitivity analysis can not prove or show anything; it can only suggest.

Somewhat different from the problem of arriving at general conclusions from fuzzy sensitivity analysis is the question of specific, falsifiable predictions. Since the basic simulation run represents what is known, congruity between it and some set of data is not a significant result. However, correspondence between sensitivity runs, with altered parameters, functions, or structures, and empirical results from situations corresponding to those altered parameters, functions, or structures constitutes a check on model predictions. By means of fuzzy, as well as rigorous, sensitivity analysis, the less obvious corollaries inherent in a model may be ascertained and, hence, tested. Thus sensitivity analysis may be used in conjunction with validation to produce scientifically acceptable results.

3.8.4 Considerations Relevant to the Regional Model

From the above argument, it is clear that sensitivity analysis must be considered imperative in any comprehensive modelling study. However, in the case of the regional model, special problems exist. First, the model is gargantuan; the generation of a single, complete set of output requires an appreciable amount of work. Second, most of the model parameters, functions, and

structures are based on substantially indirect evidence. Third, the regional model is an interactive one, with many possible "decision" settings. Hence, a complete sensitivity analysis would require as much effort, in all likelihood, as the development of the model itself. The possibility of such a project must be dismissed.

Further restrictions on any possible sensitivity analysis of the regional model are apparent. The non-linearity of the model makes impossible any approaches based on multiple linear regression (cf. Lawless et al, 1971). In view of the complexity and sheer size of the model, Miller's (1974) approach is infeasible. Assessment of data-base sufficiency seems pointless, since it is already known that the data were inadequate and, in any event, obtaining appreciably more data would be extremely costly. Model exploration, in the case of the regional model, presents an infinitude of possibilities, too many, indeed, to begin. Specific, falsifiable predictions arising from the model are probably unlikely. In fact, specific objectives that could be attained by means of sensitivity analysis in the case of the regional model seem to be scarce.

However, in certain respects, the model is ideally suited to sensitivity analysis, at least of a bastardized sort. If one takes the decision ("exogeneous") variables to be the parameters of interest, both the model's hardware and software are ideally suited to such a sensitivity analysis. If it is accepted that the actual model is not so much a model per se as an interactive simulation game, it can be of great benefit in aiding policymakers to reach conclusions in the light of: (a) the need for more data in the determination of the optimum policy; (b) the sensitivity of the entire socioeconomic cultural system to variations in a given policy; (c) the results of model exploration pointing, subject to the model's limitations, to possible consequences of various policy decisions. All of this, in fact, constitutes a kind of sensitivity analysis.

3.8.5 Sensitivity Results

A number of functions in the communications component were selected for sensitivity tests. These are listed in Table 3.1.

Table 3.1

Functions	Relationship
F221 - F226	Functions affecting media penetration.
F261, F263	Effects of population and disposable income on private road traffic.
F269 - F272	Effects of telecommunications on private road traffic.
F406 - F408	Effects of telecommunications on education expectations.
F459 - F461	Effects of telecommunications on health service expectations.

The approach taken in testing model sensitivity to the functions listed above was as follows. Four function types were chosen to represent possible variations in the nature of the particular relationship. These four function types are plotted in Figure 3.45. The marginal linear relationship (function type 1) has a slope of 0.05 (a 5% increase for a doubling of the independent variable with respect to its nominal value of unity). Function type 2 is a proportional relationship with a slope of unity. The two nonlinear forms are a monotomically increasing function (type 3) and a Sigmoid curve (type 4). A choice was made for the set of exogenous variables that resulted in moderate dynamic changes for most of the model variables; all were set constant except the world prices for forest and mineral resources, which were set to increase by 2% per year. The response of the model to changes in each function type was then observed for each of the functions listed in Table 3.1 for a 30-year time span. This was done without consideration of the form that each function was originally assumed to take. In other words, an attempt was made objectively to assess the sensitivity of the assumptions made about each function in the original model. Clearly, to evaluate the response of the model to function

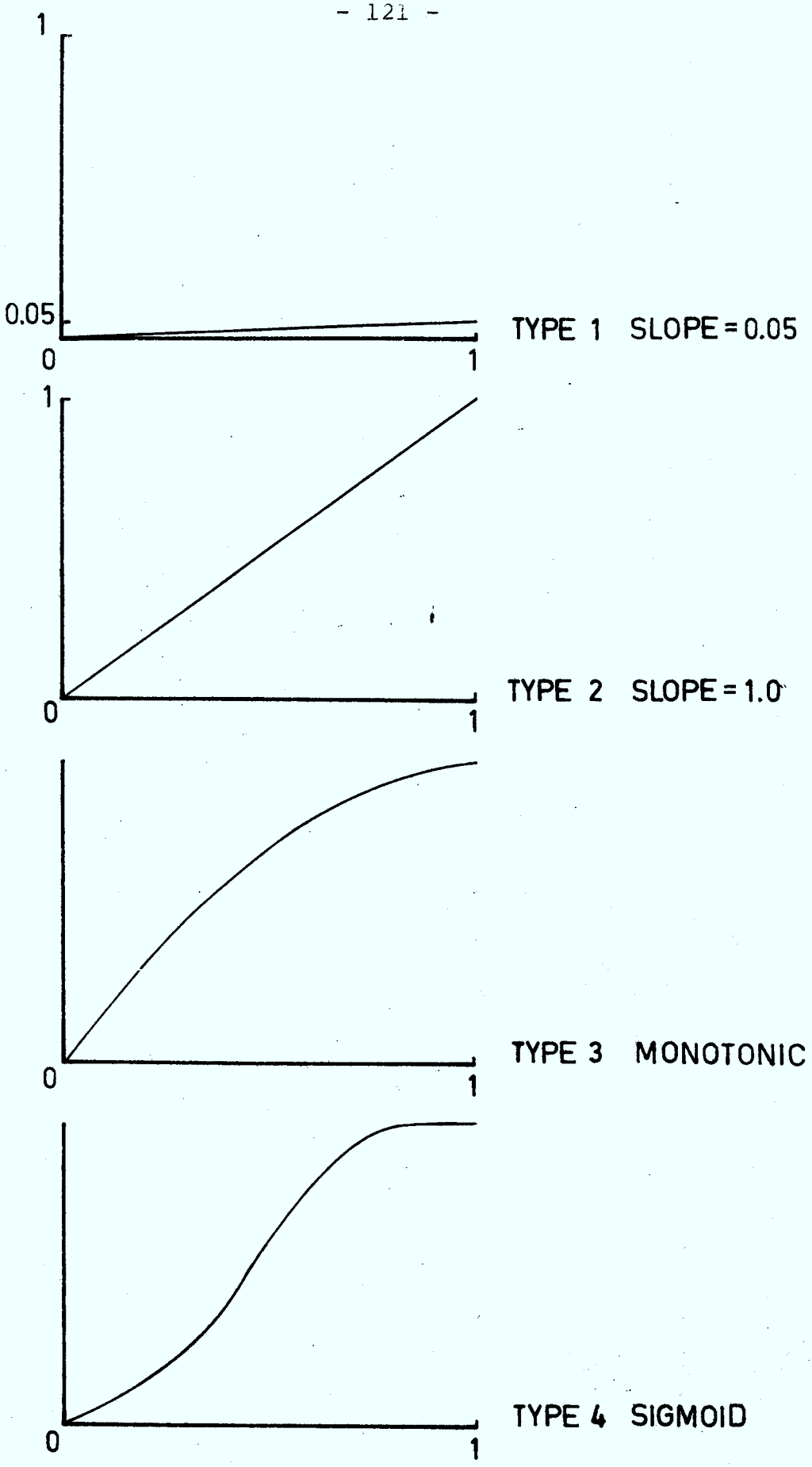

1
0.05
0
1
TYPE 1 SLOPE = 0.05
1
0
1
TYPE 2 SLOPE = 1.0
0
1
TYPE 3 MONOTONIC
0
1
TYPE 4 SIGMOID

Fig. 3.45

changes, all model variables would need to be observed for each run. Since this was impossible, given the existing time and manpower limitations, only those variables most directly affected by the function being investigated were observed.

Let us first consider the functions associated with the media variables (F221-F226). For convenience, this part of the model is reproduced in Figure 3.46. Function F221 relates changes in the average level of education (L400) to changes in newspaper circulation (V222). Figure 3.47 shows the maximum variation in V222, which occurred between function types 1 and 3. As would be expected, given the relatively small variation in L400 over the 30-year run, the model sensitivity to changes in F221 is low. Function F222 relates changes in the level of urbanization (V103) to changes in newspaper circulation (V222). Figure 3.48 shows the variation in V222 for function types 1 and 3. As in the case of F221, sensitivity is low. It can further be concluded from the above two results that the model sensitivity to functions of V222 (newspaper circulation) is likely to be low, due to the small dynamic range observed for this variable. These functions are F406, F459, F266, F269, F274 and F318. This conclusion is, of course, justified only for exogenous conditions similar to those used for the above tests (those which produce small changes in V222).

Functions F223 and F224 relate changes in the level of urbanization to changes in television (V221) and radio (V220) penetration (receivers per capita). Variations in V221 due to changes in the function F223 were observed to be negligible for all four function types. Figure 3.49 shows the small variation in V220 for changes in F224. Again, it can be concluded that model sensitivity to functions F223 and F224 is low.

Functions F225 and F226 relate changes in average disposable income (V306) to changes in radio and television penetration. As was seen from the simulation runs discussed previously, V306 exhibits fairly large changes over the 30-year time span under favourable economic conditions (such as the 2% growth rate for resource demand that was used). One would expect the sensitivity of variables V220 and V221 to be high to changes in F225 or F226. Both functions produce similar responses to changes and only F226 will be discussed here. Figure 3.50 shows the response of V220 to changes in function type for F226. The behaviour of V220 for the strong function types, 2, 3, and 4, is also reflected in the behaviour of V252, V253 and V254 (road traffic), through functions F268 and F271, and V251 (air traffic) through function

F276. The conclusion to be drawn here is that it is dangerous (and unrealistic!) to assume a strong dependence of radio and television penetration on disposable income, given the present number of receivers in the region. This is especially true in the case of radio receivers and is reflected in the mild form assumed for F226 (see Appendix A.2).

Now consider the functions affecting private road traffic (V253). Population (V101) affects road traffic through function F261. Figure 3.51 shows the variation in V253 for function types 1 and 3 used for F261. Since the regional population exhibits a relatively large dynamic range, the model sensitivity to F261 is predictably high. It should be noted that the nominal form for F261 is linear with a slope of unity, which results in a trajectory for V253 lying between the two extremes shown in Figure 3.51. The sensitivity of V253 to function F263 (a function of disposable income, V306) is similar to that for F261, as can be seen from Figure 3.52. Again, the nominal form for F263 is intermediate between function types 1 and 3.

Functions F269-F272 relate changes in telecommunications development, including media, to changes in private road traffic, V253. With the exception of F272, a function of total telephone traffic, V207, all are assumed to be weak links (see Appendices A.2 and A.8) expressing a possible transportation reinforcement effect on telecommunications. Figure 3.53 shows the effect of changing function F272 on variables V253 and V254 (private road traffic and total road traffic, respectively). The maximum variation occurs between function types 1 and 4. The nominal form for F272 produces a response intermediate between these two curves. The effects of variations in functions F269-F271 are similar and are typified by the trajectories shown for F271 in Figure 3.54. The sensitivity of V253 and V254 to the extreme forms for F271 is moderate. The basic form of the trajectories is not affected. In all cases, of course, the cumulative effects of variations in a number of functions on the response can be greater than that shown in the preceding runs. In most cases, only one or two relationships are predominant (such as F259 and F261 in the case of V253) and the others (such as F269-F272) are effective only in the long run.

It should also be pointed out that the results reported above for functions F261, F263, and F269-F271, also apply to functions F260, F264 and F266-F268. The latter group modify commercial road traffic, V252, in a similar manner to that in which private road traffic, V253, is modified by the functions discussed above.

Functions F406-F408 relate the effects of media telecommunications on education level expectations, V402. In a similar manner, functions F459-F461 modify health service expectations, V452; the results of these sets of sensitivity tests are similar and only those concerned with education will be discussed here. The effects of varying the form of F406 on the behaviour of the education sector of the model were found to be negligible, largely due to the low dynamic range of the independent variable, V222 (newspaper penetration). Variations in functions F407 and F408 produced similar results. Figure 3.55 shows the variables V402 and V401 in the education sector for function types 1 and 3 used for function F407. The strong function (type 3) results in increased expectations at an earlier date but, due to the time delays inherent in the path from expectations to an increase in the level of education, the latter's trajectory is altered only slightly (V401).

3.8.6 Comments on Sensitivity Analysis

The above results pertain to only a portion of the regional model, namely those variables associated directly with communications. Some general conclusions can, however, be drawn.

(a) Those functions that are based only on conjecture, but are weak in their effects compared to other functions affecting the same variable, need not be of concern in sensitivity analysis since their overall effects are marginal. There is good reason to believe these relationships could be eliminated from the regional model. However, they do serve to express ideas or hypotheses which under some circumstances could become more important in terms of their effect on the system behaviour (especially in the long run).

(b) Those functions that are dependent on variables exhibiting limited dynamic range for a wide variety of exogenous conditions are not likely to be of concern in sensitivity analysis.

(c) The functions representing the strongest links in the model are likely to govern the overall model dynamics and hence the model will exhibit a high degree of sensitivity with respect to their form. One compensating factor is the fact that these functions are likely to be the best understood and most easily supported by data.

(d) The most useful result of the sensitivity analysis

described in this section is to indicate the essential relationships in the model. As a consequence, a more simplified model could be constructed having similar overall behaviour. For example, the health and education components are very insensitive to exogenous conditions or function alterations. Their general behaviour is to produce a gradual movement toward southern Ontario standards. This could be generated by a much simpler structure than that employed in the existing model.

(e) The sensitivity results contribute little toward establishing model validity. They only indicate which relationships are vital, not whether these relationships reflect reality. The matter of validation will be discussed later in this report.

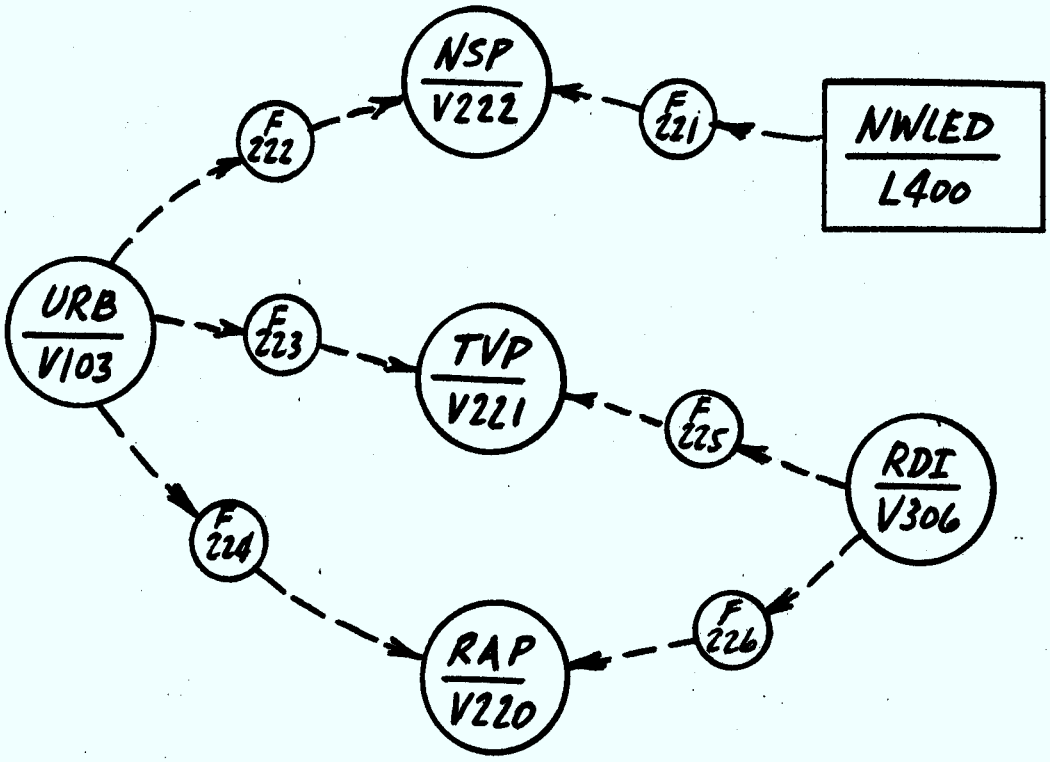
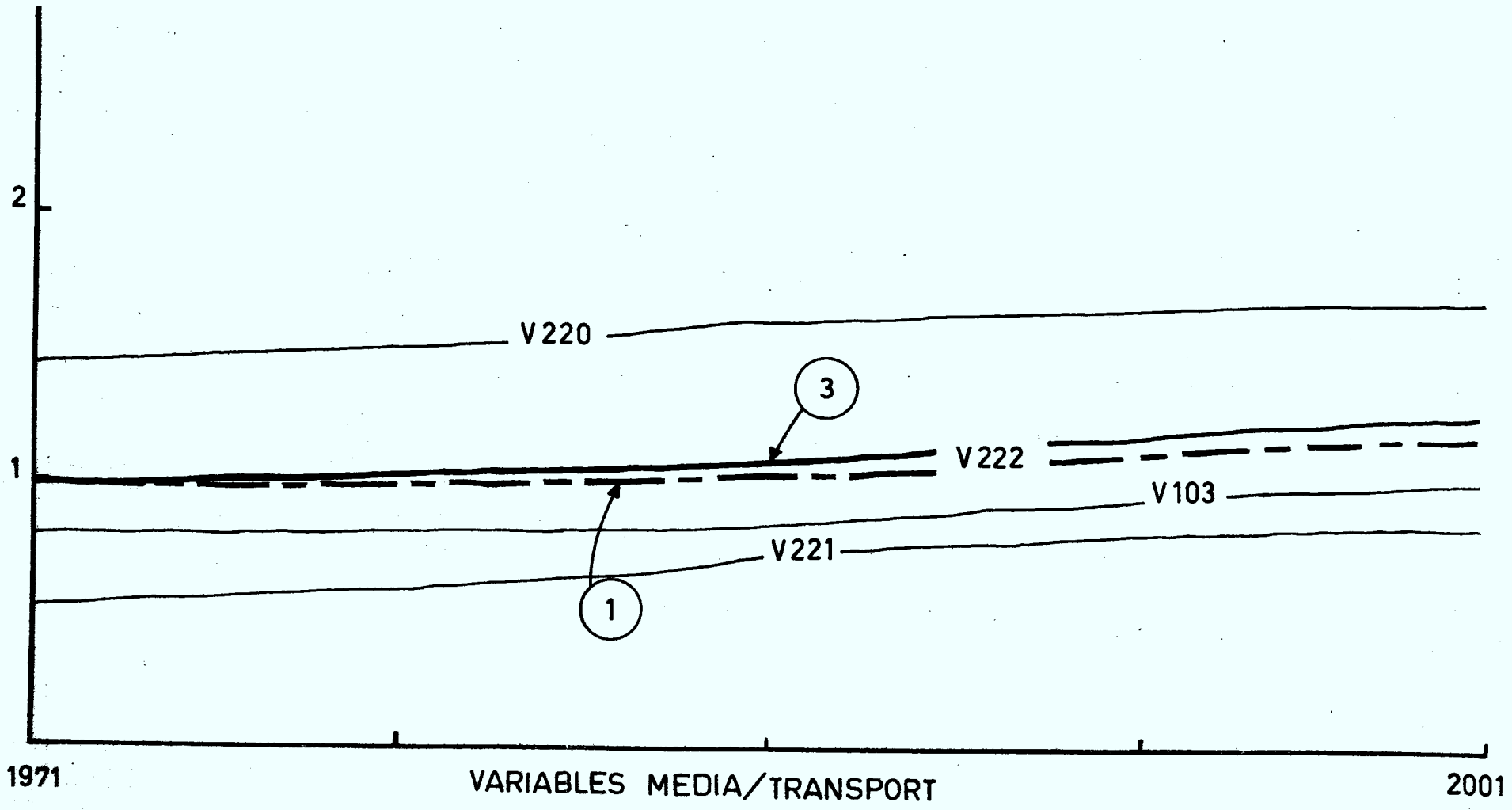

NSP
V222
F
221
NWLED
L400
F
222
URB
V103
F
223
TVP
V221
F
225
RDI
V306
F
224
F
226
RAP
V220

Fig. 3.46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V220
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V222
V103
V221
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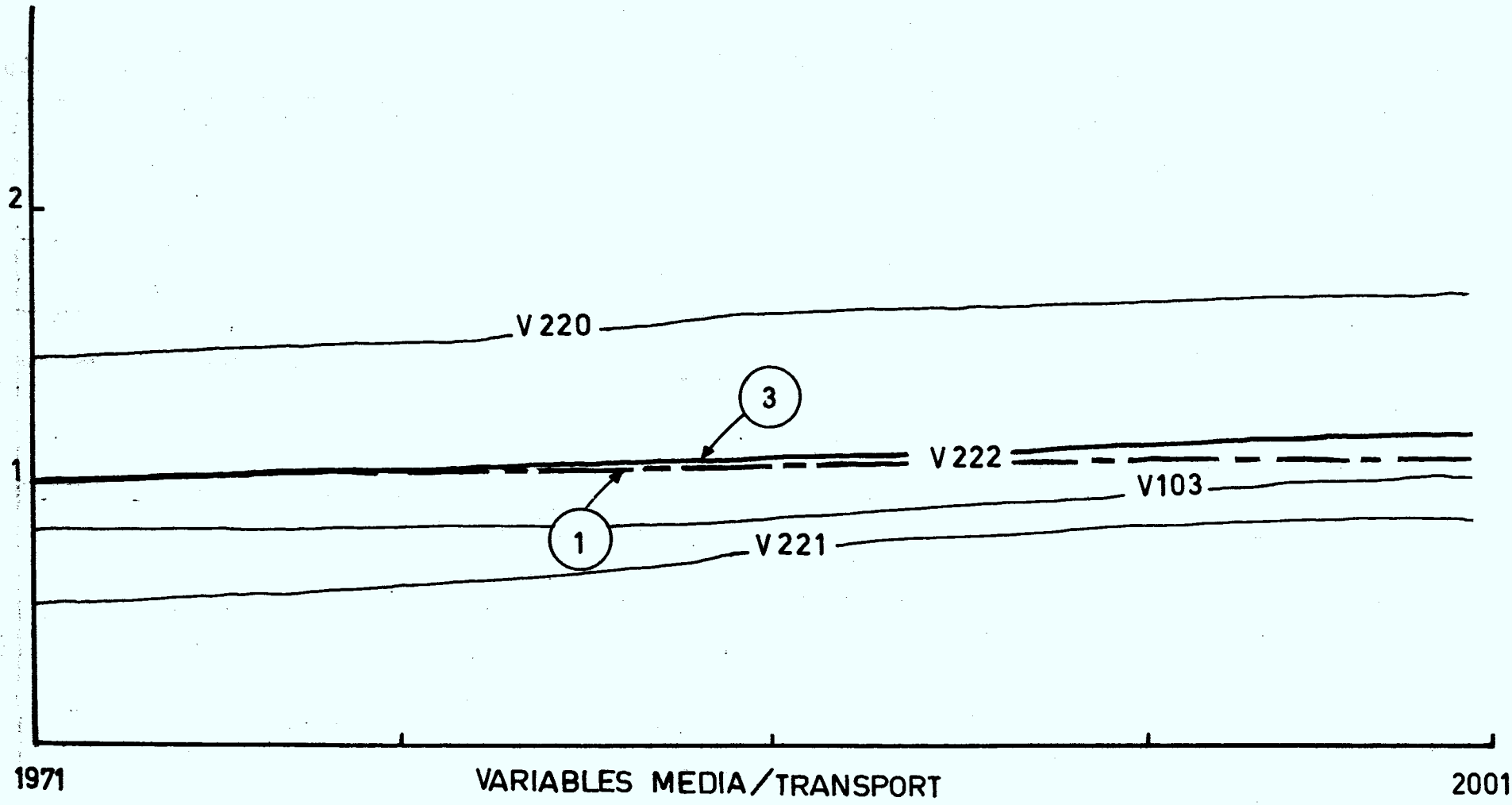
1971
VARIABLES MEDIA/TRANSPORT
2001

Fig. 3.47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V 221
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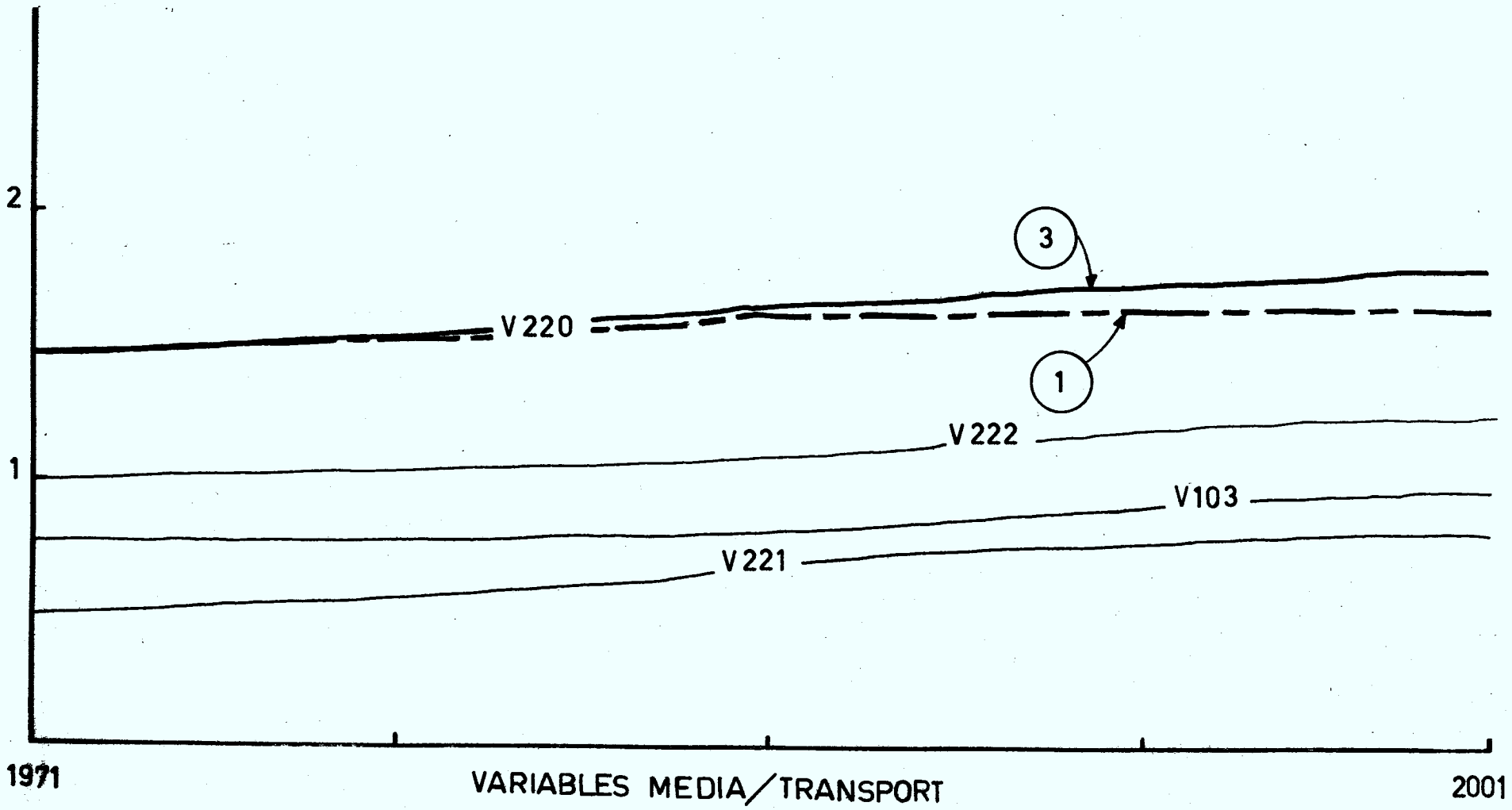
VARIABLES MEDIA/TRANSPORT
2001

Fig. 3.48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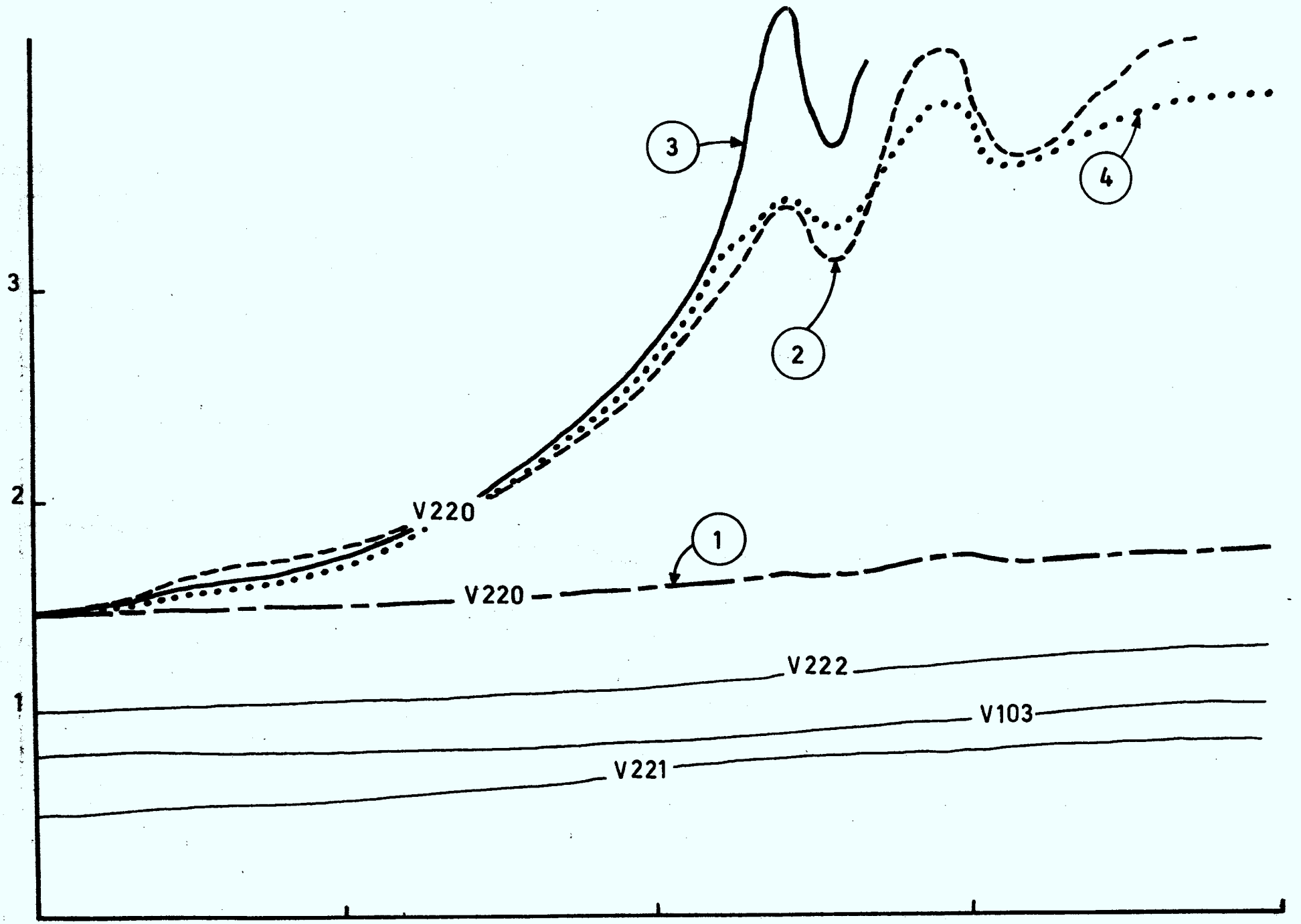
VARIABLES MEDIA/TRANSPORT
2001

Fig. 3.49


3
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VARIABLES MEDIA / TRANSPORT
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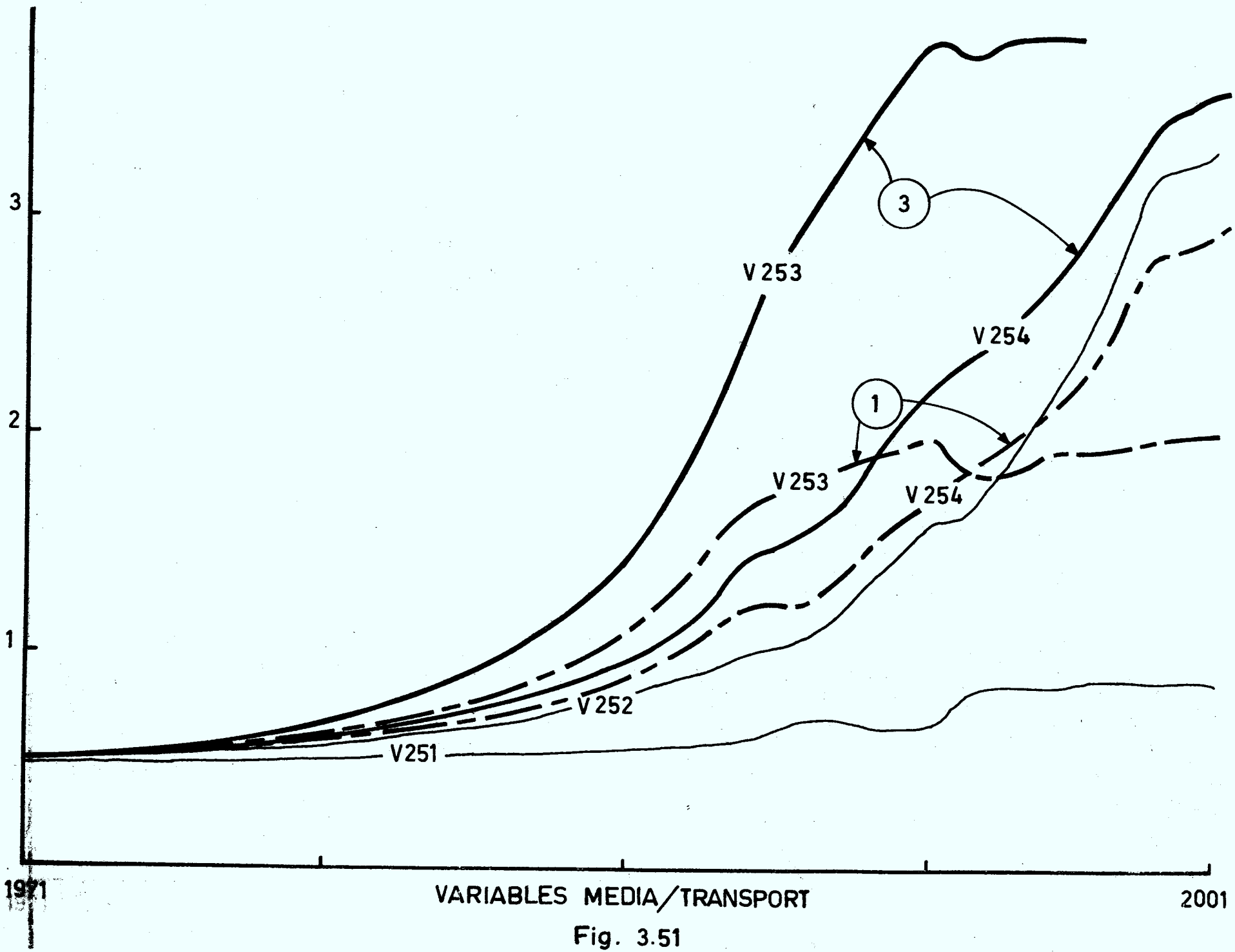
Fig. 3.50


3
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V 254
V 252
V251
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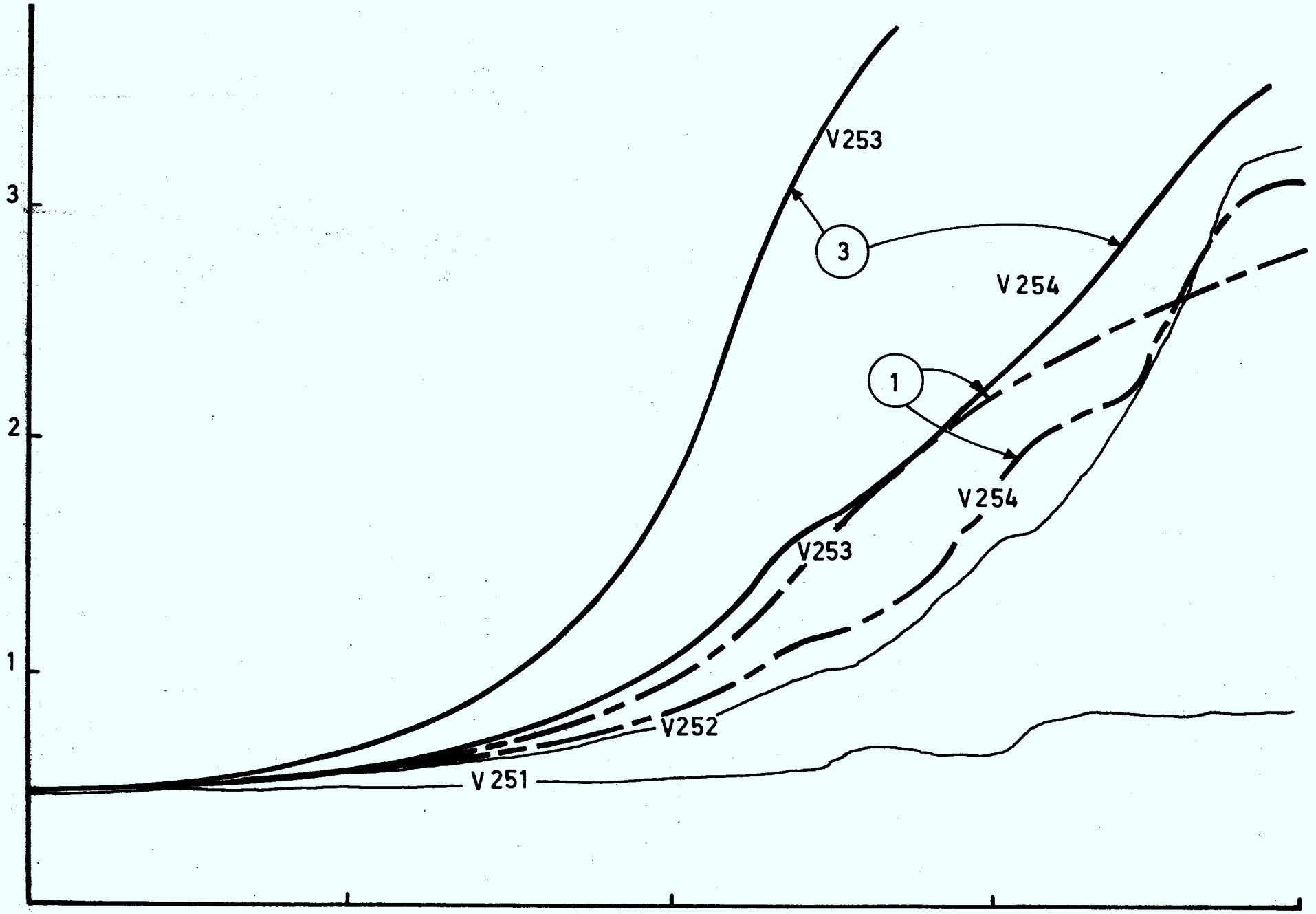
VARIABLES MEDIA/TRANSPORT
2001

Fig. 3.51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V 251
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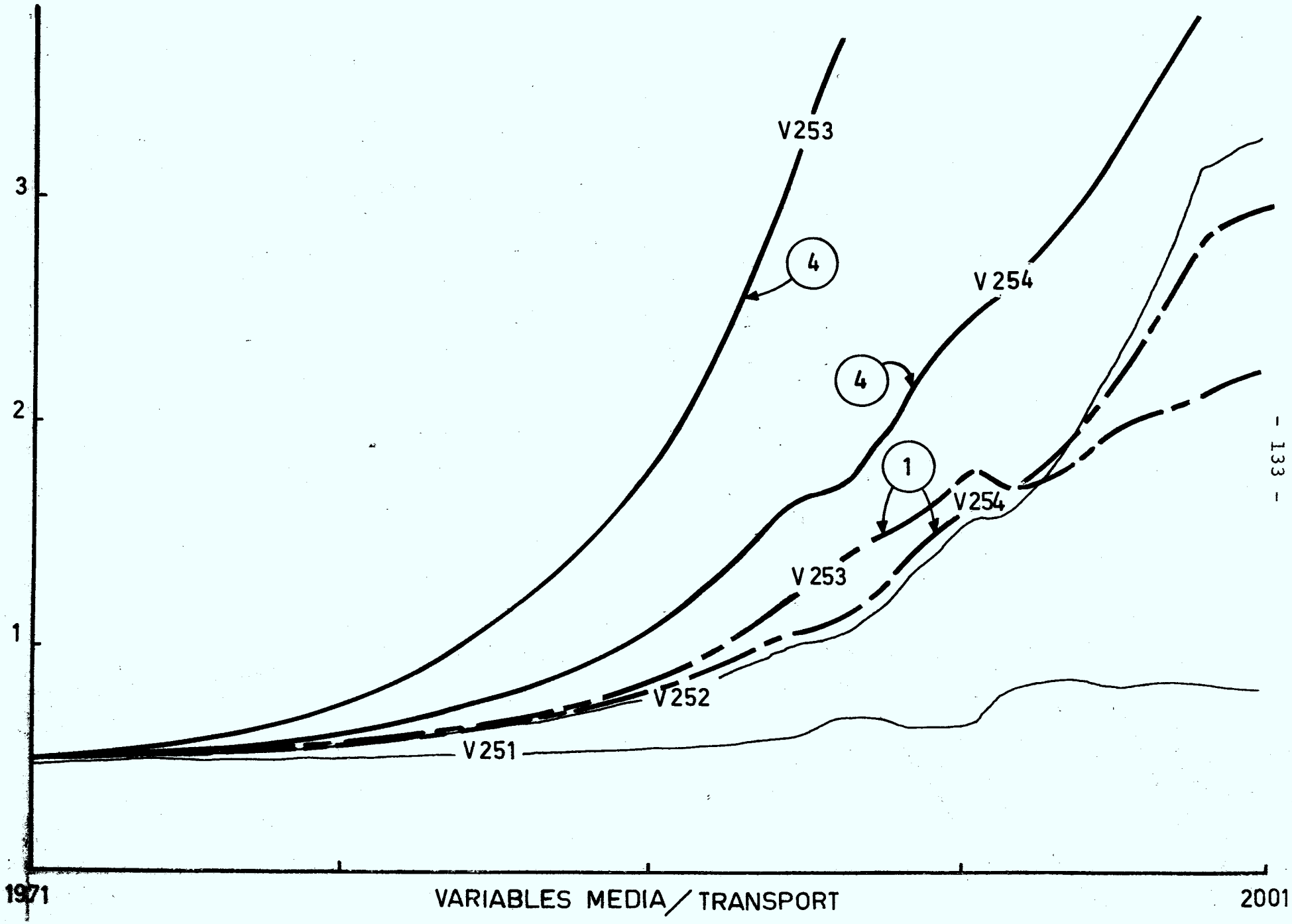
VARIABLES MEDIA / TRANSPORT
2001

Fig. 3.52


3
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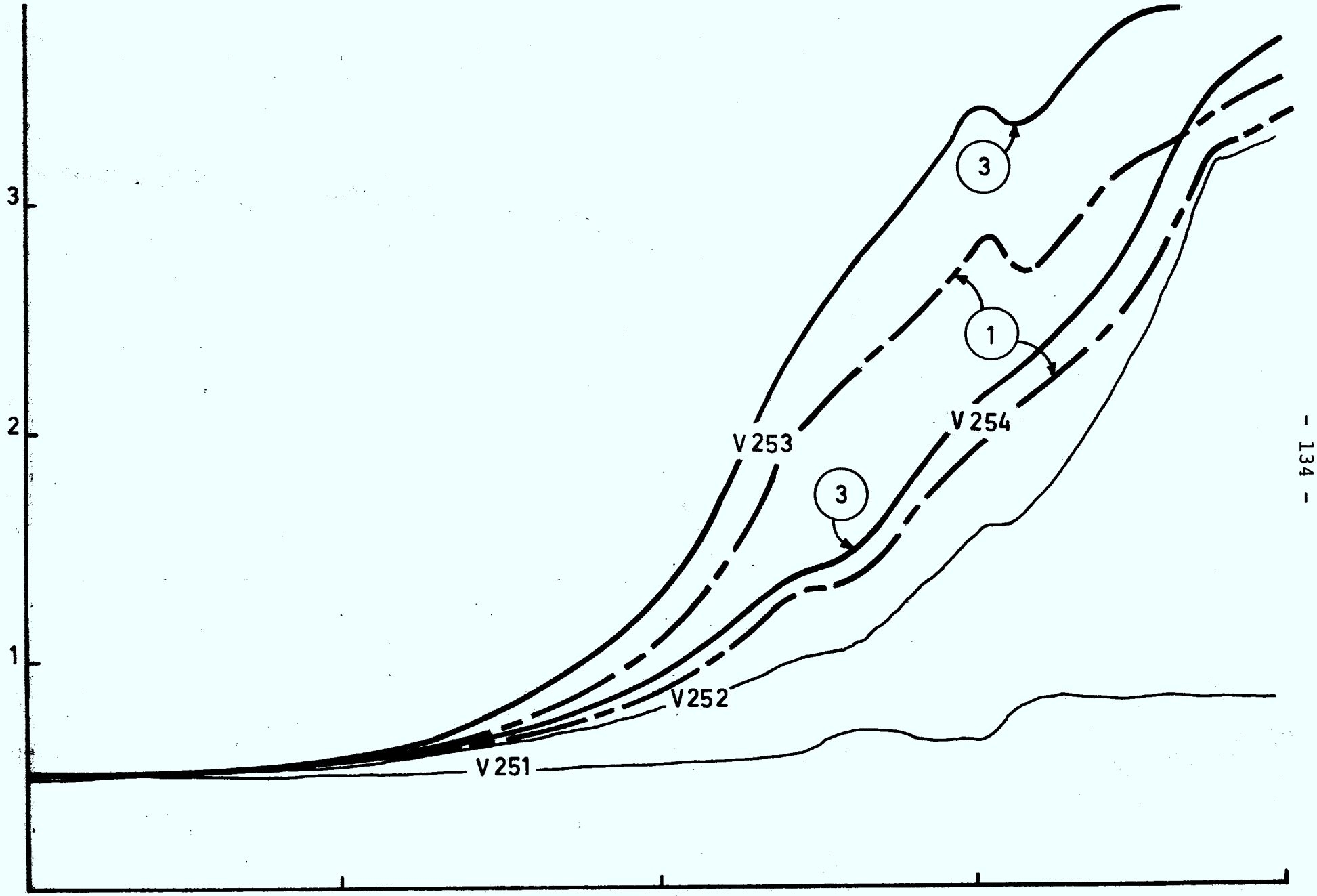
VARIABLES MEDIA / TRANSPORT
2001

Fig. 3.53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VARIABLES MEDIA / TRANSPORT
2001

Fig. 3.54

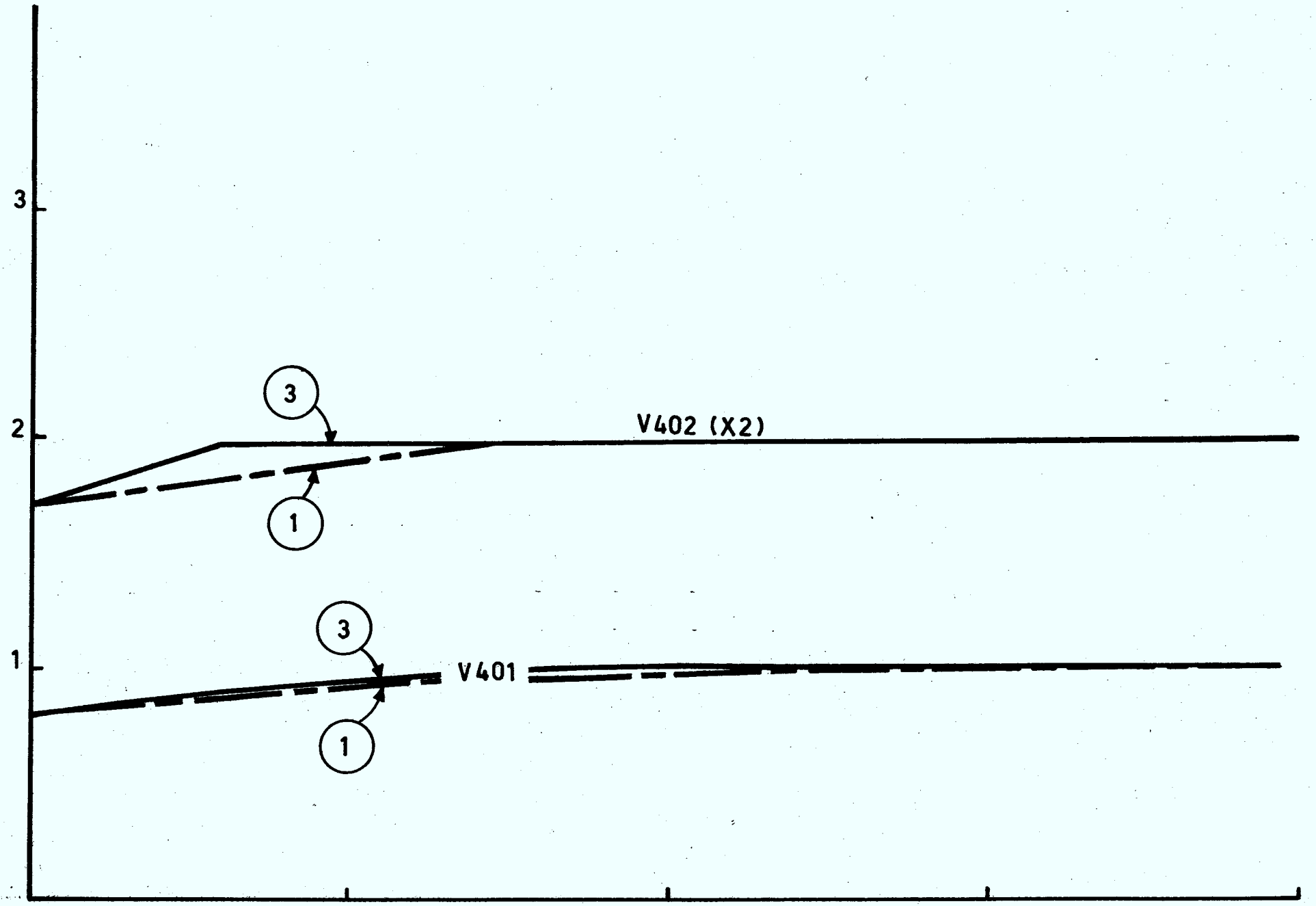


Fig. 3.55

4. MODELS OF INDIVIDUAL COMMUNITIES IN NORTHWEST ONTARIO

4.1 Introduction

In order to allow for a proper evaluation of the dynamic modelling techniques discussed previously, with respect to their usefulness in investigating the role of telecommunications in northwest Ontario, it was realized at an early stage that models on a more microscopic scale than the regional model would have to be explored. It is clear from the previous discussion in Section 3 concerning the regional model that only a limited number of socioeconomic links with the region's telecommunications network were considered. Primarily, links with economic growth, social services, transportation utilization and urbanization were explored. Since a wide range of specific communications media is available in the region, it was found impossible to deal with truly social and psychological impacts of telecommunications at the level of aggregation deemed appropriate for the regional model.

Not only are the communications services offered in the region diverse but so are the types of communities present. These range from native communities of a few families to the urban centre of Thunder Bay. Certainly both the needs for and effects of telecommunications facilities will differ widely from community to community in the region. Thus, in considering a more microscopic level for model development, the community (or a number of communities) was a natural choice.

The development of community models was carried out in conjunction with social and psychological field studies in the communities of interest. The nature and detailed findings of these studies are presented elsewhere in this report. Given the problems associated with aggregation in the regional model and the fact that the field studies would provide a direct source of data and information, two choices as to the approach to be taken in developing the community models presented themselves. First, an entirely different approach could be taken such as describing all aspects of the community social and economic structure in terms of information flow or some other esoteric concept. While academically appealing, such an approach has a high risk of providing little in the way of useful information for policymakers. Second, a compromise between the high level of aggregation of the regional model and the lack of usefulness of a

completely abstract model could be sought. The latter approach was taken and it remains to be seen how successful this compromise is, perhaps by further exploration in a realistic environment of policy planning.

Models were developed for two of the communities studied during the course of the project: the native village of Aroland and the town of Sioux Lookout. As will be indicated in the discussion of each model which follows, a number of positive results and conclusions can be made as a result of each modelling exercise. There is also a limited aspect to the immediate usefulness of each. Due to lack of time and information, the Aroland model was not developed beyond the structural stage and due to time and human resource limitations, the Sioux Lookout simulation model software has not been developed completely.

The purpose of this section is to describe the structure for each model and the underlying assumptions in some detail. Where possible, summaries have been provided for readers requiring a more general understanding of the models.

4.2 Aroland Community Model Structure

4.2.1 Introduction

From the beginning it was evident that a great deal of information concerning Aroland had been obtained as a result of the fieldwork but that due to the nature of the community and the lack of quantitative data it would not be profitable to develop a working computer simulation model at this time. Rather, a structure showing possible relationships between salient characteristics of the social and economic system would be developed which would clearly indicate roles played by telecommunications.

While an overall diagram of the model is included in Figure 4.1, smaller segments will be referred to for the sake of clarity. In all cases, an attempt will be made to relate the assumptions made regarding the model to the findings of the field studies carried out in 1973 (see Appendix A.5.

4.2.2 Economic Component

As in most of northwest Ontario, the economic base for the region around Aroland is the development of natural resources. In the case of Aroland, the primary resource is timber and the economic activity is that of wood cutting in which 24 men are employed by Kimberly-Clark.

COMMUNITY MODEL OF
AROLAND, ONTARIO

Note: The details of this Figure are amplified elsewhere in this Section.

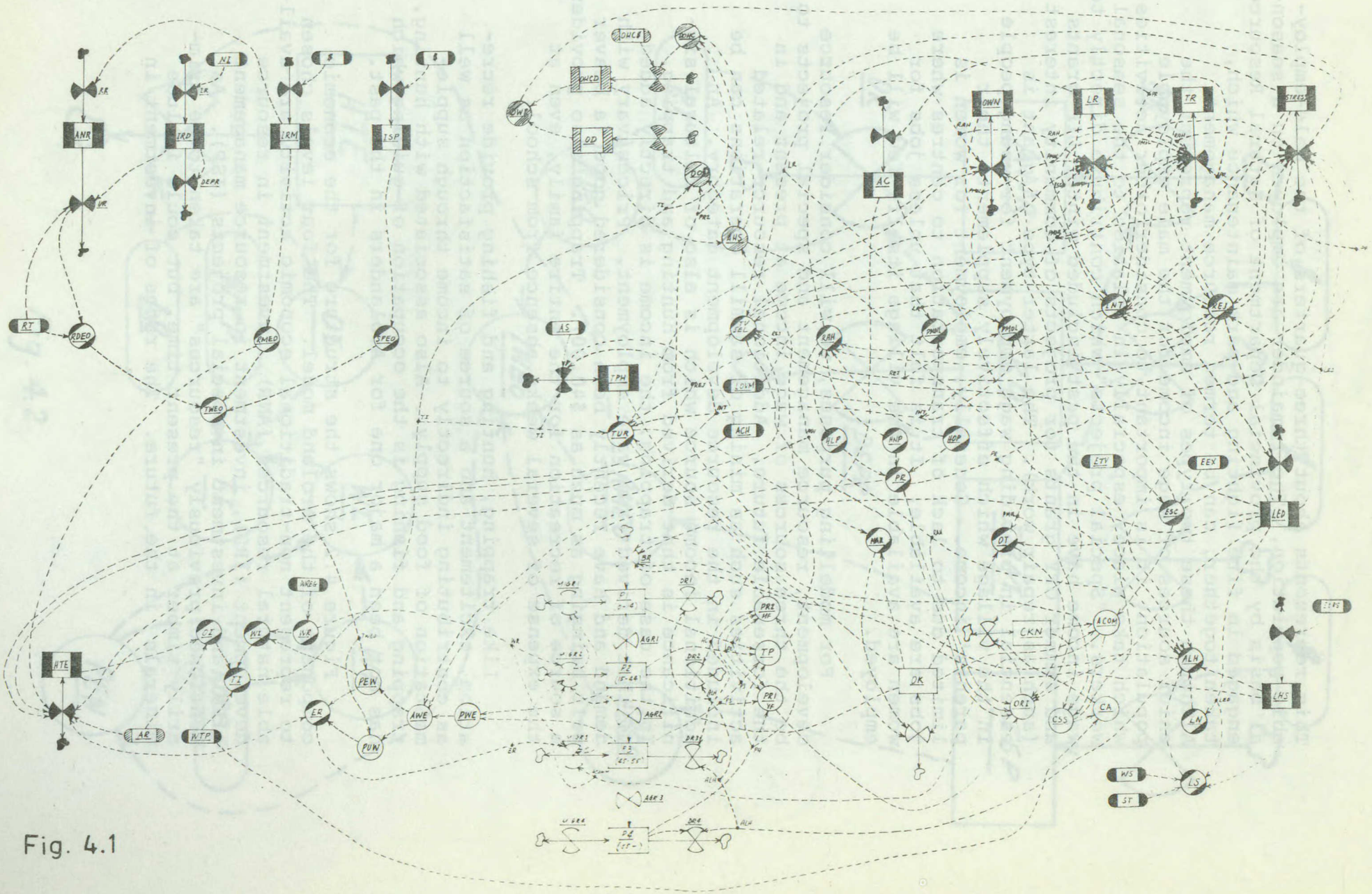


Fig. 4.1

This represents about three-quarters of the male-employable population. The remainder are employed on a seasonal basis by the provincial Department of Natural Resources engaged in fire fighting and park maintenance which, taken together, can be termed resource management. Although these two types of employment represent the chief sources of wage income for the male employable population, it is important to consider other activities which take place, especially in relation to the seasonal workers. "Special projects" which contribute directly to wage income have in the past included winter LIP grants and summer OFY grants for projects of community interest (such as repair work). The latter type of grant is essential in providing wage employment for young people in the village which effectively supplements their parents' income. Generally, employment for women is limited due to lack of transportation to centres where jobs are available. It is felt that unless jobs for women are available in the village itself, few will be employed.

For modelling purposes, we will consider resource development, resource management and special projects to be the three sources of wage income at present and in the forseeable future. Additional resource-related activities such as mining or sawmill operations can be included in the resource development category. An additional income source which is also of cultural significance is that derived from hunting and trapping. In the case of trapping, the income is directly added to that derived from wage employment. Prices vary with demand and have recently been considered good (a beaver pelt bringing as much as $40.00). Trapping also provides a source of recreation for the entire family, even at the expense of several weeks absence from school.

Like trapping, hunting and fishing provide recreation, excitement and a source of satisfaction as well as contributing indirectly to income through supplementation of food supply. Also associated with hunting, trapping and fishing is the occupation of guiding which has not been a major one for Arolanders in the past.

Figure 4.2 shows the structure for the economic component of the Aroland model. The four levels chosen to represent non-traditional economic activity are available natural resources (ANR), investment in resource development (IRD), investment in resource management (IRM) and investment in special projects (ISP). As mentioned previously "resources" are taken to be primarily timber at the present time, but could include minerals in the future. The rates of investment in

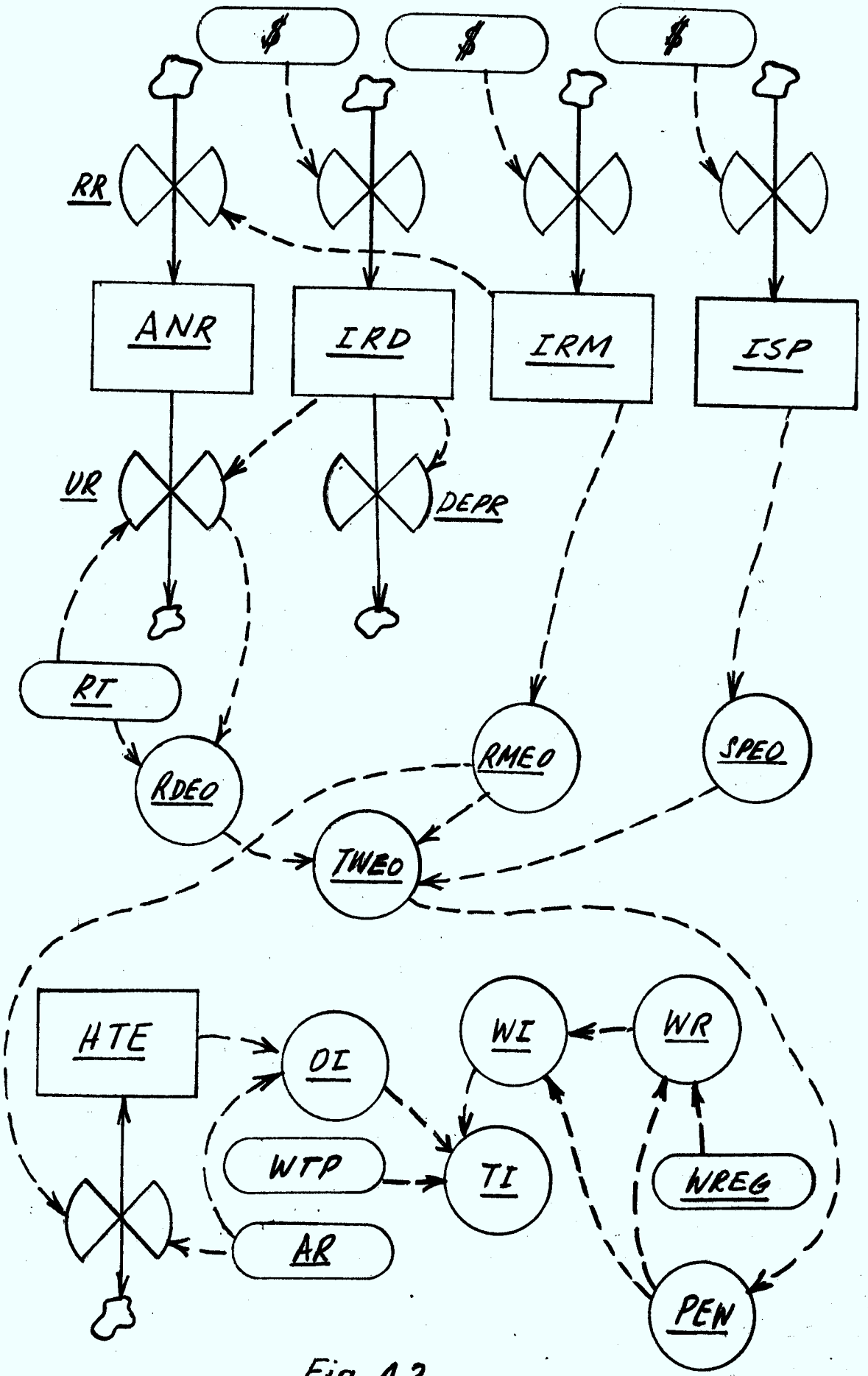

RR
ANR
IRD
IRM
ISP
UR
DEPR
RT
RDEO
RMEO
SPEO
TWEO
HTE
OI
WI
WR
WTP
TI
WREG
AR
PEN

Fig. 4.2

resource development (harvesting), resource management (reforestation) and in special projects are all taken to be functions of exogenous decisions. The level of investment in resource management governs the rate of reforestation (RR). Since part of the investment in resource development will be in the form of capital equipment, a depreciation rate (DEPR) is included.

The usage rate of resources is then a function of investment and the resource availability. It is felt that if timber cutting and loading operations could not be carried out near Aroland due to resource depletion, these would cease to be major occupations for Arolanders.

Employment opportunities then arise from resource development (RDEO), resource management (RMEO) and special projects (SPEO). An exogenous factor affecting the former category is that of resource technology (RT) (for example, the use of machinery for timber cutting and loading) which will affect the resource usage rate (UR) as well as the jobs available. Total wage employment opportunities are represented by the variable TWEO.

'Employment' in traditional pursuits (trapping, hunting and fishing) is represented by the level of "hunting and trapping effort" (HTE). Taking into account the available animal resource (AR), this effort determines the average amount of "other income" (OI) earned by Arolanders. Added to wage income (WI), and to income from welfare transfer payments (WTP), the total average income (TI) is obtained. Wage income is a function of the wage rate (WR) and the number of persons employed in wage positions (PEW). The average wage rate is taken to be an exogenous variable determined in part by regulations (WREG).

One of the economic factors affecting the rate of change in HTE is felt to be the number of forest management employment opportunities (RMEO) available since these tend to be of a seasonal (summer) nature and complement traditional (winter) pursuits.

4.2.3 Demographic Component

Here we are concerned with population, births, deaths and migration. Figure 4.3 shows a somewhat simplified version of this component. The Aroland population is modelled in four age groups corresponding to 0-14 years, 15-44 years, 45-54 years and 55+ years. The second group (level P2) represents the fertile population while the last group (level P4) represents people not normally (i.e. in the past) part of the

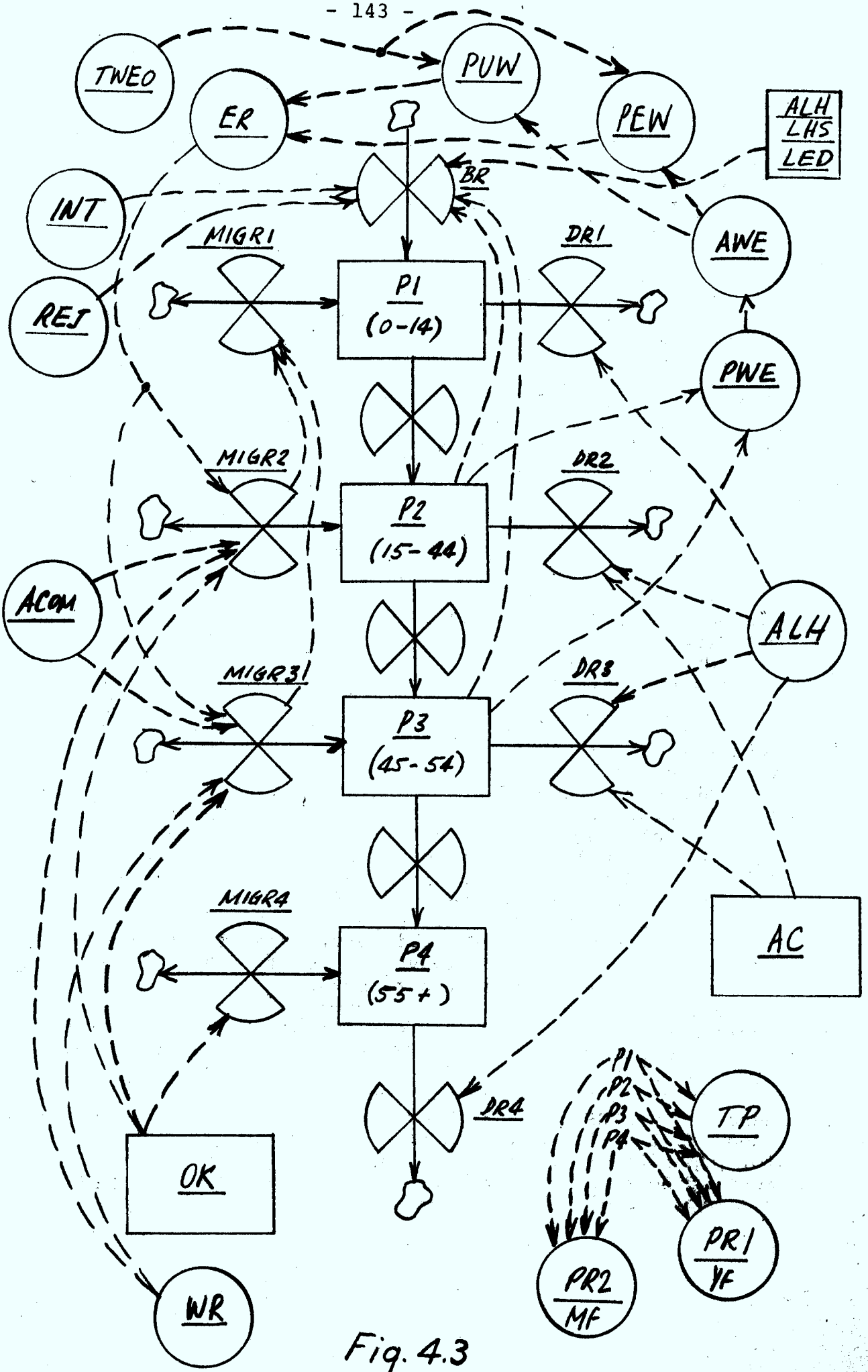

TWEO
PUW
ER
PEW
ALH
LHS
LED
BR
INT
MIGR1
DR1
AWE
REJ
P1
(0-14)
PWE
MIGR2
DR2
P2
(15-44)
ACOM
ALH
MIGR3
DR3
P3
(45-54)
MIGR4
AC
P4
(55+)
DR4
P1
P2
P3
P4
TP
OK
PR1
VF
PR2
MF
WR

Fig. 4.3

potential wage earner group (PWE). The youngest age group (P1) has associated with it four rates: the birth rate (BR), the death rate (DR1), the migration rate (MIGR1) and the ageing rate (number of 15 year-olds). With the exception of the birth rate, other levels are similarly modelled.

It was not possible to determine the exact present value for birth rate in Aroland but it is safe to say that it is higher than the provincial or national average and will probably continue to be so for some time (such was indicated by comments and opinions on desirable family size made by Arolanders). It was found, however, that the younger people were now questioning the value of large families, which in the past have been felt to be desirable (eight couples in the age bracket of 35-50 years have eight or more children).

As can be seen from Figure 4.3, factors affecting the present birth rate were chosen to be the average level of health of the population (ALH-measured by incidence of health problems), the level of health service in Aroland (LHS - measured by time to obtain service), the average level of education (LED - years of formal education) and the attitude to the larger white society as indicated by the variables termed integration (INT) and rejection (REJ) which will be discussed later.

Death rates for all population levels are taken to be functions of the average level of health which in turn is a function of the level of health service. The availability of health service (in the case of Aroland, the difficulty in obtaining medical help) appears to be a major factor contributing to infant deaths (DR1). The nearest full-time clinic is in Geraldton, 55 miles from Aroland by a rough road. Thus the low level of health service is undoubtedly a contributing factor to the death rate for the adult population as well. Deaths by natural causes are generally attributed to tuberculosis (see a later discussion of average level of health) and those by accident, usually attributed in part to alcohol consumption (for example, as a likely cause of automobile accidents). Links from the level of alcohol consumption (AC) to death rates DR2 and DR3 are shown in Figure 4.3.

Migration rates for the four population groups are denoted by MIGR1, MIGR2, MIGR3 and MIGR4. The first of these is taken to be a function of the migration rates for population groups P2 and P3 which are the groups most affected by migration. The field studies indicated

that the unavailability of employment is the most important factor drawing families and young married couples away from Aroland. Thus in Figure 4.3, the employment ratio (ER - the ratio of persons employed in wage positions to persons unemployed) and the wage rate (WR) are shown to be factors affecting MIGR2 and MIGR3. In addition, social factors felt to be modifiers of the economic factors are the degree of attachment to the community (ACOM) and the number of outside kin (OK).

In addition to the four population levels described above, for use in other areas of the model, three additional population variables are defined: total population (TP = P1 + P2 + P3 + P4), population ratio PR1 (YF = (P1 + P2)/TP) and population ratio PR2 (MF = P2 + P3)/TP).

4.2.4 Housing Component

The housing component of the Aroland model is shown in Figure 4.4. As reported in the field study report (Appendix A.5), Aroland appears to be a "hodge-podge" of randomly placed houses and shacks constructed by the residents themselves, apparently from scraps of lumber. They appear to be in poor condition; few are painted and windows are often covered with cardboard. Although the interiors are generally kept clean and tidy, conditions are crowded (for example, a family of eight may live in a two-room dwelling). Attendant with the high average household size, are problems associated with the difficulty in obtaining water and the purity of that water. These will be discussed later as part of the health component. Probably in response to the crowded housing in the village, a number of Ontario Housing Corporation (OHC) dwellings are being constructed which will have modern sanitation facilities.

Two levels of housing are thus defined: the number of "OHC-type" dwellings (OHCD - whether constructed by OHC or not) and the number of other dwellings (OD). Knowing the total population (TP), the average household size (AHS) can be calculated. This is taken to be one factor in generating a demand for OHC-type dwelling (DOHC) as well as a demand for lower-standard dwellings (DOD). The "middle-fraction" (PR2) of the population (i.e. the number of employable adults) and the total income (TI) are also considered as factors affecting the demand for housing and especially the class of housing which is chosen. Because of the differences in the sanitation facilities possible with the two types of

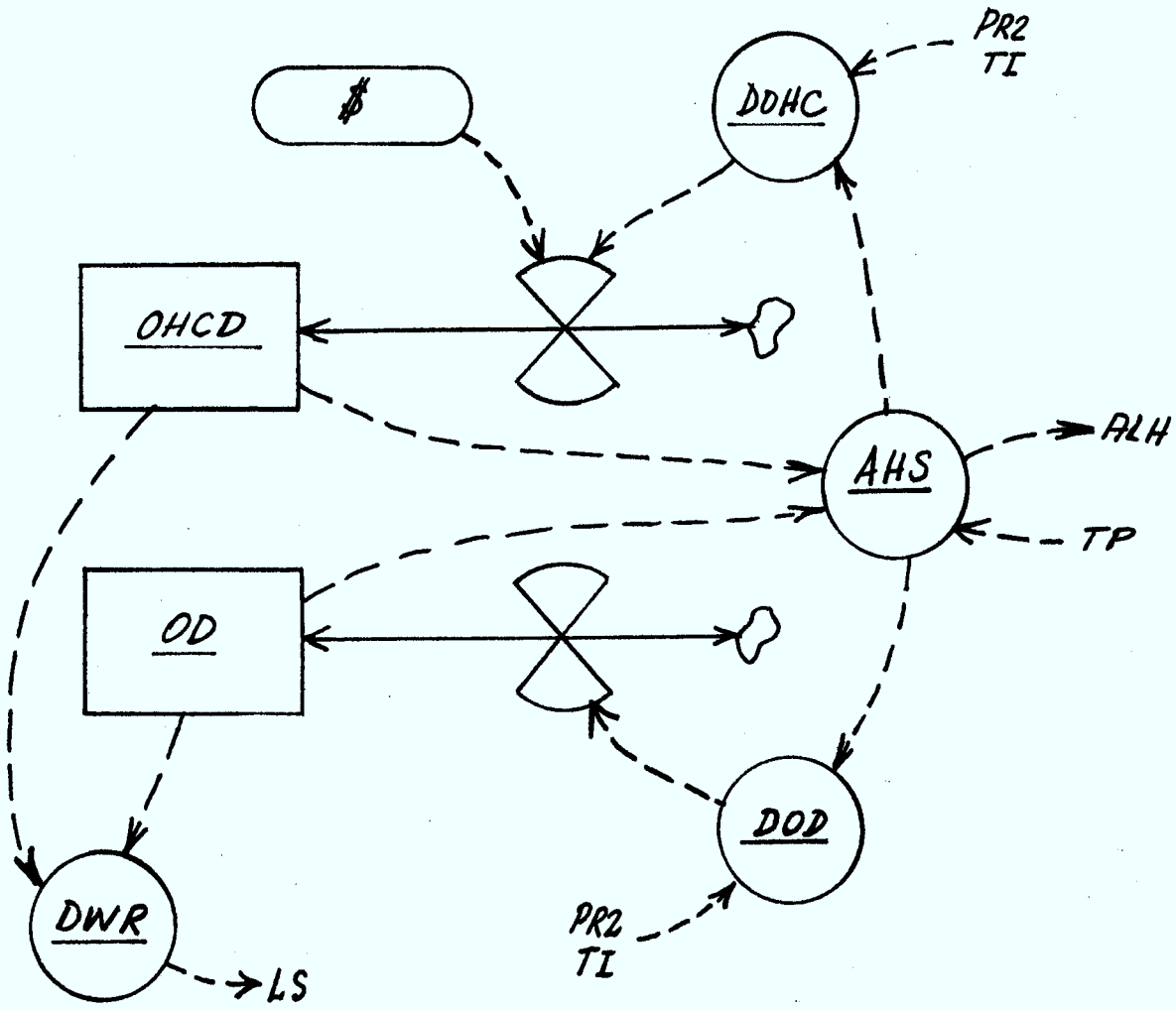


Fig. 4.4

dwelling, the dwelling ratio (DWR = OHCD/OD) is a useful quantity to consider in determining the level of sanitation (LS) in the health component. Similarly the average household size (AHS) will affect the average level of health (ALH).

4.2.5 Health and Education Components

The health and education components will be considered together since they are similar in structure. For education, one level is used to represent the average number of years of formal "southern-style" education for individuals in the community (LED). At the present time, the average level of education is relatively low. For example, no males over forty years of age have attended school. This is due primarily to the lack of school facilities in Aroland until the late forties. For the 26 to 39 age group, average level of education is about six years; for the 16 to 25 age group it is about nine years (10 for males, 7.5 for females). Three in this last group have attended one year at a community college. Thus the present rate of increase in LED is relatively high. The future is not clear however, since there exists some doubt as to the usefulness of formal education for life in Aroland. For example, it does not guarantee a well-paying job and at the same time robs a child of the chance to learn traditional skills (no attempt is made to give students special instruction in Ojibway history or language). Clearly, the matter of education and its style is related to the Arolanders' level of acculturation and their attitude to the white society as evidenced by the measures of integration and rejection.

Figure 4.5 shows the relevant structure for both the education and health components of the model. As described above, the rate of change of the level of education (LED) depends in part on attitudes toward the white society as indicated by the levels of integration (INT) and rejection (REJ) as well as the educational services available in Aroland (ESC-measured as level obtainable). The available facilities including qualified staff depend on expenditure on education (EEX) and could be effectively enhanced by the availability of educational television (ETV) in the community. The latter two variables are treated as exogenous inputs. The availability of schools in Aroland will likely affect the degree of traditional language retention (LR) and the feeling of attachment to the community (ACOM) of Arolanders. Education level also is likely to have an impact on the levels of integration and rejection, stress levels and the amount of printed material in non-native

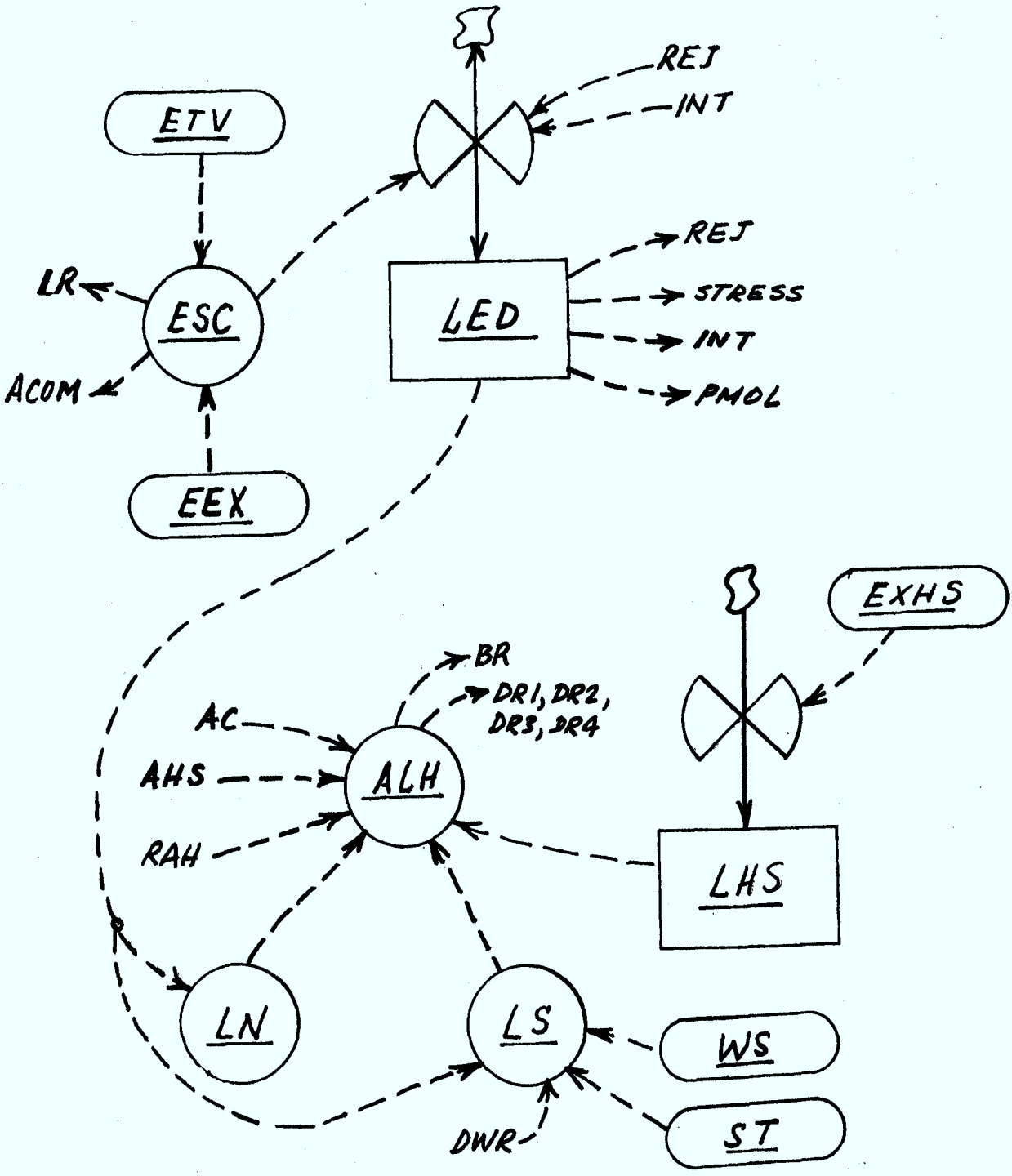

REJ
INT
ETV
REJ
LR
ESC
LED
STRESS
INT
ACOM
PMOL
EEX
EXHS
BR
DR1, DR2,
DR3, DR4
AC
AHS
ALH
RAH
LHS
LN
LS
WS
DWR
ST

Fig. 4.5

language which is read. The links from integration and rejection to the rate of change of the education level and the subsequent effects of education level on integration and rejection levels is a good example of a simple feedback loop within the model.

The level of health service in Aroland (LHS) is measured in terms of the number of hour-miles needed to obtain medical services. The present level is relatively low (55 miles over rough road to the nearest full-time clinic in Geraldton - by taxi). In order to alter this level some expenditure (EXHS) would be required. Every month or so, a public health nurse and doctor from the Department of Indian and Northern Affairs hold clinics in the village which are generally well attended. There is also a clinic available in Nakina which is rarely utilized for reasons unknown. Generally, although most of the available services are highly used, there is not a ready acceptance of medical advice. Nevertheless, there appears to be no perception of any inadequacy in the medical services available. The average level of health (ALH) of an individual then is only partly dependent on the level of service (LHS); of equal importance are variables related to preventative medicine. Thus the degree of alcohol consumption (AC), the average household size (AHS), the level of nutrition (LN) and the level of sanitation (LS - measured in terms of distance to water supply) are important factors affecting ALH. Community radio (Radio Kenomadiwin) has in the past been used to alert the populace to available services. In the model, the average time spent listening to the radio (RAH) is included as a modifier of ALH.

Levels of nutrition and sanitation are thought to be primarily functions of the level of education. The level of sanitation is also dependent on the availability of water supply (WS), the use of sanitation technology (ST), (which are treated as exogenous variables), and the relative number of OHC-type dwellings (DWR) in the community, with these providing adequate water and sewage facilities.

4.2.6 Social Component

Four variables are chosen to describe features of the social system in the community: attachment to community (ACOM), community autonomy (CA), community social stability (CSS) and orientation (ORI), as shown in Figure 4.6. The units of measurement of such variables are not immediately obvious; it may be best to use ordinal scales employing such terms as "relatively

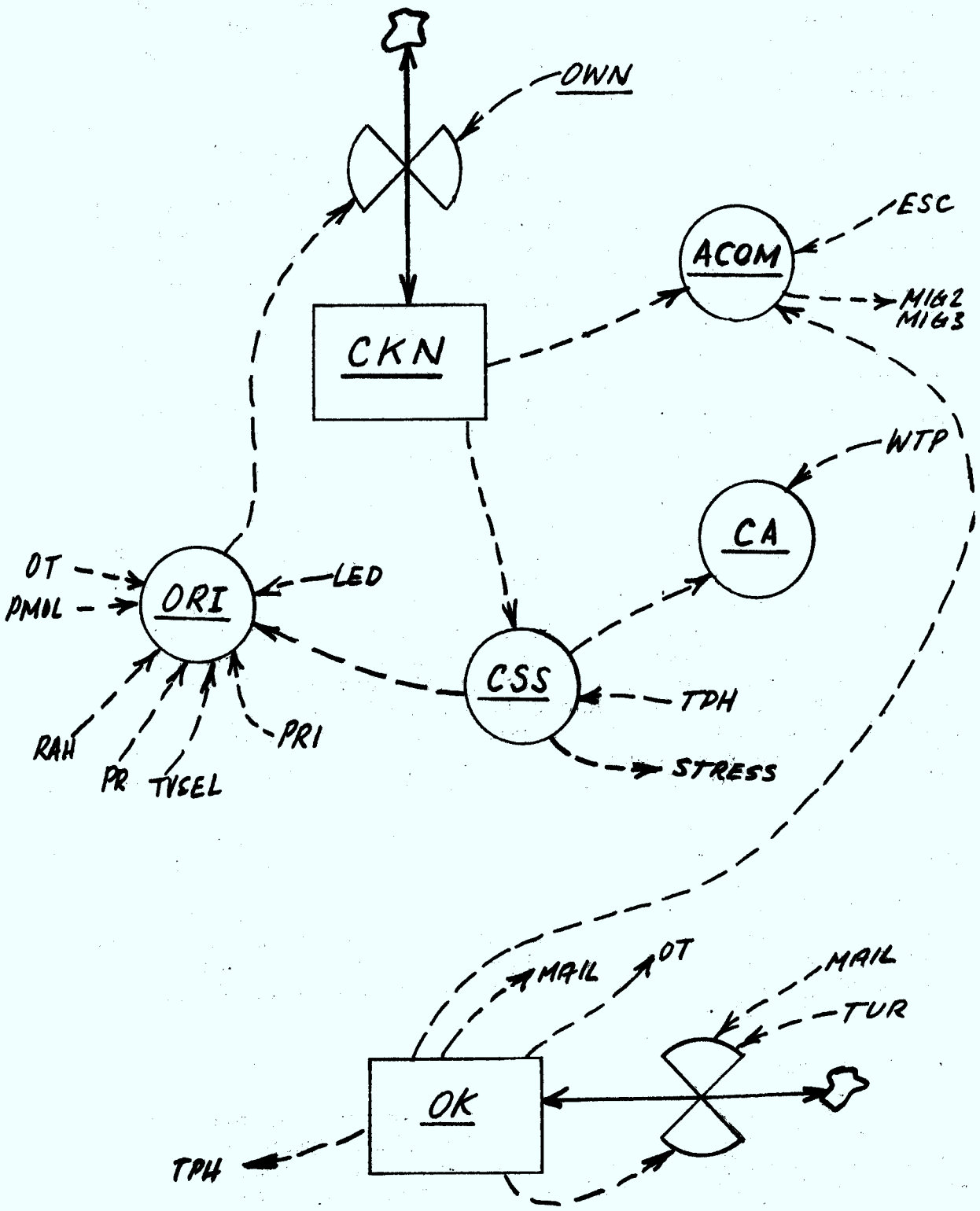

OWN
ESC
ACOM
MIG2
MIG3
CKN
WTP
CA
OT
PMOL
ORI
LED
CSS
TPH
STRESS
RAH
PR
TVSEL
PRI
MAIL
OT
MAIL
TUR
OK
TPH

Fig. 4.6

low", "medium", "relatively high", etc., rather than assigning numerical values based on some arbitrary unit. The functions (specifying interrelationships) which interface the social variables with other model components can be chosen so as to allow the use of such "units of measurement". The model structure for the social component can be thought of as a representation intermediate between a mathematical and a verbal description of the social system.

Aroland can be described as an orderly community in which privatization is great. It is rare that community problems are deemed to require outside help (e.g. from the Ontario Provincial Police). Thus, social control is achieved when necessary by the community itself. Theoretically, the Aroland Indian Association has the responsibility through various committees to set and carry out policies relating to the local cooperative store, education, entertainment, etc. In practice, meetings are held in times of crisis, when a problem presents itself.

The community kinship network is modellled by the level CKN which measures the individual's perception of the number of kin living in the community. This level plays an important role in modifying the individual's feeling of community attachment (ACOM) and the stability of the existing social structure (CSS). Social stability is also affected by the degree to which communication within and without the community is possible (most directly by the telephones per household, TPH - at present zero). Stability is probably an important factor governing the degree of community autonomy, which for Aroland is great. Autonomy is seen to be diminished by the effect of welfare transfer payments (WTP) when these become a significant portion of the total community income. Social stability plays a role in determining the stress level (STRESS) for Arolanders - this will be discussed later. It is also an input to the orientation variable (ORI) which describes the scope of those matters that concern the population of the village; that is, whether or not they are confined to matters of interest only within the village or of more or less global interest. This variable is obviously communication dependent as Figure 4.6 shows it to be affected by the amount of outside travel (OT) by Arolanders, the amount of printed material in non-native language read (PMOL), the hours spent "attentively" listening to radio (RAH), the fraction of those hours involving non-native language (PR) and the degree of selectivity exercised in television viewing (TVSEL). Also important as far as orientation is concerned is the level of education (LED) and the fraction

of "young" people in the community (PR1).

Attachment to community (ACOM) is affected by the internal kinship network (CKN), the number of kin living outside Aroland (OK) and the degree to which education facilities (e.g. high school) are available in the village. Attachment plays a modifying role in determining migration, which was described earlier as being primarily dependent on the availability of employment. Maintenance of kinship relations with former Aroland residents depends on communication and, hence, is affected by usage of telephones (TUR) and mail service (MAIL). Also, the rate of increase of outside kin is dependent on the present number of individuals who have "set an example" and moved away from the community. The number of kin outside Aroland (OK) is also a factor in influencing the use of communications and so potentially affects the use of mail services (MAIL) the installation of telephones (TPH) and the amount of outside travel (OT) carried out by Arolanders.

4.2.7 Psychological Component

The model component concerned with acculturation and with psychologically-determined social variables is the most complex in terms of the number of interrelationships specified. Figure 4.7 shows the general type of structure which is common to the levels of ownership (OWN), language retention (LR), traditional religion retention (TR) and stress (STRESS), (see Appendix A.9). All involve the additudinal variables termed integration and rejection. Together with the variable termed assimilation (not included in the Aroland model), these variables describe the attitudes held by individuals in a culture contact situation (traditional native culture in contact with that of Western technological society). Integration represents the degree to which individuals favour the acceptance of some elements of the larger (Euro-Canadian) culture while retaining other elements of their own culture. Total integration would represent a stable situation in which both the features of the traditional culture and of the larger society are in coexistence. Rejection represents the degree to which all elements of the larger society are felt to be unacceptable. Assimilation represents the degree to which all elements of the larger society are felt acceptable to the exclusion of any elements of the traditional culture. Total rejection would exclude all non-traditional cultural elements. Since Aroland is primarily a native community and is likely to remain so, assimilation is not considered a significant variable; it is therefore excluded from the model structure.

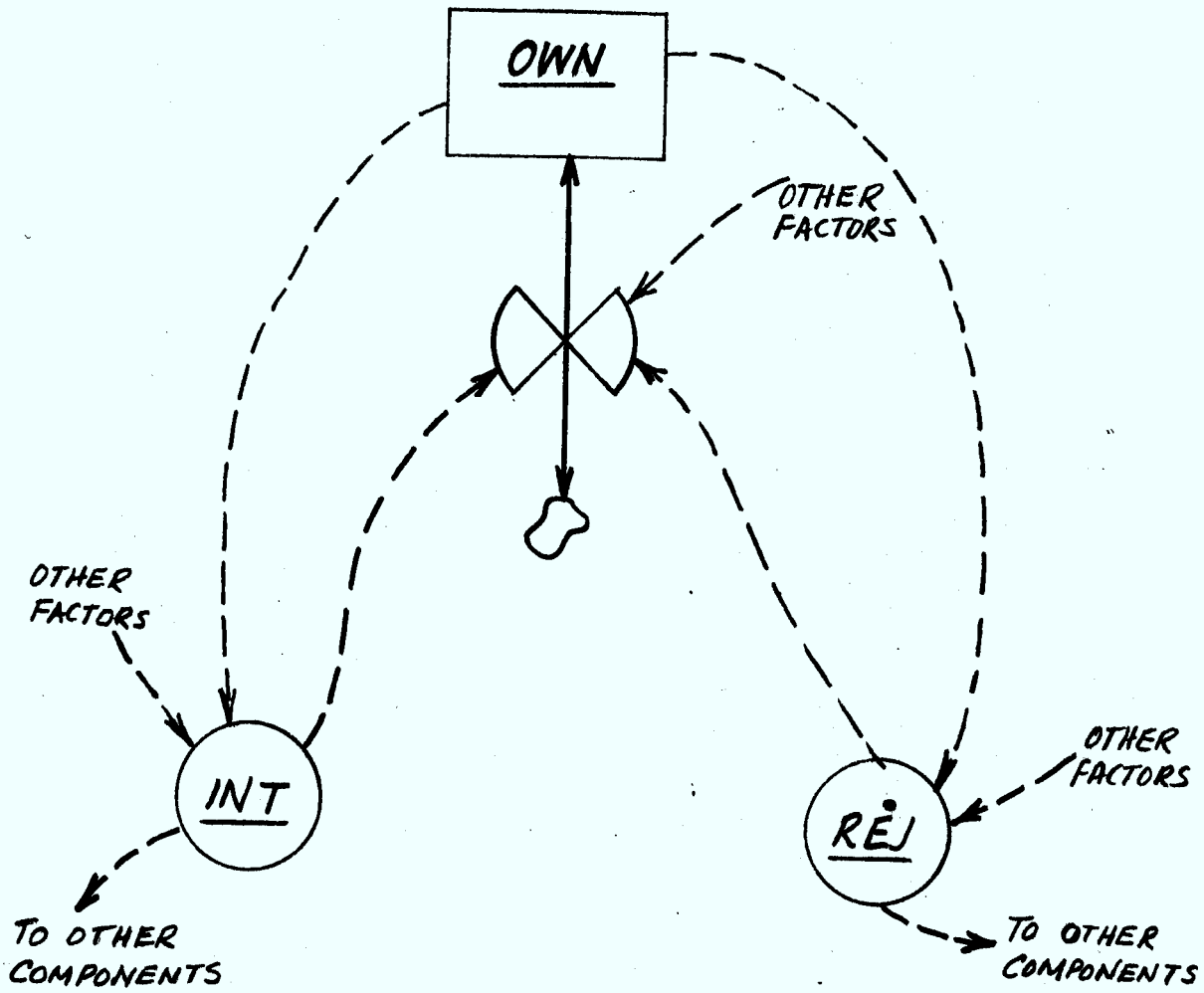

OWN
OTHER FACTORS
OTHER FACTORS
INT
REJ
OTHER FACTORS
TO OTHER COMPONENTS
TO OTHER COMPONENTS

Fig. 4.7

Figure 4.7 shows how one measure of acculturation, namely that of ownership (OWN), and the integration (INT) and rejection (REJ) variables, are modelled. Ownership is possible to measure using the scale developed for use in the field studies which assigns a value from 0 to 5 depending on the number and type of a list of items which are owned. The level of ownership then is taken to be one factor influencing attitudes toward integration and/or rejection. (Note that these two variables describe different phenomena and are not necessarily mutually exclusive although an attitude favouring rejection would likely be accompanied by an attitude rejecting the concept of integration). Thus there is a link between the level OWN and both INT and REJ. The attitudes INT and REJ in turn affect the change in the level of ownership; hence there are links from INT and REJ back to the rate of change of OWN. If OWN were the only component of INT or REJ, one attitude would probably prevail as time progressed; however other levels and variables also affect INT and REJ and hence both attitudes can be held to greater or lesser degrees. Similar feedback loops to those described for ownership can be traced out for stress, language retention, level of education, and retention of traditional religion (see Figure 4.1).

Attitudes alone do not specify rates of change of the levels relating to the acculturative situation. Stress, which is measured by the existence of medical and paramedical symptoms is also felt to be affected by social stability (CSS), by mass media (television - TVSEL, locally produced video material - LOVM, radio - RAH and PR, printed material - PMOL and PMNL) and by telephone usage (TUR). The presence of information communicated by mass media and via telephone is felt to represent increased cultural contact which generally, depending on attitudes (INT and REJ), tends to increase stress (see Section 6 of this report concerning psychological field studies). Stress itself can affect changes in attitude and also contribute to social disorders such as a high rate of alcohol consumption (AC). Field tests generally indicate a lower stress level in Aroland than in the nearby reserve community of Longlake.

Ownership is felt to be affected by (in addition to attitudinal factors) the same communications-related factors mentioned in the case of stress. Here again, communication with the larger society (especially one-way communication in the case of the mass media) represents increased cultural contact which, depending on the prevailing attitude to the larger society, can effect changes in such culture-related levels as ownership. Thus factors affecting the rates of change of retention

of traditional language and religion are similar to those affecting stress and ownership.

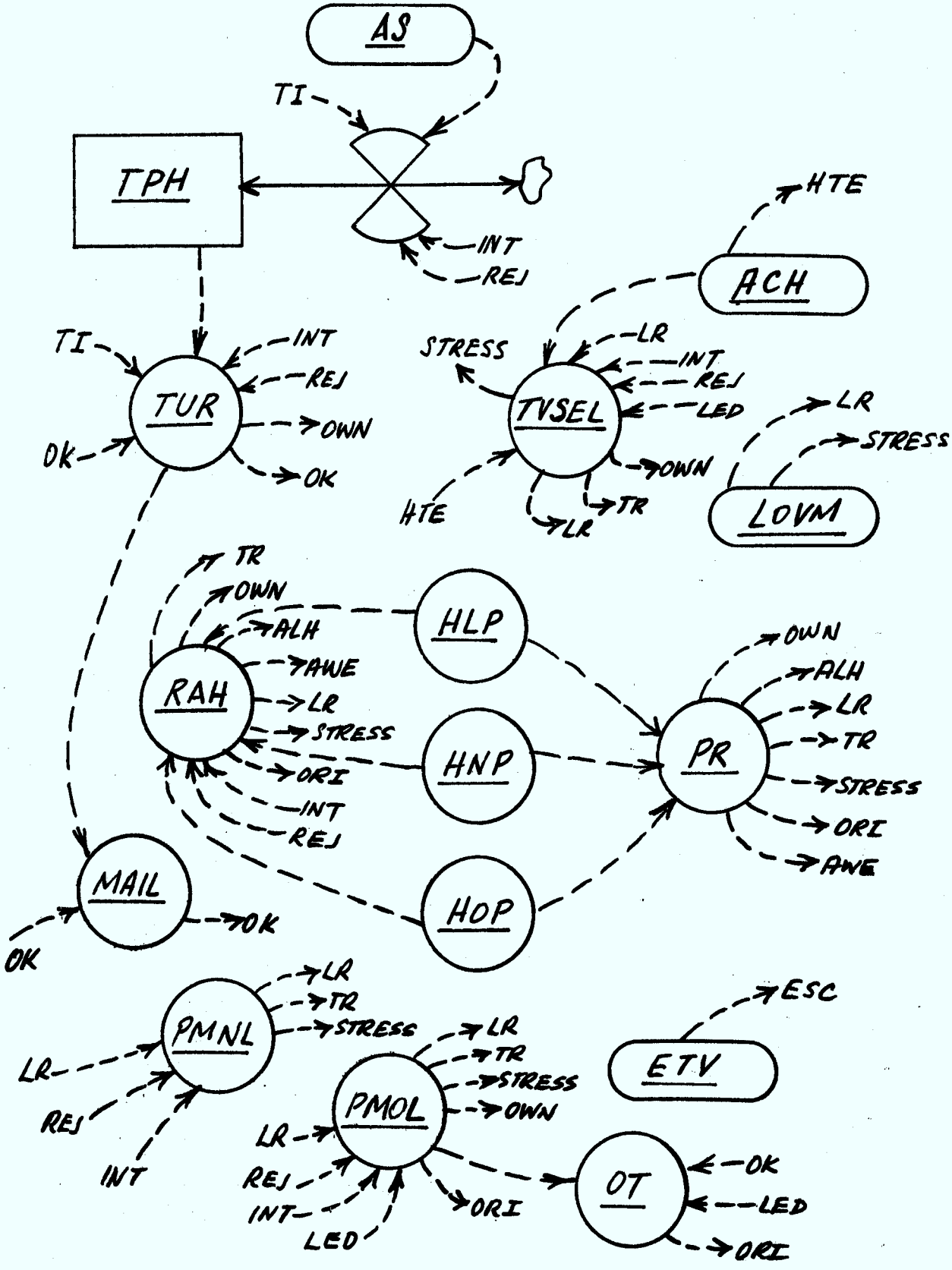
4.2.8 Communications Component

Let us now discuss the communications component of the model and examine its relationship to the remainder of the model which has been described above. The variables associated with communications are shown in Figure 4.8, together with links with the other model variables.

First, let us review the available communications facilities in the community and the nature of communication within the village and with points outside. Aroland has at present four pay telephones, only two of which are readily accessible to the residents. Only six survey respondents out of forty-five reported using the telephone once a week. Hence, the usage rate is very low, especially among the older people. Service appears to be the major reason for using the telephone. Some reasons suggested for the low usage rate are cost (all calls are long-distance), inconvenience, difficulty with English and lack of outside kin having telephones. A petition to have household phones installed was organized and sent to the Government and Bell Canada and it is probable that such service will be extended from Nakina. Despite the petition, interest in having household telephones remains low.

There is little printed material available in Aroland, probably due to the low literacy level; however what magazines present in the community were judged to be well "read" from cover-to-cover, despite language difficulties.

In contrast to the availability and presence of printed material, the average number of television receivers per household was typical of a Euro-Canadian community with some households having two or more receivers (three respondents had colour television). A high degree of selectivity in television viewing appears to be a salient characteristic of Arolanders with respondents reporting that they watched one or two favourite programs per week and nothing else. Only one channel (CBC Geraldton) is presently receivable but the main factor influencing this high selectivity and correspondingly low number of contact hours in television viewing would seem to be the availability of other activities such as fishing, trapping and hunting which have recreational value in addition to their economic value.


AS
TI
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ALH
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STRESS
ORI
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HLP
HNP
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ORI
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MAIL
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STRESS
PMNL
LR
REJ
INT
LR
TR
STRESS
OWN
PMOL
LR
REJ
INT
LED
ORI
ESC
ETV
OK
LED
ORI
OT

Fig 4.8

Radio ownership is not as widespread as for television and listening is on a more casual basis (other activities can be carried out at the same time). A substantial number listen to the CBC news from a repeater station in Geraldton, as well as music from whatever stations are receivable (e.g. some high-powered Chicago stations are receivable at night). The mobile low-power AM station, Radio Kenomadiwin, was listened to by all Arolanders, when located in Aroland. The main factors in its popularity seemed to be the music featured ("country"), and its airing of requests from people of all ages. The community-related aspects of the station's programming were minimal and could have been expanded given adequate resources and personnel.

Due to illiteracy among the older people, the practice of letter writing, except for business purposes, is rare in Aroland except for the younger age groups (under 25 years of age). The process of sending and receiving business mail is however, taken as a matter of course by most Arolanders.

The choice of variables shown in Figure 4.8 reflects the present state of communications in Aroland described above. The level representing the average number of telephones per household (TPH) is the only communications level used. This fact reflects the desire to model how communications facilities are used rather than how many such facilities are available. The rate of change in TPH is taken to depend on the total income (TI) for the village, the service which is available (AS) (i.e. whether or not it is possible to have telephones in every household) and the attitudinal variables, integration (INT) and rejection (REJ). The telephone usage rate (TUR) is a function of the number of telephones available (TPH - reflecting the convenience of telephoning), total income (TI - reflecting the cost factor), the number of outside kin (OK) and the attitude toward technological society (INT and REJ). The usage rate (TUR) in turn is felt to affect changes in ownership (OWN), the maintenance of outside kin (OK), and the use of mail (MAIL) for both business and social matters. The quantity of mail sent and received is itself influenced by outside kin and can serve to maintain ties with those kin.

Selectivity in television viewing (TVSEL) was chosen as the main variable describing how television is used by the population. Selectivity can be defined as the ratio of the number of programs (or hours) spent in "attentive" viewing to the total number available. It is affected by level of education (LED), language

retention (LR), attitudes to the larger society (which is reflected in the type of programs viewed) (INT and REJ), and the amount of time spent in hunting, trapping and fishing activities (HTE). Although it is dangerous confidently to specify the effects of television viewing on the community, this question can be taken to be of such significance that some possible links to the remainder of the model should be considered. Consequently, in Figure 4.8, selectivity (which, for a fixed number of programs available, is proportional to hours of viewing) is shown to affect levels of ownership (OWN), traditional language and religion retention (LR and TR), and stress (STRESS). An exogenous variable (ACH) is used to specify changes in the number of channels available, which is likely to affect time spent in traditional activities (HTE), as well as selectivity in viewing (TVSEL). Use of video tape equipment to produce locally originated video material (LOVM) which could be viewed over existing television receivers is included as a future possibility by an exogenous variable which would have possible effects on stress and language retention and likely other social variables which are difficult to specify since it is impossible to predict the uses to which this medium (video tape) could be put.

The role of radio in the community is even more difficult to assess than that of television since listening is on such a casual basis. The principal variable chosen is "radio attention hours" (RAH) which is a measure of the time spent on the average attentively listening to radio programming. Three variables (which could be considered exogenous) are used to describe the nature of the programming available - HLP (hours of local programming, at present zero without Radio Kenomadiwin), HNP (hours of native language programming) and HOP (hours of "other", non-native language, programming). The ratio of native language programming to the total is defined as PR = (HLP + HNP)/(HLP + HNP + HOP). Thus in suggesting possible influences of radio listening, both RAH and PR are important and both are felt to influence levels of ownership (OWN), stress (STRESS), traditional language (LR), and religion retention (TR) and the orientation of the population (ORI) toward local or global matters. The public service potential of radio is reflected by links to average level of health (ALH) and actual wage earners (AWE). Radio listening is itself influenced by the type of programming available and attitudes toward integration and rejection.

Use of printed material is measured by the number of publications read in native language (PMNL) and in non-native language (PMOL). Both are influenced by

attitudes (INT and REJ) and by traditional language retention (LR). In addition PMOL is influenced by the level of education (LED - indicating degree of literacy in English). Information obtained from printed media is felt to have an influence on changes in the levels LR, TR, STRESS and, in the case of PMOL, on OWN and outside travel (OT). Outside travel is also a function of outside kin and general level of education (LED). It is probably a factor changing orientation towards a more global outlook.

4.2.9 Conclusions

The above somewhat lengthy description of the Aroland community model structure has been presented in order to provide information useful to those who might wish to develop such a model for other communities. Also, it has served as a guide in the construction of the more functional Sioux Lookout model and its further development. A fundamental argument could be raised against the development of model structures for social systems which contain a multitude of unspecified relationships and a number of variables whose units of measurement cannot be precisely defined. We, however, strongly believe in the usefulness of such an exercise despite its subjective and hence non-scientific nature. It can be thought of as the first step in applying a systems methodology to the task of attempting to understand the nature of a social system. Since it is but a first step, one cannot expect answers to planning questions to be provided directly; however, it does provide the necessary basis from which to continue the overall task in a coordinated multidisciplinary manner.

4.2.10 List of Abbreviations Used in Aroland Model

AC	Alcohol Consumption
ACH	Available Channels
ACOM	Attachment to Community
AGR1	Ageing Rate P1 to P2
AGR2	" " P2 to P3
AGR3	" " P3 to P4
AHS	Average Household Size
ALH	Average Level of Health
ANR	Available Natural Resource
AR	Animal Resource
AS	Available Service
AWE	Actual Wage Earners
BR	Birth Rate
CA	Community Autonomy
CKN	Community Kinship Network
CSS	Community Social Stability
DEPR	Depreciation Rate
DOD	Demand for Other Dwellings
DOHC	Demand for OHC Type Dwellings
DR1	Death Rate for Population Group 1
DR2	" " " " " 2
DR3	" " " " " 3
DR4	" " " " " 4
DWR	Dwelling Ratio
EEX	Education Expenditure
ER	Employment Ratio
ESC	Education Services in the Community
ETV	Educational Television
EXHS	Expenditure on Health Service
HLP	Hours of Local Programming
HNP	Hours of Native Language Programming
HOP	Hours of Other Programming
HTE	Hunting and Trapping Effort
INT	Integration (attitude toward)
IRD	Investment in Resource Development
IRM	Investment in Resource Management
ISP	Investment in Special Projects
LED	Level of Education
LHS	Level of Health Service
LN	Level of Nutrition
LS	Level of Sanitation
LR	Language Retention
LOVM	Locally Originated Visual Material
MAIL	Mail Volume
MIGR1	Migration Rate for Population Group 1
MIGR2	" " " " " 2
MIGR3	" " " " " 3
MIGR4	" " " " " 4

NLP	Hours of Native Language Programming
OD	Other Dwellings
OHCD	Ontario Housing Corporation Type Dwellings
OI	Other Income
OK	Outside Kin
ORI	Orientation
OT	Outside Travel
OWN	Ownership
P1	Population Group 1
P2	" " 2
P3	" " 3
P4	" " 4
PEW	Persons Employed in Wage Positions
PMNL	Printed Material in Native Language
PMOL	" " " Other "
PR	Fraction of Radio Attention Hours Involving Non-Native Language
PR1	Population Ratio 1
PR2	" " 2
PUW	Persons Unemployed in Wage Positions
PWE	Potential Wage Earners
RAH	Radio Attention Hours
RDEO	Resource Development Employment Opportunities
REJ	Attitude Toward Rejection
RMEO	Resource Management Employment Opportunities
RR	Replacement Rate
RT	Resource Technology
SPEO	Special Projects Employment Opportunities
ST	Sanitation Technology
STRESS	Stress Level
TI	Total Income
TP	Total Population
TPH	Telephones Per Household
TR	Traditional Religion Retention
TUR	Telephone Usage Rate
TVSEL	Television Selectivity
TWEO	Total Wage Employment Opportunities
UR	Usage Rate
WI	Wage Income
WR	Wage Rate
WREG	Wage Regulations
WS	Water Supply Availability
WTP	Welfare Transfer Payments

4.3 Sioux Lookout Community Model Structure

4.3.1 Introduction

At the beginning of the task of constructing a framework for the Sioux Lookout community model, the experience gained in developing the northwest Ontario regional model and the Aroland community model had to be evaluated as to its application to this new task. Although a thorough overall evaluation of both is presented in Section 7, a summary of characteristics of each will be given here. The regional model is characterized by a high level of aggregation with a rather complex interconnecting framework. This was evidenced by the results of the sensitivity analysis which identified a number of functions that had a marginal effect on overall model behaviour. In the simplest terms, the major fault in the regional model structure is the incongruity between the level of aggregation and the level of complexity. Thus, although it is of interest to describe, for example, the effects of telecommunications on public expectations for improved health services, the basic structure of the regional model makes this difficult. Generally, the main structural framework is quite robust and such subtle factors have little influence on the characteristic behaviour. This fact is not a condemnation of the regional model; rather it indicates the value of undertaking an experimental exercise in modelling a region as the one sure way to learn the necessary lessons about the nature of such models and how to construct them.

The lack of subtlety dictated by the structure of the regional model is certainly not evident in the Aroland model. Despite the lack of information available to support the model, it is felt that the structure is well suited to the exploration of the social role of communications in a native community. Despite this, its application to a model for Sioux Lookout is limited due to the dissimilarity of the communities and, more importantly, the difference in the social and cultural issues at stake. In Aroland, the question of acculturation is paramount, while in Sioux Lookout the problem of achieving economic and social advancement, while retaining community individuality and autonomy, is one of several that are of interest.

As a consequence of the above, the structure that evolved for the Sioux Lookout model contains fewer economic factors than the regional model, but a more detailed demographic description, and a more subtle description of the social characteristics of the community. Communications are modelled in terms of their usage by

the community with the actual services available treated as exogenous variables.

Two aspects of demography are highlighted: social mobility and migration. The former refers to the mobility between social groups (defined in this case by the nature of employment) and the latter, which is treated in more detail than in the regional model, takes into account the "attractiveness" of the community.

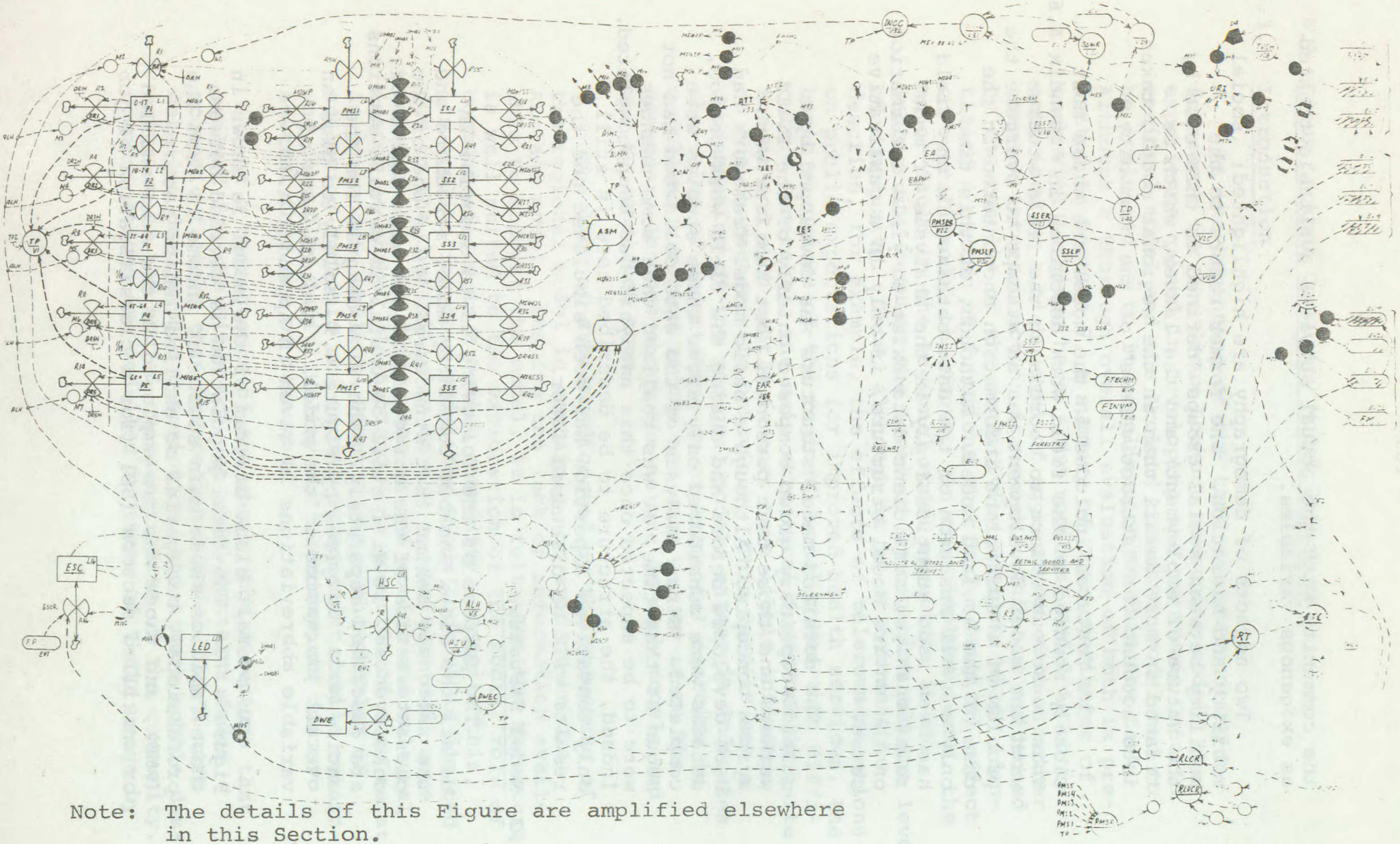
The features included in the model are those most closely studied in the field work described in Appendix A.6. This conscious effort to coordinate the field studies with the model development was an attempt to overcome the problem of insufficient information encountered in the case of the Aroland model. Although, at this time, only a small fraction of the data obtained in the field has been used quantitatively in the analysis of model relationships, sufficient data exist to yield information on the entire model structure, if only in a qualitative sense.

The detailed model structure was developed by a multidisciplinary group composed chiefly of the field workers and those team personnel most familiar with system concepts. Although a basic model framework had been developed before and during the field work period, details were considered only after these studies were completed. Since analysis of the data collected had not begun at that time, it was realized that some changes were to be expected once this analysis had been completed. Indeed, the structure to be described here is still only tentative; a portion has been simulated and the results will be discussed later.

4.3.2 Model Structure

The purpose of the following is to describe in detail the Sioux Lookout community model structure and the rationale behind that structure. While one of the characteristics of the structure is its high degree of cohesiveness, it will still be useful if certain sections are described separately. The flow diagram for the entire model is given by Figure 4.9, solely to give an overall impression of the model. A dictionary of variable abbreviations is given in Appendix A.10.

An overall block diagram of the model is shown in Figure 4.10. The total population is divided between those families whose main source of income is from the professional, managerial or skilled labour sectors (PMS), and those who are employed in the semi-skilled or unskilled sectors (SS) (for a classification of job



Note: The details of this Figure are amplified elsewhere in this Section.

Fig. 4.9 COMMUNITY MODEL OF SIOUX LOOKOUT, ONTARIO

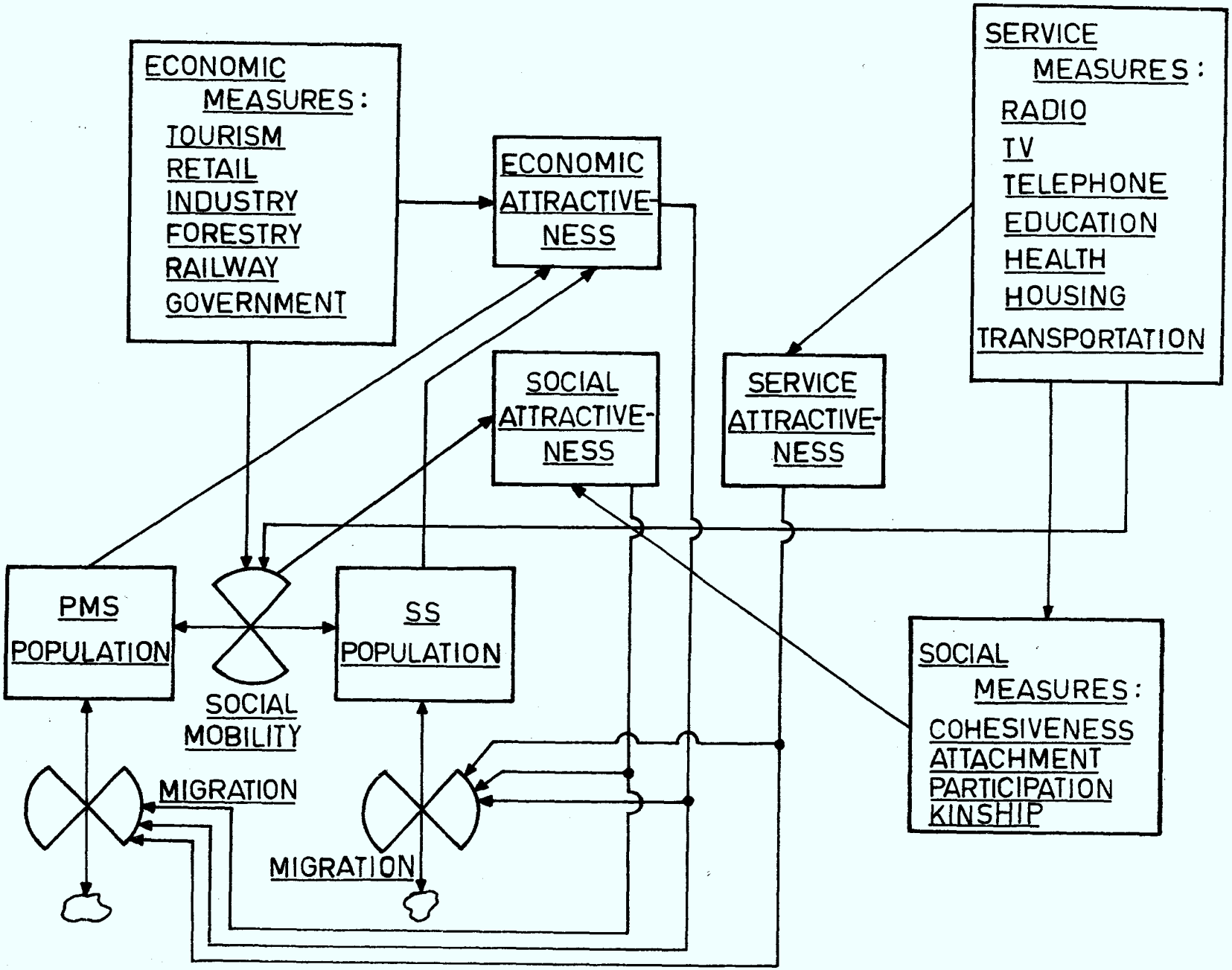


Fig. 4.10 SIOUX LOCKOUT COMMUNITY MODEL BLOCK DIAGRAM

types see Appendix A.10). The rates at which families move from one group to the other are indications of social mobility.

Measures of the economic activity in the community are jobs generated in each of six categories: resources (mineral, forest), retail services, industrial services, tourism, railway, and government. Opportunities for employment are a measure of the economic attractiveness of the community and as such affect migration. Two other aspects of community attractiveness are modelled. Service attractiveness is a function of available communications, transportation, housing, education, and health services. Social attractiveness is a function of a number of social indicators such as community cohesiveness, degree of individual attachment to the community, degree of individual participation in community affairs, and the extent of the kin and friendship network. The degree of social mobility is also taken to be a component of social attractiveness.

The descriptions of individual sections of the model that follow provide a more detailed view of the model structure. Equations are provided where useful. In many cases, functional relationships cannot be specified at this time, except to indicate whether the effect is positive or negative.

4.3.3 Demography and Social Mobility

Figure 4.11 shows the structure describing demography, social mobility, and migration for one age group of the population. Five such age groups are included and modelled as level variables designated P1 (0-17), P2 (18-24), P3 (25-44), P4 (45-64) and P5 (65+). With the exception of the birthrate for level P1, each population level has four associated rates of change: the input rate from the previous age group; the ageing rate of the population group itself; the death rate; and the migration rate. Ageing rates are in fact delayed versions of the birth rate, altered by cumulative deaths and migration. For simplicity, the ageing rates are taken to be proportional to the number of persons in each level. That is, if there are 500 persons in level P2 (18-24 years), the ageing rate (number of 25 year-olds) would be 500/7 per year. This is equivalent to assuming a uniform age distribution in each age group. An indication of the actual age distribution for Sioux Lookout is given by the population profile shown in Figure 4.12. Computation of the flow rates associated with each population level will be discussed shortly. Let us now examine the social mobility and migration model enclosed by the dashed line in Figure 4.11.

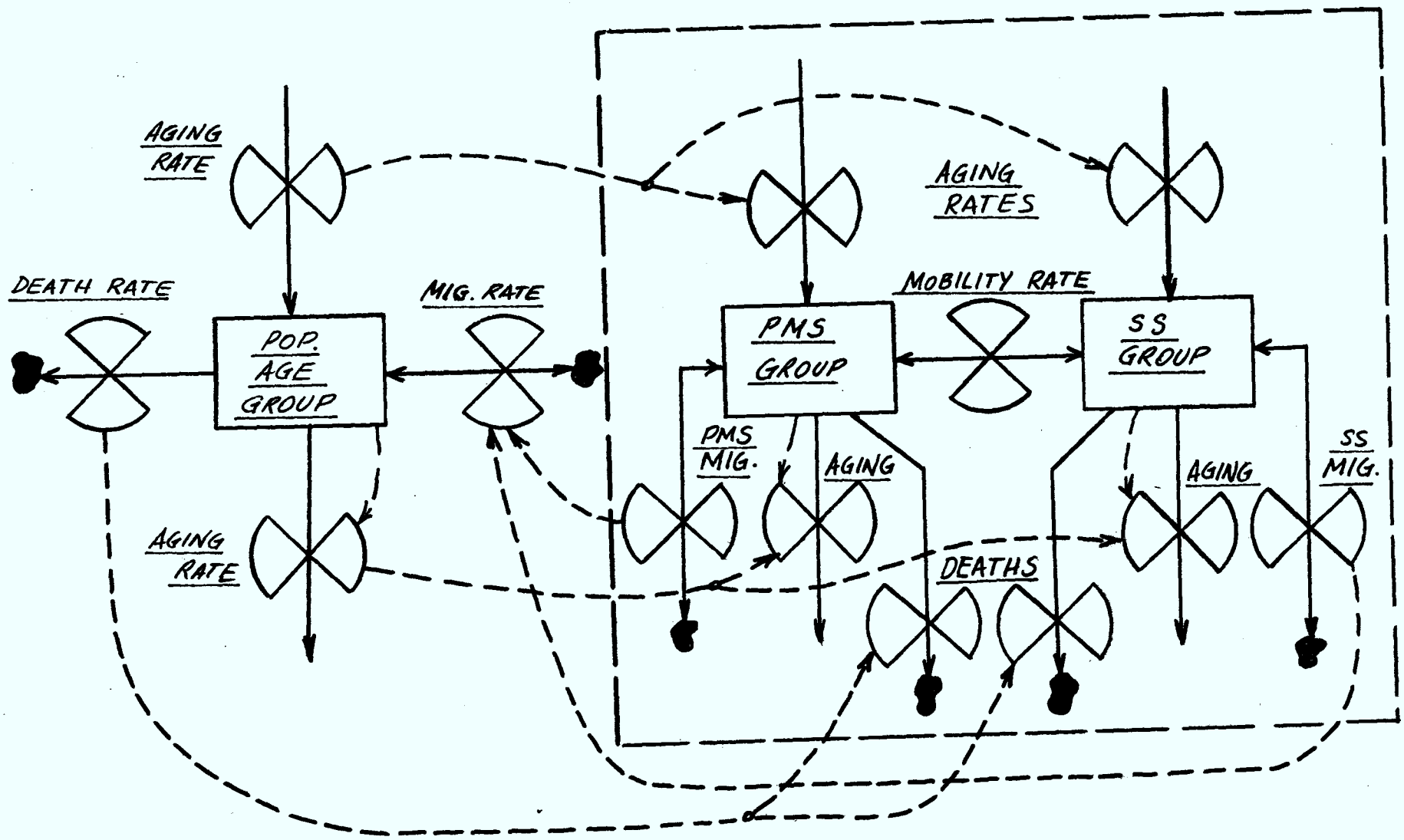

AGING RATE
AGING RATES
DEATH RATE
MIG. RATE
MOBILITY RATE
POP. AGE GROUP
PMS GROUP
SS GROUP
PMS MIG.
AGING
AGING
SS MIG.
AGING RATE
DEATHS

Fig. 4.11

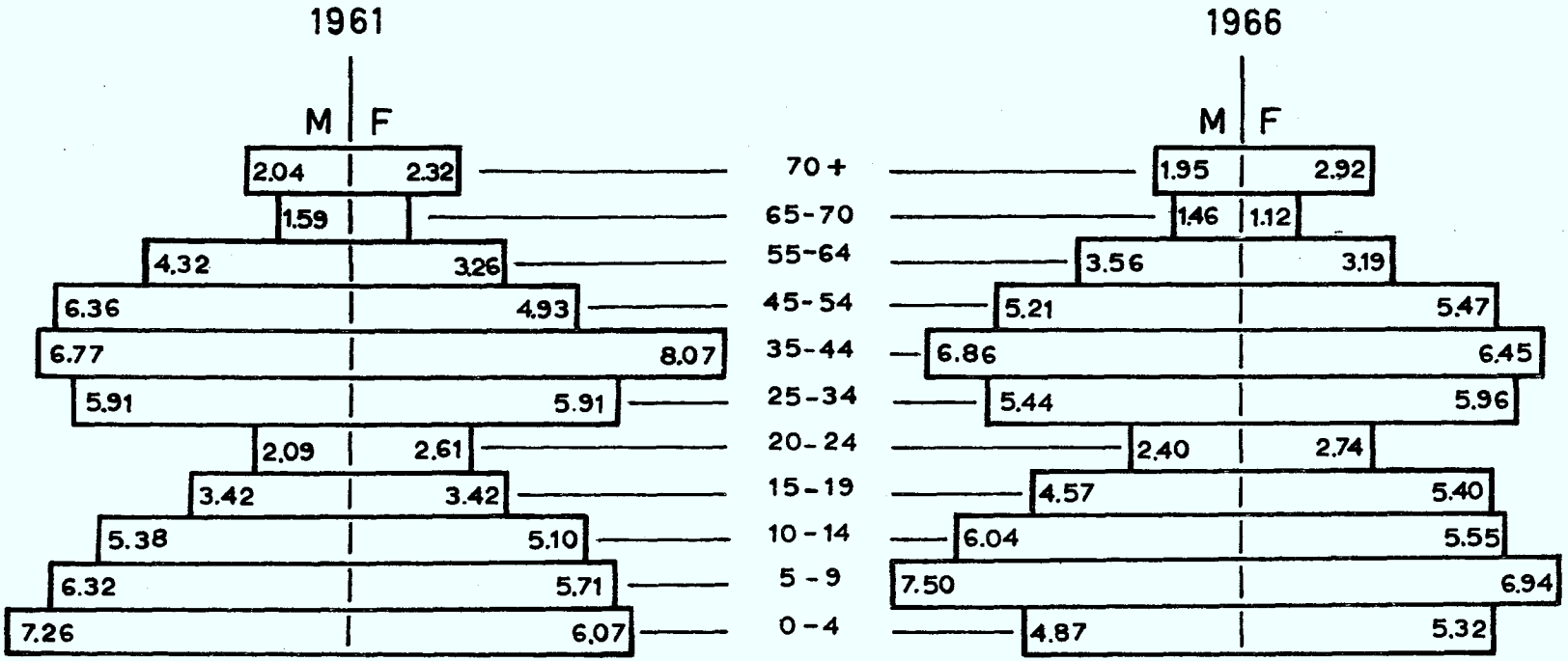


Fig. 4.12 POPULATION PYRAMIDS, SIOUX LOOKOUT

Source: See Appendix A.6.

The simplest way to model social mobility was chosen: namely, to divide each population level into two social groups defined by the nature of their occupation. The first group (PMS) comprises families who derive their income from professional, managerial and skilled occupations; the second group (SS) comprises families who derive their income from semi-skilled jobs. The ageing and death rates for each social group are assumed to be proportional to those rates for the age group as a whole. Migration rates are calculated separately and added to yield the net migration for the total age group. The rate at which families move from one social group to the other is termed a mobility rate. Actually, two such rates are defined; upward mobility (SS→PMS) and downward mobility (PMS→SS).

Let us now consider how individual rates in the demographic/social mobility section are modelled. Figure 4.13 shows population level P1 (0-17 years) as an example. The birth rate is defined by

$$BR = (BRN)(P2+P3)(M1)(M2) \qquad (4.1)$$

where BRN is the normal birth rate (1974 value) in births per year per person in the fertile age group (P2+P3). Multiplier functions M1 and M2 are functions of the income per capita (INCC) and the average level of health (ALH), respectively. Level of education, normally considered a modifier of birth rate, was not included in (4.1) since its present value was felt to be sufficiently high to make future effects on the birth rate relatively small. Average level of health, which will be discussed later, is a measure of the morbidity rate for the community.

The death rate, DR1, is defined by

$$DR1 = (DR1N)(P1)(M3) \qquad (4.2)$$

where the normal death rate, DR1N, includes infant mortalities and the sole modifier is M3, which is a function of ALH.

The migration rate MIG1 is simply the sum of the migration rates for the two social groups PMS1 and SS1. Thus the net rate of change of P1 is given by

$$R_{P1} = BR - DR1 + MIG1 - (1/17)(P1) \text{ per year} \qquad (4.3)$$

Note that MIG1 can be either positive or negative while all the remaining rates are positive.

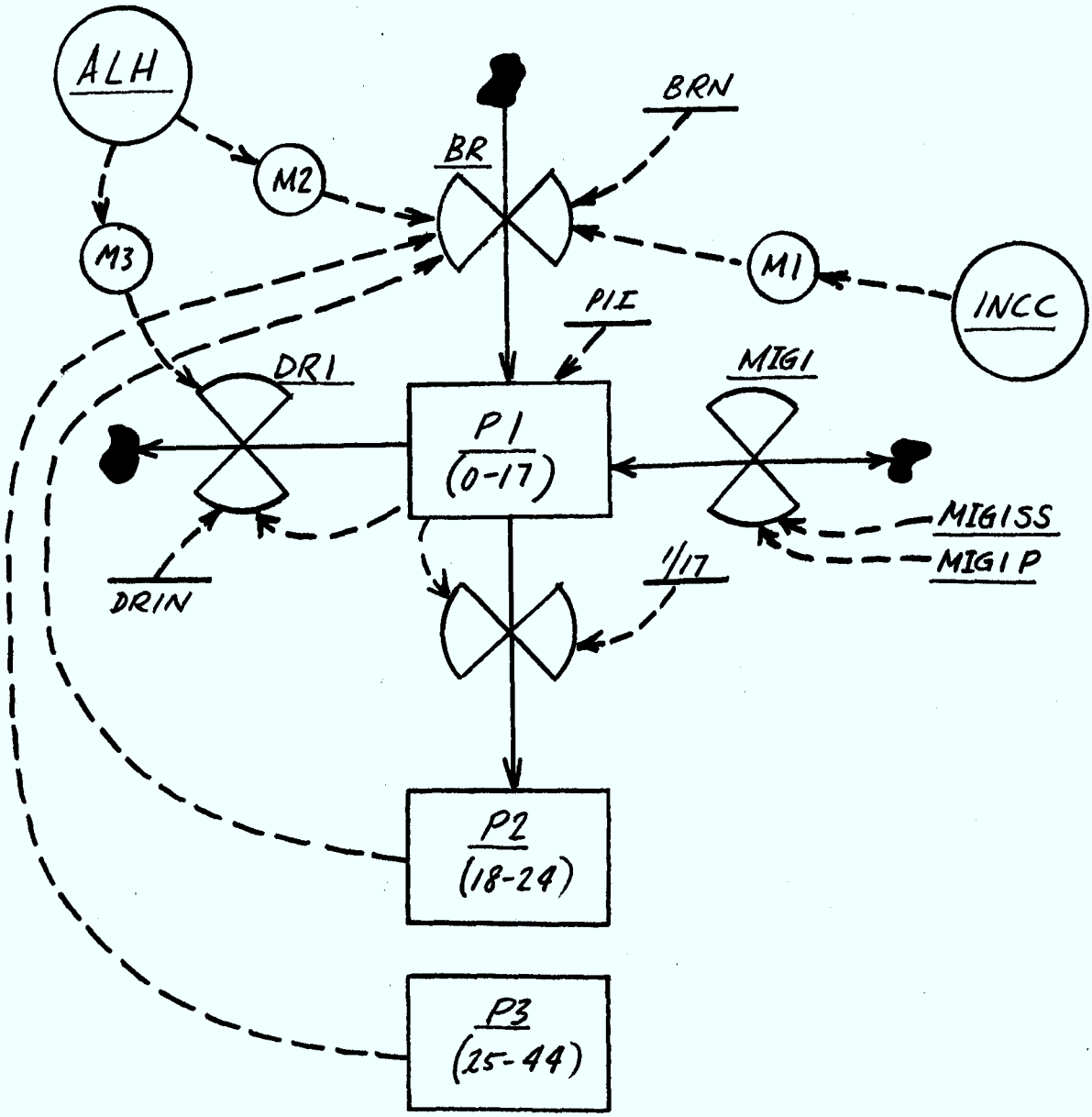

ALH
M2
M3
BR
BRN
M1
INCC
PIE
DR1
MIG1
P1
(0-17)
MIG1SS
MIG1P
DRIN
1/17
P2
(18-24)
P3
(25-44)

Fig. 4.13

4.3.4 Migration

Figure 4.14 shows the details of the migration model. There are a total of ten migration rates, two for each population group, one for each social group. Four measures of community attractiveness are used to modify rates of migration: economic attractiveness for the PMS group (EAPMS); economic attractiveness for the SS group (EASS); social attractiveness (SOCA); and service attractiveness (SERA). The latter two variables will be discussed at length later in this section. Briefly, SOCA is a measure of the average social mobility and community cohesiveness while SERA is a measure of the availability of such services as health, education, housing, and communications (cable TV, FM radio, community TV, community radio). Transportation could be considered as a component of attractiveness but is assumed to be relatively fixed for the forseeable future (paved access to the Trans-Canada highway and air and rail services). The two economic attractiveness variables are measures of employment opportunities for each social group. Thus EAPMS is a delayed function of the PMS employment ratio, PMSER, and EASS is a delayed function of the SS employment ratio, SSER. The employment ratios are indicators of the relative supply and demand of labour in the community.

Note that the migration rates for the 0-17 age group (P1) are taken to be functions of the migration rates for the 18-24 and 25-44 age groups. Also, the economic attractiveness measures are not felt to affect migration of the 65+ age group (P5).

When all attractiveness measures are assumed to remain constant, there are nominal migration rates (as obtained from census data) for each population group. For example, the nominal migration rate for the group PMS3 is MIG3PN and the migration rate is given by

$$MIG3P = (MIG3PN+M10+M34+M17)(PMS3) \tag{4.4}$$

where the modifiers are functions as follows:

$$\begin{aligned} M34 &= (M34)(SERA) \\ M10 &= (M10)(SOCA) \\ M17 &= (M17)(EAPMS) \end{aligned} \tag{4.5}$$

as indicated above,

$$MIG1P = (MIG3P)(M114)+(MIG2P)(M115) \tag{4.6}$$

$$MIG1SS = (MIG3SS)(M116)+(MIG2SS)(M117) \tag{4.7}$$

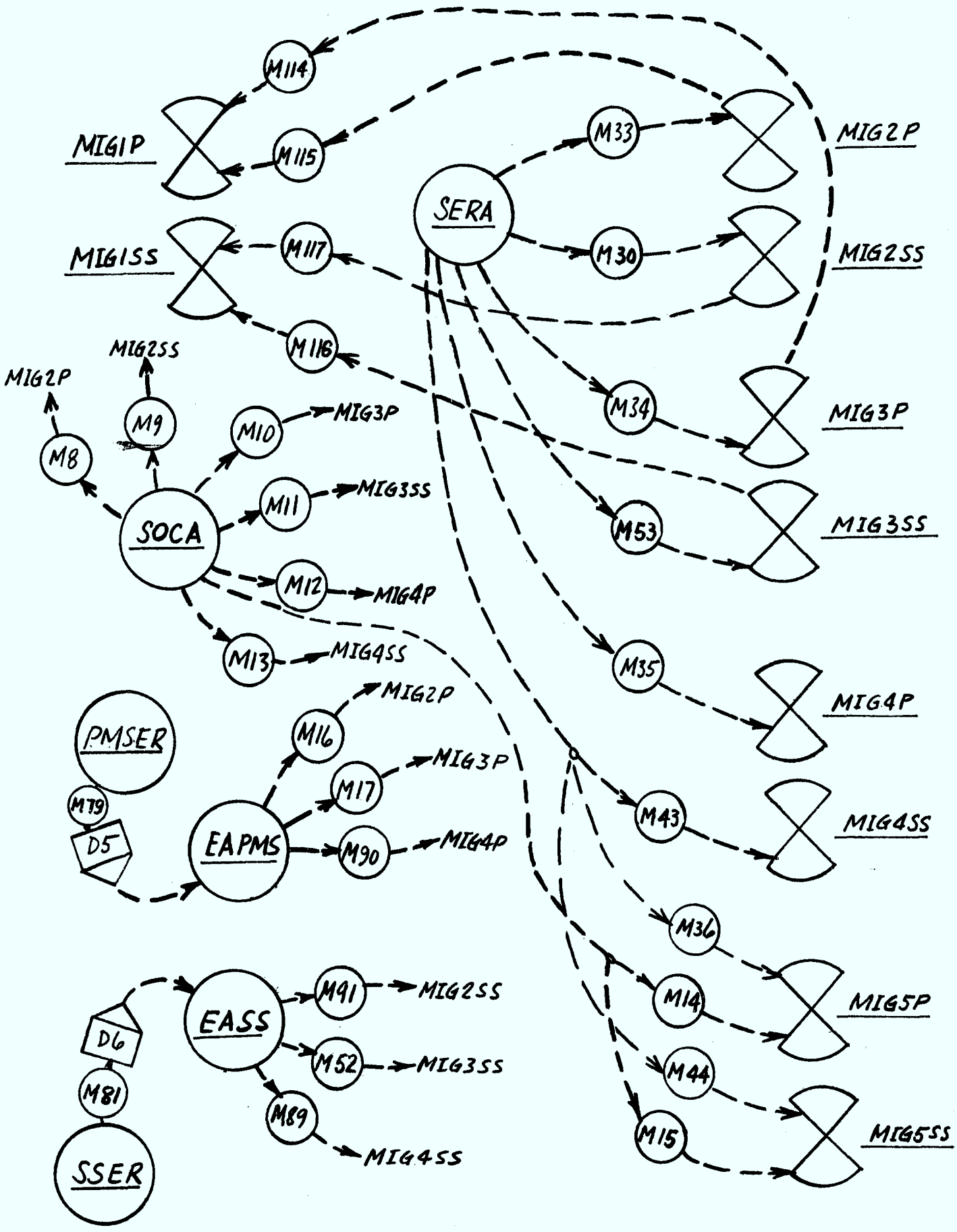

M114
MIG1P
M115
M33
MIG2P
SERA
M117
MIG1SS
M30
MIG2SS
M116
MIG2SS
MIG2P
M9
M10
MIG3P
M34
MIG3P
M8
M11
MIG3SS
SOCA
M53
MIG3SS
M12
MIG4P
M13
MIG4SS
M35
MIG4P
MIG2P
M16
PMSER
MIG3P
M17
M43
MIG4SS
M19
D5
EAPMS
M90
MIG4P
M36
M91
MIG2SS
M14
MIG5P
EASS
D6
M52
MIG3SS
M44
M81
M89
M15
MIG5SS
SSER
MIG4SS

Fig. 4.14

where the multipliers are constants reflecting average family size of migrants in the P2 and P3 groups.

4.3.5 Social Mobility

Figure 4.15 shows the structure of the social mobility model. Both an upward and a downward mobility rate is associated with each population group. For example, for population level P3 the two rates are UMOB3 and DMOB3. Two factors are seen as influencing social mobility in the community: the prevailing nature of employment available; and the rate at which the average education level is changing (LEDR). The population group P1 (0-17 years) is assumed to be the most socially mobile. Normally, this group maintains the same social classification as that of the parent groups (P2 and P3) but its social mobility is also affected by changes in the level of education (to a large extent, it is the group contributing to such changes). The mobilities of population groups P2, P3 and P4 are taken to be functions of the economic attractiveness ratio, EAR = EAPMS/EASS. There is some delay in the effect of this ratio since EAPMS and EASS are delayed versions of the actual employment ratios. Also, since these attractiveness variables affect migration as well, the effect of EAR on the adult mobility rates will only apply to those persons who choose to remain in the community. For simplicity the mobility rates for the 65+ age group (P5) are assumed to be zero. The mobility rates for two examples are similar to those for migration and are given by

$$UMOB1 = [(UMOB2)(M18)+(UMOB3)(M19)](M120) \quad (4.8)$$

$$UMOB3 = (UMOB3N)(M26)(SS3) \quad (4.9)$$

4.3.6 Education

The education section shown in Figure 4.16 includes two levels: the average level of education (LED); and the education services in the community (ESC). The latter is measured in terms of the highest level of education service offered (e.g. Grade 13). The ratio of student population (P1) to the services available (ESR), taken together with provincial and local education policy (EPOL1), determines the rate of change of education services. In addition, educational television (EDTV) has the potential to affect ESC. Thus,

$$ESCR = (M102)(EPOL1)+EDTV \quad (4.10)$$

The average level of education can change due to two factors. First, the prevailing employment market (as well as the type of education, not modelled here) which

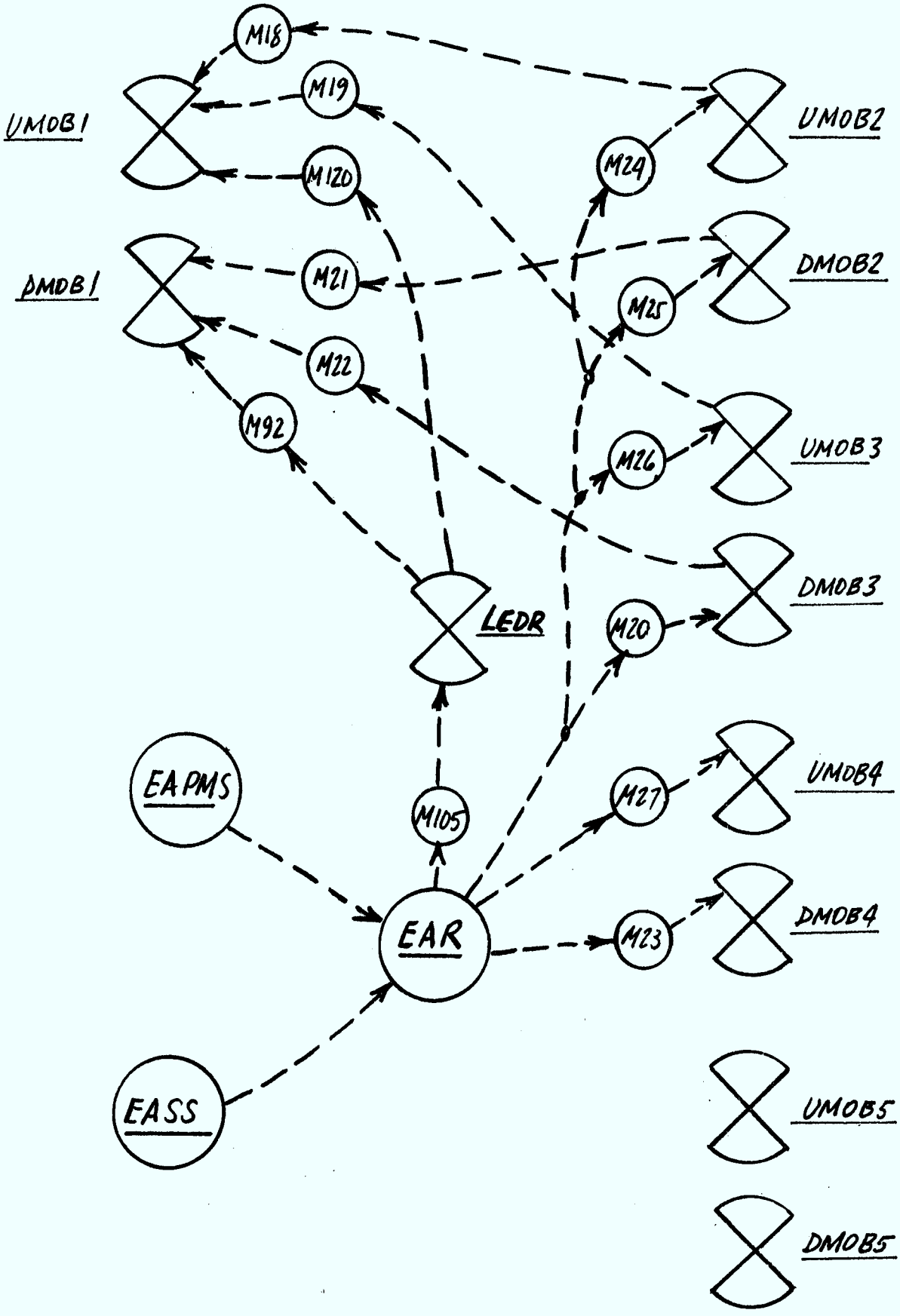

M18
M19
UMOB1
M120
UMOB2
M24
DMOB1
M21
DMOB2
M25
M22
M92
M26
UMOB3
DMOB3
LEDR
M20
EAPMS
M105
M27
UMOB4
EAR
M23
DMOB4
EASS
UMOB5
DMOB5

Fig. 4.15

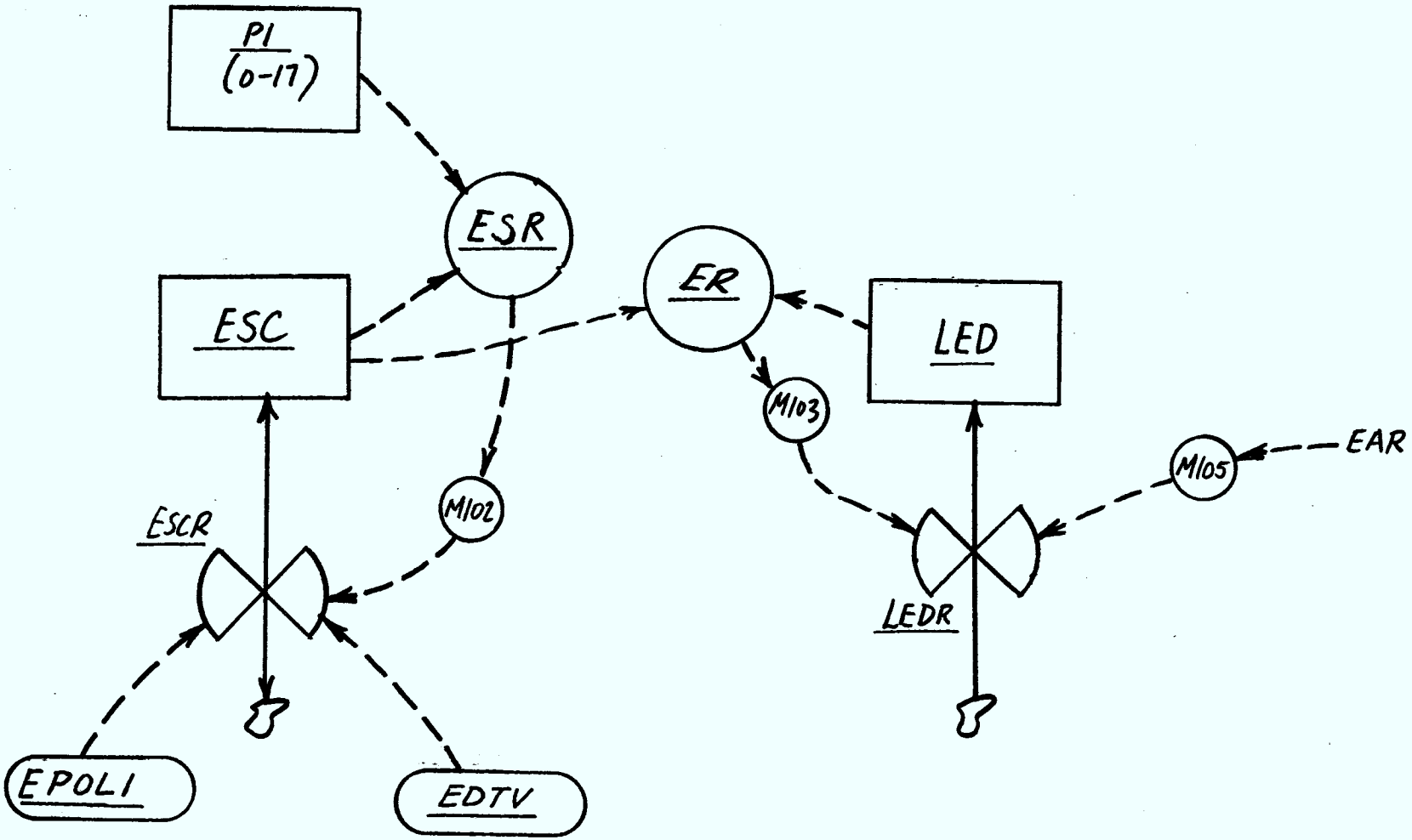


Fig. 4.16

students receive. This effect will be modified by the education facilities actually available in the community compared to the average level of education (ER = ESC/LED). The variable ER reflects the fact that some students might only attend university or technical school if such facilities were available in the community. Thus,

$$LEDR = (M105)(M103) \qquad (4.11)$$

4.3.7 Health Services

Figure 4.17 shows the structure of the section of the model concerned with health services and their use. The level HSC is a measure of the availability of health services in the community. As in the regional and Aroland models, a useful unit of this measurement is the time required (on the average) to receive a typical service. It is thus a reflection of the staff available, their training, hospital size, efficiency of hospital and clinical management, etc. The rate of change in HSC is a function of the use of the available services, the ratio of the total population to the available service (HSR = TP/HSC) and the federal, provincial and local government policy on health services expenditures (HPOL1). Thus,

$$HSCR = (M112)(M109)(HPOL1) \qquad (4.12)$$

Health service utilization (HSU) is a descriptive variable (high, medium or low) which indicates the propensity of residents requiring health services to make use of those in the community rather than those in, say, Winnipeg. The average level of health (morbidity rate), ALH, the services available, HSC, and the government policy on utilization (HPOL2), all influence HSU. Also, the orientation (ORI) of the community, which will be discussed later, will affect the degree of use of community services. The morbidity rate, ALH, is seen to be a function of level of education (LED), stress (STR) and the services available (HSC).

4.3.8 Community Social Dynamics

Several of the ideas employed in the Aroland model of community social dynamics have been used in the sociological section of the Sioux Lookout model shown in Figure 4.18. The two levels of interest in the model are the degree of community cohesiveness (that is, the degree to which the community appears as a unified identity as far as its social and political characteristics are concerned), and the size of the kinship and friendship network (KFN). These levels were chosen to reflect the changes in social structure that might take place due to changes in communications. Associated with the two levels

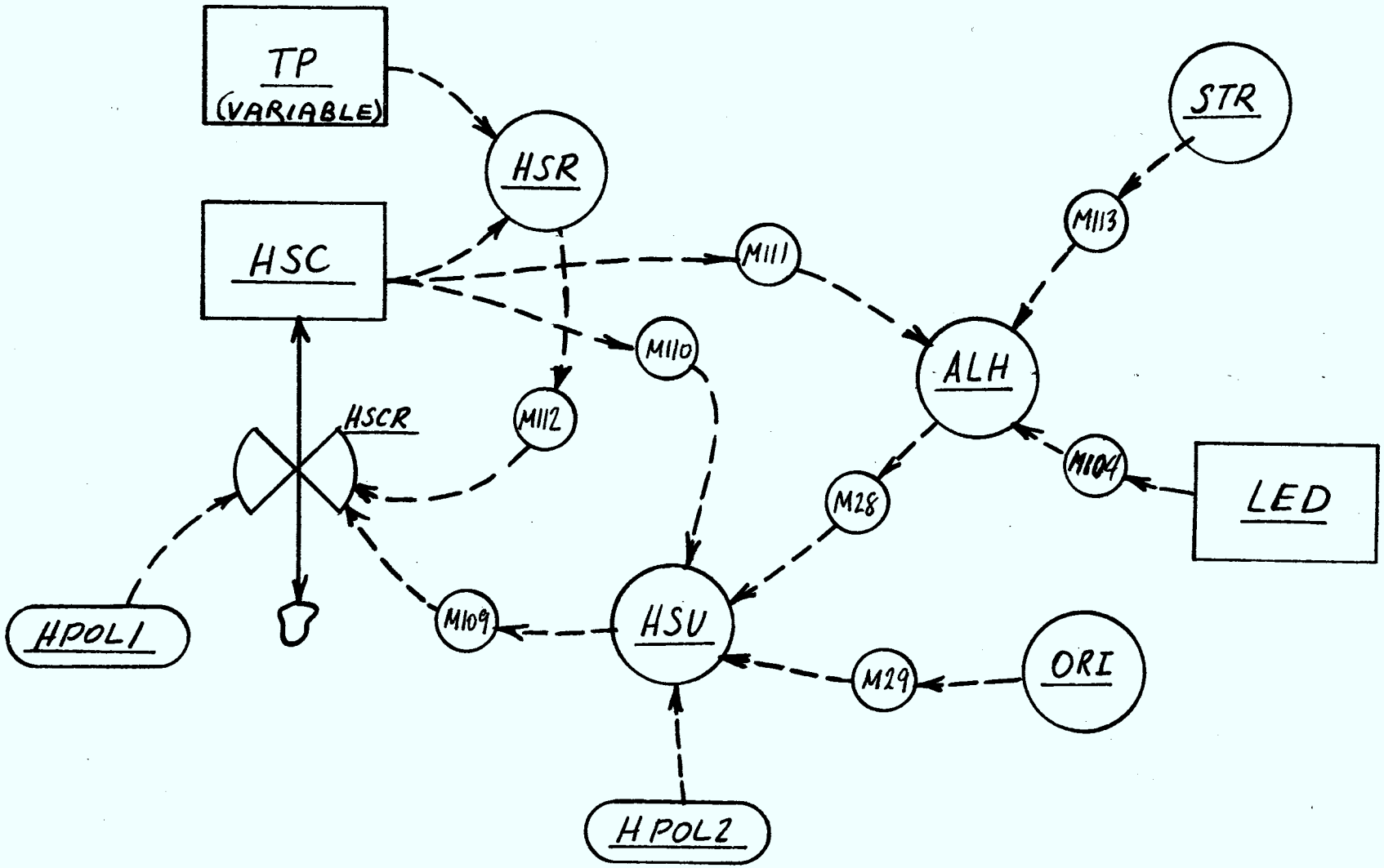

TP
(VARIABLE)
HSR
HSC
STR
M113
M111
M110
ALH
HSCR
M112
M104
LED
M28
HPOL1
M109
HSU
ORI
M29
HPOL2

Fig. 4.17

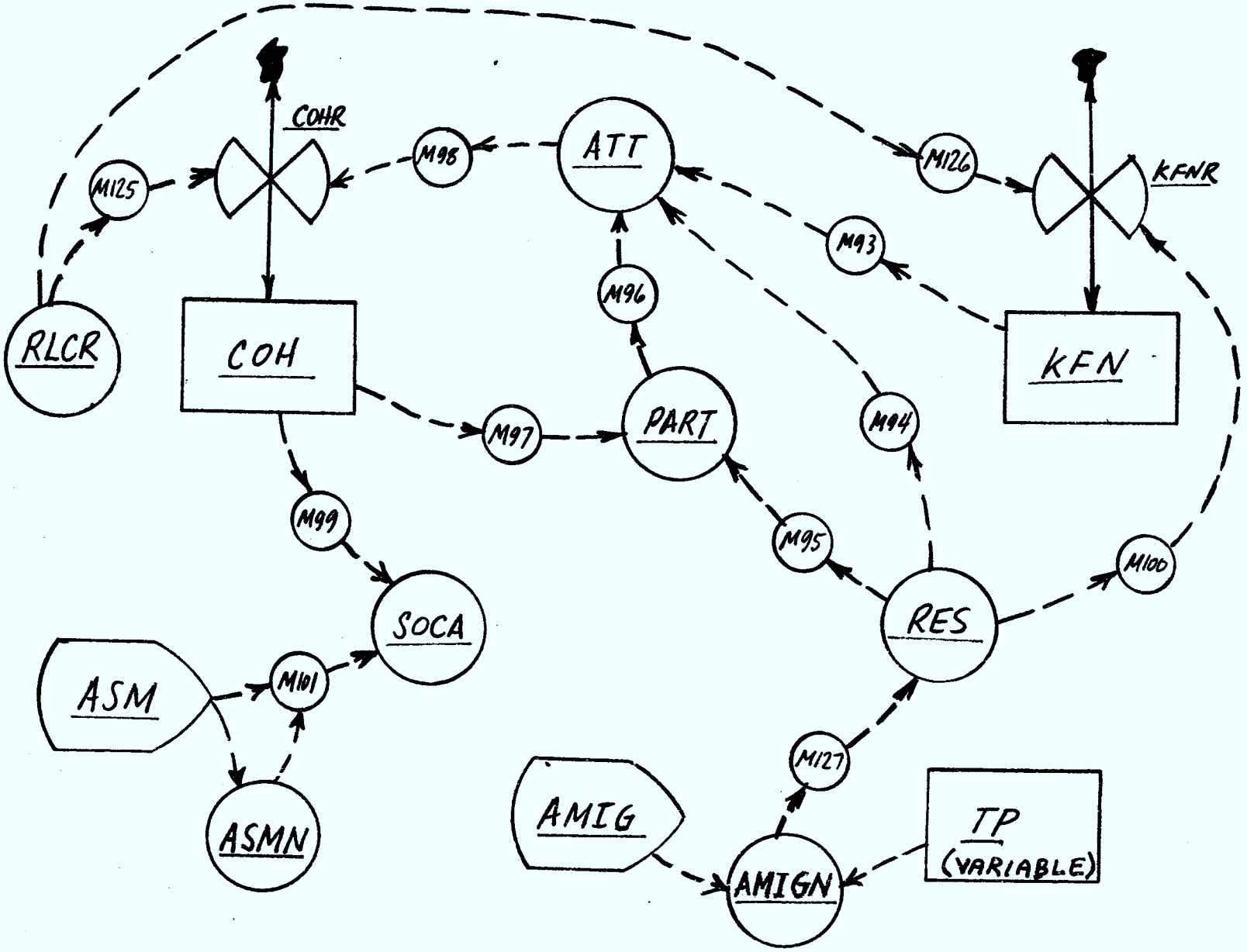

COHR
KFNR
M125
M98
ATT
M126
M93
M96
RLCR
COH
KFN
M97
PART
M94
M99
M95
M100
SOCA
RES
ASM
M101
M127
AMIG
TP
(VARIABLE)
ASMN
AMIGN

Fig. 4.18

are the variables describing attachment to the community (ATT), community participation (PART) and length of residency (RES). For each of the two levels and three variables mentioned, it will be necessary to use a qualitative unit of measurement. That is, each will be described at any time as being "high", "medium", or "low". This system matches the terms chosen to describe these quantities in the survey questionnaire used in the field study of Sioux Lookout. In some cases, for the purpose of data analysis, it may be useful to assign an arbitrary numerical scale to these variables. This matter will be discussed later since it is of particular importance in describing the associated multiplier functions.

Let us now describe the structure of this section of the model. Community cohesiveness (COH) is seen to increase primarily as a result of high individual attachment to the community (ATT). This establishes the degree to which individuals identify with others in the community who feel likewise about the community itself. The rate of change of cohesiveness (COHR) is also assumed to be influenced by the residential local telephone calling rate (RLCR). In other words, RLCR indicates the degree to which individuals become and remain aware of their common interest in, and attachment to, the community; a high RLCR reinforces high attachment.

Cohesiveness, together with the average social mobility rate (ASM), is seen to determine the social attractiveness of the community (SOCA). That is,

$$SOCA = (SOCAI)(M99)(M101) \tag{4.13}$$

and

$$ASM = ASM(UM0B1, DM0B1, UM0B2, \ldots, DM0B4) \tag{4.14}$$

where SOCAI is the assumed social attractiveness prevailing at the present time. Note that ASMN is a normalized form of ASM.

Average length of community residency (RES) is modified by the number of people leaving or entering the community relative to the initial (1974) value. Thus, the normalized average migration is given by

$$AMIGN = 1+AMIG \tag{4.15}$$

where the average migration rate, AMIG, is a function of the individual migration rates for the various population groups:

$$AMIG = (MIG1+MIG2+MIG3+MIG4+MIG5)/L1+L2+L3+L4+L5) \tag{4.16}$$

$$RES = (RESI)(M127). \tag{4.17}$$

Length of residency is seen to influence the rate of change of the size and strength of the kin and friend network (KFN), the degree of individual attachment to the community (ATT) and the level of individual participation in clubs, political organizations, unions, etc., (PART). As in the case of cohesiveness, the local telephone calling rate (RLCR) is assumed to augment the effect of residency on the maintenance of KFN. Thus,

$$KFNR = (M100)(M126). \tag{4.18}$$

Participation is reinforced by a high community cohesiveness as well as a high average residency. Thus,

$$PART = (PARTI)(M95)(M97). \tag{4.19}$$

Attachment to the community (ATT) is a combined function of participation, residency and the kin and friend network. That is,

$$ATT = (ATTI)(M93)(M94)(M96) \tag{4.20}$$

It is useful to note both positive and negative feedback loops affecting community cohesiveness. First, as COH increases, PART increases leading to greater attachment which further increases COH. However, as COH increases, so does the social attractiveness (SOCA). This can result in increased migration into the community (See Figure 4.14) which reduces RES, reducing both participation and attachment and hence reducing COH. This is a reasonable situation since no community is completely isolated and able to establish a highly coordinated (cohesive) society without attracting new members which for a time will tend to reduce this high level of cohesiveness.

4.3.9 Economics

To a large extent, the economic dynamics of a community such as Sioux Lookout are a function of the economic situation in the rest of Canada and the world. There are certain local decisions that can be made, especially in the area of tourism, but even the effectiveness of factors such as these depends on the disposable income of prospective tourists from outside the community. Thus the approach taken in modelling the economic aspects of the community is to treat each economic input as an exogenous variable influenced by a number of decisions, some local but most from provincial and federal governments or from the private sector. Figure 4.19 and 4.20 show the economic model structure.

In Figure 4.19 there are six categories of economic activity in the community: forest resource development, railway maintenance and operation, government services, tourism, industrial goods and services, and retail goods

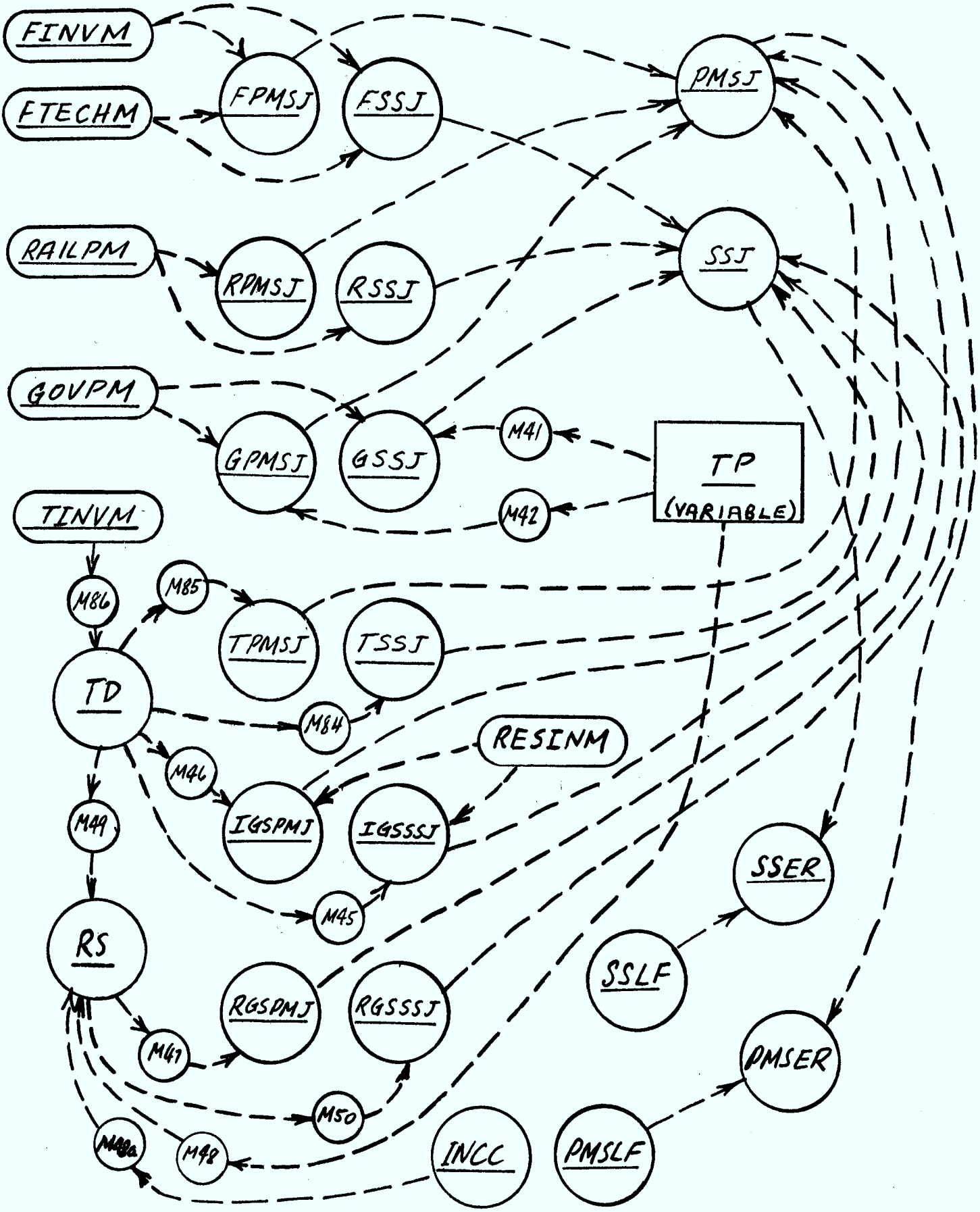

FINVM
FTECHM
FPMSJ
FSSJ
PMSJ
RAILPM
RPMSJ
RSSJ
SSJ
GOVPM
GPMSJ
GSSJ
M41
M42
TP
(VARIABLE)
TINVM
M86
M85
TPMSJ
TSSJ
TD
M84
RESINM
M46
IGSPMJ
IGSSSJ
M49
SSER
M45
RS
SSLF
RGSPMJ
RGSSSJ
M47
PMSER
M50
M48a
M48
INCC
PMSLF

Fig. 4.19

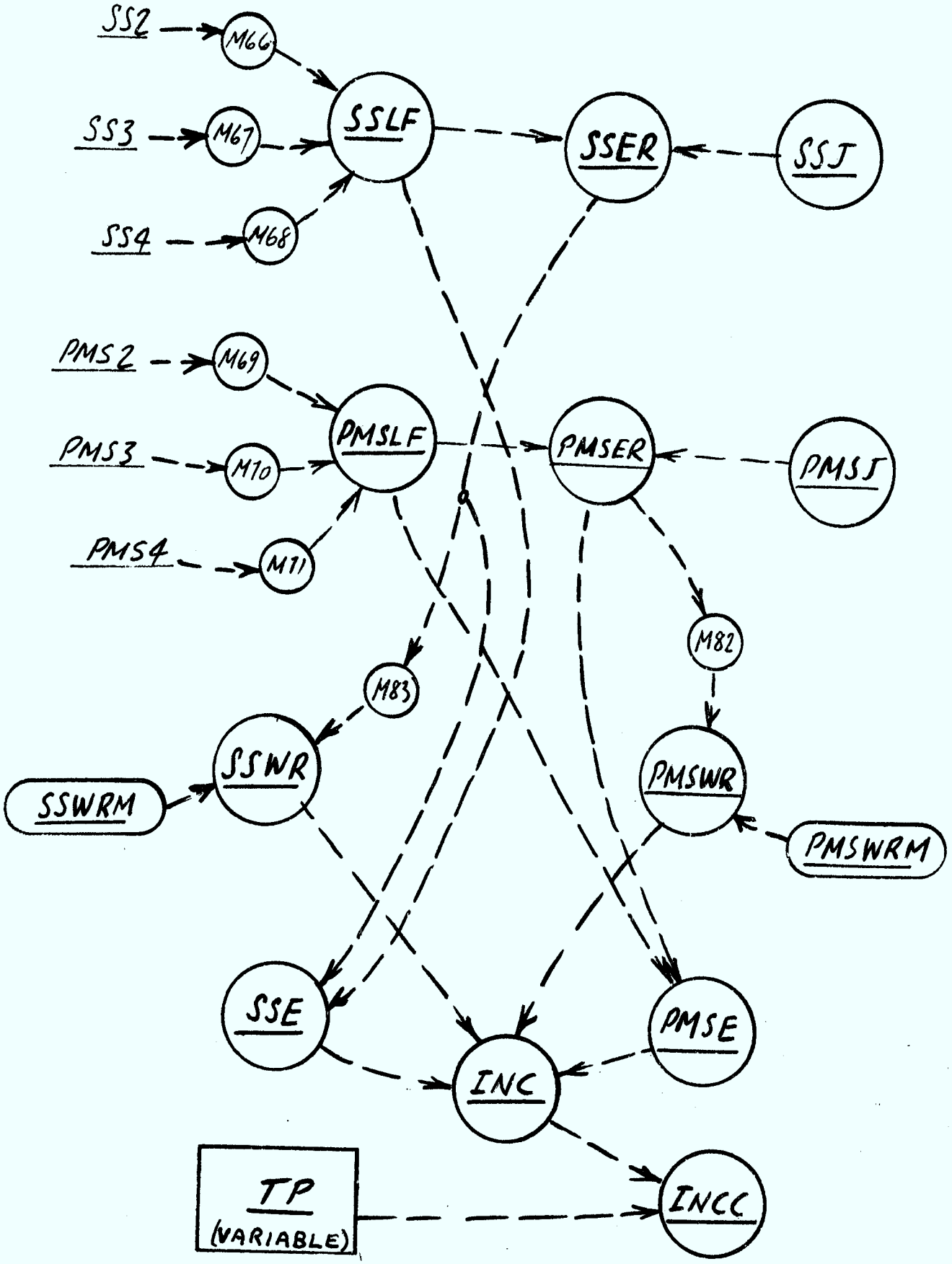

SS2
M66
SS3
M67
SS4
M68
SSLF
SSER
SSJ
PMS2
M69
PMS3
M70
PMS4
M71
PMSLF
PMSER
PMSJ
M82
M83
SSWR
SSWRM
PMSWR
PMSWRM
SSE
PMSE
INC
TP
(VARIABLE)
INCC

Fig. 4.20

and services. Associated with each category are two variables representing the labour demand (jobs available) for professional/managerial/skilled workers and that for semi-skilled workers. Thus in the case of forest resource development, the two variables are FPMSJ and FSSJ.

A number of exogenous inputs affect the demand for labour. In the case of forest resource development, the forestry investment multiplier (FINVM) can alter the jobs available relative to their present level and the forestry technology multiplier (FTECHM) serves to reflect the effect on labour demand of the use of automation in forest harvesting etc.

The rail policy multiplier (RAILPM) reflects changes in policy of the Canadian National Railways that could affect labour demand in this sector of the economy. For example, if Sioux Lookout were no longer a divisional point on the railway, labour demand would likely fall. Similarly, the government policy multiplier (GOVPM) affects labour demand for government services (local, provincial, and federal).

The effects of investment in the tourist industry (facilities, advertising, services) are reflected by the tourism investment multiplier (TINVM) which modifies the level of tourism (tourist-days per year), TD. It is this measure of actual tourist activity which affects the labour demand for goods and services directly related to tourism (TPMSJ and TSSJ), as well as labour demand for industrial goods and services and retail sales (RS). The latter also depends on total population (TP) and income per capita (INCC).

Retail sales (RS) is used as a measure of labour demand in the retail goods and services sector of the economy. Labour demand for industrial goods and services is seen to be primarily a function of resource development investment, as modelled by the resource investment multiplier (RESINM).

The above discussion can be summarized by the following equations.

FPMSJ = (FPMSJI)(FINVM)(FTECHM) (4.21)

FSSJ = (FSSJI)(FINVM)(FTECHM) (4.22)

RPMSJ = (RPMSJI)(RAILPM) (4.23)

RSSJ = (RSSJI)(RAILPM) (4.24)

GPMSJ = (GPMSJI)(GOVPM)(M42) (4.25)

GSSJ = (GSSJI)(GOVPM)(M41) (4.26)

TD = (TDI)(M86) (4.27)

TPMSJ = (TPMSJI)(M85) (4.28)

TSSJ = (TSSJI)(M84) (4.29)

IGSPMJ = (IGSPMJI)(RESINM)(M46) (4.30)

IGSSSJ = (IGSSSJI)(RESINM)(M45) (4.31)

RS = (RSI)(M48)(M48a)(M49) (4.32)

RGSPMJ = (RGSPMJI)(M47) (4.33)

RGSSSJ = (RGSSSJI)(M50) (4.34)

The total PMS and SS jobs can then be computed as

PMSJ = FPMSJ+RPMSJ+GPMSJ+TPMSJ+IGSPMJ+RGSPMJ (4.35)

SSJ = FSSJ+RSSJ+GSSJ+TSSJ+IGSSSJ+RGSSSJ (4.36)

Figure 4.20 shows how these labour demand totals for the two types of jobs are related to the labour supply and govern the income per capita for the community. The PMS labour force (PMSLF) and the SS labour force (SSLF) are functions (M66-M71) of the populations in the various population groups. Thus,

SSLF = (SS2)(M66)+(SS3)(M67)+(SS4)(M68) (4.37)

and PMSLF = (PMS2)(M69)+(PMS3)(M70)+(PMS4)(M71) (4.38)

The employment ratios are defined by

SSER = SSJ/SSLF (4.39)

and PMSER = PMSJ/PMSLF. (4.40)

The actual numbers of PMS and SS employees at any time are assumed to be

$$PMSE = \begin{cases} PMSLF, & PMSER > 1 \\ PMSJ, & PMSER \leq 1 \end{cases} \quad (4.41)$$

and

$$SSE = \begin{cases} SSLF, & SSER > 1 \\ SSJ, & SSER \leq 1 \end{cases} \quad (4.42)$$

The total income is then a function of the average wage rate and the number of employees. That is,

$$INC = (PMSE)(PMSWR)+(SSE)(SSWR). \quad (4.43)$$

The wage rates are assumed to be functions of prevailing wage rates outside the community as reflected by the wage rate multipliers, PMSWRM and SSWRM, as well as the employment ratios. Thus,

$$PMSWR = (PMSWRI)(PMSWRM)(M82) \quad (4.44)$$

and

$$SSWR = (SSWRI)(SSWRM)(M83). \quad (4.45)$$

Income per capita is simply INCC = INC/TP.

4.3.10 Communications

Figure 4.21 shows the basic structure of the section of the model concerned with the effects of radio and television services on the community. A number of additional links with the rest of the model may be added with a further analysis of the data obtained from the field study.

The availability of radio and television services of various kinds is modelled in terms of exogenous variables. It was felt that the inclusion of factors affecting demand for local services, extra TV channels, etc., was impossible given the present state of knowledge concerning such factors, and especially on consideration of the role of government legislation and policy in the determination of what services can be offered at any time. The exogenous variables describing the television services available are: available TV channels (AVCH), hours of programming on TV (HPTV), the fraction of TV programming of regional interest (REGFRT) availability of community TV (COMTV), cable TV (CABTV), and educational TV channels (EDTV). For radio services, the variables are: available receivable stations (AVRS), regional programming fraction (REGFRR) availability of community radio (COMR) and availability of FM radio (FM). Some of the above variables such as the availability of particular services will be described by two states: either the service is available or it is not. There are also links between exogenous variables which draw attention to their interdependence. For example, the availability of community antenna TV (Cable TV) will imply an increase in the available TV channels.

At the present time, the best measure of the effects of radio and television on the social system is felt to be the orientation (ORI) of individuals (and hence of

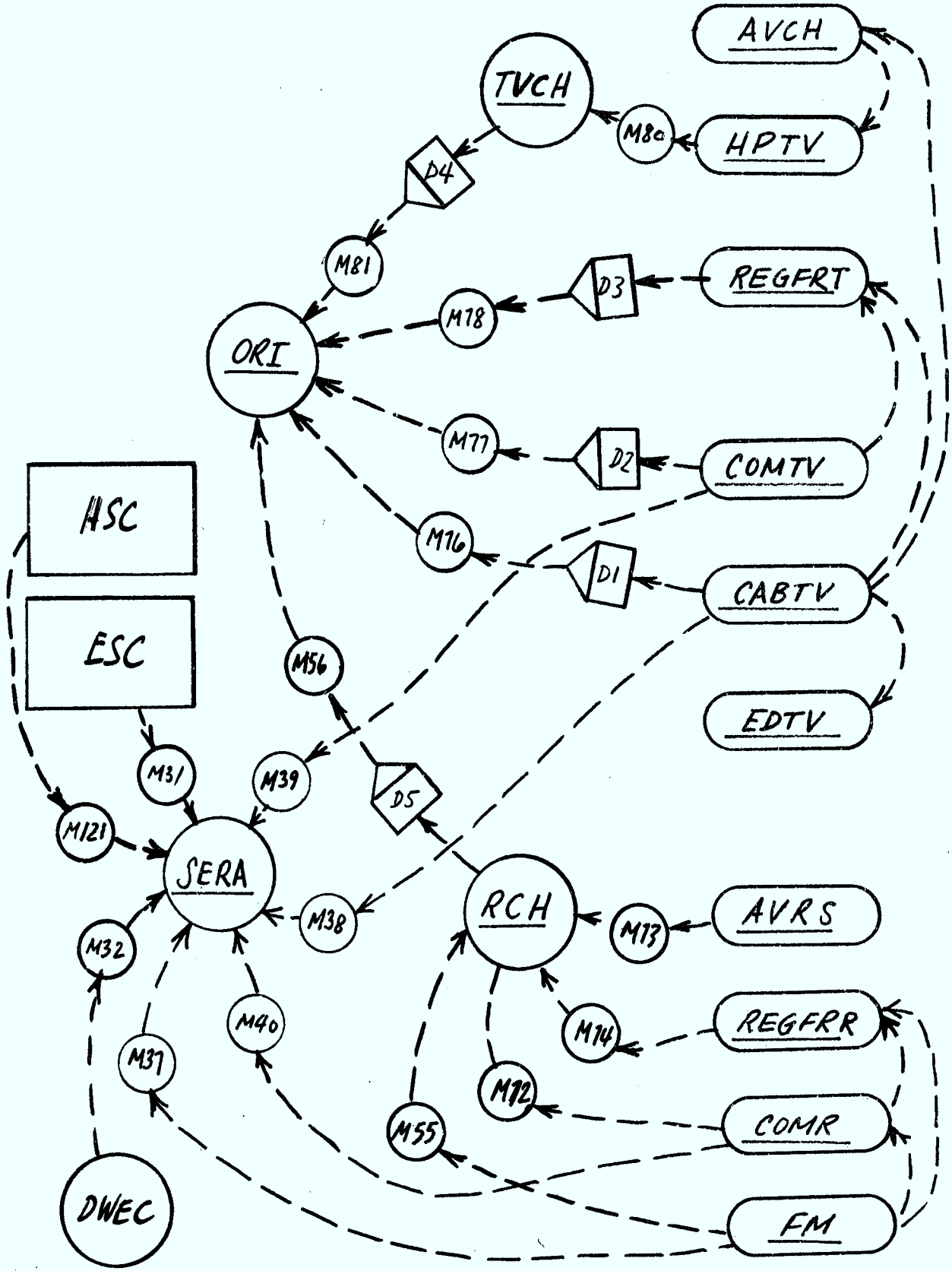

AVCH
TVCH
M80
HPTV
D4
M81
D3
REGFRT
M78
ORI
M77
D2
COMTV
M76
D1
CABTV
HSC
ESC
M56
EDTV
M31
M39
D5
M121
SERA
RCH
AVRS
M38
M73
M32
M74
REGFRR
M40
M37
M72
COMR
M55
DWEC
FM

Fig. 4.21

the community as a whole). Orientation describes the consciousness of individuals regarding their community of interest with respect to their community of residence. Thus, on one end of the scale, an individual living in Sioux Lookout might be oriented completely toward the world outside the community; on the other end, an individual might see the limits of his "world" to be the limits of the community itself. Thus the variable, ORI, should have links with the social structure described previously; these await further data analysis. At present, ORI depends on radio and television services and contact hours. Thus,

$$ORI = (ORII)(M81)(M78)(M77)(M76)(M56) \qquad (4.46)$$

where the multipliers are lagged functions of TV contact hours (TVCH), REGFRT, COMTV, CABTV and radio contact hours (RCH). Television contact hours is seen to be dependent in part on total hours of programming available. Radio contact hours is felt to be more dependent on the nature of the services provided and thus is a function of AVRS, REGFRR, COMR and FM. Thus,

$$TVCH = (TVCHI)(M80) \qquad (4.47)$$

$$RCH = (RCHI)(M72)(M55)(M73)(M74) \qquad (4.48)$$

Various radio and television services contribute to the measure of service attractiveness for the community (SERA):

$$SERA = (SERAI)(M37)(M38)(M39)(M40)(M121)(M31)(M32) \qquad (4.49)$$

Figure 4.22 shows the structure for the section of the model relating to telephones and their utilization. The variables relating to telephones are: residential telephones per dwelling (RTPD), total residential telephones (RT), residential telephones per capita (RTC), residential local calling rate (RLCR), and residential long-distance calling rate (RLDCR). Residential telephones per dwelling (RTPD) depends primarily on income per capita (INCC) and the average occupancy level of dwellings as indicated by the number of dwellings per capita (DWEC). The residential local calling rate (calls per person per year) is dependent on residential telephones per capita (RTC), orientation (ORI), the degree of community participation (PART), and the extent of the kin/friend network (KFN). Residential long-distance calling rate (RLDCR) depends on RTC, ORI, income per capita (INCC), and the faction of the population engaged in professional, managerial and skilled jobs (PMSF). The

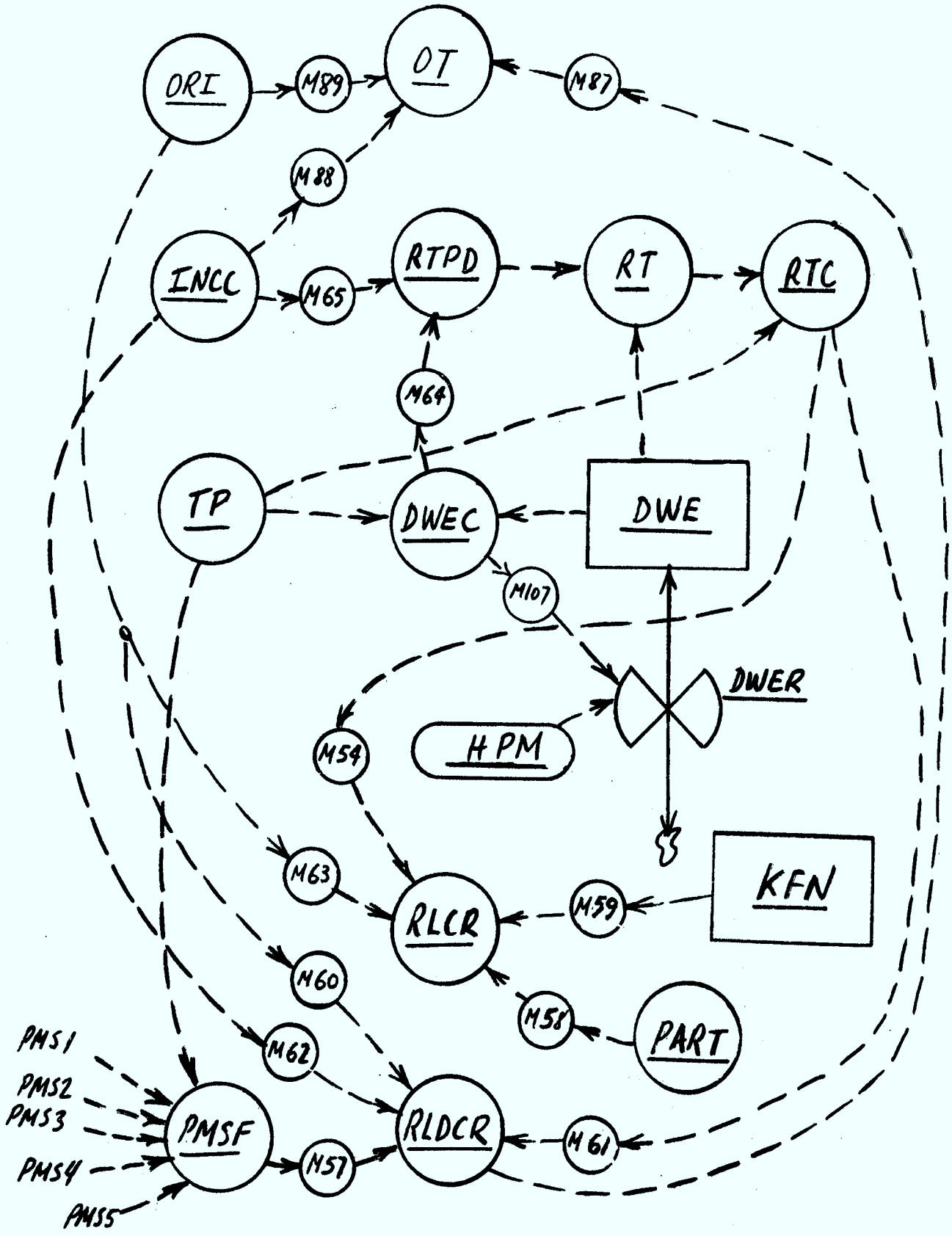

ORI
M89
OT
M87
M88
INCC
M65
RTPD
RT
RTC
M64
TP
DWEC
DWE
M107
DWER
M54
HPM
M63
RLCR
M59
KFN
M60
M58
PART
M62
PMS1
PMS2
PMS3
PMS4
PMS5
PMSF
M57
RLDCR
M61

Fig. 4.22

latter factor is included since it is felt that those who regularly make a large number of long-distance calls as part of their job are likely to make more long-distance calls at home, other factors being equal. The equations that summarize the telephone section of the model are:

$$RTPD = (RTPDI)(M65)(M64) \quad (4.50)$$

$$RT = (RTPD)(DWE) \quad (4.51)$$

$$RTC = (RT)/(TP) \quad (4.52)$$

$$RLCR = (RLCRI)(M54)(M63)(M59)(M58) \quad (4.53)$$

$$RLDCR = (RLDCRI)(M60)(M62)(M57)(M61) \quad (4.54)$$

Outside travel (OT) is seen to be positively influenced by the long-distance calling rate (RLDCR), orientation (ORI), and income per capita (INCC). It is simply a measure of the miles travelled outside the community per person per year and is included here only as an indication and hence is not linked back to any section of the model.

4.3.11 Housing

The number of dwellings (DWE) in the community is modelled as a level as shown in Figure 4.22. The rate of change of DWE (DWER) is a function of the present number of dwellings per capita (DWEC) as well as local and other government housing and land use policy (HPM). Thus,

$$DWER = (DWERI)(M107)(HPM) \quad (4.55)$$

4.3.12 Preliminary Simulation and Choice of Multiplier Functions

The results of the analysis of census data and field study data are reported elsewhere in this report (see Appendix A.6). Given sufficient time they could be applied to the task of specifying the form of the multiplier functions in the model. Some preliminary results of this nature will be discussed later. Financial and temporal limitations did not allow this aspect of the work to be completed and an alternative approach was investigated. Since the demographic component is less dependent on functional relationships between variables, it was decided to proceed with simulation of this sector isolated from the rest of the model. The severed links were connected to exogenous variables representing possible behaviour of the other model components.

The structure of the entire model of Sioux Lookout is shown in Figure 4.9, which is included earlier in this Section. It is simply the result of interconnecting the various sections described earlier. Figure 4.23 indicates how the demographic component was isolated and the exogenous variables that were chosen to simulate the behaviour of the remainder of the model. It is evident from comparing Figures 4.9 and 4.23 that the feedback loops present in the complete model have been broken by the inclusion of these exogenous variables. The results of the simulation runs should thus be treated only as indicators of the general behaviour of the demographic sector and not as indicators of how that sector would behave if the remainder of the model were also operating.

The isolated demographic component shown in Figure 4.23 includes the following multiplier functions:

M1 - modifies the birth rate (BR) as a function of income per capita (INCC);

M2 - modifies the birth rate (BR) as a function of average level of health (ALH);

M3, M4, M5, M6, M7 - modify the death rates for population groups P1 (0-17), P2 (18-24), P3 (25-44), P4 (45-64), P5 (65+), as functions of average level of health (ALH);

M8 to M15 - modify the migration rates MIG2P, MIG2SS, MIG3P, MIG3SS, MIG4P, MIG4SS, MIG5P, MIG5SS, as functions of the social attractiveness (SOCA);

M114 to M117 - modify the migration rates MIG1P and MIG1SS, as functions of the migration rates, MIG2P, MIG3P, MIG2SS, MIG3SS;

M16, M17, M90 - modify the migration rates MIG2P, MIG3P, MIG4P, as functions of the economic attractiveness for professional/managerial/skilled workers (EAPMS);

M91, M52, M89 - modify the migration rates MIG2SS, MIG3SS, MIG4SS, as functions of the economic attractiveness for semi-skilled workers (EASS);

M33, M30, M34, M53, M35, M43, M36, M44 - modify the migration rates MIG2P, MIG2SS, MIG3P, MIG3SS, MIG4P, MIG4SS, MIG5P, MIG5SS, as functions of the service attractiveness (SERA);

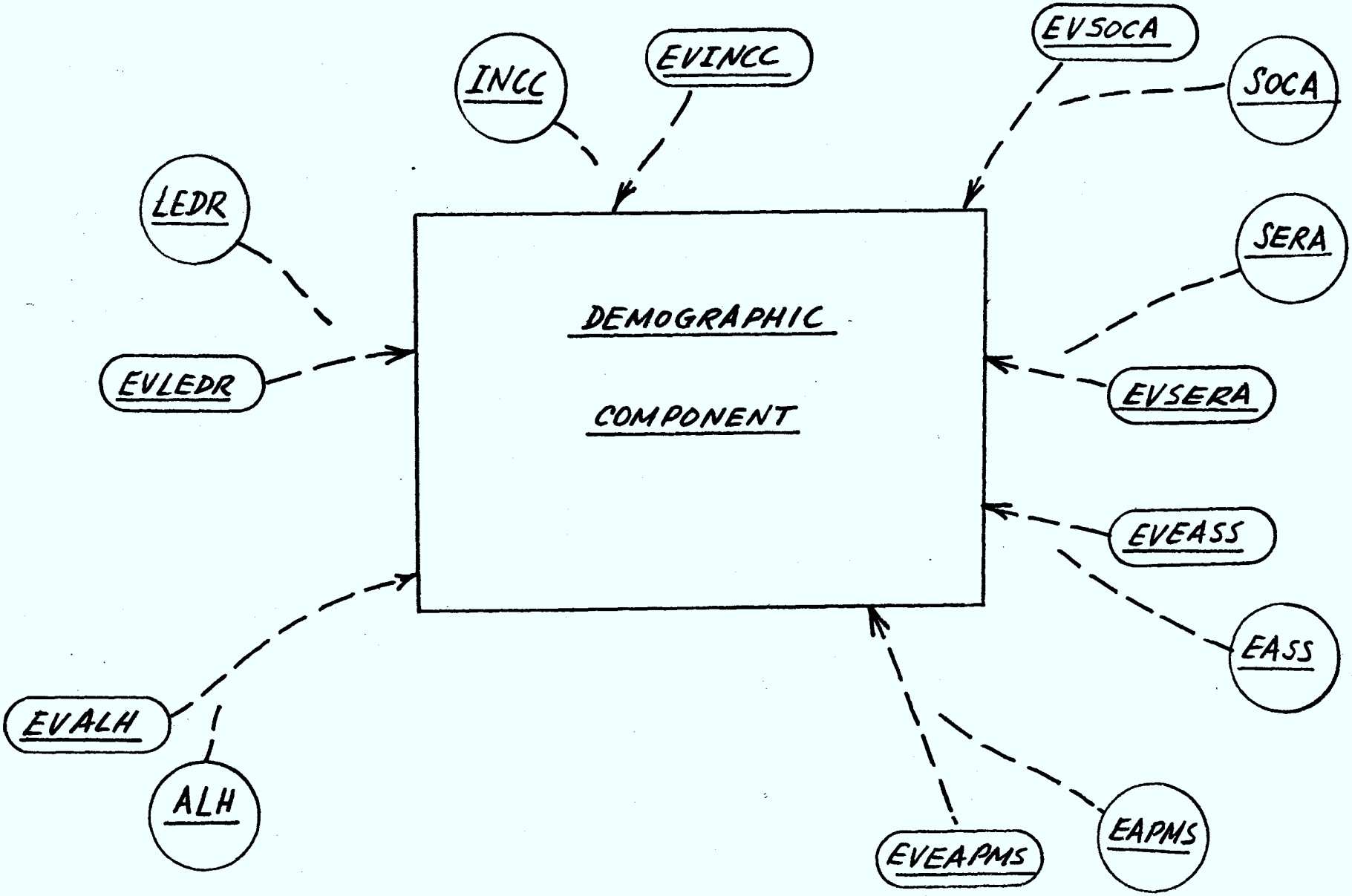

INCC
EVINCC
EVSOCA
SOCA
LEDR
SERA
DEMOGRAPHIC
COMPONENT
EVLEDR
EVSERA
EVEASS
EASS
EVALH
ALH
EVEAPMS
EAPMS

Fig. 4.23

M24, M25, M26, M20, M27, M23 - modify the mobility rates UMOB2, DMOB2, UMOB3, DMOB3, UMOB4, DMOB4, as functions of the economic attractiveness ratio (EAR);

M120, M92 - modify mobility rates UMOB1 and DMOB1 as functions of the rate of increase in level of education (LEDR);

M18, M19, M21, M22 - modify the mobility rates UMOB1 and DMOB1 as functions of the mobility rates UMOB2, UMOB3, DMOB2 and DMOB3.

Most of the above multipliers are plotted in Figures 4.24 to 4.27. Some are, however, simple constants, (M114 to M117, M18, M19, M21, M22), and are identified only in the following comments, which serve to explain why all these particular functions were chosen.

M1 - The most relevant information concerning the future effects of income on family size (i.e. the birth rate) is the cross-tabulation of ideal family size and income data obtained from the field survey. An analysis of these data shows no significant trend, and indeed, the question of "ideal" family size has a tenuous relation to future changes in the average birth rate. The function M1 allows for a 20% reduction in the birth rate if real income per capita doubles with respect to the 1971 nominal rate of 0.0593 per individual 18-44 years of age.

M2 - Average level of health is defined to be directly proportional to the morbidity rate for the community. If the difference between the death rates for Sioux Lookout and for southern Ontario is attributed to the difference in morbidity rates, then the average level of health for Sioux Lookout is about 30% above that for southern Ontario. Function M2 allows for a 20% increase in the birth rate if the average level of health reaches the level for southern Ontario. In fact, the birth rate for southern Ontario is presently about 25% below that for Sioux Lookout.

M3-M5 - Since it is assumed that population groups P1-P3 contribute negligibly to the total death rate, these functions are set equal to unity.

M6, M7 - For increasing morbidity rates (ALH>1), the death rates for the population groups P4 and P5 are assumed to be modified in a directly proportional manner. A 30% reduction in death rate will result if the average level of health reaches the level for southern Ontario. This agrees with the statistics discussed under M2 above.

M8-M13 - The component of changes in the migration rates for population groups P3, P4 and P5 attributed to changes in social attractiveness is given by M8-M13. Since little relevant data concerning this aspect of migration were available, the functions M8-M13 were chosen somewhat arbitrarily to provide a maximum increase in the immigration rate to 5%, for a large increase in social attractiveness. Decreases in social attractiveness from the existing level result in only marginal increases in emigration.

M14, M15 - These functions, which pertain to the 65+ age group, are similar to M8-M13 but with a relatively stronger effect for decreases in social attractiveness from the existing level.

M16, M17, M91, M52 - The effects of changing employment opportunities on migration are assumed to be much stronger than the effects of either social attractiveness or service attractiveness. A variation of + 10% in the existing attractiveness levels is assumed to produce a + 10% effect on existing migration rates for population groups P2 and P3 (18-44 years).

M90, M89 - For population group P4 (45-64 years), the effect of economic attractiveness is assumed to be half as great as for the younger, more mobile, age groups.

M33, M30, M34, M53, M35, M43, M36, M44 - The relationship between migration and service attractiveness is assumed to be weak for increased attractiveness relative to existing levels and to be somewhat stronger for reduced services. This is especially true for the over 65 years age group. The reason for the weak effect of service attractiveness on immigration is the relatively high attractiveness of other parts of Ontario and Canada in this respect.

M24, M26 - The upward mobility of the 18-24 age group is assumed to be more sensitive to the economic attractiveness ratio (EAR) than is the 25-44 age group.

M20, M23, M25, M27 - The upward mobility of the 45-64 age group and the downward mobility of all age groups are assumed not to be affected by the economic attractiveness ratio; hence these functions are set equal to unity.

M120-M92 - The nominal rate of change in the level of education was taken to be 5% for Sioux Lookout. Function M120 provides for a 50% reduction in the upward mobility for the 0-17 age group if the level of education becomes static (i.e. LEDR = 0.0). Education is assumed not to affect downward mobility of this age group, hence M92 = 1.0.

M18, M19, M21, M22 - If the social mobility of the 0-17 age group is assumed to be dependent on that for the 18-44 age group, these functions relate changes in parental mobility to that of their children. It is assumed that the average family sizes for groups P2 and P3 are 1 and 2 children respectively. Hence M18 = M21 = 0.5 and M19 = M22 = 1.0.

M114-M117 - By use of the same arguments as for M18, M19, M21 and M22, these functions are assigned the values M114 = M116 = 1.0, and M115 = M117 = 0.5.

Initial conditions for the demographic component are based on census and survey data wherever available; in the case of migration and mobility rates, reasonable assumptions are made. Table 4.1 lists the populations for each social and age group for the base year of 1971. The birth and death rate nominal values are calculated as shown below:

$$\text{Total birth rate (1971)} = \frac{69 \text{ births}}{\text{population (18-44)}} = \frac{69}{1114} = 0.062$$

$$\text{Infant mortality (1971)} = 45.5/1000 \text{ live births}$$

$$\text{Birth rate normal (BRN)} = 0.062 - \frac{(45.5)(69)}{(1000)(1114)} = 0.059$$

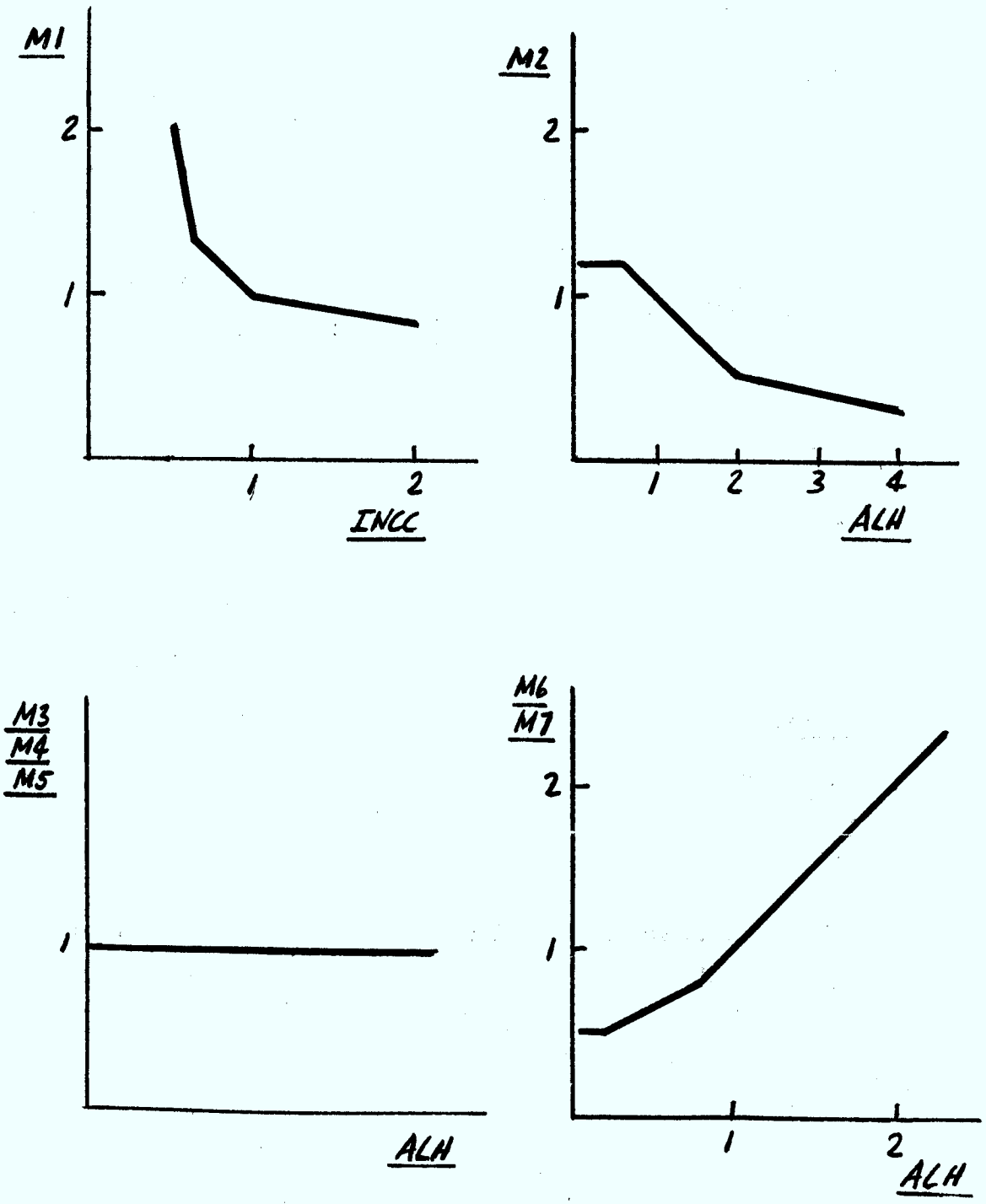


Fig. 4.24

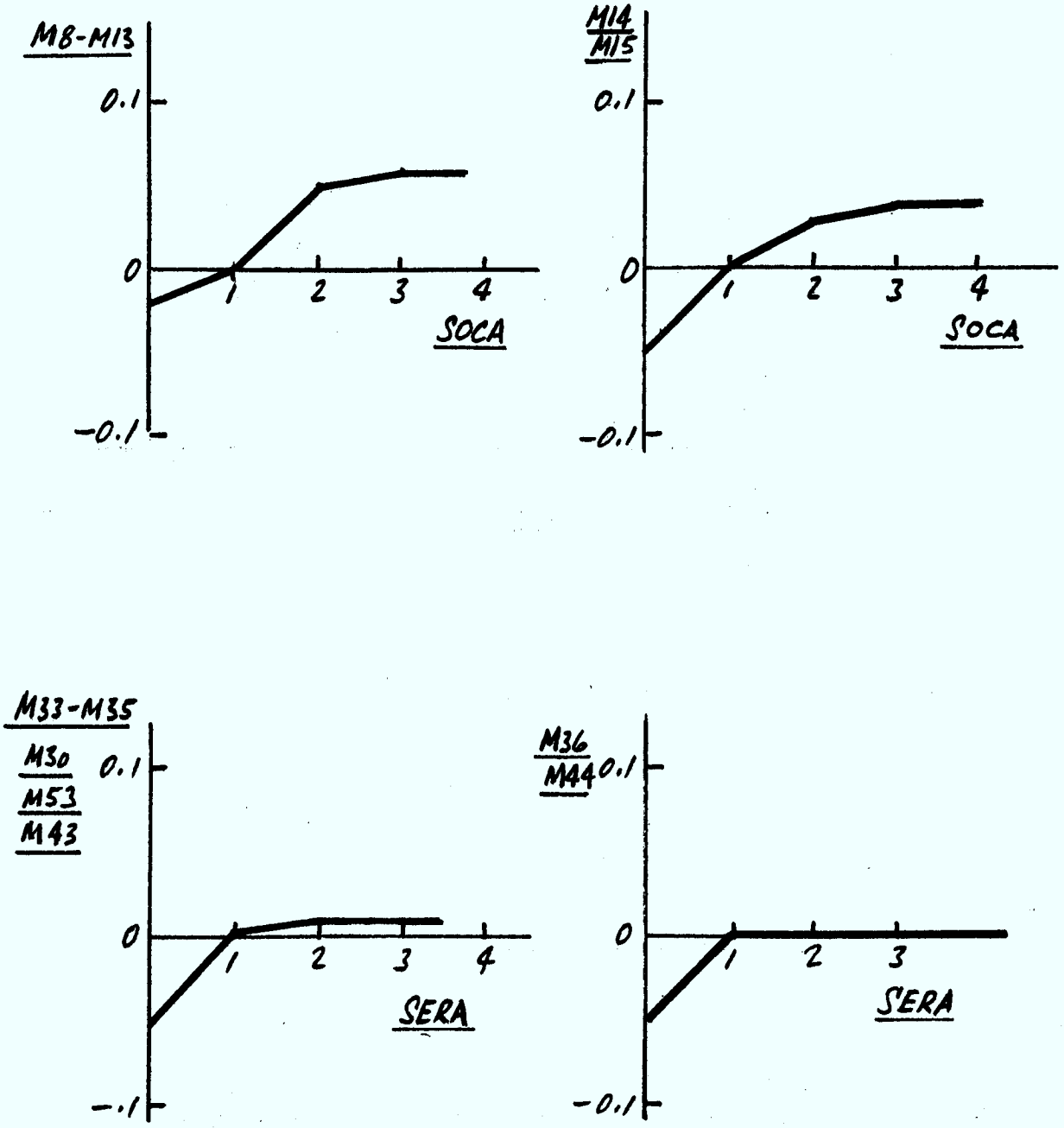

M8-M13
0.1
0
-0.1
1
2
3
4
SOCA
M14/M15
0.1
0
-0.1
1
2
3
4
SOCA
M33-M35/M30/M53/M43
0.1
0
-.1
1
2
3
4
SERA
M36/M44
0.1
0
-0.1
1
2
3
SERA

Fig. 4.25

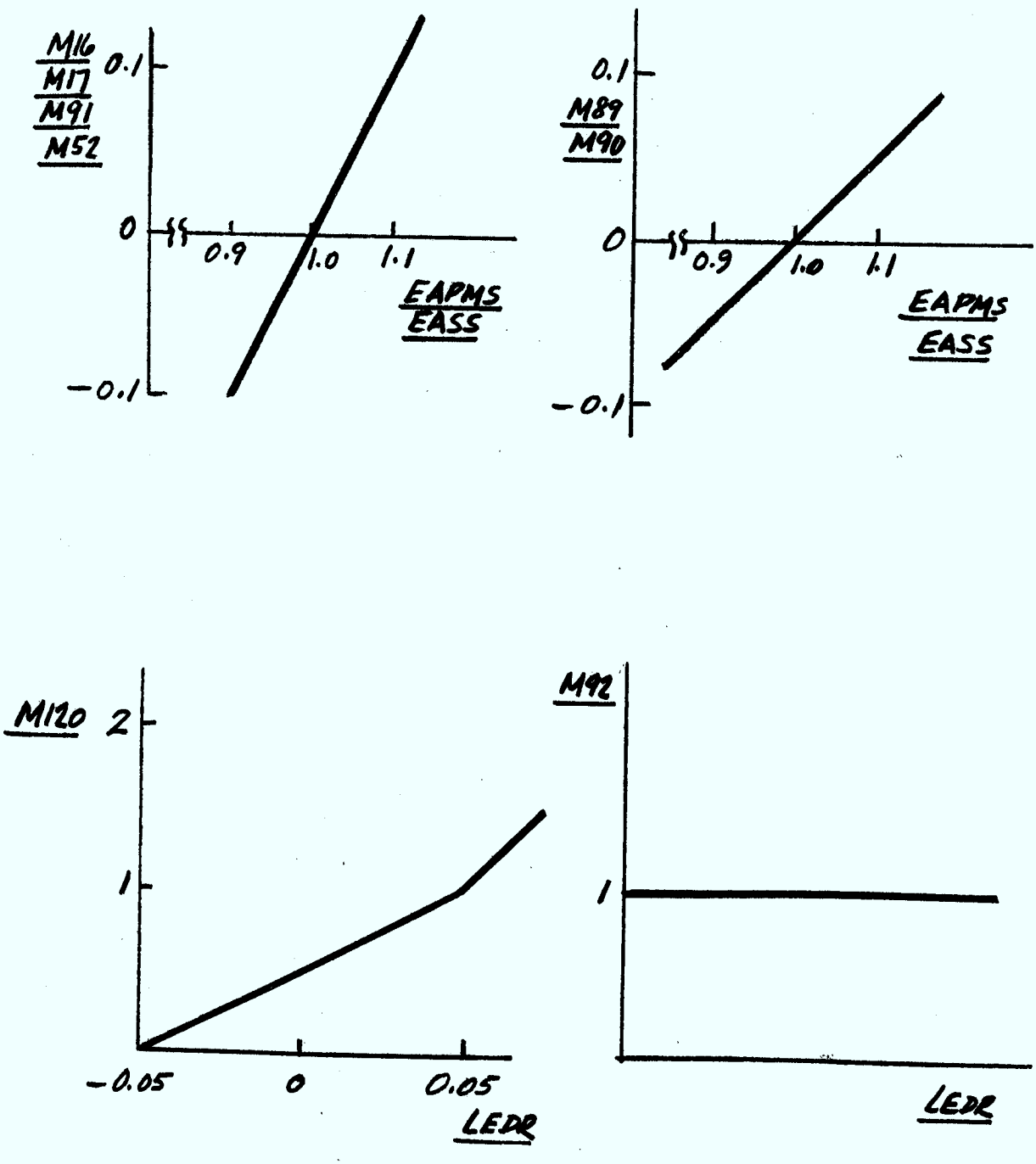

M16
M17
M91
M52
0.1
0
-0.1
0.9
1.0
1.1
EAPMS
EASS
M89
M90
0.1
0
-0.1
0.9
1.0
1.1
EAPMS
EASS
M120
2
1
-0.05
0
0.05
LEDR
M92
1
LEDR

Fig. 4.26

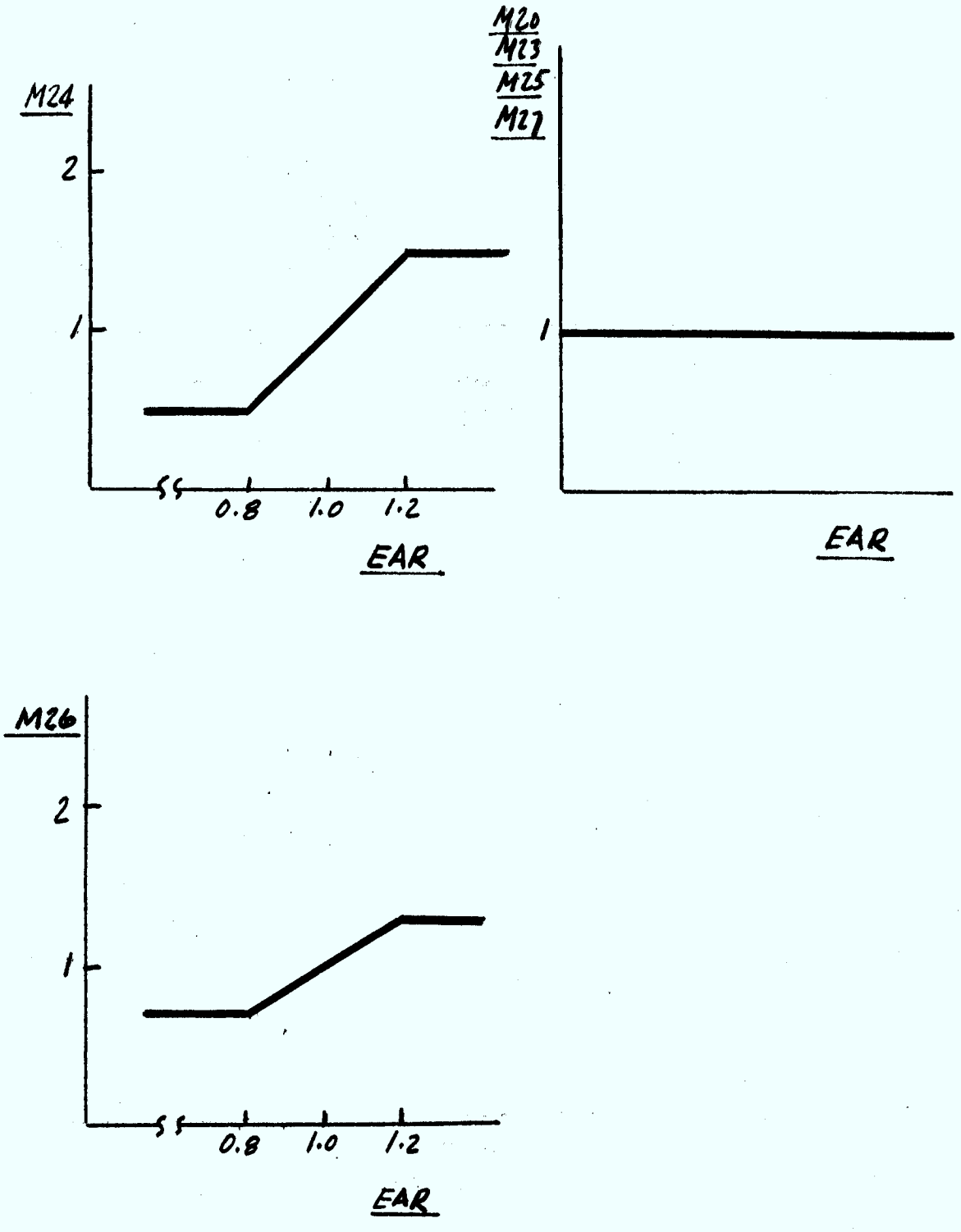


Fig. 4.27

Population Level	Age	Population (1971)*	PMS**	SS**
P1	0-17	738	331	407
P2	18-24	533	148	385
P3	25-44	581	261	320
P4	45-64	490	207	283
P5	65+	195	97	98
TOTAL POPULATION		2537	1044	1493

* From census data (1971).

** Estimates based on survey research (1974).

Table 4.1 Population Distribution by Age Groups and Social Groups

Death rate (1971) = 23 deaths

Estimated life expectancy = 75 years

Death rate for population (65+) = $\frac{1}{75-65}$ = 0.1 = DRN5

Deaths for population (65+) = 0.1(195) = 20 deaths

Assumed deaths for population (45-64)= 23-20 = 3 deaths

Death rate normal for population (45-64) = $\frac{3}{490}$ = 0.0061 = DRN4

Assumed death rate normal for population (0-44) = 0.0

= DRN1,2,3

Under existing conditions, it is assumed that the nominal migration rates are zero. Census data is only useful in describing long term net migration rates. The 1961-1971 period shows a +0.3% per year net growth in population. Nominal social mobility rates are chosen based only on the assumption that social mobility decreases with age. Hence UMOB2N = 5%, DMOB2N = 1%, UMOB3N = 3%, DMOB3N = 0, UMOB4N = 2%, DMOB4N = 0.

4.3.13 Computer Output for Preliminary Simulation

The simulation program for the demographic component is given in Appendix A.11. A dictionary of variable abbreviations and a cross-reference between abbreviations and the variable labels used in the program are given in Appendix A.10.

Figures 4.28 to 4.32 show the "nominal" trajectories for the demographic component of the Sioux Lookout model. For this run, all exogenous variables are equal to unity for the duration of the run except for LEDR which is constant at +5% per year. An unfortunate error in the simulation programme relating to the death rate for population group SS2 revealed itself too late for rectification, within the time and money constraints of the project. This results in a decreasing population in this group and, as a result, in the total population for the 18-24 age group, P2. These erroneous effects appear in all the related trajectories shown in this Section. The simulation results reported here are still useful as a means of assessing the model's response to changes in exogenous variables from their nominal values and will be discussed in this light.

From Figure 4.32 it can be seen that there is a steady growth in the total population (TP) of the community due to the excess of the birth rate over the death rate. Also, there is a shift in population from the semi-

skilled class (SS) to the professional/managerial/skilled class (PMS), primarily due to the increasing level of education. The average migration rate for the nominal run is zero, leading to AMIGN = 1.0, and the average percentage social mobility rate (ASMN) decreases as the total population in the SS groups declines.

Now consider a number of changes in the exogenous variables. Figures 4.33 to 4.36 show the important demographic variables when the economic conditions are more favourable to immigration. For this run, the economic attractiveness measures for each population group are equal to 1.03 for the duration of the run. In other words, there is a 3% vacancy rate in jobs in the community. The primary effect is to produce about a 2% average immigration rate, which results in a doubling of the population (TP) before the year 2000. Social mobility is not affected since economic attractiveness is equal for both groups.

Figures 4.37 to 4.40 show the effects of a continuous 3% unemployment condition (EASS = EAPMS = .97). The -2% average migration rate (AMIGN) keeps the population nearly constant. Again, social mobility (ASMN) is not affected.

Figures 4.41 and 4.42 show the effects of increased services in the community (SERA increases by 0.05 per year beginning at 1.0 in 1971). Although the functions relating migration to service attractiveness are weak (M30, M33, M34, M35, M36, M43, M44 and M53), the greatly augmented service variable produces an average migration rate of +0.5% which increases population growth relative to the nominal case.

Figures 4.43 and 4.44 show how the relatively strong links between social attractiveness and migration can produce a large population growth for a small yearly increase in social attractiveness (SOCA increases by 0.01 per year beginning at 1.0 in 1971). There is a +4% average migration rate (AMIGN) for the duration of the run.

Figures 4.45 to 4.48 illustrate the effects on the population growth when more jobs are available in the SS category than in the PMS category (EASS = 1.03, EAPMS = 1.0). Although the mobility rates are themselves affected by this situation, the primary effect is to favour immigration of SS families. This can be seen by comparing Figures 4.47 and 4.48 with Figures 4.30 and 4.32 for the nominal run. The 2% immigration rate of Figure 4.48 represents entirely SS families since there is no particular attraction for PMS families.

The runs described above serve only to test the relative response of the demographic model to variations in those variables with which it interacts. One conclusion that can be drawn is that, in the analysis of field data or in the collecting of further data, careful attention should be paid to factors affecting migration. The sensitivity of the demographic model to migration is much higher than it is to social mobility or to natural increases or decreases. In fact, a great deal of information pertaining to migration was obtained from field studies discussed elsewhere in this report (see Appendix A.6); given sufficient time this could be used to identify more accurately the functions and parameters of the demographic component.

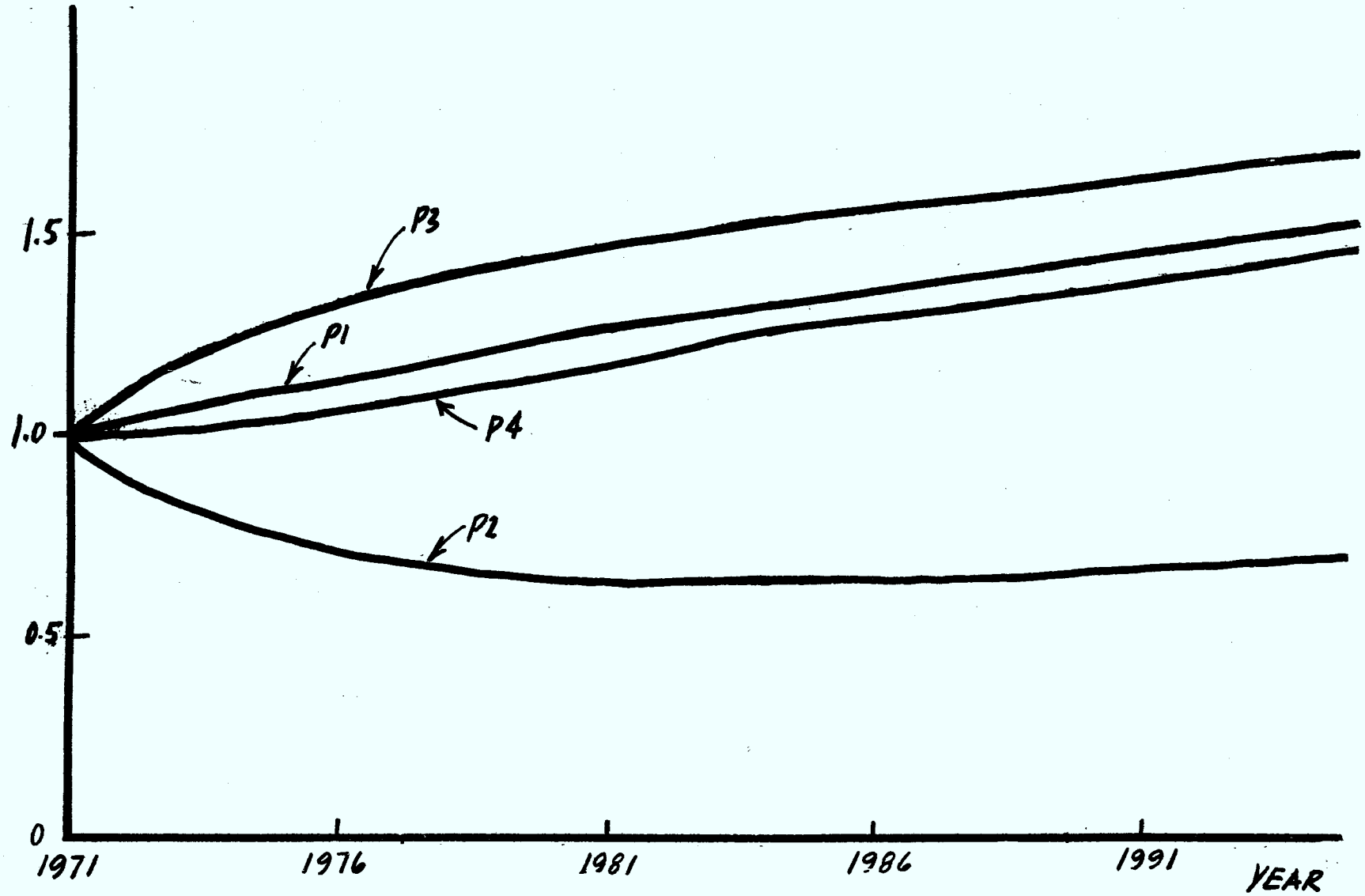


Fig. 4.28

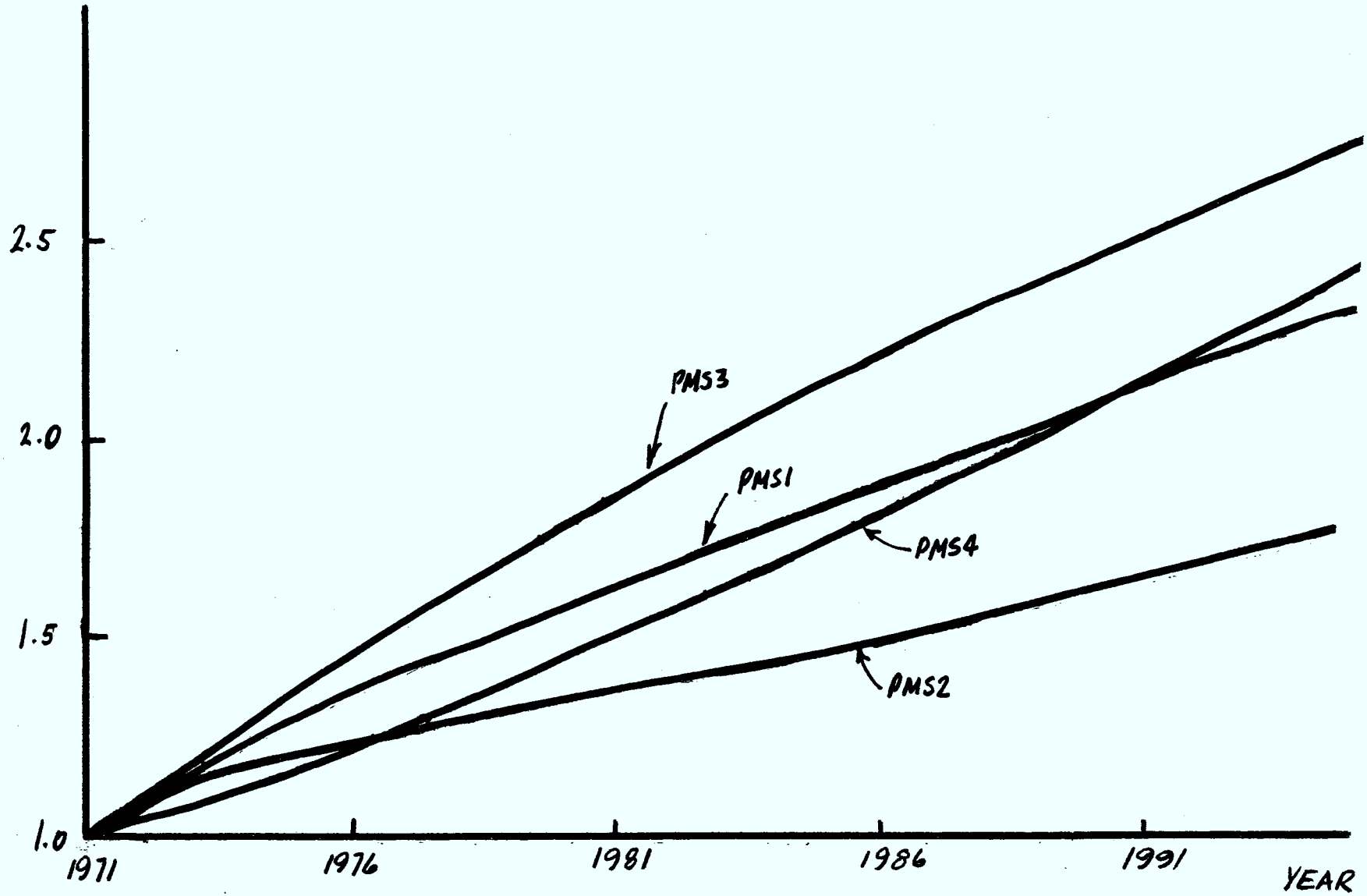


Fig. 4.29

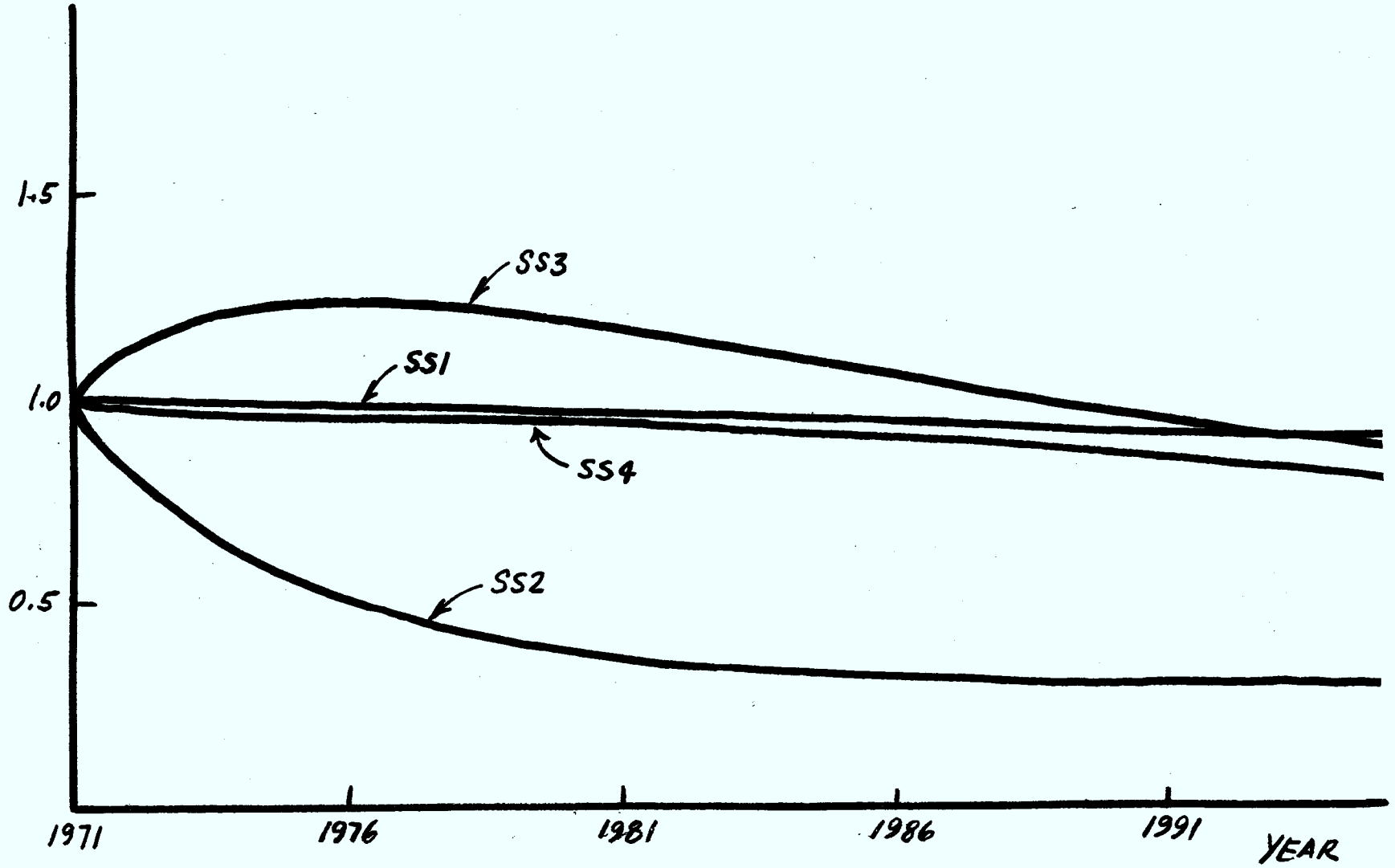


Fig. 4.30

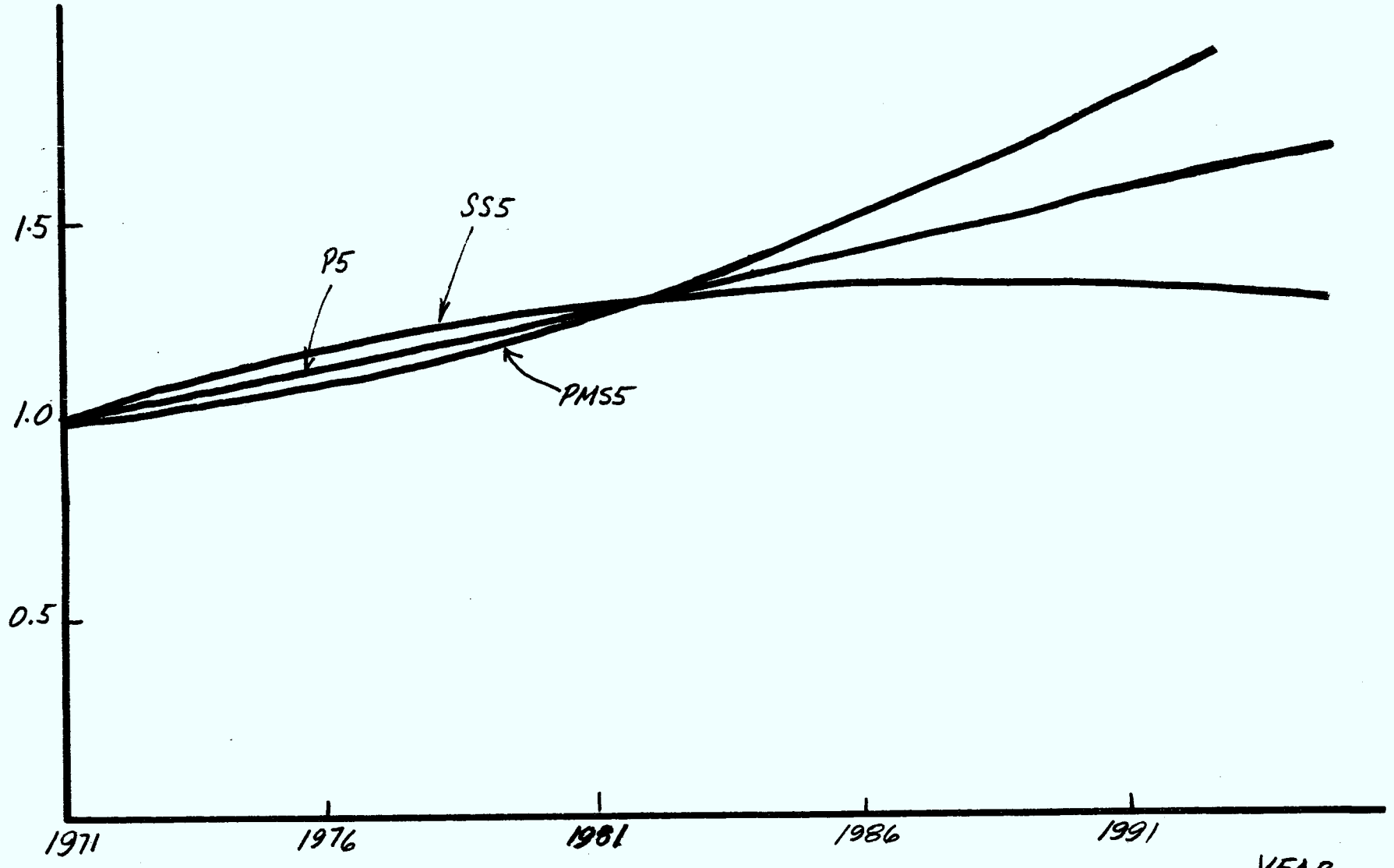


Fig. 4.31

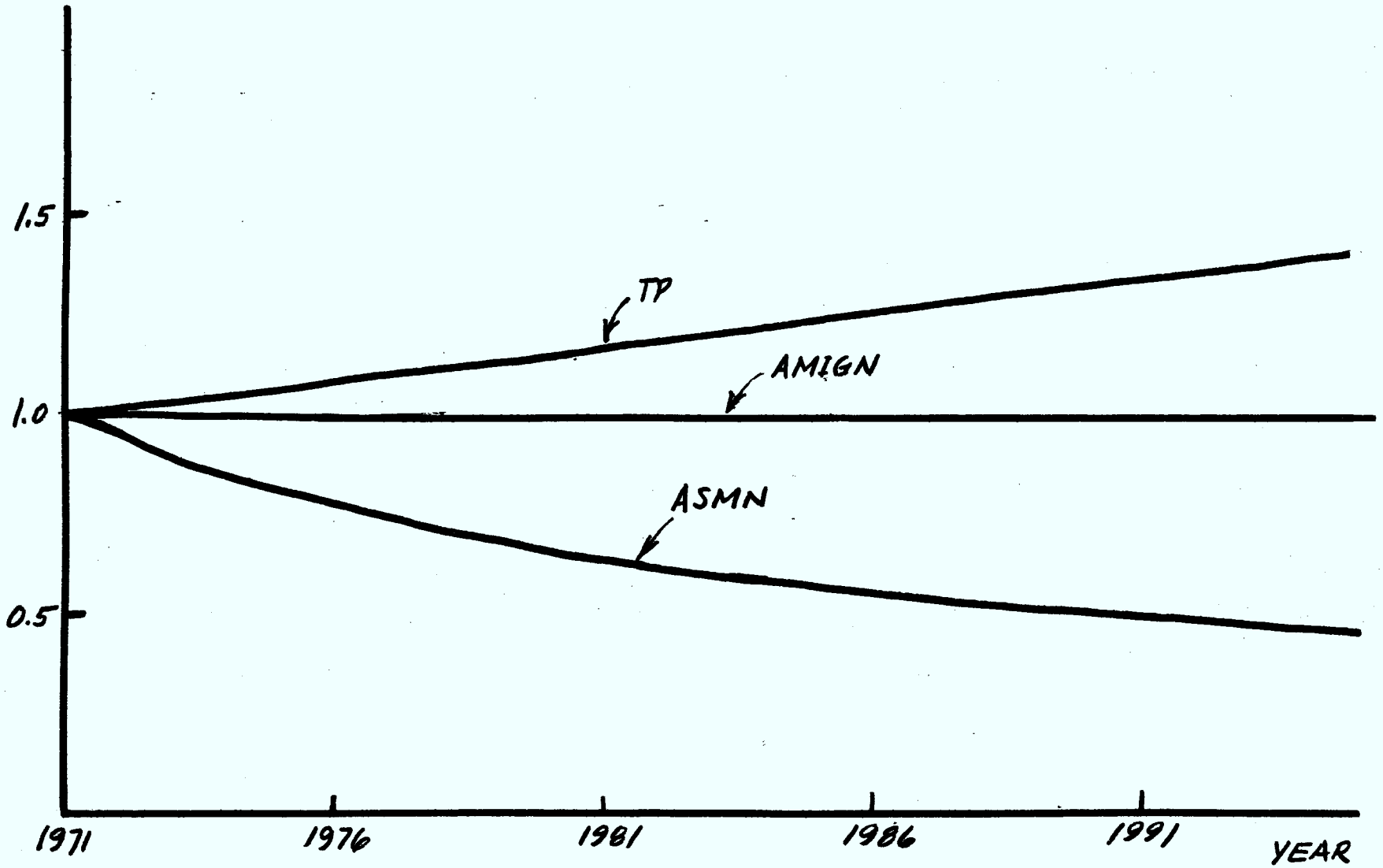


Fig. 4.32

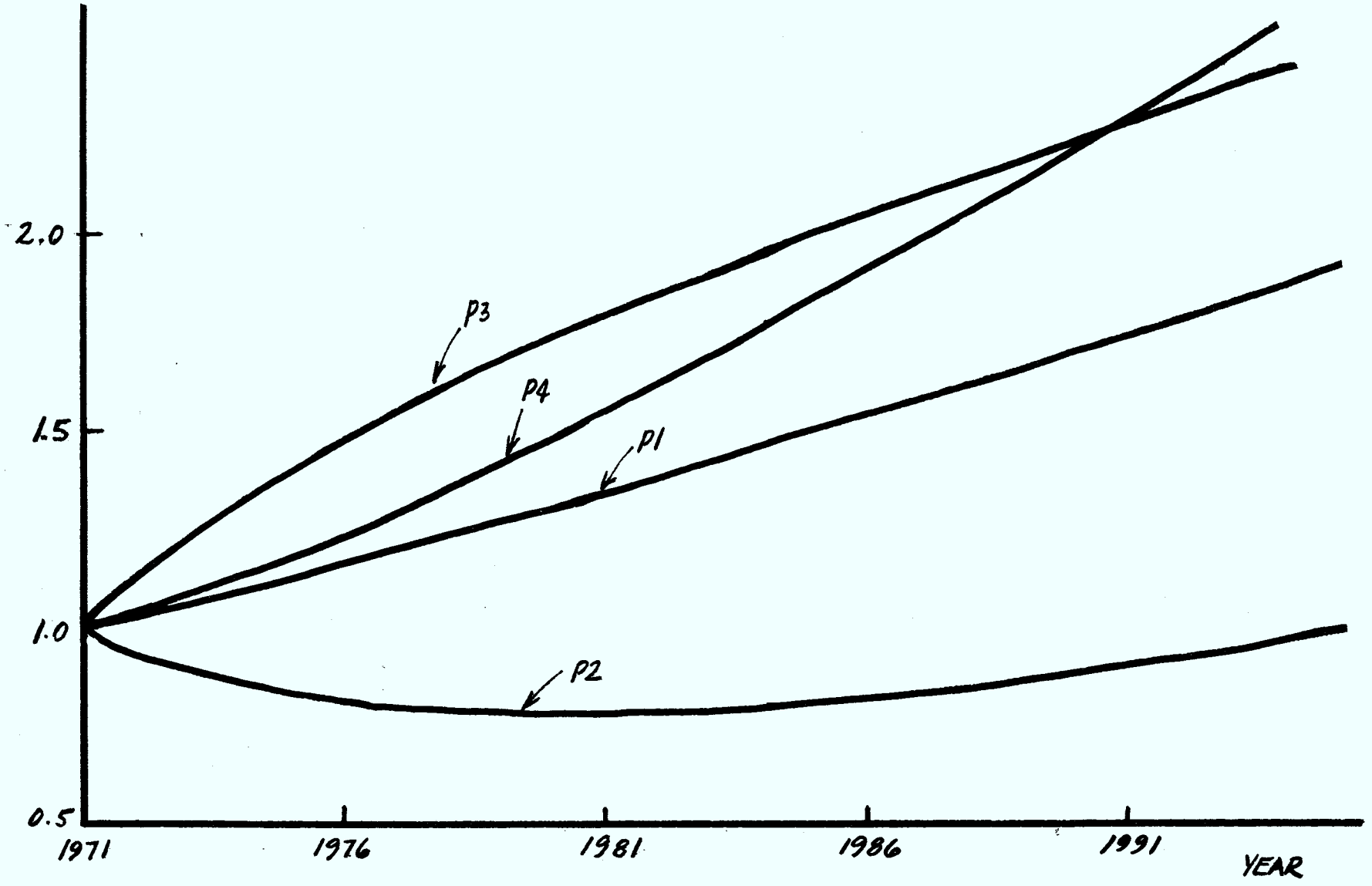


Fig. 4.33

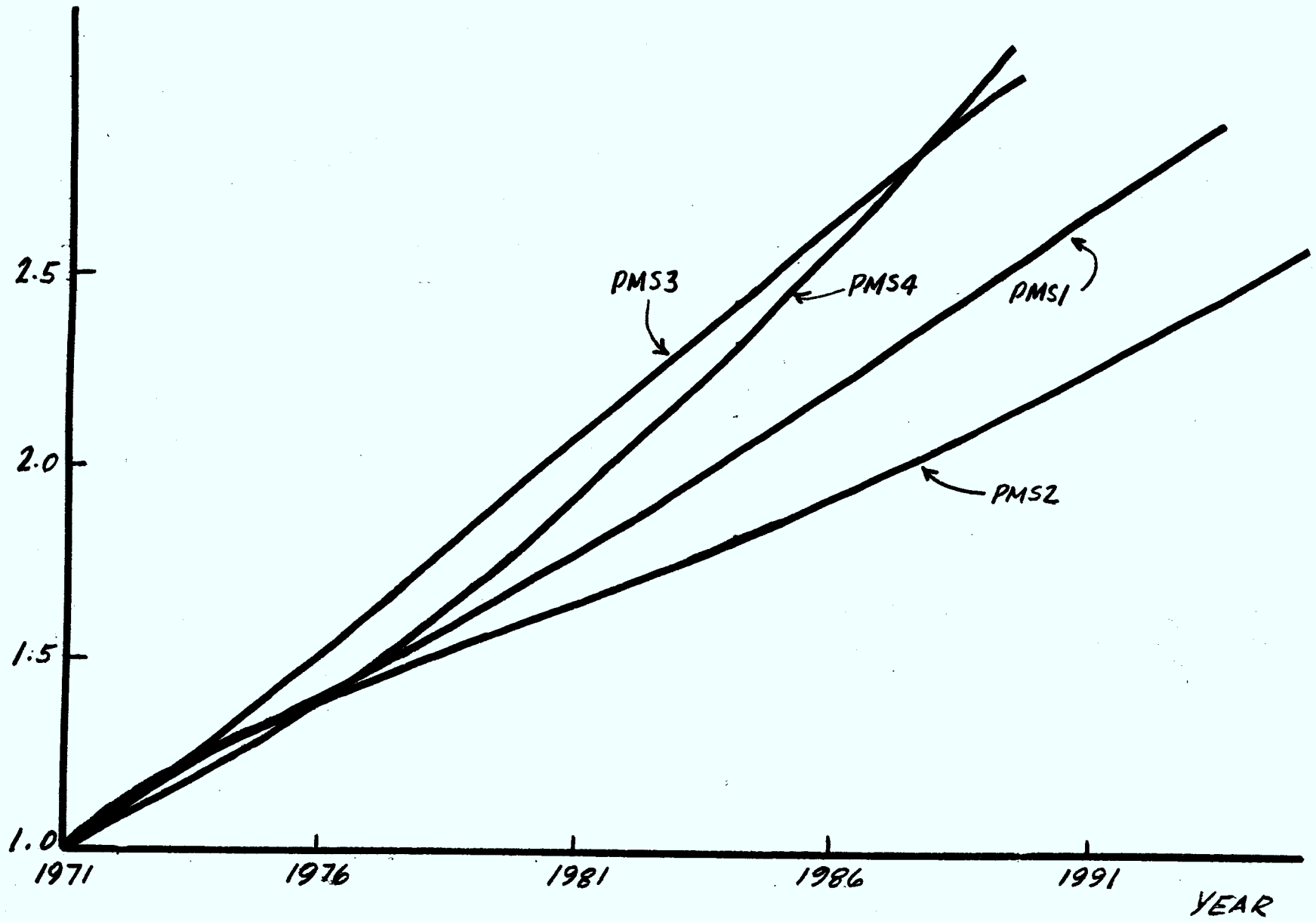


Fig. 4.34

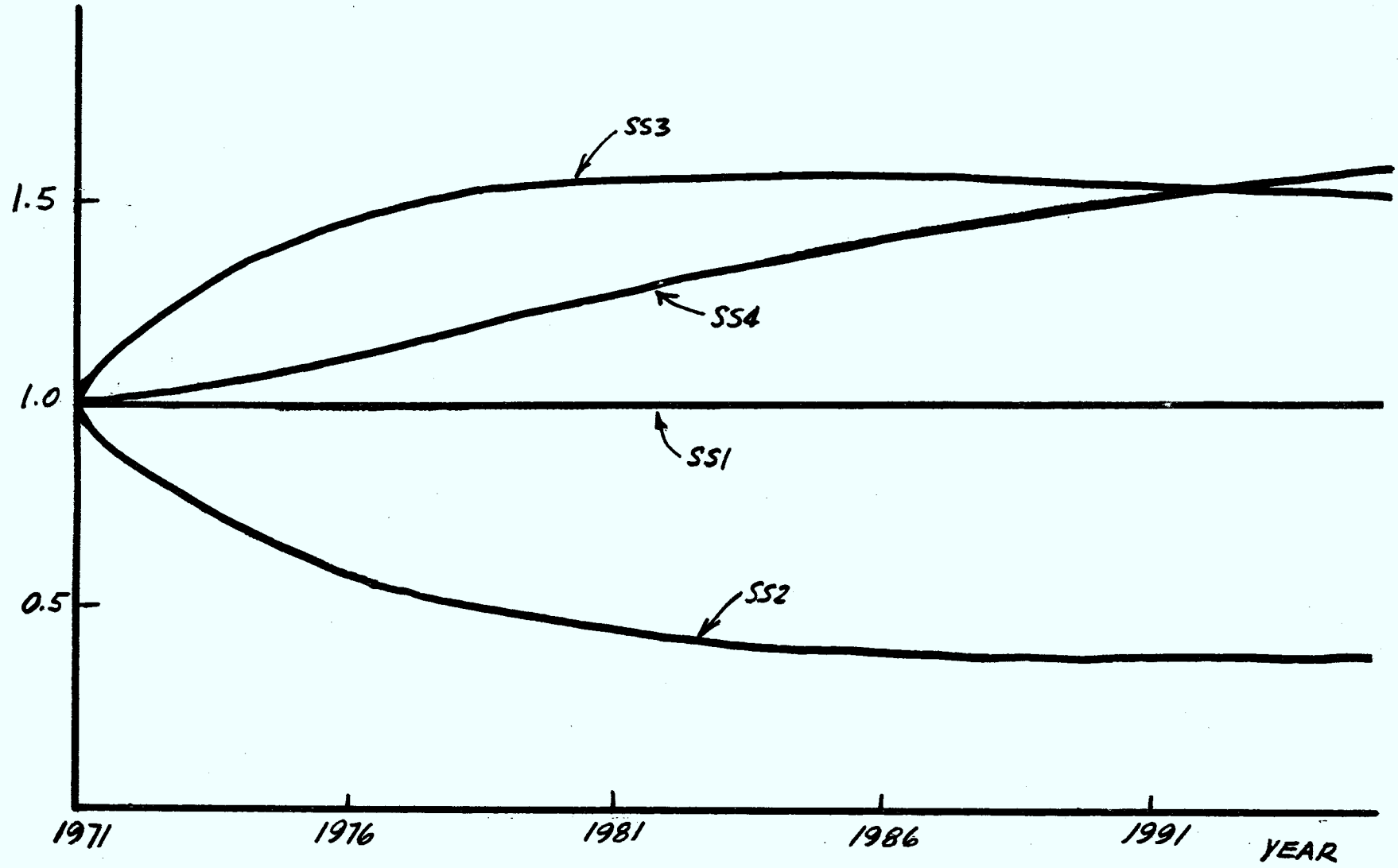


Fig. 4.35

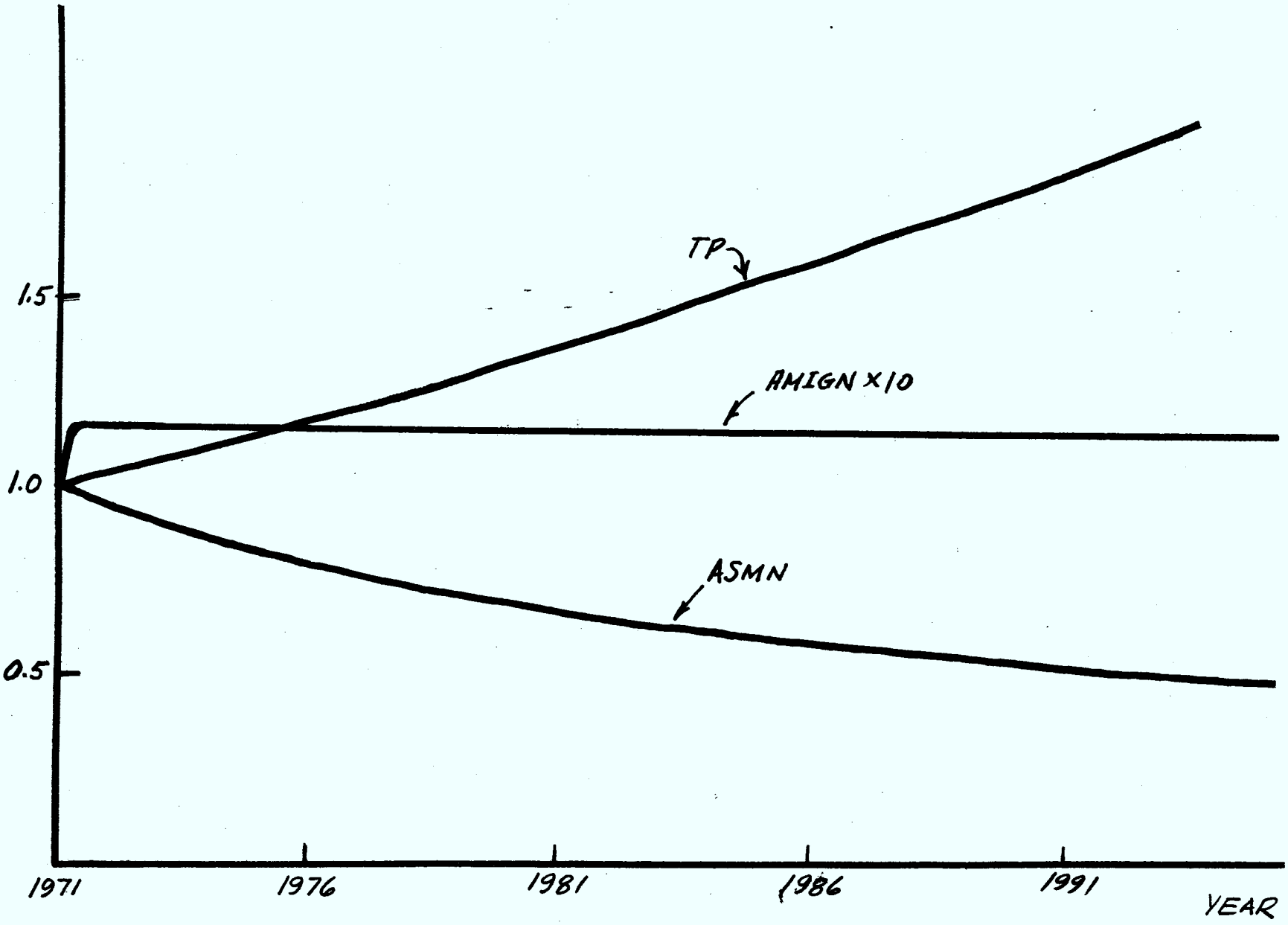


Fig. 4.36

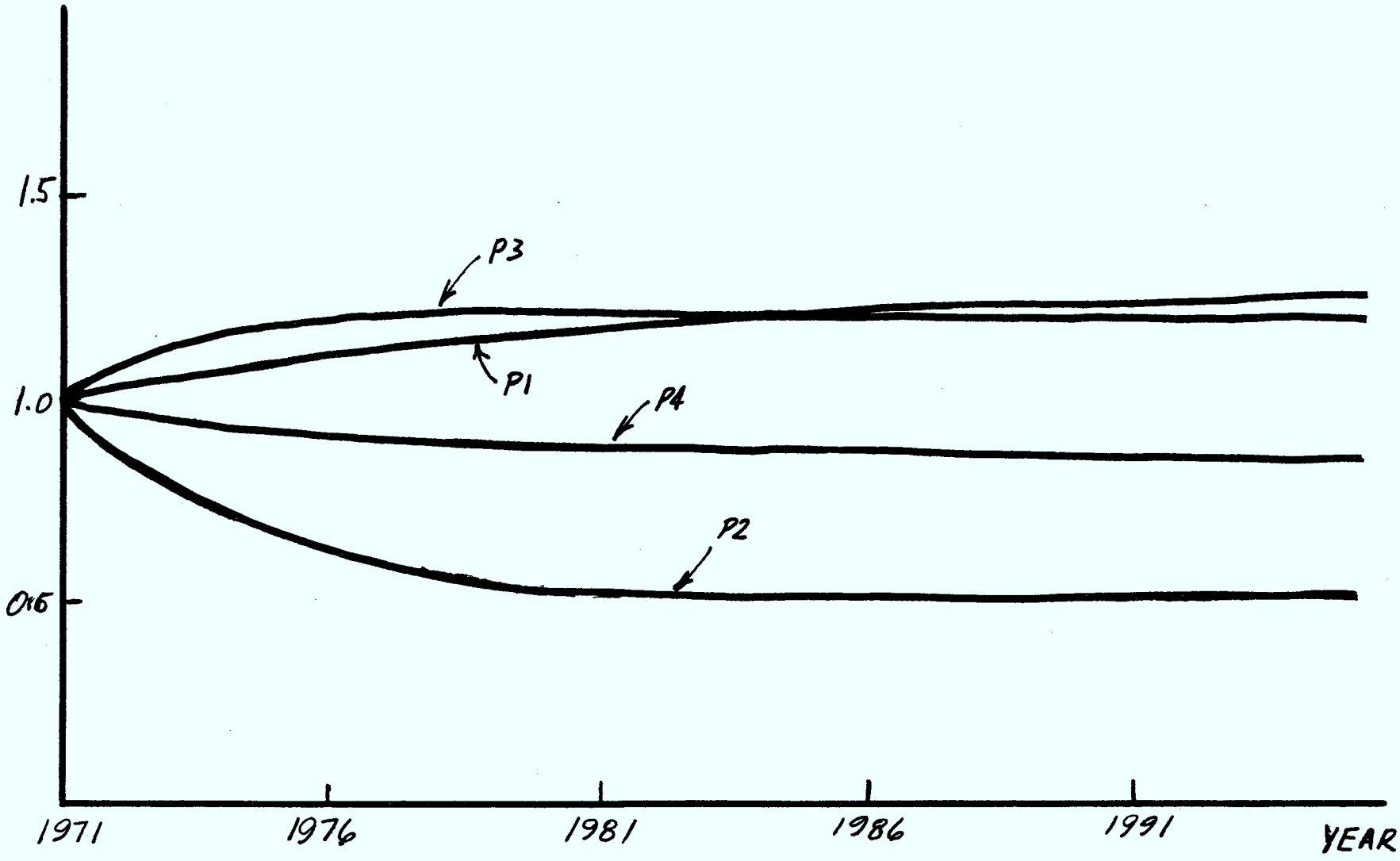


Fig. 4.37

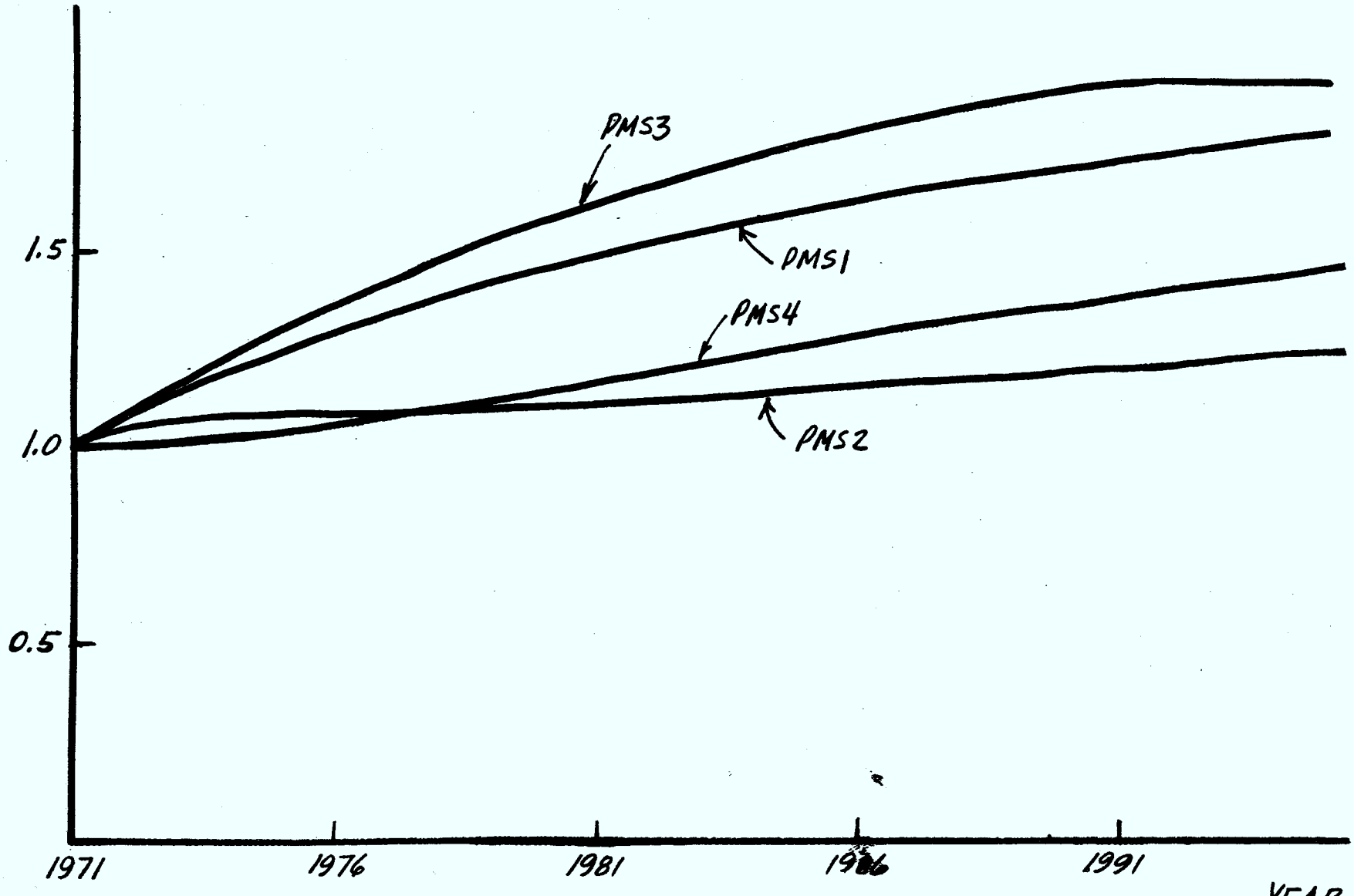


Fig. 4.38

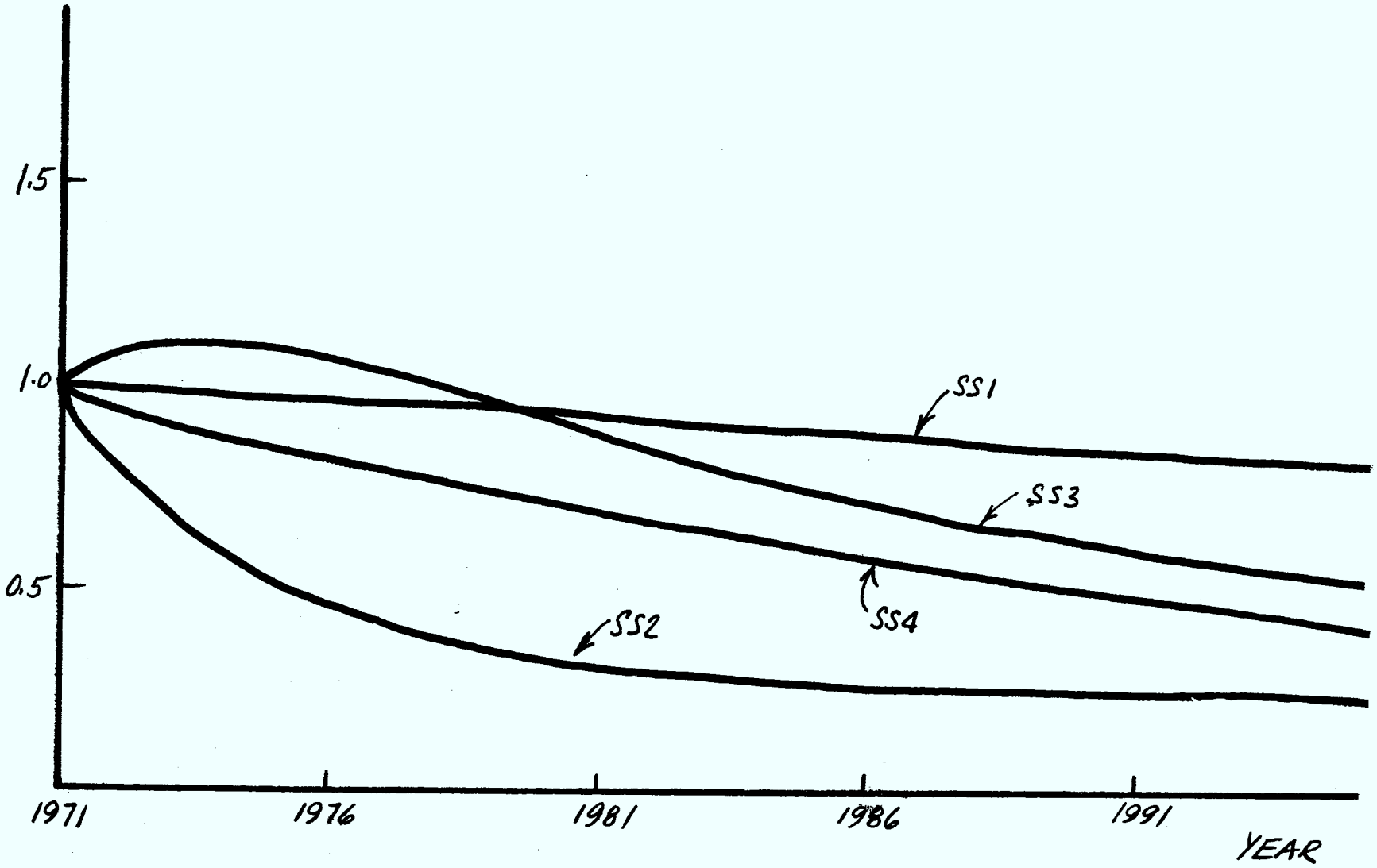


Fig. 4.39

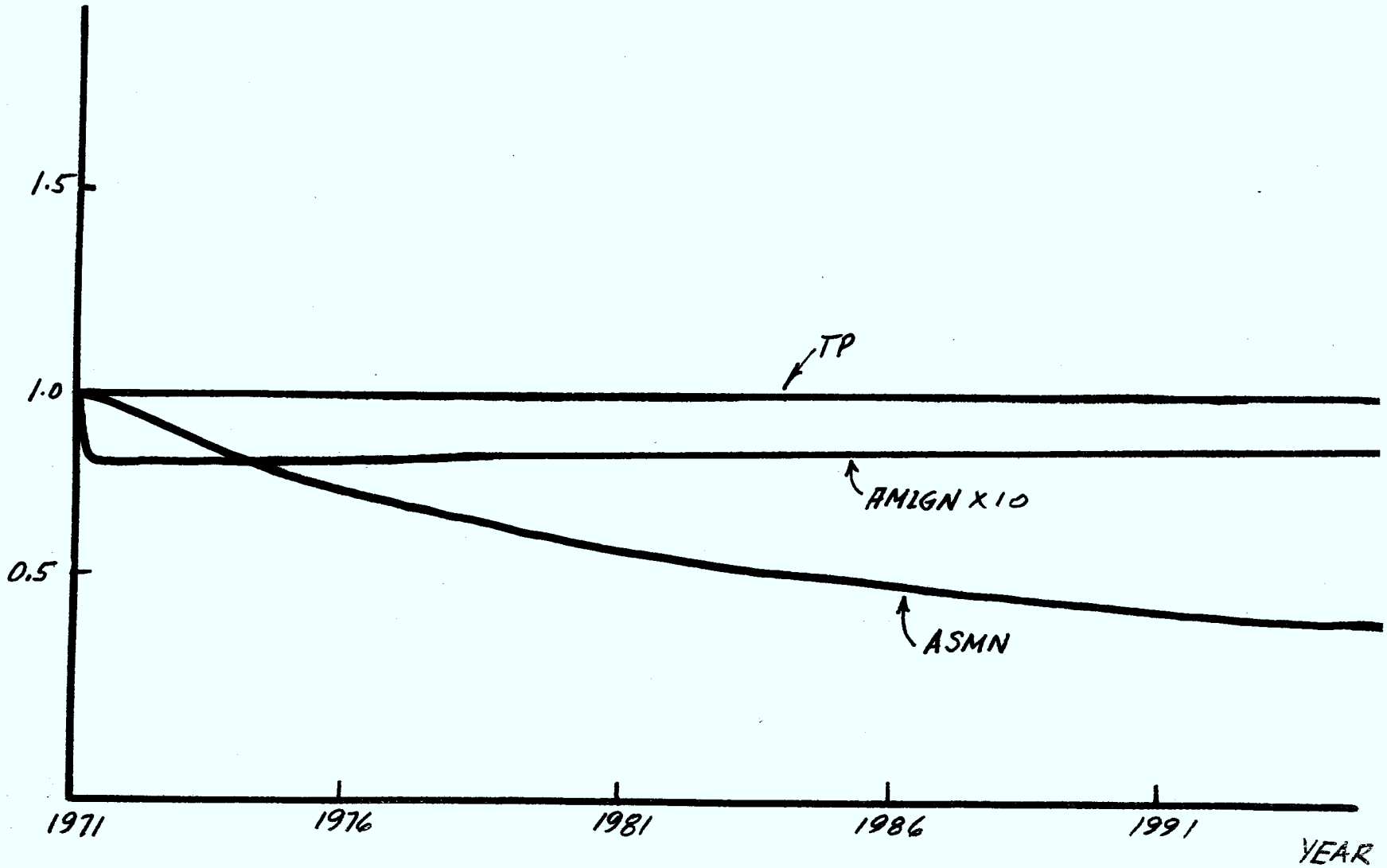


Fig. 4.40

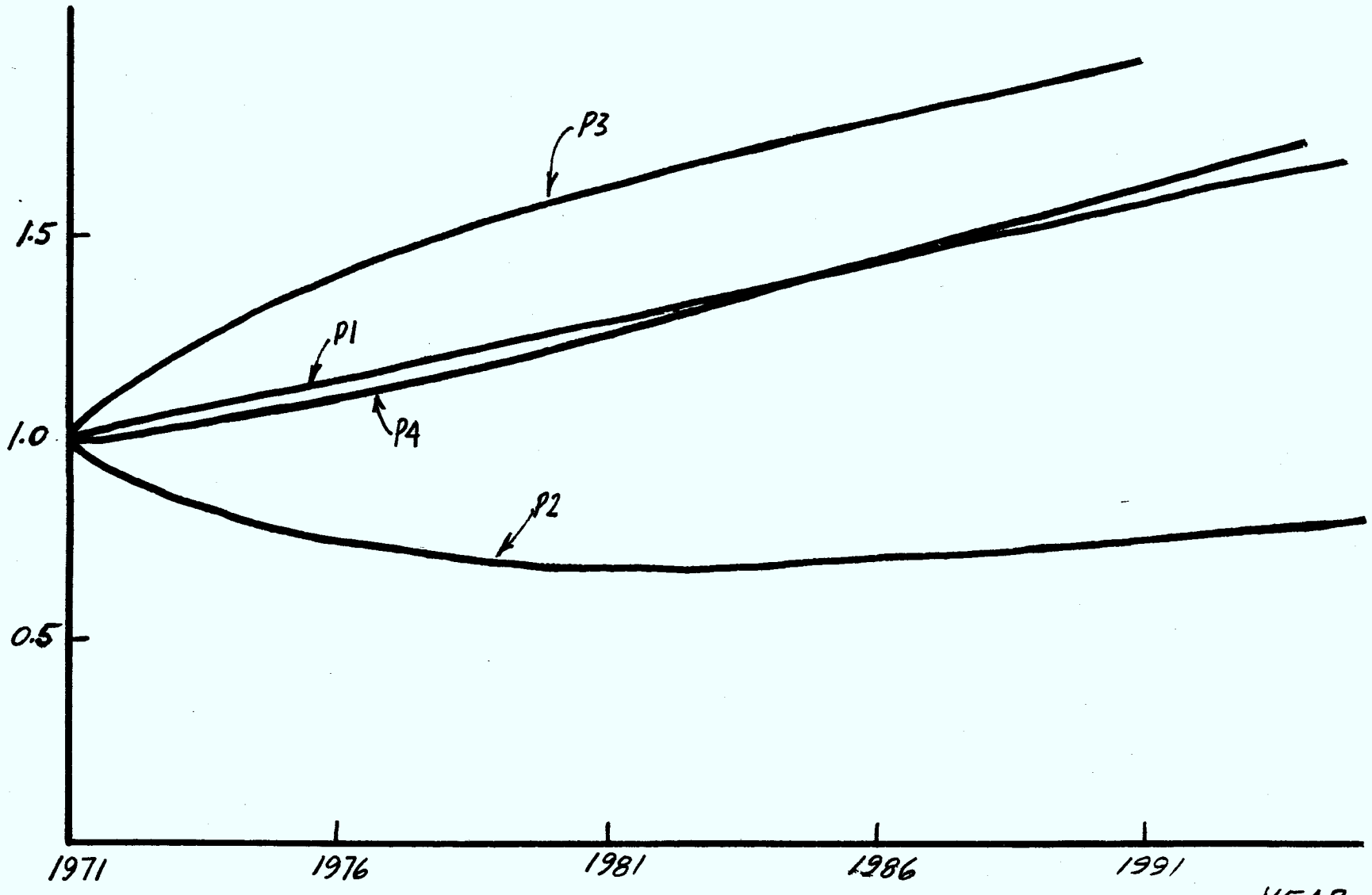


Fig. 4.41

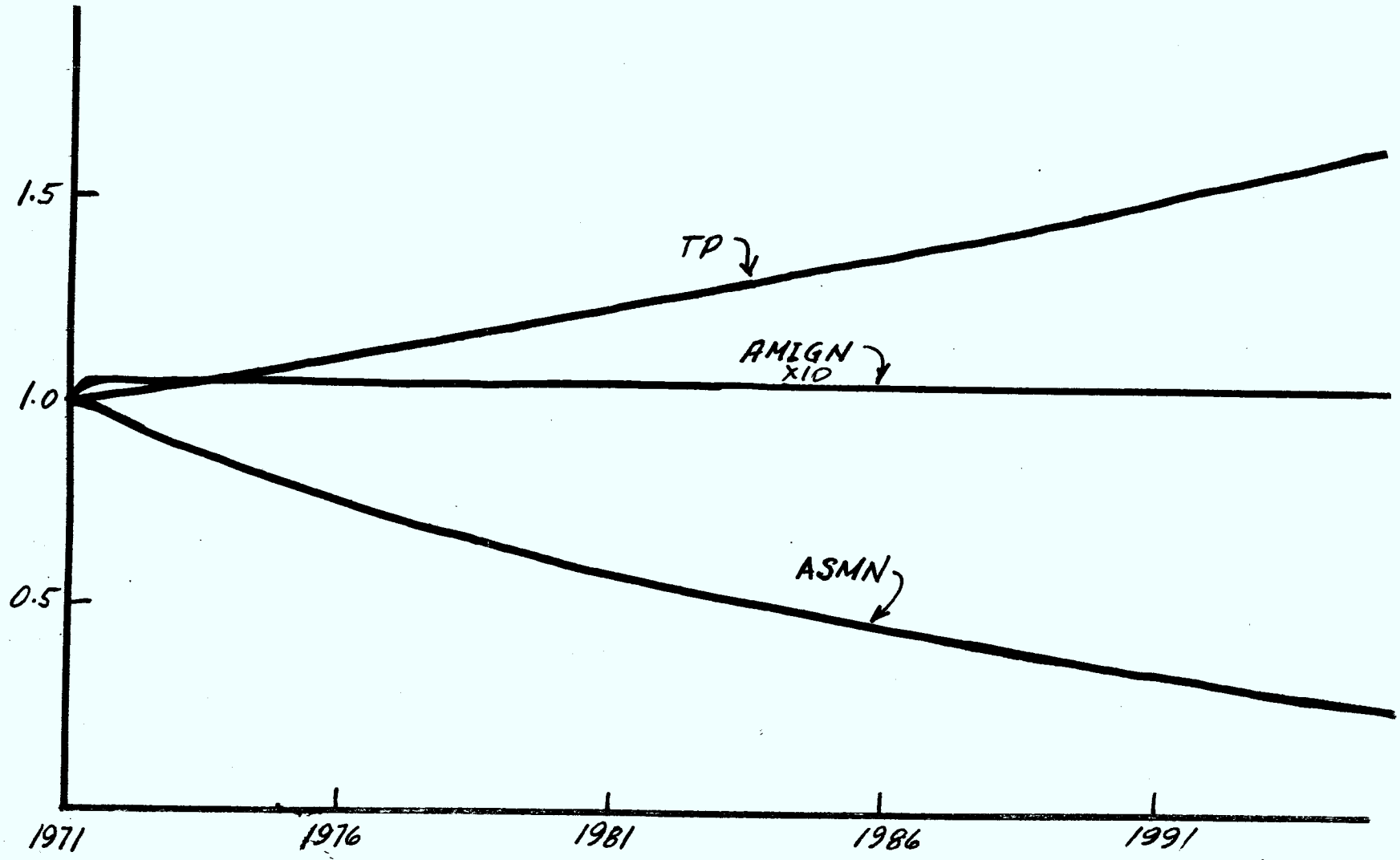


Fig. 4.42

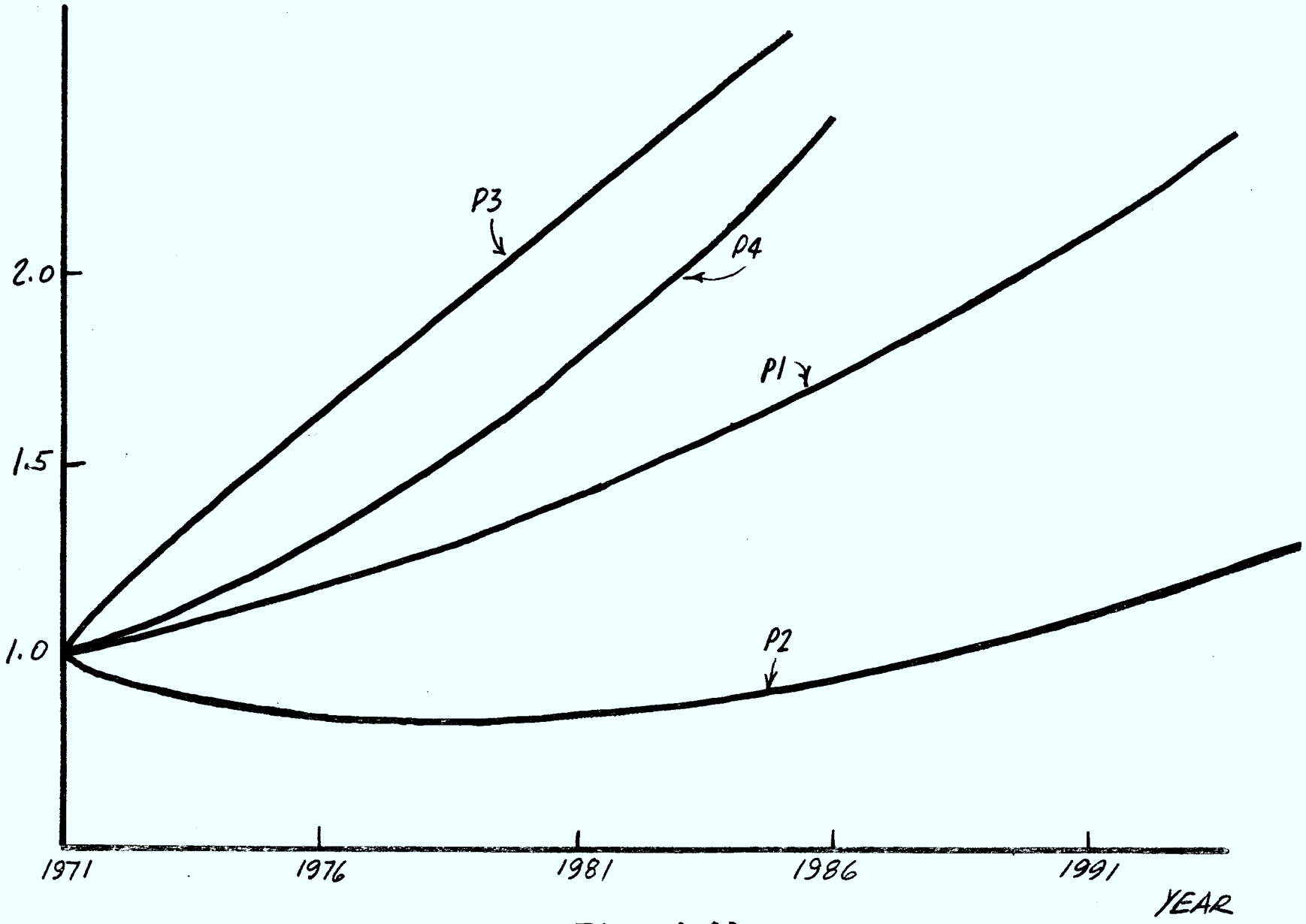


Fig. 4.43

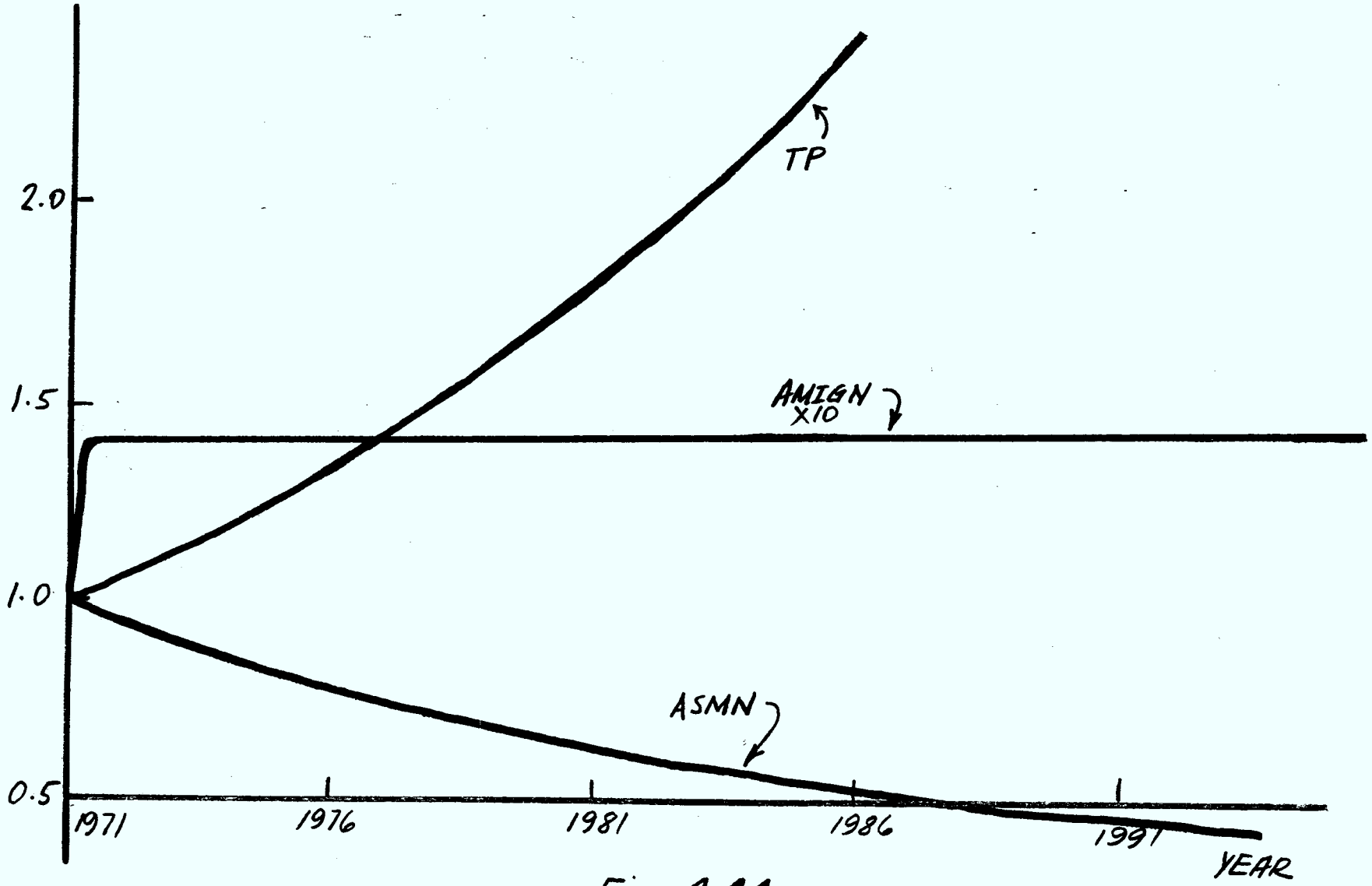


Fig. 4.44

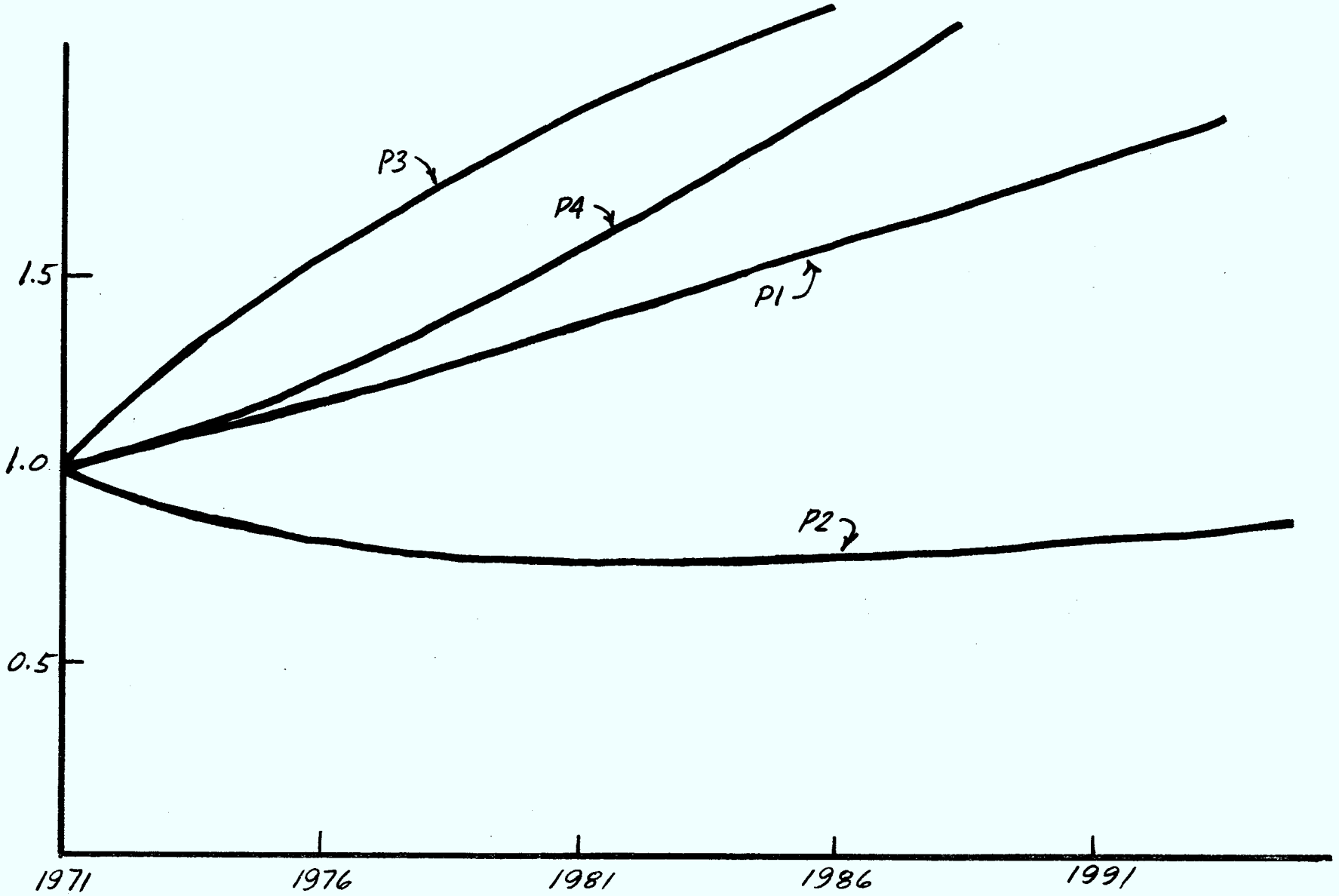


Fig. 4.45

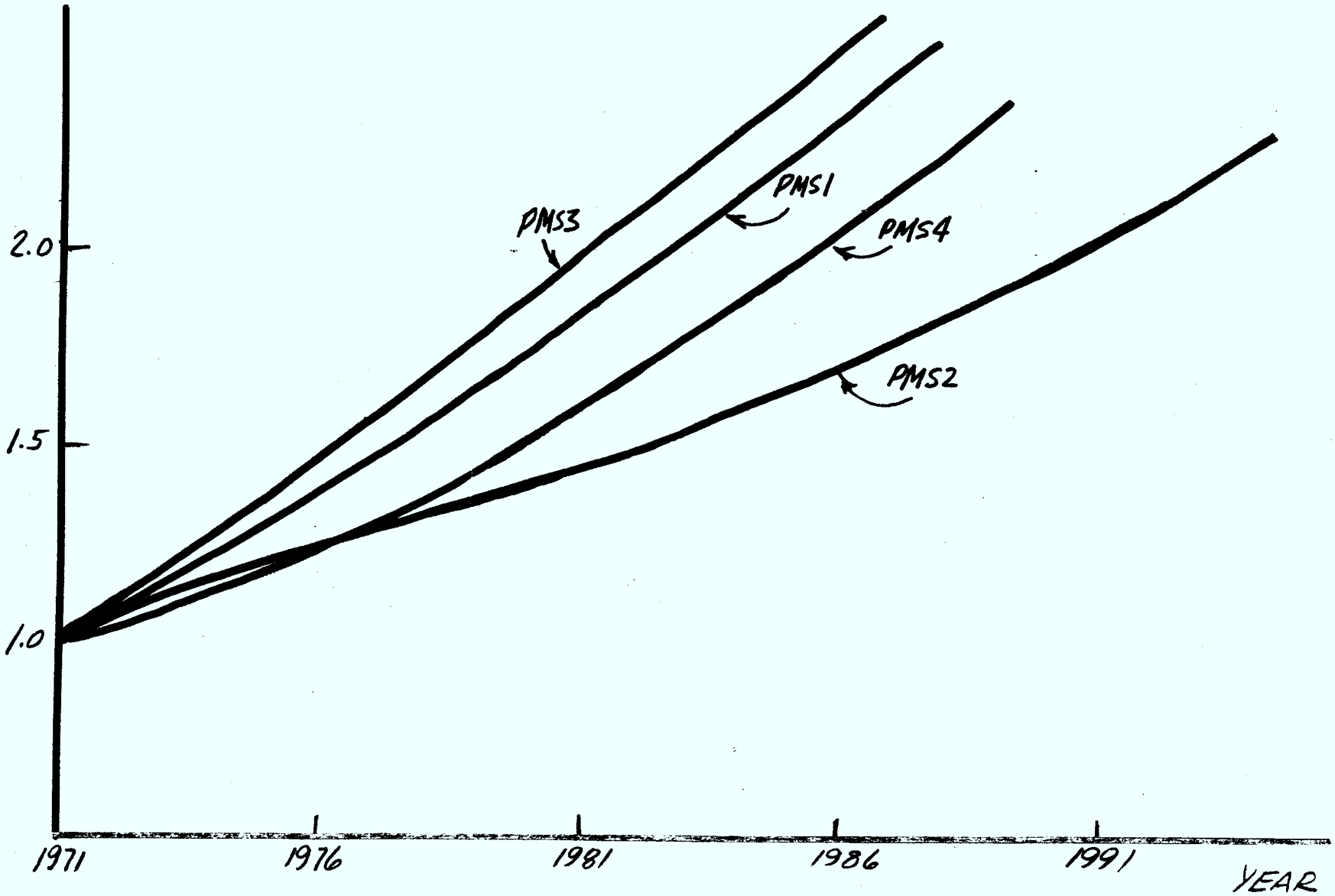


Fig. 4.46

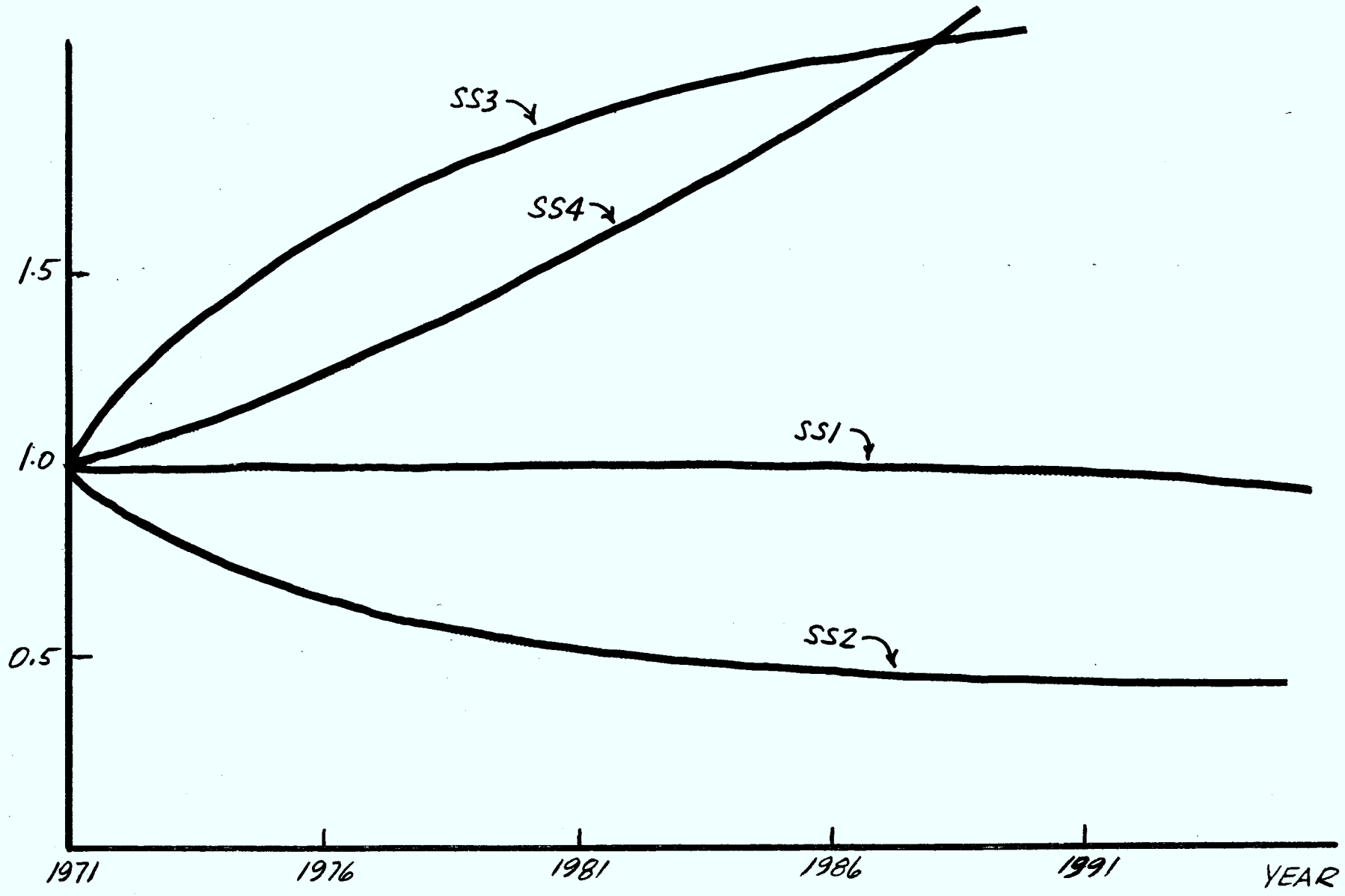


Fig. 4.47

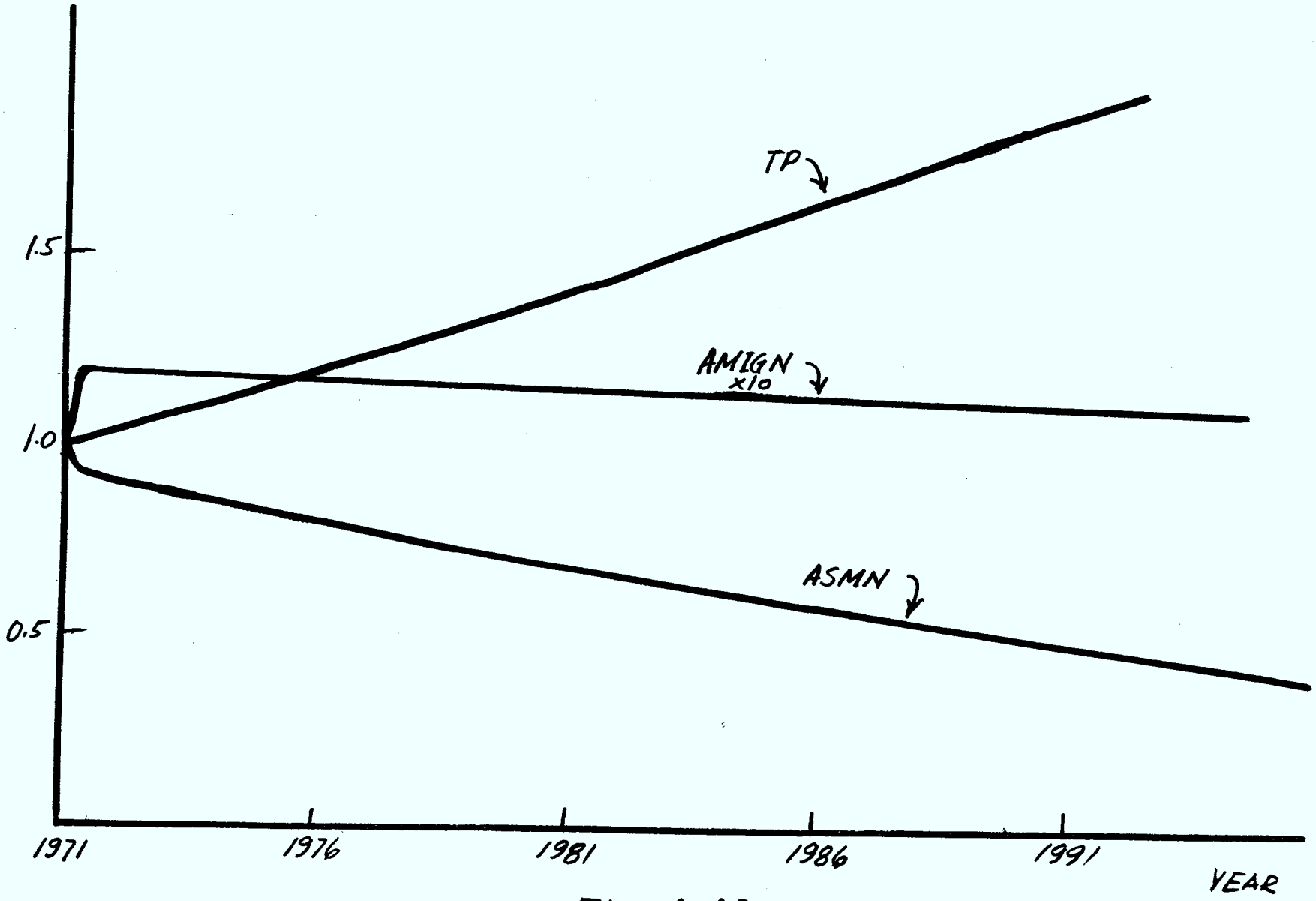


Fig. 4.48

5. SUMMARY OF SOCIOLOGICAL WORK

5.1 Introduction

Detailed reports of the three communities selected for intensive field work are provided in Appendices A.5 (Aroland and Longlake 58) and A.6 (Sioux Lookout). The sociological rationale informing these studies and some of the general conclusions derived from them will be delineated here. The reader seeking more specific information should refer to the pertinent appendix. In addition to the community studies which provided the data base for the community models, demographic data for the regional model (northwestern Ontario) were the responsibility of the sociologists on the team.

In the literature on development, access to and utilization of modern modes of communication (telephone, telegraph, radio, television, newspapers, magazines, etc.) are seen as indicators of modernization. Telecommunications link the hinterland to the metropolitan centre, and these hitherto isolated communities are brought into the mainstream of "popular culture" and of national political consciousness.* Another index that is often used to measure the process of modernization is family structure. It is posited that as modernization proceeds, the extended kinship system gives way to the nuclear family; kinship bonds and obligations become muted; responsibilities to kinsmen beyond the nuclear family of parents and immature children become permissive rather than obligatory.** Because kinship is a private institution and hence most resistant to change, the extent to which this process has occurred is of particular interest. These changes in family structure are encouraged and facilitated by the intensive social and geographic mobility which characterize an industrial society. Furthermore, personal and social disorganization are considered to be the corollary of these acculturation and modernization processes. The hypothesis is that when new values and institutions are imposed upon traditional values and established ways of doing things, contradictions emerge which lead to conflict, alienation and anomie. The extent to which telecommunications are cause, consequence, or concomitant of these processes of disorganization and change is not clear.

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*See, e.g., Bert Hoselitz and Wilbert E. Moore (eds.) Industrialization and Society (Paris: UNESCO - Mouton, 1963); Bert F. Hoselitz, Sociological Factors in Economic Development (Glencoe: The Free Press, 1960).

**Wm. J. Goode, World Revolution and Family Patterns (N.Y.: The Free Press of Glencoe, 1963); Wilbert E. Moore, Social Change (Englewood Cliffs: Prentice-Hall, 1963).

Informed by this literature, we were interested in the two Indian community studies (Aroland and Longlake) to find out to what extent the people had maintained their own cultural identity and social independence in the face of strong forces for cultural and social assimilation. It was posited that new developments in telecommunications, the principal focus of the research project, would accentuate and facilitate trends already underway. We were fortunate in our selection of Aroland (albeit quite by the vagaries of political accident) for this native community appears to have successfully managed the best of both worlds: the old and the new; traditional and modern; Indian and white. Thus it provided a good benchmark from which we could test the conventional wisdom of modernization theory, and against which we could measure the more stereotypical reserve community of Longlake 58.

5.2 The Indian Community Studies

Aroland is a politically independent Indian community with a history dating back to pre-conquest times, which has displayed a remarkable degree of persistence and stability. At the time of the study, 260 Indians (both status and non-status) and 7 whites were living there. Manifesting a high level of political and social stability, this community has somehow been able selectively to adapt the institutions of surrounding white society, allowing them to serve its needs while avoiding the personal demoralization which has become all too familiar a pattern for much of Canada's Indian population. Politically, the community is managed by an elected board and an appointed manager. This structure also functions effectively as a means of social control; the community manages both its internal and external affairs so well that it has rarely been necessary for outside agents (police, social workers, bureaucratic officials) to interfere. Economically, Aroland is well integrated into the wage economy of the surrounding society. All adult males are employed and there is almost no need for outside welfare assistance. Entrepreneurial activity is engaged in on a collective basis, and is reasonably successful. Migration from the community occurs, especially on the part of younger members seeking better opportunities elsewhere, but it is evident that these migrants retain close kinship and affectional ties, and community attachment remains strong.

Use of telecommunications in Aroland, as with other "white" institutions, is selective and does not take priority over traditional native patterns of recreation and communication. Radio, television and newspapers have had some impact as acculturative forces, but the strength of commitment to traditional native culture (for example the Ojibway

language continues as the "lingua franca" of the community and many persons speak English either not at all or very little), mutes the impact of these foreign influences considerably.

Longlake 58, a reservation some 50 miles from Aroland, was the second Indian community studied. It fits fairly closely the stereotype for such communities in Canada, manifesting a high level of personal and social disorganization, the consequence, many observers argue, of the political and economic dependency generated over the past century by the federal reserve system, and the unmitigated acculturation thrust of the church-sponsored educational system. Admittedly, new policies are now directed at reversing this drift to demoralization and dependence. At the time of our study, however, Longlake 58 was in striking contrast to Aroland. Native culture, most notably language, has been all but forgotten, and there appears to be little retention of the native values of independence and self-reliance. Family breakdown, child abuse, violence, juvenile delinquency, alcoholism, and other indicators of disorganization are common. Unemployment is high, and most of the community were receiving some sort of welfare assistance.

The pattern of utilization of telecommunications closely resembles that of the rest of Canadian society, with widespread use of telephone, radio and television, and for much the same reason; as a substitute for direct personal and social contact, and for leisure-time activity. There is a greater use of reading material in Longlake 58 than in Aroland, and it is of a different kind as well. In the latter, where the Ojibway language remains current, native newspapers and magazines, many of a political nature, are read selectively; in Longlake, English language materials of the tabloid variety, almost devoid of intellectual and political content, are read indiscriminately. The penetration of Canadian culture at the lowest level of mass taste is extensive.

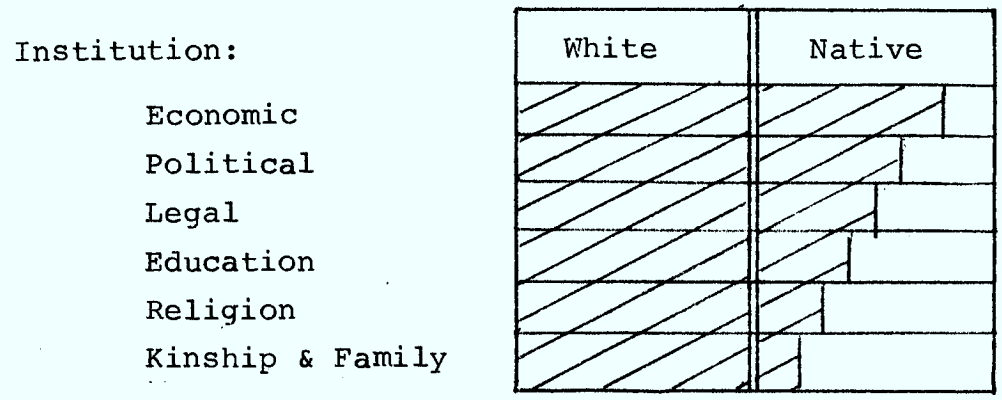
5.3 Implications for Telecommunications Policy - Indian Communities

We believe that our study of these two Indian communities has implications for telecommunications policy, particularly with respect to native peoples. That policy will be informed, in part at least, by the more general society: goals that are defined not solely by the Canadian government and by white society but, increasingly, by native peoples themselves. We assume that Canadians are committed to the value of cultural pluralism, and that it is this value that shapes our national policy with respect to all cultural groups within the society, including native peoples. The corollary of this assumption is that cultural

assimilation and social homegeneity are rejected as overarching political goals. The conclusion to be drawn from these assumptions is that communications technology is a resource available (though not necessarily equally available) to native peoples to be used in the satisfaction of their needs and aspirations as they define them.

Our study of the Aroland community suggests to us that this particular group of people, at least, has been able selectively to take some institutions from the surrounding white society and adapt them to their own needs and purpose, while rejecting others. This process of institutional selection is almost complete in the economic sector: entrepreneurial activity, full time employment, a wage economy, purchase and use of consumer goods and participation in public, long-term, financial assistance programs. But even in this institution the assimilation process has not been total; traditional ways of obtaining food supply are used extensively. Less total but still considerable is the acceptance of the legal and political institutions of white society: the formal structure of the Community Association, for example, is that of a legal-rational organization, although its informal operation derives at least as much from traditional native patterns of individualism and privacy. These same values make traditional modes of social control effective except in extreme situations when the white man's institutions of the police and the law are accorded some level of legitimacy. Acceptance of the educational and religious institutions is much more partial and superficial, while the traditional institutions of kinship and the family have remained more or less intact.

This pattern of penetration of white into native institutions can be diagrammed thus:



Note that "private" institutions appear to be less susceptible to cultural penetration than those that functionally are more "public".* Telecommunications can hasten or impede this process.

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*Our use of the public/private dichotomy to characterize institutions closely parallels the external/internal classification of Parsons, "Pattern Variables Revisited", American Sociological Review, Vol. 25, August 1960.

If this analysis has any validity then the implications for policy are as follows. Community control of communication systems (particularly TV and video because of the high visual orientation of native peoples) will further reinforce cultural values and normative structures in the "private" sector, particularly with respect to cultural belief systems and the primary institutions of socialization, the family, religion, education. At the same time, community involvement at ownership, management and program levels of communication media, because of the logic of the organizational structure required, reinforced by our hypothesized propensity to adapt "foreign" technological, political and managerial knowledge to their own needs, would facilitate the further integration of native and white institutional structure in the more "public" sector.

On the other hand, where the process of cultural loss has been more extensive, as in the case of the Longlake 58 reserve, but with limited assimilation of the group into white society, community control of communication media could well hasten the process of social and cultural disorganization.

Selective experimentation in different types of communities would test these hypotheses.

5.4 Sioux Lookout

Sioux Lookout, where field work was done in the summer of 1974, is an ethnically-mixed white community (population 2,570) with a small, transient Ojibway Indian fringe population. This community study provided the data base for the community "model" of Sioux Lookout discussed elsewhere in this report.

Sioux Lookout is located approximately 200 miles northwest of Thunder Bay, forty miles off the Trans-Canada Highway and directly on the Canadian National Railway's main line. The nearest larger city is Dryden, sixty miles to the south. Sioux Lookout is a major communications centre, linking communities further north to the south. As a service centre, it has a federal hospital used primarily by Indians from the entire northern region and a general hospital for the town residents; three small airways used to transport people and supplies north; government agency representatives; a high school attended by white and Indian students from the town, the outlying areas and the northern communities; a native Indian Friendship and Communications Centre used as a home-base for out-of-town Indian residents; and various businesses, churches, banks, tertiary service agencies, and many organizations, associations and clubs.

Some of the community's institutions manage to combine the dual functions of linkage with the north and general

service centre. The Federal Government some years ago dispensed with the Indian Residential School system in Sioux Lookout; it now uses the old school building as a residence for Indian chilren from the northern hinterland, while busing them in to attend the town's elementary schools, thus combining Indian and white education into one system. It is likely that in the near future the present two-hospital system will be amalgamated into one general hospital serving both community and hinterland residents, white and Indian. Similarly, the Ontario Provincial Police provide patrols for both town and outlying districts.

We found it profitable to study this interesting community in terms of its institutional structures and social networks. For the most part, these social networks were either kinship-based or developed around the place of work. Some of the most obvious and important from the sociological point of view were: 1) the Canadian Armed Forces base and its separate residential community (where we were not allowed to interview); 2) a network of employees of the Department of Natural Resources; 3) the school teachers; and 4) the town's "élite" of executives and professionals, including the school principals and some C.A.F. officials. This group of individuals has instituted what might be classified as an upper-class private club, which meets regularly in the social atmosphere of a lounge at the Forces Base. Membership into this club is by invitation only, though a limited number of guests are admitted. It appears that this network includes all the town members who hold any power, influence or affluence and prestige, and though social it nevertheless operates as a social control mechanism in many community issues. Other networks included those associated with the union of Canadian National Railway employees, and the town's merchants. In a town of this small size, many of these network boundaries are more easily penetrated than in a larger town or city where class structure is more strictly defined and interaction between and among the social classes is more routinized.

In studying personal interaction in the community, analysis was also made of participation and community attachment of town residents. It is well recognized that many exogenous factors play important roles in influencing these latter two elements. In the systemic model, where community organization and friendship and kinship networks are basic assumptions, these constitute essential elements of the natural fibre of the social system. Such networks function to give the individual a sense of place, a feeling of "this is where I belong". Using several indicators, both objective and subjective, a "community attachment" variable was constructed which revealed that 51% of the town's residents had a strong attachment to community, 21% were somewhat indifferent, and 28% rated very low on the scale. This variable, community

attachment, was highly correlated with a number of other variables, including length of residence, intentions of remaining, and interest in local affairs. Social bonds, however, were not the only factors influencing attachment. The degree that individuals care for the community itself, its territorial location and environmental surroundings, its services and facilities, and many other external independent variables, play an important role in determining attachment to community. 78% of the sample respondents reported strong positive sentiments towards Sioux Lookout, 11% were relatively indifferent, 10% disliked it. This is not surprising, since over half the sample was raised in northwest Ontario, and felt firmly settled in a place they consider "home".

The location and degree of closeness with kin was studied in some depth as well. The data indicate a high relationship between kinship proximity and degree of kin attachment or closeness, and between kinship and community attachment. These relationships were considered significant predictors of mobility in and out of the community, and we found this to be indeed the case. 50% of those respondents who had lived for more than 10 years in the community had close kin nearby, while none of those without close kin in the area had remained that long. Other data showed that the most mobile in and out of the community were persons, mostly fairly highly educated and now in the professional or paraprofessional occupations, whose origins were elsewhere and whose community attachment was fairly weak. While they might like the community very much, and contribute significantly to its development and everyday activity while there, they are not likely to put down permanent roots. The stable core of the community remains those persons and their descendants who are born and brought up in the region. Once again it is apparent that kinship and family, the most "private" institutions, are stronger predictors of personal mobility and community stability than the obligations and sentiments generated by the economic and other "public" institutions.

5.5 Implications for Telecommunications Policy - Sioux Lookout

Telecommunications function in an important way to link hinterland resource communities - Sioux Lookout is an example - to the metropolitan centre. The residents of this community display many elements of an urban life style, and much of this can be attributed to the impact of the media. People move in and out of the community in search of economic opportunity; but since kinship bonds continue to be a strong predictor in long-term settlement decisions, the more accessible the community is to the outside world, principally through telephone and transportation facilities, the more likely it will be that people from outside the

region can be persuaded to settle there more or less permanently. Otherwise, such a community becomes merely a way-station for upwardly mobile persons as they start their climb on the career ladder.

Currently, the community is strongly regionally oriented, as evidenced by the residents' preference for radio and television emanating from Winnipeg or Thunder Bay rather than a more socially and geographically remote Toronto. Moreover, we found little evidence that the media were contributing to a strong sense of local community. While such a commitment does exist, it appears to derive from an historical attachment to the place rather than from more immediate persuasion through public education. Indeed, there was evidence of a low political consciousness, bordering almost on apathy, with respect to potentially divisive community issues, e.g. the hospital amalgamation issue. It may well be that more local control of radio and television programming would help to increase commitment to community and public goals. Such an hypothesis can be neither supported nor rejected by the data accumulated in this study; it remains to be tested.

6. PSYCHOLOGICAL STUDIES OF TELECOMMUNICATIONS

6.1 Introduction

The purpose of conducting psychological studies as part of this project was to examine at the individual level those behaviours which may be implicated in the reception of, orientation to, and consequences of telecommunications. Obviously a large array of behaviours could be included within the scope of such a study, and so a selection of behaviours was made based upon three criteria. The first was that the study meet some of the basic questions of interest to telecommunications policy-makers; these were considered to be largely in the area of attitudes toward telecommunications use, and the effects of them. A second criterion was that the behaviours be relevant to the cultural setting in which the study was to take place; for reasons of validity the behaviours must be characteristic of the life style of the people. And third, the study must not be isolated from the extant body of psychological knowledge; otherwise the interpretation of such novel data would be extremely difficult.

With these criteria in mind, it was decided to work with samples of individuals from a number of communities which varied along a dimension of acculturation ("traditional" to "acculturated"), and to work in four areas of psychological testing and interviewing. There were "Perceptual Skills", "Personal Style", "Attitudes" toward ways of relating to the larger society, and problems of "Acculturative Stress". These areas of research are outlined below; details of the tests and interview materials are presented in Section 6.11.

6.2 Perceptual Skills

A fairly substantial literature has grown up around the topic of cultural group differences in perceptual and cognitive skills (e.g. Berry, 1966, 1971a; Berry and Dasen, 1974). Briefly, the findings are that in a variety of cultures, people develop ability patterns which are adapted to the ecological press and cultural forms in their particular area. Specifically, it has been found that those peoples who have traditionally pursued a nomadic hunting and gathering life style have a high level of skills in the detection and disembedding of visual cues, in organizing these cues into an awareness of spatial relations, and in the analysis of visual materials. In contrast, those peoples who have pursued a sedentary

farming existence typically have lower levels of these skills. On the basis of this literature, it was expected that the Ojibway people in this study (being traditionally a hunting and gathering people) would be well-developed in this skill area. However, the state of our knowledge was far below that of a confirmed generalization (or "law"), and it was important to study these behaaviours to check the skill level and pattern which was characteristic of these samples. And from the point of view of relevance to telecommunications use, the importance of visual skills is obvious; without them, there can be no use or impact, or if they are relatively undeveloped, the use or impact may be minimal.

However, this joint rationale for studying visual skills may be extended to a second perceptual problem, and that is the question of auditory skills. Very little information was available on this topic with respect to cultural groups, but its importance was at least equal to the study of visual functioning. It was decided, therefore, to develop auditory tests which would parallel the visual tests being used.* The basic questions of interest were the level of auditory skills in these samples, and the relationship between auditory and visual skills.

For tests of visual and analytic skills three standard tasks were employed. The first was the Portable Rod and Frame Test (PRFT) which provides an estimate of the ease with which an individual can visually disembed an item from its context. The second was the Kohs Blocks Test which requires the analyses and construction of geometric designs. And the third was the Ravens Matrices Test which involves the perceptual analysis of a sequence of designs, and an inference to the next design in the sequence. For auditory tests, two were developed which required the detection of a sound in the context of a cluster of sounds. In the first, termed the Sequential Tones Set (SETT), the one sound was a short sequence of notes hidden in a longer sequence of notes. And in the second, termed the Simultaneous Tones Test (SITT), the one sound was a single tone embedded in a chord.

6.3 Personal Style

Over and above the question of the skill or ability to handle visual or auditory aspects of communication is the personal preference one may have for engaging in the communication process. One may have the capability of, but not the interest in, either giving out information

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*See Section 6.12 for details of these tests and their development.

or being influenced by communications. From the point of view of the culture of northern native peoples, there is some evidence that a "reticence" (Preston, 1970) or "reserve" (Berry, 1971b) characterizes most hunting societies in Northern Canada (Hallowell, 1946). This personal communication style is usually described as one involving a limited interest in revealing information about oneself, and a strong sense of independence during social encounters (Honigmann, 1968). Such a characteristic is thought to exist not only when northern Native peoples interact with Eurocanadians, but more basically in their own interactions in traditional life. Once again this description was not at the level of a valid generalization, but had to be checked with the samples in this study.

A second rationale for exploring these behaviours lay in their relevance to communications policy. If it were the case that interest in giving and receiving information was generally low in these samples, then the use of telecommunications might be low. And if low, then decisions about the installation and operating of such services might be affected.

Two tests were employed to estimate behaviour in this area of psychological functioning. The first, termed Social Influence, is a task which requires the individual to make a judgement about some materials after he is confronted with an erroneous judgement attributed to a group of his peers. An acceptance of this group influence is represented in the judgement the individual makes. The second task, termed Social Reserve, requires the individual to indicate whether he would release certain kinds of personal information to his parents or peers. The proportion of refusals over a series of questions is taken as an indication of reserve in social interaction.

6.4 Attitudes

A third area to be explored was the way in which an individual thought this group (in this case, the Ojibway) should relate to the larger society (that is, the Canadian society as a whole). These attitudes were conceptualized in more general terms than telecommunications alone for a variety of reasons. There is a current debate among Native peoples (and to a lesser extent among other "immigrant" ethnic groups) about the nature of their overall relationship to the society. One general view is that a distinctive culture is no longer of value, and that all people should merge into a fairly homogeneous Canadian culture; this has been termed the Assimilation alternative (Berry, 1974).

A second general view is that a distinctive native culture is of great value, and that the only sure way to retain and develop it is by avoiding major contacts with the larger society; this has been termed the Rejection alternative. Thirdly, there is a general view that a distinctive native culture is of value, but that it can be developed within the larger Canadian "mosaic", this has been termed the Integration alternative.

With the Multicultural Policy now being implemented (Government of Canada, 1971), and a national assessment of its acceptance now being conducted (Berry, Kalin and Taylor, 1975), the general importance of this topic is self-evident. But specifically for telecommunications policy, the patterning to be discovered among these three attitudes may be able to provide some guidance for those responsible for "culture content" decisions.

To assess these attitudes, a scale previously developed for use with Australian Aboriginal and northern Amerindian samples was modified for use with the Ojibway and Eurocanadian samples in this study. For use with the native samples, the questions are phrased in terms of how the respondents feel Amerindian peoples should relate to the larger society, while for use with the Eurocanadian samples the phrasing is in terms of how the Eurocanadian respondents think the Amerindian peoples should relate. Thus in this latter case, the Rejection alternative becomes, for Eurocanadian respondents, a Segregation alternative.

6.5 Acculturative Stress

In the psychological literature on social change there are two kinds of changes usually observed with acculturation. One is a general "shift" in behaviour toward the norms of the larger society; these shifts may be observed directly over time, or may be inferred from behavioural differences between samples which have differential exposure to the larger society.* A second change which is often observed is a rise in "acculturative stress" which appears as a function of the pressures being exerted on a cultural group by the larger society. If we consider the general set of pressures, it is possible to include a large variety of indicators, but three (education, wage employment, and media use) are often thought to be most central (see for example Berry, 1975).

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*This point will be considered further when the design of the studies is presented.

As a general response to pressures from the larger society, including telecommunications, measures of Acculturative Stress may be used as indicators of the likely consequences of continuing acculturation. In this study, two tests were employed. The first, termed Stress, is a checklist of psychosomatic symptoms often employed in this kind of study. The second, termed Marginality, is a scale which assesses the degree to which the individual feels "poised in psychological uncertainty" between two cultural traditions, and has been employed often in acculturation studies. These two measures, then, are used to estimate the degree of psychological distress being experienced in the samples; and by analysis of responses in relation to extant indicators of acculturation, we may anticipate its likely course with further pressure.

6.6 Interview

Finally, in addition to psychological testing in these four areas, an interview was conducted with each individual in the sample; a copy of the record form is found in Appendix A.12. Moreover, a good deal of the general information collected by other members of the multidisciplinary team, particularly by the sociological members, has been used to supplement this set of background materials. The interview sought to gather specific details about age, education, work experience, travel history, ownership of various "modern" conveniences, language use, literacy and early socialization experience.

6.7 Design and Samples

An ideal design which would meet the goals of this study would be both cross-sectional and longitudinal in nature. That is, to study the relationships between these behaviours and telecommunications, it would be best to select a cross-section of samples ranging from very traditional to highly acculturated, and to follow them through a period before, during, and after the introduction of major changes in telecommunications in their area. The latter (longitudinal) dimension was not possible for practical reasons (time and funding), and so the design was based solely on the former (cross-sectional) dimension. This is not a serious problem, for if the cross-section of samples is relatively well-controlled, it may still be possible to infer some of the longitudinal and dynamic features of the relationships in addition to describing behaviour in each sample.

Even this other half of the ideal design was not

met fully, for a variety of reasons. The shortfall lies in the absence of a very traditional sample. The co-incident operation of the Northern Pilot Project* in the region and the general political climate for research in traditional communities (among other factors) led to the decision not to force the study toward the ideal traditional pole, but to make do with those samples which met the other criteria for a cross-sectional design.

In all, five samples were included in the study; three were Ojibway, representing three degrees of acculturation to the larger society, and two were Eurocanadian. One of the latter samples was drawn from the same area as the Ojibway samples, and is employed as a local example of the norms toward which acculturation may be taking place. The other Eurocanadian sample was drawn from a village well removed from the other four samples, and provided an indication of non-northern, and non-urban life style. The location, names, numbers of these samples are provided in Table 6.1.

TABLE 6.1: SAMPLES IN THE STUDY

NAME	CULTURAL GROUP	LOCATION	NUMBER of PERSONS			AGE	
			Male	Fem.	Total	Mean	Sd.
1. AROLAND	OJIBWAY	N.W. ONTARIO	20	19	39	33.3	15.5
2. LONGLAKE	OJIBWAY	N.W. ONTARIO	17	20	37	31.8	8.4
3. SIOUX LOOKOUT	OJIBWAY	N.W. ONTARIO	13	18	31	28.4	10.3
4. SIOUX LOOKOUT	EUROCANADIAN	N.W. ONTARIO	19	21	40	35.7	15.3
5. WESTPORT	EUROCANADIAN	S.E. ONTARIO	23	25	48	35.0	15.1
	SUB TOTAL OJIBWAY		50	57	107		
	SUB TOTAL EUROCANADIAN		42	46	88		
	TOTAL PERSONS IN SAMPLE		92	103	195		

*The Northern Pilot Project was an experimental network of radiotelephone stations linking up to 25 small, remote communities and has now become fully operational.

The sampling of individuals was intended to provide a total of 40 persons, with an equal number of males and females, and to sample over the age range 18 to around 65. This goal was sought in order to provide a diverse and approximately balanced and representative sample of the communities. The sex distribution in Table 6.1 indicates a fair success in that goal, and the age (mean and standard deviation) also indicates fair success. The one clear deviation lies in the shortfall of males in Sioux Lookout (Ojibway); an inspection of the age data indicates that this shortfall was primarily among older men. It was the case that very few older Ojibway men were resident in Sioux Lookout, and so the sample may still be fairly representative if not balanced.

Further background characteristics of these samples are provided in Table 6.2. In particular it was important to check on the degree of acculturation which was intended during the selection of the communities, so that our assumptions could be verified. As indicators of acculturation, mean years of formal education are provided, along with the "ownership index", based upon the respondents' ownership of various "modern" conveniences. For the two Eurocanadian samples, equivalent information is provided for comparative purposes.

TABLE 6.2: SAMPLE ACCULTURATION

SAMPLE	CULTURE	ACCULTURATION				DESIGNATION
		EDUCATION		OWNERSHIP		
		Mean	Sd.	Mean	Sd.	
1. AROLAND	OJ	5.7	4.6	3.7	1.1	"Relatively Traditional
2. LONGLAKE	OJ	6.9	2.9	2.8	1.1	"Transitional"
3. SIOUX LOOKOUT	OJ	8.1	6.2	3.2	1.4	"Relatively Acculturated"
4. SIOUX LOOKOUT	EC	10.9	2.4	4.6	0.7	"Northern EC Norm"
5. WESTPORT	EC	12.2	2.1	4.9	0.3	"Southern EC Norm"

It is clear that the samples are spread and ordered on the educational index as intended; there is a perfect rank ordering from Aroland to Sioux Lookout, while the two Eurocanadian samples have higher levels as expected. However, on the ownership index, the ordering within the Ojibway communities did not turn out as expected (Aroland low, Sioux Lookout high). On the contrary, Aroland yielded

the highest index, and this reflects their substantial economic position in relation to the two other Ojibway samples. The low level in Longlake and the higher level in Sioux Lookout, however, are much as we had expected. Further, it should be noted that there is a clear division between the three Ojibway and two Eurocanadian samples.

In our discussion of an ideal design we noted the lack of a really traditional Ojibway community. This lack is highlighted by the more than 5 years (on the average) of educational experience in our most "traditional" sample of Aroland, and, as already noted, by their high ownership index in relation to the other Ojibway samples. What had been intended ideally was to obtain a more traditional sample of, for example, mean education around 2 or 3 years, and ownership index of around 2. But for the reasons already stated, this proved impossible. Nevertheless, the evidence from the education data in particular, and from general community observations, allows us to designate the three Ojibway communities as "Relatively Traditional" "Transitional" and Relatively Acculturated", respectively, and to employ the two Eurocanadian samples as the "Northern Eurocanadian Norm" and "Southern Eurocanadian Norm", respectively.

6.8 Results

The data which were collected may be analysed and presented in a variety of ways. Perhaps the most informative display is to provide the means and standard deviations for each test for each of the five samples, and then to examine the relationships which obtain among the various tests and between test scores and some of the background variables. In the discussion section, we will then be in a position to explore the meaning of these results, and we will do so by comparison across the samples within this study, and by comparison of these results with those from other studies in the literature.

First, in Table 6.3, the means and standard deviations for all tests are displayed. Analyses of variance were carried out across the three Ojibway samples and the Sioux Lookout Eurocanadian sample. The resultant F ratio (and probability level) are indicated. The rationale for including the Sioux Lookout sample in, but excluding the Westport sample from, the analysis of variance is based upon the assumption that the closest Eurocanadian towns provide the norm towards which acculturation may be taking place. The Westport data are included only for comparison purposes and do not enter into the analyses across samples. Note that in Aroland, it proved impossible to acquire a good sample for the SETT

TABLE 6.3: MEANS AND SD.'S ON TWELVE TEST VARIABLES

SAMPLE	STATIS-TIC	PERCEPTUAL SKILLS					PERSONAL STYLE		ATTITUDES			ACC. STRESS	
		VISUAL			AUDITORY								
		PRFT	BLOCKS	MATRICES	SITT	SETT	INFLUENCE	RESERVE	ASSIMILATION	INTEGRATION	REJ	STRESS	MARG
1. AROLAND	M	33.5	101.1	27.3	13.5	-	10.8	10.7	+ 0.50	+ 1.76	+ 1.08	3.9	3.3
	Sd	15.4	32.9	5.4	2.9	-	3.7	5.1				2.3	2.2
2. LONGLAKE	M	34.0	99.1	27.2	13.2	12.7	10.8	8.3	+ 0.92	+ 1.33	+ 1.58	5.9	5.8
	Sd	9.3	29.0	5.4	2.7	2.2	4.9	5.3				4.4	3.4
3. SIOUX LOOKOUT	M	33.3	106.1	28.7	14.4	14.7	9.6	8.1	+ 0.97	+ 2.20	- 1.53	5.1	3.8
	Sd	10.0	28.9	5.2	2.8	2.5	5.5	4.1				3.3	2.8
4. SIOUX LOOKOUT	M	31.1	94.1	29.7	15.0	16.4	7.9	6.5	+ 2.35	+ 1.20	- 4.15	2.9	1.8
	Sd	13.9	29.8	5.9	3.9	4.1	5.1	3.5				2.7	1.9
5. WESTPORT	M	22.8	101.6	30.5	13.2	13.9	10.2	9.8	+ 3.50	+ 0.98	- 2.86	1.8	1.9
	Sd	8.7	24.0	3.4	2.5	3.3	3.9	4.0				2.3	2.3
	F	0.31	0.83	1.71	2.41	6.93	2.96	5.57	1.96	0.66	22.8	6.11	14.28
	PC	NS	NS	NS	NS	.001	.05	.01	NS	NS	.001	.001	.001

test because of administration difficulties. Note also that to maintain a common direction in test scores, PRFT and Influence means have been subtracted from 50 and 20 respectively. Finally, note that the Attitude means are given as positive or negative deviations from the neutral or mid-point of their respective scales.

Turning to the relationships which obtain among the various tests and some of the background variables, Table 6.4 presents a correlation matrix for the three Ojibway samples combined, and Table 6.5 presents the same matrix for the Eurocanadian Sioux Lookout sample. Although there are some variations among the three Ojibway samples, and between the two Eurocanadian samples, these two matrices provide the essential overview of the patterning of these variables. Note that since "male" is scored 1 and "female" is scored 2, a positive coefficient in the sex row indicates a higher score for females.

TABLE 6.4:

INTERCORRELATIONS AMONG TEST AND BACKGROUND VARIABLES IN THREE OJIBWAY SAMPLES COMBINED

	TEST VARIABLES											
	PRFT	BLOCKS	MATRICES	SITT	SETT	INFLUENCE	RESERVE	ASSIM	INTEG	REG	STRESS	MARGINALITY
PRFT	-											
BLOCKS	+.47	-										
MATRICES	+.39	+.62	-									
SITT	+.23	+.28	+.32	-								
SETT	+.14	+.26	+.01	+.20	-							
INFLUENCES	-.21	+.02	+.22	+.10	+.11	-						
RESERVE	-.08	+.09	+.31	+.10	-.05	0	-					
ASSIM	-.17	+.16	+.14	-.11	0	-.27	-.11	-				
INTEG	-.08	+.19	-.02	+.14	-.24	+.22	+.25	-.40	-			
REJ	-.26	-.28	-.29	-.42	-.16	-.07	-.02	-.11	-.27	-		
STRESS	-.51	-.58	-.37	-.29	-.21	-.13	-.27	-.01	-.04	+.25	-	
MARG	-.31	-.25	-.19	-.30	-.18	-.09	-.23	+.04	-.12	+.33	+.57	-
EDUC	+.13	+.37	+.32	+.34	0	+.29	+.02	+.13	+.05	-.16	-.09	+.08
AGE	-.05	-.36	-.45	-.21	0	-.16	-.13	-.24	-.02	+.12	+.09	-.09
SEX	-.12	-.02	-.05	-.17	+.01	-.04	+.02	+.27	-.22	-.04	+.20	+.25

TABLE 6.5:

INTERCORRELATIONS AMONG TEST AND BACKGROUND VARIABLES IN EUROCANADIAN SIOUX LOOKOUT SAMPLE

	TEST VARIABLES											
	PRFT	BLOCKS	MATRICES	SITT	SETT	INFLUENCE	RESERVE	ASSIM	INTEG	REG	STRESS	MARGINALITY
PRFT	-											
BLOCKS	+.07	-										
MATRICES	+.21	+.64	-									
SITT	+.31	+.12	+.17	-								
SETT	+.06	+.34	+.28	-.41	-							
INFLUENCES	-.11	-.07	-.31	+.09	-.02	-						
RESERVE	-.02	+.07	-.15	+.10	-.24	-.13	-					
ASSIM	-.20	-.07	-.09	-.31	-.32	-.29	-.04	-				
INTEG	-.05	+.08	-.04	+.26	+.06	+.23	+.11	-.25	-			
REG	+.03	-.03	-.50	-.02	-.25	+.34	+.48	+.02	+.19	-		
STRESS	+.11	-.29	-.11	-.08	-.30	+.09	+.14	-.02	+.07	+.15	-	
MARG	-.24	-.20	+.14	+.07	-.06	+.23	+.25	-.18	+.08	-.08	+.64	-
EDUC	+.11	+.36	+.29	+.04	+.09	+.18	-.05	-.09	+.25	+.10	-.05	0
AGE	0	-.48	-.64	-.07	-.13	+.16	-.16	+.14	-.03	+.23	+.04	-.13
SEX	+.26	-.11	-.12	+.28	-.01	+.11	+.31	+.02	+.11	+.07	+.30	+.20

6.9 Discussion

Considering first the performance of the samples on the tests of Perceptual Skills, it is apparent that the Ojibway and Eurocanadian samples do not differ very much at all from one another. The most consistent finding (Table 6.3) is that in visual perceptual skills (PRFT, Blocks and Matrices) there are no sample differences. On the basis of the nomadic hunting and gathering background, this is what had been expected; this result is in sharp contrast with those for peoples who were traditionally agriculturalists (Berry, 1966, 1971a; Witkin and Berry, 1975). We are observing once again, then, a high level of visual skills in a hunting population, a skill which does not vary significantly across samples differing in degree of acculturation. However, in Tables 6.4 and 6.5 we may note that for all three tests, there is a consistent set of positive correlations with educational experience when the relationship is analysed within samples.

For the two auditory skill tasks (SITT and SETT) we have no differential performance for the first, while in the second there is a significant spread. It will be remembered that the latter test encountered some difficulties in Aroland, and indeed there appeared to be a general problem of comprehending the task. Thus this single example of differential performance on a perceptual task might be interpreted either as a real difference in skill, or as an artifact due to problems of test administration. We may note again in Tables 6.4 and 6.5 a tendency for education to correlate positively with test performance, especially for SITT among the Ojibway samples.

Overall, then, we have found generally no differences across the samples on tests of Perceptual Skill, much as we had expected. Exceptions to this general result are the significant variation on SETT, and the somewhat lower performance on PRFT in the Westport sample. But the general finding is strong and fairly consistent, and stands in contrast to the usual results found with non-hunting samples.

This first result also contrasts with the pattern of results across samples for the other seven tests, where five of them are significantly spread. Considering first the two Personal Style tests, we find that there is a significant spread for both tests across the Ojibway samples, and the drift in sample means is toward that of the Sioux Lookout Eurocanadian population. These trends confirm the expectation that behaviour is shifting during acculturation. And the somewhat different means for Westport

support the decision to employ a Eurocanadian sample in the same regional setting in the examination of the patterning of these behavioural shifts with acculturation. Of course only further research will enable us to clarify this separation of means between the two Eurocanadian samples on these tests.

With respect to the Attitude measures, we find that only one of the three (Rejection) is significantly spread across the four samples, while one other (Assimilation) is just short of significance ($P<06$). The third (Integration) displays no significant variation or trend. For Assimilation, there is a slight increase across the Ojibway samples with acculturation in the selection of this mode of relating to the larger society, and this is confirmed by the low positive correlation with education in Table 6.4. The greatest contrast, however, lies between the low Ojibway acceptance of this option and the fairly strong view of the Eurocanadian samples that Amerindian peoples should assimilate.

A reverse pattern is displayed for the Rejection alternative with a moderately positive response in the two less acculturated Ojibway samples, a moderately negative response in the Sioux Lookout Ojibway sample, and a strongly negative response in the two Eurocanadian samples. This pattern is an extremely interesting one, and deserves some more discussion. In Aroland, which is fairly smoothly functioning and prosperous, even though remote, it is probably the case that this moderate acceptance of the Rejection alternative represents a desire to be left alone by the larger society. In Longlake, which is a somewhat disrupted community, the view is more in favour of Rejection; it appears that the source of the ills of the community are being attributed to the larger society. And finally in Sioux Lookout, since most of the sample has migrated to the town and is fairly well settled there, it is reasonable to view their negative view of the Rejection alternative as confirmation of their position in the town.

For the Integration alternative, the level of support is fairly high in all samples and, as we saw, does not vary across samples. Since this attitude includes elements of cultural retention and positive intergroup relations, it appears to be the compromise most generally acceptable. Since it is also the model currently pursued by the Multicultural Policy, and since it is the one attitude which does not exhibit contrasts between the Ojibway and Eurocanadian samples, it is perhaps the alternative to consider the most seriously in policy formulation.

Our last behavioural domain, that of Acculturative Stress, exhibits a striking variation across samples, and one that is not linear. For both Stress and Marginality, the highest scores are for the Longlake community which, as we have noted, suffers some degree of community disorganization. Levels are lower in Aroland, and intermediate in the Sioux Lookout Ojibway sample. Thus we find a relatively unstressed sample in the relatively traditional and economically comfortable sample, rising dramatically in the transitional sample, and falling off somewhat in the relatively acculturated sample. This non-linear trend is in contrast to the linearity of sample differences on the other tests, but it is consistent with the patterning of stress in relation to acculturation found in other Amerindian samples (Berry and Annis, 1974; Berry, 1975). Consistent with this non-linearity is the low level of correlations with education in the three samples combined. When examined separately, we find negative correlations (-.21 and -.11 with Stress and Marginality) in Longlake, low positive in Sioux Lookout (+.04 and +.01, respectively), and a mixed set in Aroland (-.16 and +.21, respectively).

The strongest contrasts in these data are between the Ojibway and Eurocanadian samples on both tests. It is clear that life is considerably more stressful for those in the Ojibway communities, than for the Eurocanadian samples. This finding, too, is also consistent with the literature.

We turn now to a consideration of some patterns among the variables. First, we will consider task correlations within each of the four behavioural areas, then the correlations between the four areas, and finally the test correlations with age and sex.

For the three tests of Visual Skills, the correlations are all positive and generally substantial. The one exception (+.07 in the Sioux Lookout sample between PRFT and Blocks) is not repeated in Westport (where it is +.65) nor in the general literature. This overall pattern suggests that we are measuring an interrelated set of skills fairly consistently, and confirms their designation as tests belonging to the same area of behaviour. This conclusion is also true of the relationships between SITT and SETT, where positive correlations exist in both Tables 6.4 and 6.5, but here the level of correlations is somewhat reduced.

A similar pattern emerges when we consider the correlations between the visual and auditory tasks: all correlations are positive, and range from +.01 to +.32, with an average of a little over +.20. Thus we appear to be tapping a more general Perceptual Skill pattern (across sensory modes), one which tends to be well-developed in these traditionally hunting samples. This is consistent with the high level of performance (in relation to the Eurocanadian samples) noted earlier for the three visual tests, and by the performance level and pattern for one auditory test (SITT); and is only inconsistent for the other auditory test (SETT) for which we noted some administration difficulties.

Correlations between these perceptual tasks and those of Personal Style and Attitude measures tend to be variable, with no consistent pattern emerging. But for the Acculturative Stress variables, we find support for a previous result (Berry and Annis, 1974); in the Ojibway samples (where the Acculturative Stress concept has its inherent meaning) correlations with all Perceptual Skill test scores are negative, ranging from -.18 to -.58, with a mean of -.32. Two interpretations of this substantial result are logically possible. One is that those who are perceptually skilled are better able to ward off the stress of acculturation; the other is that the stress reactions interfere with optimal performance on these tests. There are probably elements of both at work, but for reasons beyond the scope of this report, the first interpretation is more in keeping with the psychological literature on stress in general.

Finally we may note that age tends to be negatively correlated with these perceptual tests, but that sex has no consistent correlation. Since these samples are all adult, it is not unexpected to find a general performance decline on these tasks. Note that the strength of the decline is greatest for the Blocks and Matrices tests, while it is only minimal for the others. The question of sex differences is a difficult one, and there is a substantial literature on the topic for hunting and gathering populations (e.g. Berry, 1966, 1971a). But since there is no consistent or significant patterning of the data by sex in these samples, it is possible to ignore the broader discussion in the report.

Turning to the area of Personal Style we note that there is no relationship between the two tasks (Influence and Reserve) in the Ojibway samples, and only a low positive one in the Eurocanadian samples. We are thus dealing with essentially unrelated behaviours, which may not

even belong together in the same descriptive category. Although the two tests are patterned consistently (and significantly) across the three Ojibway samples, there is no individual correspondence within samples. The same random patterning appears in their relationships with the other behavioural areas, and in their relationship with age and sex. Thus, although the cross-sample differences may be interpreted meaningfully, the within sample analyses appear to provide only random relationships.

In the set of Attitude measures, we find a clear negative relation between Assimilation and Integration; these two are being viewed as alternative modes of intergroup relations by both Ojibway and Eurocanadian samples. This negative relation extends to the other two coefficients in the Ojibway samples, with Integration and Rejection being viewed as more negatively related than Assimilation and Rejection. However, in the Eurocanadian samples these latter two are viewed as positively related, perhaps because they are not clearly distinguishable by non-native respondents.

A strong positive relationship emerges between Rejections and the Acculturative Stress variables in the Ojibway samples, indicating that those who wish to opt out of further relations may have sound reasons for doing so. With respect to age, we find that in the Ojibway samples it is the older (more traditional) respondents who have lower interest in Assimilation, and higher in Rejection, while in the Sioux Lookout Eurocanadian sample the older respondents tend to consider both Assimilation and/or Segregation the most suitable relationship. Finally, with respect to sex, in the three Ojibway samples, women are more in favour of Assimilation than the men, while there is no sex difference on the Rejection alternative.

Finally turning to the area of Acculturative Stress, we find very strong correlations in both Tables 6.4 and 6.5 between the two measures; this confirms their allocation to the same behavioural area. And, as we have already noted, there is a very clear patterning of negative relationship in all Ojibway samples between these two measures and the five tests of visual and auditory skills. With respect to age, there are no relationships, although it is common to find a slight increase in these scores with age (e.g. Berry, 1975). The reasons for this lack of relationship are unknown, but it may be due to the relatively better social and health services which are available to these communities when compared to other Amerindian samples where such an age relationship has been

observed. Finally, with respect to sex, there are substantial relationships in both Tables 6.4 and 6.5, with females exhibiting both higher Stress and higher Marginality scores. For Stress this is a common finding, both in the cross cultural literature and in conventional studies. But for Marginality, the pattern in the literature is variable; for some reasons, it is the females who feel most caught between the two cultural systems. However, it should be noted that, while this is true for Aroland and Sioux Lookout, it tends to be the males who experience greater feelings of Marginality in Longlake.

6.10 Conclusions

What conclusions may be drawn from this set of studies, both for general psycho-cultural purposes, and for those of telecommunications policy?

With respect to the general conclusions, we may say that the primary aims have been met to a fair degree. The design of the study (employing a cross section of communities varying in degree of acculturation) allow for meaningful interpretations of the data, and permit some inferences to the longitudinal course of behavioural changes with acculturation. In general, those behaviours which are well-developed in traditional life (perceptual skills) do not show any substantial change with acculturation, while some aspects of personal style do. The two behavioural areas which were selected specifically for their relevance to the process of acculturation (Attitudes and Stress) however, exhibited a clear patterning with degree of acculturation; in the former there was a definite reciprocal shift between Assimilation and Rejection, while in the latter there was a non-linear shift in which Stress levels rose and fell with degree of acculturation.

Materials which were adapted or developed for use in this study appear to have been well received (with the exception of SETT), and appear to have been relevant to the individual behaviours and problems of transition which existed in the communities at the time of the study.

Finally, the data gathered in this study both enhance, and are enhanced by, the general knowledge in this field of enquiry. This information thus contributes to the information available about hunting and gathering peoples, and their experience of acculturation; and its consistency with the bulk of the extant information enhances its validity and meaning. Overall, then, the study has made a contribution, both methodologically and empirically to the literature. Some of the general uses of these results are indicated in Appendix A.14.

More importantly, what are the specific conclusions which may be drawn for telecommunications policy? Taking each of the four behavioural areas in turn, we may discern a number of indicators in the patterns and relationships among these data. First, for perceptual skills, especially for visual and analytic skills, there is substantial evidence for their high development in these populations. There is also evidence for their lack of variation with degree of acculturation, suggesting that they constitute a firm base for developing telecommunications. There is some evidence that the visual skills are better-developed than auditory ones, and that the latter are influenced by acculturation; however, the importance of this difference is probably less than originally thought at an earlier stage in this work. Such differences may, of course, be due to a common ear difficulty in the north (otitis media) and therefore be amenable to medical change. Overall, then, there is a solid perceptual skill base for the development of telecommunications in this region.

Secondly, in the area of Personal Style there is a significant variation across samples on both tests employed. The Ojibway samples exhibit greater Reserve and are more Independent in the issue and reception of information, and this difference shifts across the acculturation dimension. This finding which is consistent with anthropological observations of northern Amerindian life, suggests that the response to telecommunications may be different in these populations than in Eurocanadian communities. It would be hazardous to attempt to predict the nature of this differential response on the basis of these findings alone. It is thus very important to monitor concrete situations such as the community radio station known as Radio Kenomadiwin and the Northern Pilot Project (both referred to elsewhere in this Report), as well as the Inuit demands. However, some aspects of these situations are consistent with our psychological data, and suggest a waryness of, or controlled interest in, the development of telecommunications.

Thirdly, (and consistent with the evidence from the Personal Style area) there is a strong and clear differential attitude toward intergroup relations in the Ojibway and Eurocanadian samples. Assimilation tends to be favoured by the latter, while Rejection has some support among the former. These differences, however, appear to be shifting with continuing acculturation. The one area where no differential response is apparent is that of Integration, where retained cultural integrity and mutual goals within a larger mosaic are indicated. This is consistent with current Multicultural Policy, and for both reasons, may provide the firmest base for the development of telecommunications policy.

Finally, there is a high level of Stress in the Ojibway samples, which rises and then falls with acculturation. In relatively traditional and relatively acculturated settings stresses are lower than for those undergoing transition. At the very least, telecommunications policy should not contribute to the rise of such pschological discomfort; on the contrary, it may be possible to contribute to its decline. The patterning of the data suggests that this would be possible either by strengthening Amerindian cultural worth or by eliminating it; however, the latter option is inconsistent both with the Attitudes displayed and with the current Multicultural Policy. Thus, the direction is clear - to employ telecommunications for the enhancement of Amerindian cultural values and identity.

Overall, few inconsistencies are apparent in these four behavioural areas. The skill base is present, there is a stylistic and attitudinal waryness of further intrusion from the larger society, and if there is such intrusion, psychological stresses will probably increase, at least in the short run. All this suggests that if telecommunications facilities are to be developed for Amerindian use, then they should be under the control of those for whom they are being developed. Such a suggestion is consistent with our data, with current cultural policy, and with current educational policy (National Indian Brotherhood, 1972) for Amerindian peoples. Further, it is important to note that such a course would be appropriate not only for the above reason, but also for technical reasons. That is, the very perceptual (and analytic) skills which are characteristic of these populations form the psychological basis for technological and scientific competence; operational control, it is predicted, could soon be mastered as well.

6.11 Appendix on Psychological Tests

For readers of this report who are unfamiliar with the tests employed in this study, brief descriptions of them are provided here. All of the tests (with the exception of the two Tones Tests discussed in Section 6.12) are described in the psychological literature; further details may be obtained by referring to the articles cited below.

Portable Rod and Frame Test. This test requires the setting of a tilted rod to a vertical position while it is being viewed against a tilted frame background. (Oltman 1968; Witkin et al., 1962). Over 8 trials the deviations from true vertical are summed to provide a total error score. In this study, this total has been subtracted from 50, to provide a score in which a high number is indicative of low error (high skill).

Kohs Blocks. This test requires the analysis and construction of 17 designs employing blocks with various colours on the faces. A high score (maximum possible is 131) indicates a successful performance (Kohs, 1923).

Ravens Matrices. This test requires the analysis of a series of patterns, and an inference to the next (missing) one in the series. The response is to be selected from a set of six alternatives which is provided. In this study sets A, Ab and B are employed (Raven, 1963). A high score indicates successful performance; maximum possible is 36.

Influence. This is a test of the ability of an individual to make a judgement of line length (to select the correct alternative) in the face of a suggestion of a group norm which is not correct. It is based on a test by Asch (1956) and was developed for field use by Berry (1967). The score is a sum over four trials; a high score indicates an independent style in making the judgements.

Reserve. This test requires the respondent to say whether he would, or would not, tell others (parent or peers) about some common personal experiences. It is based upon the self-disclosure test of Jourard (1971); a high score indicates a high degree of reserve, and the maximum possible score is 20.

Attitudes. These three scales consist of 24 attitude statements which suggest ways in which Amerindian people may relate to the larger society. There are nine

items each in the Assimilation and Integration scales, and six in the Rejection scale. Respondents indicate their agreement or disagreement on a 5 point scale, and a summed score is derived for each of the three scales. Scores are presented as positive or negative means relative to the mid-points of the scales (Sommerlad and Berry, 1970).

Stress. This test is a version of Cawte's et al., (1968) adaption of the Cornell Medical Index (Brodman et al., 1952). It consists of a checklist of 20 psychosomatic symptoms, and the respondent indicates which of them pertain to him. A high score is indicative of high stress, with a maximum possible score of 20.

Marginality. This scale is an adaptation of the one developed by Mann (1958) for use in South Africa. It has been used previously in Australia by Berry (1970) and with Amerindian samples by Berry and Annis (1974). The content of items is intended to express the feeling of "being poised in psychological uncertainty between two cultures" (Park, 1928). Each item is responded to on an agree/disagree basis. A maximum possible score is 14, and a high score is indicative of a high level of marginality.

6.12 Appendix on the Two Tones Tests*

Because these two tests were developed for the purposes of this study, a fuller description is provided here. The basic tests (Mawhinney, 1973) consist of 25 items each. In both, the task is to say whether one sound is contained in a more complex sound. In SITT, the first sound is a single note, and the complex is a chord; the respondent must say, after hearing the single note first, whether it is contained in a chord which is presented immediately after it. In SETT, the first sound is a short sequence of notes, and the complex is a larger sequence of notes; the respondent must indicate after hearing the first sequence, whether it is contained in the subsequent sequence. Details of both tests and their items are provided in Tables 6.6 and 6.7.

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* In addition to those listed elsewhere as assisting in the project, three other individuals helped in the construction, analysis and refinement of the Tones Tests: H.A. Witkin, R.C. Annis and J. van de Koppel. Further analyses and refinements of the test are being conducted by the latter two as part of a study of Pygmy and Bantu peoples in the Central African Republic, co-ordinated by H.A. Witkin and J.W. Berry.

The sounds were produced by a portable positive organ which provided a fairly pure wind sound. These were recorded on tape along with instructions and practice trials. The test was administered either individually or in groups, and the respondent recorded his answer (either a "yes" or a "no") independently on his record sheet. A random guessing strategy would produce a mean score of 12.5 for each test. A minimum of 0 and a maximum of 25 were possible.

The tests have proved to be moderately reliable, with only a few bad items in each. An item analysis has been performed among the Sioux Lookout, Amerindian, and Eurocanadian samples combined. This analysis is presented in Table 6.8

Finally, some studies have been conducted with both SITT and SETT in addition to the ones in this report. The original development of the test (in Mawhinney, 1973), all with Toronto school children, yielded the correlation matrix in Table 6.9. The GEFT test referred to is a Group Embedded Figures Test, which is a visual test of ability to locate a small picture in the context of a larger picture. As such, SITT and SETT are auditory analogies of GEFT. A further study (with 29 Dutch university students) has employed both SITT and SETT, with the correlational results indicated in Table 6.10. The "drums" tests referred to is an auditory test similar to SETT, but using drum beats rather than note frequencies. The "EFT" test, is an individual version of GEFT which is a visual test of picture disembedding (van de Koppel, 1974).

TABLE 6.6: SITT ITEM CHARACTERISTICS

(In 5 BLOCKS of 5 Items Each)

	RELATIVE POSITION OF TARGET IF PRESENT	NO. OF NOTES INCLUDING TARGET	TARGET PRESENT
BLOCK 1 M Target / 1 : E	B	2	Y
	C	4	N
	T	2	N
	B	3	Y
	T	2	N
BLOCK 2 H Target / 2 : C	C	4	Y
	T	3	Y
	B	3	N
	C	4	N
	T	3	Y
BLOCK 3 L Target / 3 : G	C	4	Y
	B	2	N
	C	3	N
	T	4	Y
	B	2	N
BLOCK 4 M Target / 4 : E	B	2	Y
	T	4	N
	B	3	N
	B	2	Y
	T	3	Y
BLOCK 5 H Target / 5 : C	B	4	N
	T	2	Y
	T	3	Y
	B	2	N
	C	3	Y

Y=13 : N=12

Note

Range of notes used in both tests is from G below middle C to D plus one octave.

Letters H, L, M, denote high middle and low ranges of four notes each within the larger range.

TABLE 6.7: SETT ITEM CHARACTERISTICS

(In 5 BLOCKS of 5 Items Each)

			TARGET PRESENT
BLOCK 1	M target / 1:	GEFF	
	Trials 1.	DFFEFGEFF	N
	2.	GDGEFFGEGF	Y
	3.	EGEGDFEG	N
	4.	DFFGEFFGE	Y
	5.	FEEGEFFG	Y
BLOCK 2	H target / 2:	BAD	
	6.	DBCCBB	N
	7.	ABDCCD	N
	8.	DABADB	Y
	9.	DBDBADAC	Y
	10.	CDACDBAA	N
BLOCK 3	L target / 3:	CGAC	
	11.	ABGCCGACB	Y
	12.	GAABACGBG	N
	13.	BACGACCA	Y
	14.	CCGACBAC	Y
	15.	CACABGBC	N
BLOCK 4	M target / 4:	DEG	
	16.	DGGDEG	Y
	17.	DDGFGF	N
	18.	DFGEDDGF	N
	19.	EEGDEGDD	Y
	20.	EFEGDEGF	Y
BLOCK 5	L target / 5:	CBAC	
	21.	ABBCBCGG	N
	22.	CBCBCBAC	Y
	23.	ABGCACGC	N
	24.	BGCBACBG	Y
	25.	GCBCGGGG	N
			Y=13 : N=12

TABLE 6.8:

ITEM ANALYSIS FOR SITT AND SETT

SIOUX LOOKOUT SAMPLES COMBINED (N=71)

ITEM - TOTAL CORRELATIONS

Item	SITT	SETT
1	.35	.29
2	.50	.28
3	.51	.30
4	.56	.31
5	.51	.13
6	.53	.34
7	.36	.34
8	.34	.36
9	.38	.11
10	.43	.25
11	.34	.19
12	.56	.25
13	.54	.31
14	.52	.49
15	.37	.33
16	.48	.28
17	.58	.05
18	.35	.32
19	.49	.31
20	.48	.46
21	.54	.37
22	.48	.36
23	.58	.41
24	.49	.24
25	.53	.30
Reliability (KR-20)	0.85	0.57

TABLE 6.9:

CORRELATION MATRIX: TORONTO SCHOOL SAMPLES (N = 114)

	SITT	SETT	GEFT	AGE	MUSICAL EXPERIENCE
SITT	-				
SETT	+.25	-			
GEFT	+.51	+.25	-		
AGE	+.39	+.15	+.59	-	
MUSICAL EXPERIENCE	+.42	+.18	+.28	+.16	-

TABLE 6.10:

CORRELATION MATRIX: TILBURG UNIVERSITY STUDENT SAMPLE (n = 29)

	SITT	SETT	DRUMS	EFT
SITT	—			
SETT	+.44	-		
DRUMS	+.22	+.25	-	
EFT	-.04	+.36	+.09	-

7. GENERAL DISCUSSION OF THE PROJECT

7.1 Models and Modelling

7.1.1 Introduction

A great deal of the body of comment concerning the development and application of socioeconomic simulation models has been concerned not with specific assumptions underlying particular model structures but with the broader questions of model validity and whether or not these models fall within the boundaries of science. These issues are not to be dismissed without careful consideration. If the large amount of effort required to collect, analyze and incorporate data and theory into a simulation model structure is to prove fruitful then the model builders must have a clear understanding of what the modelling process represents in terms of science and hence what role the model is able to play in terms of its application to the understanding of socioeconomic systems. The purpose of this section is to outline clearly the modelling process as applied to the model building task described elsewhere in this report and to comment on the nature of the resultant model as a feature of scientific enquiry into the nature of social systems.

7.1.2 A Classification of Models

The term "model" implies two characteristics which distinguish the model from the "real thing", the system being modelled. These are generality and abstraction. The degree of generality of a model limits its ability to describe the real system to a specific set of conditions or assumptions. The level of abstraction of a model describes the degree of physical realism present in the model. A useful taxonomy of models can be developed based on these two characteristics and has been described by Mihram (1972). Figure 7.1 shows how this taxonomy is used to organize all possible models into a framework based on the characteristics of generality and abstraction. It can be seen that dynamic (time-varying) models are more general than static models and that stochastic models are more general than deterministic ones. The degree of abstraction runs from the realm of replications to that of mathematical formalizations. The dynamic simulation models described in this report are classified as dynamic deterministic simulations and as such are both relatively general and abstract.

The first step in the modelling process is not

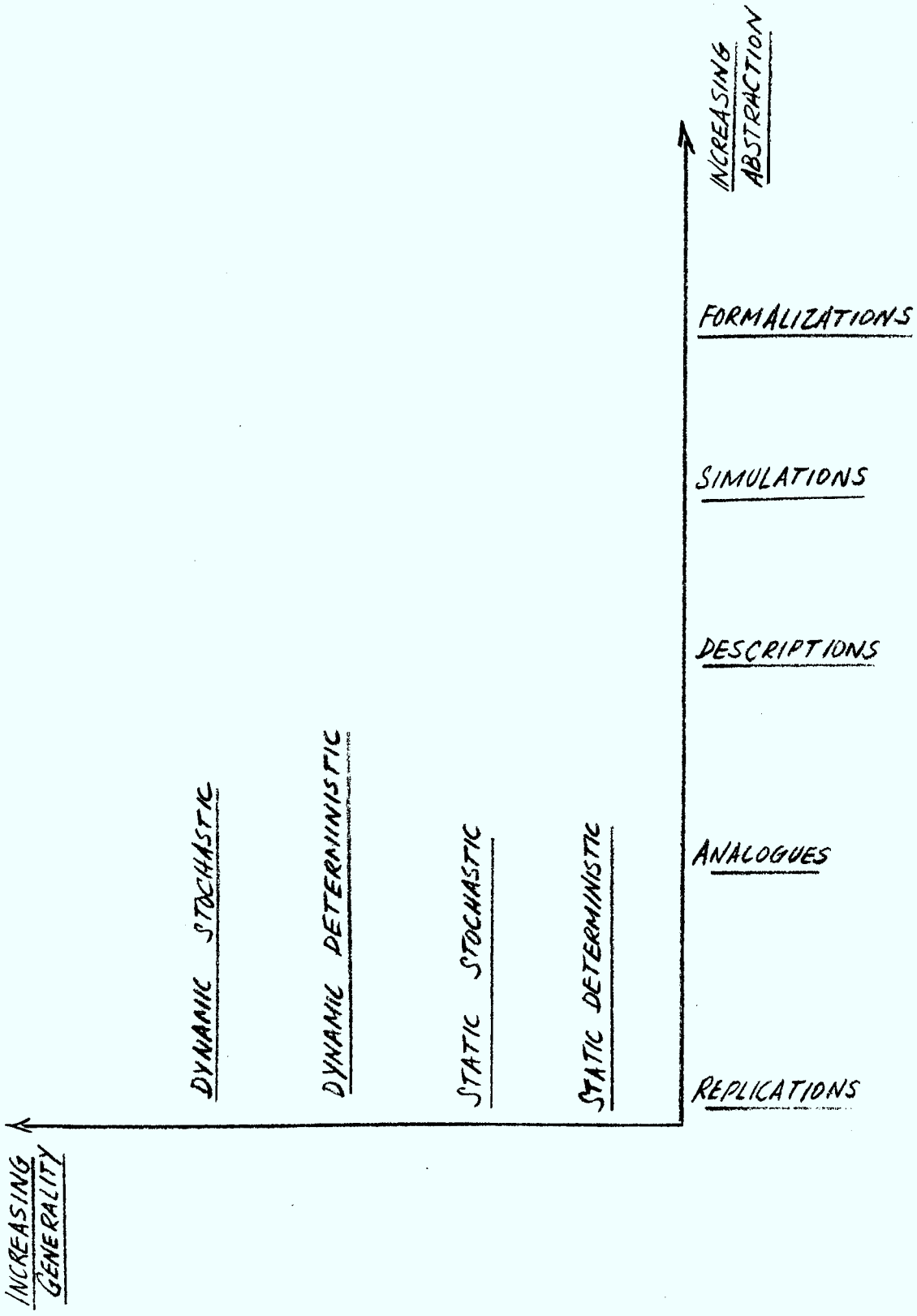

Fig. 7.1 TAXONOMY OF MODELS

necessarily that of choosing the appropriate type of model since some *a priori* knowledge of the system must be available before any intelligent choice can be made. Indeed, the type of model may change as the modelling process is carried out. For example, a simulation model can lead to the postulation of mathematical formalizations. Regardless of the model type being considered, the modelling process can be described by a series of steps, each blending into the next, with a number of feedback paths.

7.1.3 The Modelling Process

Much has been written about the modelling process itself and much more has been implied by the description of various model building techniques. For example, more than anything else, the description by Forrester (1968) of "system dynamics" is an attempt to refine the modelling process. Mihram (1972) provides a useful historical guide to this subject and Peppard (1975) summarizes the ideas of a number of writers in this area with particular application to ecological system models.

Five steps in the process will be identified here, with the understanding that the process is in reality a continuous one and any discussion of "steps" is solely for the sake of increased understanding.

(i) Consideration of Relevant *A Priori* Knowledge

This preliminary look at what is known about the system to be modelled is chiefly for the purpose of choosing the type or class of model that should be considered. It also includes a careful analysis of the objectives of the exercise, the experience of the model builders and the kinds of model users, if such exist. Usually, the choice of model type follows quite naturally from such an analysis.

Once some idea of the amount and nature of the present knowledge or theory about the system has been obtained, it should be possible to decide on the level of aggregation suitable for the model. More specifically, it should be possible to decide what features (described by model variables) of the system should be explicitly included in the model.

In what follows the modelling process will be described with particular reference to models that belong to the class of dynamic simulation.

(ii) Construction of a Model Framework: Induction and Deduction.

At this point, the model builders should have a good idea of what has been theorized about the system in the past, the failures and successes of the theories, and of the quantity and quality of the "observations" made on the system recorded as data, written records, etc. This knowledge must form the basis of the new hypotheses concerning the system, stated in the form of a model structure.

The model structure, which is to say the new hypotheses concerning the working of the system, can be seen to evolve from three sources: past theory, past observations (induction), and deductive reasoning. The last source is unfortunately not considered "scientific" by many scientists despite the fact that it has played a major role in most scientific discoveries. One philosopher of science, Karl Popper (1968) has discussed the importance of deduction (which is in effect a creative activity) at some length. As will be discussed later, the manner in which the model is tested and used is what determines its scientific quality, not how the structure is developed. Of course, it is always most truly scientific to develop a model that is in agreement with the body of verified theory already in existence, and to make use of those observations that can be used to identify model relationships, parameters, etc. If this is not done, the model (hypothesis) cannot hope to survive tests of its validity. To this basic framework are then added the insights, creativity, opinion, etc., of the model builders in an effort to explain phenomena where previous theory has failed and into which observations have failed to provide insight.

It should be noted that in the case of the modelling of a physical system, the deductive input may be relatively small; available theory (e.g. models) may be abundant and observations may thus be more useful in inferring system structure. However, in the case of social systems, deduction may have to play a larger role; little theory is available and useful observations are difficult to obtain. This is simply to say that social science is at an earlier stage in its development and a large number of new testable hypotheses (models) are appropriate and necessary. If this fact is kept in mind when considering the usefulness of a model such as that described in this report, the positive aspects of the model will become clearer and the model's value to future research, and even to decision-making, easier to establish.

What does the above discussion of the inputs used

in determining model structure imply in the case of a dynamic simulation model? According to the system dynamics formulation (see Section 2), the variables deemed to be of prime interest in describing the state of the system in question are called levels. These describe the dynamics of the salient features of the system. Links between these levels predicted by existing theory or implied from observations can be made immediately. The mathematical formulation of these links is discussed in detail in Section 2. In most cases, intermediate (auxiliary) variables will be included in the linking paths in order to describe more realistically the nature of the link in question. Parameters, such as multiplier functions, describe cause and effect relationships between variables. The structure thus obtained represents the state of knowledge about the system; it is now possible to include additional links and variables to describe the new hypotheses or modifications to existing theory which the model builders wish to make. In fact, the structure is a homogeneous mixture of induced and deduced relationships which represents a new overall description of how the system might operate; thus it is often difficult to pinpoint those relationships for which there is direct supporting evidence. Most of the relationships reflect positions of various different theories and sets of partially relevant data. It is crucial that the model builders attempt to document their reasoning in putting together each link in the structure, identifying where possible the inductive and deductive components in each case. In this report, the model descriptions of Sections 3 and 4 represent this documentation.

(iii) Model Simulation

The model structure and the mathematical description of that structure are obtained in the previous step which is naturally the most vital and time consuming of all five. The system dynamics equations are of a form that is directly programmable in a number of digital computer languages, such as FORTRAN, DYNAMO, ALGOL, APL, etc. Alternatively, a large hybrid computer could be used in the simulation task; the analogue section could handle the integration while the digital section could handle nonlinear parameter calculations, multiplications, etc. In either case, attention should be paid to the method of interfacing between man and machine (i.e. the input and output of information). A user-oriented interface will not only aid model-building personnel who are not computer-oriented (but whose evaluation of the model's behaviour is critical), but also will facilitate more efficient exploration of the model's characteristics, sensitivity

to changes in parameters, and the production of well documented output. The control console designed for the simulation of the regional model (see Section 3) represented an attempt to make the model accessible to the entire multidisciplinary team. In retrospect, an even more direct means of communications with the computer would be desirable in order to ensure the cooperation of non-technical personnel. Perhaps the graphical representation of model output is not the best way to display model behaviour. It might be worthwhile to include alternate forms such as tables, verbal descriptions, etc. The control console did, however, prove extremely useful in evaluating the regional model's sensitivity to a large number of parameter and exogenous variable perturbations, as described elsewhere in Section 3.

(iv) Model Verification

The term *verification* is used here to distinguish between the exploration of model behaviour (and its evaluation in terms of the inductive and deductive input to the model structure) and the comparison of model behaviour to real system behaviour under identical conditions. The latter is referred to as *validation* and will be discussed subsequently.

There are two steps in verification. The first involves the checking and debugging of the computer simulation software to ensure that errors have not been made in entering the model equations and parameters. This is conveniently done in segments of the overall simulation program so that errors are more easily identified and corrected. Since the model builders have only the model output (under some chosen set of conditions) for use in identifying software errors, some will probably go undetected until a later stage. However, unusual and unexpected model behaviour can lead to early detection of most errors.

The second step consists of an examination of the model's dyanmic behaviour under a variety of external and internal conditions, in order to determine whether its overall characteristics and responses are reasonable, given the assumptions and hypotheses made concerning the system's structure. A large part of this step in verification involves sensitivity analysis, such as that discussed in Section 3.8. In addition, as large as possible a number of simulation runs should be made for various time periods. The results of these runs for various choices of the values of the exogenous variable should be examined and discussed at length by the model-

building team. This is the first step in evaluation of the new hypotheses and may lead to modifications in these hypotheses and further simulation tests. This can be done without formally testing the model's behaviour relative to that of the real system; it is really an aid to refining hypotheses, not testing them.

As has been discussed in relation to the models developed in this project, the verification step can be a lengthy one and returns for effort expended must be carefully evaluated. At some point, it will become clear to the model builders just what their model has contributed to the understanding of the system and its likely capabilities as a futuristic decision-making tool.

(v) Model Validation

Much has been written concerning the validation of simulation models (for example, see Naylor and Finger, 1967, and Van Horn, 1971). Much of this discussion concerns short term econometric models or industrial dynamics models (Forrester, 1961) which can be scientifically tested (i.e. their predictions can be tested in relation to developments in the real world) over reasonably short time periods, such as every three months.

In the case of long-range simulation models, it is difficult to decide what should constitute validation. At the same time, due to the time lags inherent in the socio-economic systems which these models attempt to explain, it is the long-range responses that are of the most use in evaluating present policies. Since it appears that true validation is not possible, perhaps a careful evaluation of how these models should be used is in order. (Note that the use of historical data to test predictions of a futuristic model is not really validation but another aspect of verification.)

As has been emphasized throughout this report, the output from the model in the form of simulation runs should not be thought of as a prediction of the future state of the system but as a guide to the characteristics of the dynamic behaviour exhibited by the system when faced with a certain set of external (policy) decisions. For example, Forrester's simplistic and aggregated world model (Forrester, 1971) provides an insight into the nature of a number of growth-regulating factors over the next 50 years and gives an indication of the relative importance of pollution, food supply, crowding, etc., in considerations of policies intended to limit future economic growth. No model for which it were possible to supply complete validation could offer this type of insight.

Perhaps the best recommendation as to the use of long-range simulation models would be to add them to the already available policy-making tools and to use them to answer questions which other tools are not designed to accomodate.

Finally, it is worth repeating some of what has been said in the discussion of multidisciplinary methodology (see Section 1.2) concerning the role of the modelling process. Even if formal validation is impossible, the usefulness of the model-building task in directing the energies of members of a team toward a common goal, while at the same time demanding the consideration of a wide range of interactions present in the system under study, cannot be overestimated.

7.2 Models and the Political Process

At an early stage in the project the politics specialists noted some of the conceptual problems of developing the political aspects of the models to be constructed. Three possible approaches to modelling political aspects were suggested: first the "building block approach" in which a sub-model incorporating a statement of processes, inputs and outputs of each government programme would be made and incorporated into the model; secondly a "black box" approach in which a political model would be developed that would act as a regulator and govern the behaviour of the overall model to control it so as to optimize human welfare in the future; and thirdly an "exogenous variable" approach in which politics was simply regarded as input decisions which were fed into the overall model, and its subsequent behaviour was observed. The third, exogenous variable, approach was adopted.

Some study was also made of past and present government activities in the north with a view to attempting to develop some "building blocks". It was discovered that the bureaucratic, political, legal, and economic relationships which control government programmes could be conceptualized in terms which could lead to modelling. However, at the same time, as the holders of positions and offices changed, and as other political factors changed, the relationships controlling programmes changed. In many programmes as well - such as provincial education programmes for Indians in Ontario's north - there was quite strong competion between alternative policies, and the outcome not only was far from clear, but could vary over an extremely wide range. Any model now built of the education programme could not describe the extreme range of alternatives, and the many possible

futures. This once again confirmed the value of leaving politics as an exogenous variable in which the impact of different policy options could be assessed rather than the likely future shape of policy predicted. Quite likely the building block approach is most valuable for predictions in the near-term future, one to five years away, in which policies and organizational relationships remain stable. As the real value of the complex dynamic modelling comes in the impact of feedback over the long term, the two types of modelling are to some extent incompatible.

The black box approach was only considered conceptually, and no attempt was made to construct such a model. However, in discussion of the possible characteristics of such a model several points of interest emerged:

(i) It is obvious that human beings and human society are not as completely subject to the blind, ineluctable workings of fate as the Forrester and Meadows models suggest. Quite the contrary, human society adapts and responds continually by altering and improving technology, establishing regulations which limit and control problems like pollution, developing new ways of reducing environmental, economic, and social problems, and substituting one resource for another, one technology for another.

(ii) Both what is considered to be of value (the way the game is scored) and the structure of economic, social, political, and technological inter-relationships between people, between people and knowledge, and between people and the environment, (the rules of the game) change over time. Many things that look hard and fixed in the short term become soft and mutable in the long term. For example, birth rates vary widely over time, as does the relationship between industrial growth and consequent pollution, or the emphasis placed on environmental qualities rather than increased consuption, or the relative status of different groups in the political and social structures. The process of reaching an ideal future from the present involves long series of choices and changes of choices, of "visions" and "revisions", and often what was considered ideal to one generation is horrible to the next. The city of light of Corbusier and his school is urban blight to many of today's planners.

(iii) Any prediction of the future consequences of present choices includes a significant error and uncertainty

factor. Over the short run these errors can be insignificant, but the longer term the prediction, the more important the uncertainty and error factor. The significance of likely errors as a proportion of the total future state grows at an exponential rate and at a twenty year distance most statements are more likely to be wrong than right. The error factor is inherent in all projections. It is greater in some areas than in others and, because of the uniqueness and size of many events affecting human lives, its size is often impossible to ascertain.

(iv) The important changes and events which affect the future often come in the form of discontinuities, of innovations, and unique events. Mathematical models cannot yet handle this sort of surprise, irregular, element.

Bearing these comments in mind, the character of the models can be compared with the character of the real world as it is perceived by the political science part of the multidisciplinary team. Several salient points are apparent:

(i) The models submerge the doubts and hesitations that each discipline has about its own subject matter. The qualifications, the buts, the uncertainties with which a professional approaches an attempt to predict the future on the basis of his own discipline are left behind in the effort to construct a computer model. Sensitivity testing and other analytical techniques can uncover some of the implications of doubts and uncertainties, but not all. The hesitations of the professional are strongest in predicting the long term future, but this is also the place where the results of the computer simulation techniques are most influenced by the postulated interrelationships in which the hesitations and doubts of the professional are greatest.

(ii) The model treats as "hard" some important things that, over the long run, are "soft". Many of the things that alter the future will be as difficult to predict as the impact of the automobile would have been in 1890, or the depression in 1927, or the pill in 1960, The future, like the past, will be strewn with surprises, technological changes, and changes in social values. One useful and interesting way to study the future is to examine the way in which relationships and factors which seem fixed and solid in the short run might change and transform in the

long run. An example of this problem which is important in modern planning is the shape of the long term demand curve for energy. In the short term the demand curve for energy is quite inelastic. Ontario Hydro has to plan towards a twenty year time horizon. In making plans for the future electricity production it has assumed that long term demand is also inelastic, and that increases in price will not affect growth in demand. It is quite possible, however, that over a twenty year period the demand for electricity and other forms of energy is extremely sensitive to price. Because investment in electricity production will cost billions of dollars the shape of the long term curve is crucial; but it is an almost unknown area at present. Quite possibly the most interesting and important links in the models constructed in this project have this sort of softness over the long term.

(iii) In one sense the model is a "now is for once and for all" model, in that alterations to the model's structure cannot be made unless the users include among their number suitable experts in the programming aspects of cumputer models, and only with some difficulty and delay even then. To some extent this is mitigated by the adoption of "exogenous variables", which enable a fairly wide range of policy changes to be made; i.e. on any one thirty-year run of the model it is relatively easy to stop at the end of any one particular year and make major changes in policies, within the overall constraints of the model's structure. The real world, on the other hand, permits not only the re-choosing of policies but also the alteration of structure at virtually any time. The flexibility and adaptability that this characteristic of rechoosing, changing, and altering rules and values gives to society, is part of the great strength of human civilization. There is no evidence that this characteristic is likely to be eliminated; quite the contrary, with the growth of knowledge and techniques the possibilities of reconsidering past decisions and habits have increased.

It would be possible to build a complex dynamic computer model which could allow for doubts, softness in hard relationships, and re-choosing. Such a model would, however, become extremely complex, and would open up almost infinite ranges of choices to the users of the model. It might well be so variable that it would not be much help in considering the future consequences of possible present choices.

The models developed in this project should not be considered useless, or a waste of time, because of these limitations. The people working on the political sector found the questions raised by the process of model-building extremely thought-provoking and helpful, as was also the process of working with persons from many different disciplines. General economic models are now of great use in analysing the short and even mid-term implications of policy choices. They are also useful, though in a suggestive rather than conclusive way, in analysing long term implications of policy choices. Complex dynamic computer models might be even more useful in considering long term implications than the present sorts of economic models. However, they would be enormously expensive to create, and perhaps prohibitively so. At the same time, like present economic models, they would only form part of the repertoire of planning predicting techniques. Intensive work in one sector - like energy - or part of a sector - like nuclear technology - is also essential. Quite possibly the conclusions in separate sectors will not be worth integrating into a single unified model in computer language. Communication between people in normal human language is a tremendously flexible tool for this sort of interpretation, and is still several orders of magnitude better than computer language. After all, the brain, as an eminent mathematician noted, "is an enormous computer, having perhaps ten thousand times as many 'switches' as the largest electronic computer. The interconnections, too, are far more complex. While each switch in a computer is connected to only two or three others, each one in the brain is probably connected to hundreds".

7.3 General Discussion of the Project from a Sociological Perspective

The difficulties that confronted the sociologists on this interdisciplinary project derive from the very nature of sociological inquiry. Although sociology claims to be a science, that claim rests much more upon its logic and technique of inquiry than on the kind of data derived therefrom. For the most part, sociological data is just not amenable to the sort of mathematical manipulations that are needed to translate it into "computer language" and predictive models. The simple differences between ordinal, linear and ratio scaling is a case in point; procedures suitable to ratio scales, for example, are not appropriate to ordinal measures which is what social survey research data consists of for the most part. A further difficulty stems from the simple truism that much of what the sociologist knows about human social behavior is subjective in its quality; what

people think, feel, believe, etc., while they constitute real social facts, cannot be measured as precisely or as indisputably as the more objective facts of the physical world. The conjunction of fact and value remains a thorny and as yet unresolved issue in the methodology of the social sciences. Finally, there is the very great difficulty that has to do with the complexity of human social behavior and the capacity of a social science, now or ever, to fully comprehend it in its totality, let alone discern relationships of a causal or invariant kind. Furthermore, not all human social behavior is rational; it is unpredictable and often has an elusive 'ad hoc' quality that makes extrapolation and generalization spurious at best, or perhaps even downright misleading. Harold Garfinkel* has pointed out that the ability to act "rationally depends upon the fact that the person must be able literally to take for granted, to take under trust, a vast array of the features of social order. In order to treat rationally the 1/10 of his situation that, like an iceberg, appears above the water, he must be able to treat the 9/10 that lies below the water as an unquestioned and, even more interestingly, as an unquestionable background of matters that are demonstrably relevant to his calculation, but which appear without being noticed."

Garfinkel reminds us that sociologists have words for these taken-for-granted features - words such as "folkways", "mores", "norms", "roles", "institutions" and the like. It is only against the background of these features of every society that it is possible to decide whether a course of action is rational or reasonable. Moreover, the social reality that is captured in these concepts is itself ever-changing, and so the empirical content of the concept changes too. Descriptive material that captures some of this reality abounds in sociology, much of it very illuminating and so contributing to a better understanding of how societies function. There is in the discipline, as well, much methodological sophistication; tools unique to social science have been developed that help its practitioners to ever better levels of explanation and analysis. The "ideal type" - a model in its own way has been most productive in sociological inquiry.

Nevertheless, the difficulties remain. They are in fact, part of the "taken-for-granted" work which need not be specified when talking to or writing for their colleagues in the discipline.

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*Harold Garfinkel, "The Rational Properties of Scientific and Common Sense Activities", Behavioral Science V. No. 1 (January 1960), 82.

Interdisciplinary work, however, requires a fundamental re-examination of these taken-for-granted assumptions and modes of communication. Especially a team that mixes "soft" social scientists with "hard" physical scientists and engineers, requires continuous and concerted effort to ensure that communication is meaningful and relevant to the project at hand. Otherwise, you may have an intra-disciplinary study, but not a genuine interdisciplinary one.

Simulation modelling of social systems has been justly criticized in the past because it has failed to take into account relevant social variables. The modellers, in their defence, have responded by arguing that sociology is in too primordial a stage to provide the kind of tractable data their models require. We submit that the problem rests not in the stage of development of sociology as a science but rather in the very nature of human social behavior which itself is intractable and infinitely complex. This must be taken into account when modelling social systems whether for scholarly inquiry or for social engineering.

Perhaps, then, the greatest value of this project has been that these difficulties, which may be unique to social science, were recognized and taken seriously by the modellers. Perhaps our most significant contribution is the recognition of the limits to which modelling as an explanatory or predictive technique is appropriate to entire social systems. In this context, the decision to concentrate also on developing a useful community model, rather than to work wholly on a regional model, is noteworthy.

8. CONCLUSIONS

This report is a complete description of all the work conducted by a multidisciplinary team at Queen's University during the years 1972 to 1976. These disciplines included Biology, Business, Electrical Engineering, Political Studies, Psychology, and Sociology. The goal of the project was to investigate the application of dynamic modelling to the study of telecommunications development. A dynamic model of northwest Ontario as a typical near-northern developing region has been constructed with a strong emphasis on telecommunications. This model has been thoroughly tested and many simulation runs have been made. Models have also been constructed of two small, but quite different, communities within this region (Aroland and Sioux Lookout). Of these, only that for Sioux Lookout has been programmed and taken to the point of generation of some preliminary simulation runs. All this work has been based on very extensive field work and data collection wherever possible.

Much has been learned about the operation of a multidisciplinary team in a university environment, where it is surprisingly rare for social scientists and physical scientists to come even close to working together. While the degree of truly interdisciplinary work that emerged was limited, a great deal was gained in the insights available to the model builders who could not possibly have developed by themselves alone the data and interpretations generated by their colleagues in other disciplines.

The construction and initial testing of models such as those described here should be considered to be but the beginning of the venture. Subsequent experimental use and modification in a real planning environment, where the users themselves understand the structures and all their included hypotheses and assumptions, is the essential next stage. The current situation in socio-economic modelling of this kind is perhaps similar to that in the early history of the physical sciences, in which the initial postulations of the first models very rarely, if ever, bore much resemblance to those gradually developed later as a result of experiment and modification. Above all, models of the type described here should never be considered as exact predictors of the future; rather they should always be considered as indicators of possible alternative futures, subject to all the hypotheses and assumptions built into them by their designers. Within these limitations and those more general aspects relating to the inherent difficulty of quantifying in a simple way many complex socio-economic phenomena, these dynamic models do appear to have the potential to act as useful focuses for the efforts of multidisciplinary planning teams.

APPENDIX A.1: ABBREVIATIONS USED IN THE REGIONAL MODEL

The Regional Model of northwest Ontario is described in full in Section 3, with a complete flow diagram shown in Figure 3.2. The following list of abbreviations explains the meanings of all the symbols used in this Regional Model.

Exogenous Variables

EV1-WP - World price for mineral resources.
EV2-MTA - Mining technology availability.
EV3-S1 - Subsidy on mineral resource production.
EV4-S2 - Subsidy on mineral resource exploration.

EV50-WPF - World price for forest products.
EV51-SF - Subsidy to forestry.
EV52-FTA - Forestry technology availability.

EV200-TD - Telephone technology development.
EV201-TPI - Technological progress index.

EV300-SOIS- Subsidy on other industries and services.

EV350-CDII- Continental disposable income index.
EV351-CITR- Capital investment in tourism (rate).

EV400-SLED- Southern Ontario level of education.
EV401-SSED- Southern Ontario standard of education.

EV450-SLHS- Southern Ontario level of health service.
EV451-SSHS- Southern Ontario standard of health service.

Levels

LI	- UDNR	- Undiscovered natural resources.
L2	- RNR	- Regional natural resources.
L3	- MTU	- Mining technology used.
L50	- F	- Forest resources.
L51	- FTU	- Forest technology used.
L100	- P1(0-14)	- Population 0 to 14 years of age.
L101	- P2(15-44)	- Population 15 to 44 years of age.
L102	- P3(45-64)	- Population 45 to 64 years of age.
L103	- P4(65-)	- Population 65 years and over.
L200	- BTDR	- Business telephone density ratio.
L201	- RTDR	- Residential telephone density ratio.
L250	- RN	- Road network.
L300	- OIS	- Income from other industries and services.
L350	- T	- Tourist days/year.
L351	- CIT	- Capital investment in tourism.
L400	- NWLED	- Northwest Ontario level of education.
L450	- NWLHS	- Northwest Ontario level of health services.
L500	- POL	- Pollution.

Variables

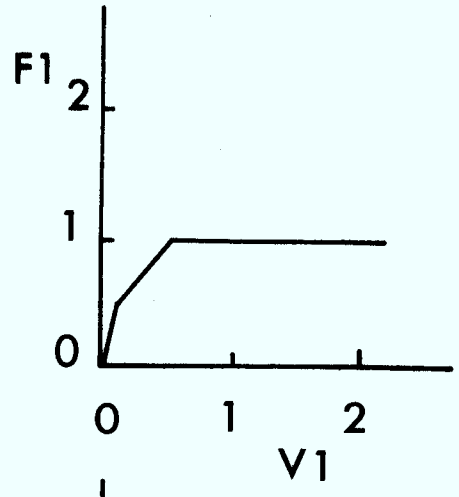
V1 - UDFR - Undiscovered fraction remaining.
V2 - TFR - Total fraction remaining.
V3 - CR - Cost ratio.
V4 - WPR - World price ratio.
V5 - DE - Demand for mineral resources.
V6 - ADE - Actual demand.
V7 - WPRN - World price ratio index.
V51 - FR - Fire rate.
V52 - RCF - Regional cost for forest resources.
V53 - WPRF - World price for regional forest resources.
V54 - DEF - Demand for regional forest resources.
V100- FER - Fertility rate.
V101- P - Total population.
V102- PL - Population of labour age.
V103- URB - Urbanization
V200- TTD - Total telephone density.
V201- LCT - Local call total.
V202- LDT - Long-distance call total.
V204- LCR - Local calling rate.
V205- LDR - Long-distance calling rate.
V206- QSC - Quality of service change.
V207- TTT - Total telephone traffic
V208- QS - Quality of service.
V209- TPIC - Telephone progress index change.
V220- RAP - Radio penetration.
V221- TVP - Television penetration.
V222- NSP - Newspaper penetration.
V240- MVC - Mail volume per capita.
V250- RCE - Road construction expenditure.
V251- NAT - Northern air traffic.
V252- RTFR - Road traffic freight ratio.
V253- RTPR - Road traffic passenger ratio.
V254- RT - Total road traffic.
V300- DL - Demand for labour.
V301- TCI - Total capital investment.
V302- UER - Unemployment ratio.
V303- WRO - Wage rate offered.
V305- RI - Regional income.
V306- RDI - Regional disposable income.
V307- TB - Tax bill.
V308- RDIC - Regional disposable income change.
V309- TCIC - Total capital investment change.
V310- SL - Supply of labour.
V312- UERN - Employment ratio.
V351- TR - Tourist revenue.
V352- TF - Tourist facilities.
V401- ELR - Education level ratio.
V402- EME - Education expectation multiplier.
V403- NWSED - Education standard northwest Ontario.
V404- DEED - Demand for education.

Variables (Cont"d.)

V405-	EXED	- Education expenditure per capita.
V406-	TEXED	- Total education expenditure.
V451-	HLR	- Health level ratio.
V452-	EMH	- Health expectation multiplier.
V453-	NWSHS	- Health standard in northwest Ontario.
V454	DEHS	- Demand for health services.
V455	EXHS	- Health expenditure per capita.
V456-	TEHS	- Total health expenditure.

APPENDIX A.2: FUNCTION PLOTS AND VARIABLE INTERACTIONS FOR THE REGIONAL MODEL

There are 124 multiplier functions in the Regional Model and a detailed plot of each one is given in the following pages. Alongside each plot a small segment of the overall flow diagram for the model is reproduced to show the manner in which each function operates.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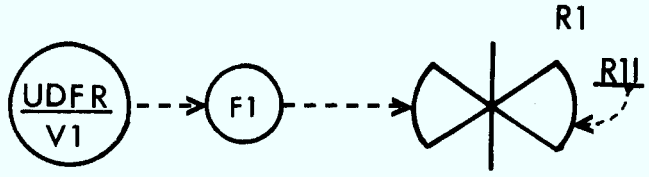
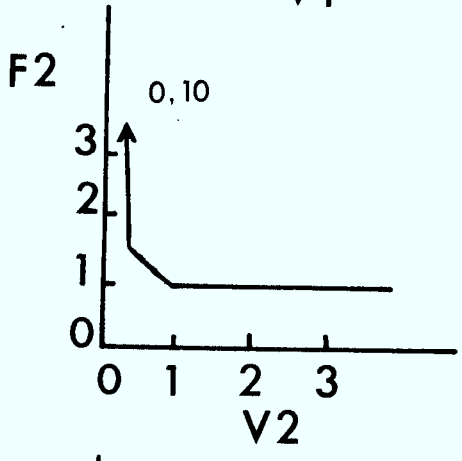
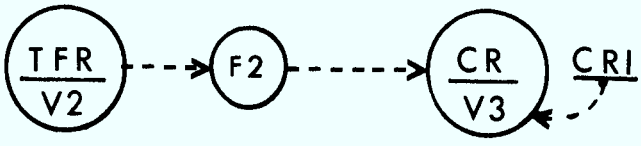
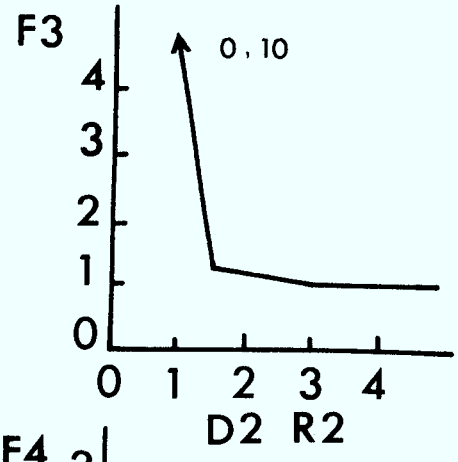
2
1
0
0
1
2
V1


R1
UDFR
V1
F1
R11


F2
0,10
3
2
1
0
0
1
2
3
V2


TFR
V2
F2
CR
V3
CR1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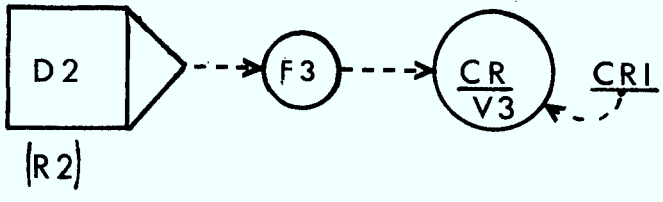
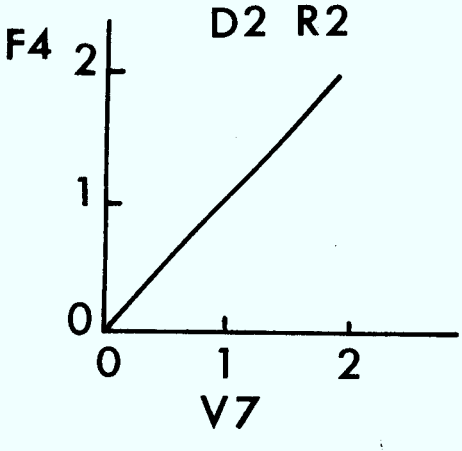
3
4
D2 R2


D2
F3
CR
V3
CR1
(R2)


F4
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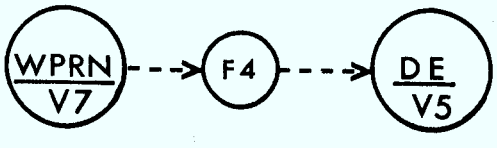
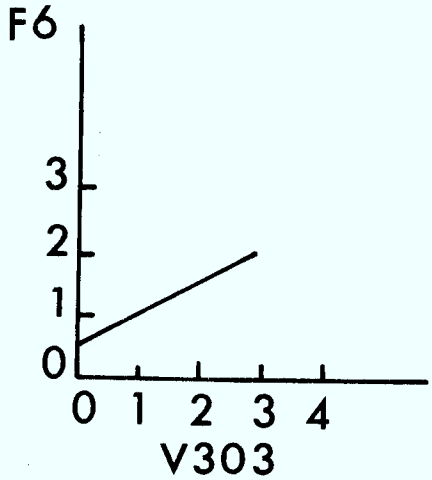
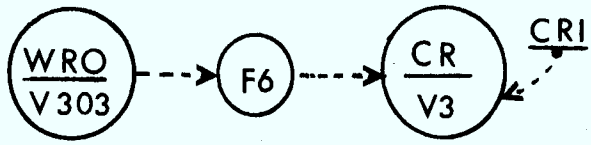
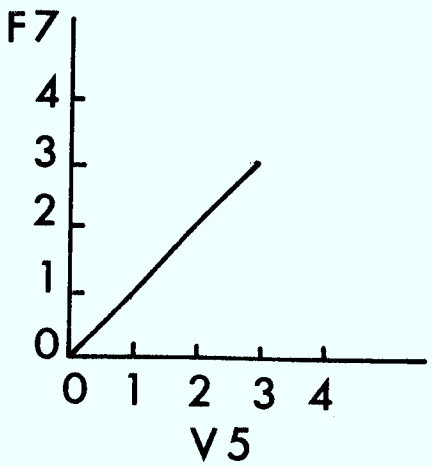
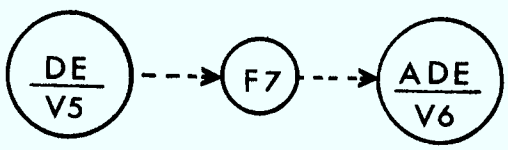
1
2
V7

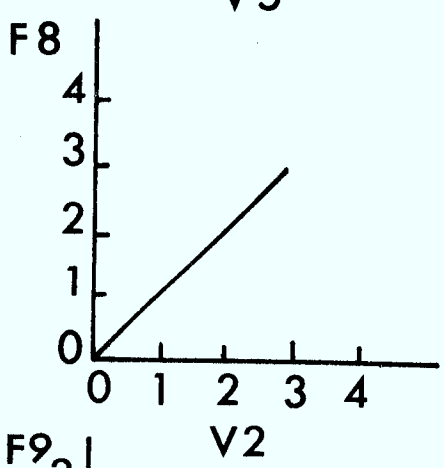

WPRN
V7
F4
DE
V5

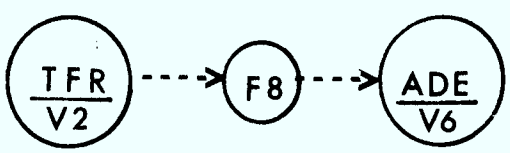

F6
3
2
1
0
0 1 2 3 4
V303

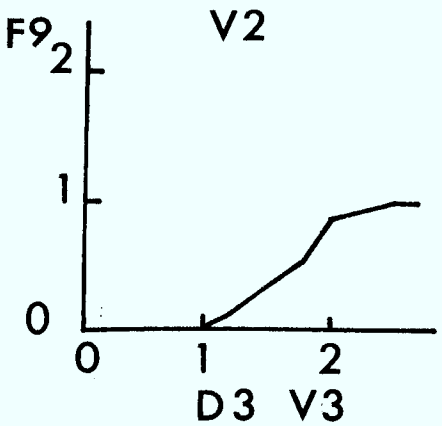

WRO
V303
F6
CR
V3
CR1

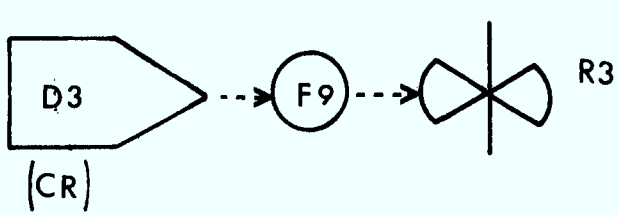

F7
4
3
2
1
0
0 1 2 3 4
V5

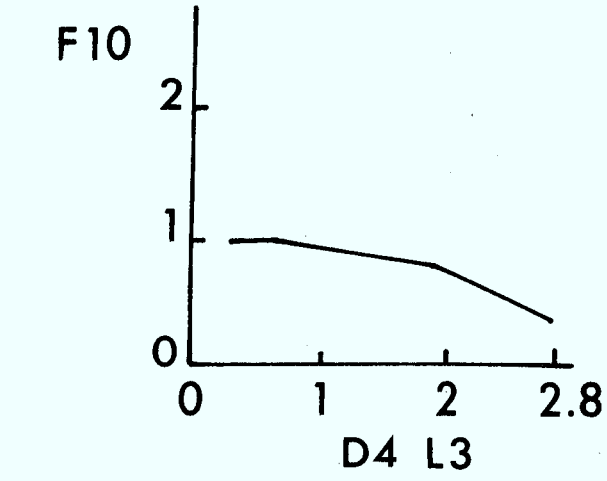

DE
V5
F7
ADE
V6

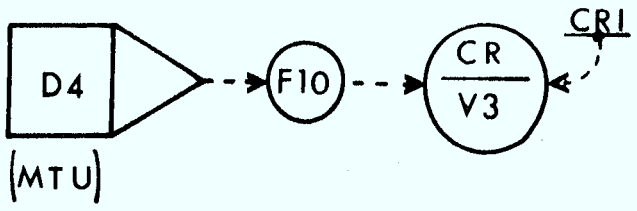

F8
4
3
2
1
0
0 1 2 3 4
V2

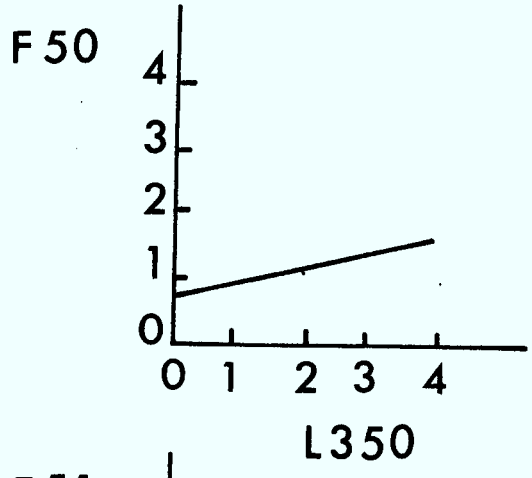

TFR
V2
F8
ADE
V6


F9
2
1
0
0 1 2
D3 V3


D3
F9
R3
(CR)


F10
2
1
0
0
1
2
2.8
D4 L3


D4
(MTU)
F10
CR
V3
CRI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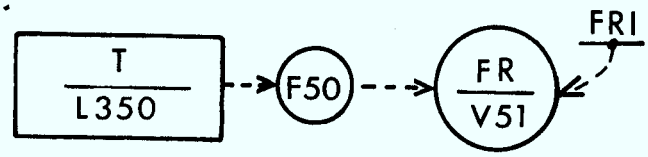
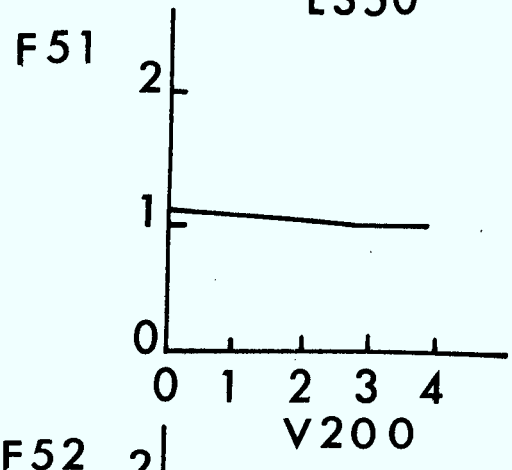
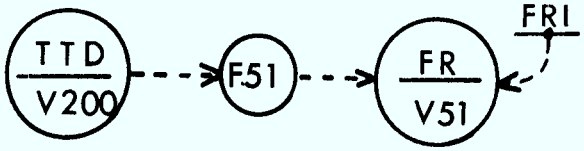
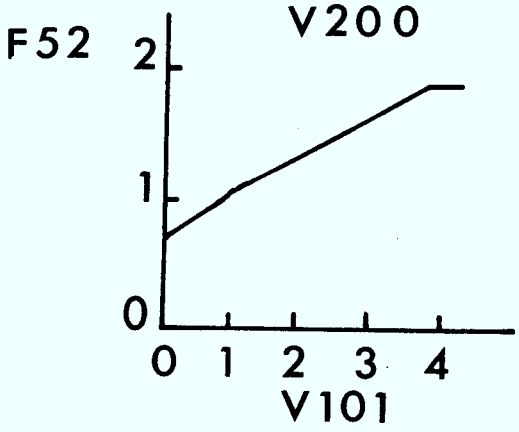
4
3
2
1
0
0 1 2 3 4
L350


T
L350
F50
FR
V51
FRI


F51
2
1
0
0 1 2 3 4
V200


TTD
V200
F51
FR
V51
FRI


F52
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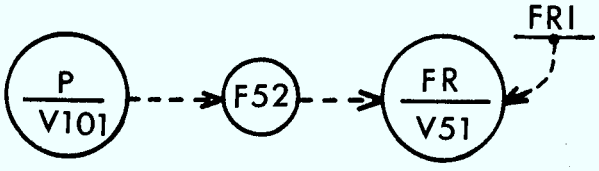
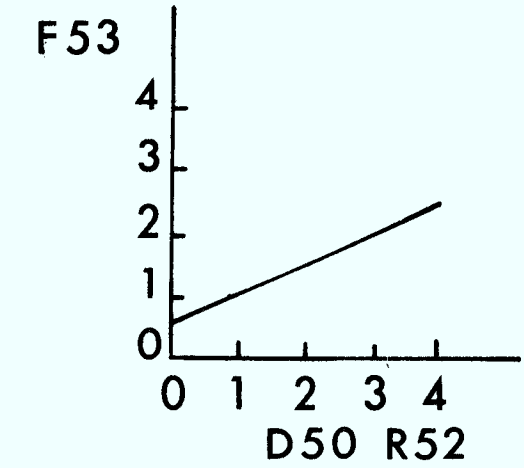
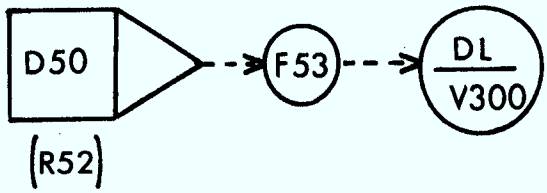
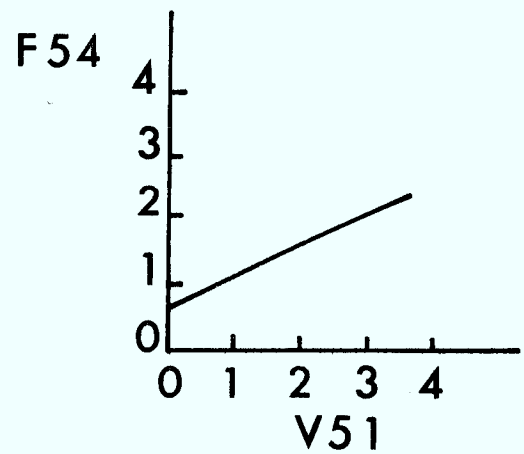
1
0
0 1 2 3 4
V101


P
V101
F52
FR
V51
FRI


F53
4
3
2
1
0
0 1 2 3 4
D50 R52


D50
(R52)
F53
DL
V300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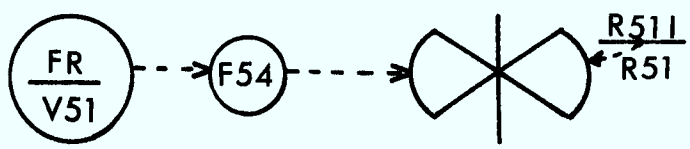
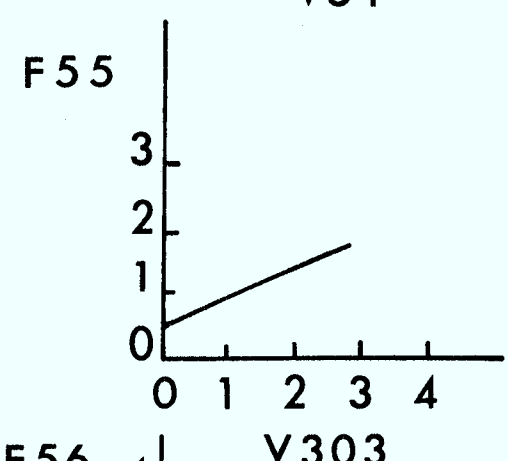
3
2
1
0
0 1 2 3 4
V51


FR
V51
F54
R511
R51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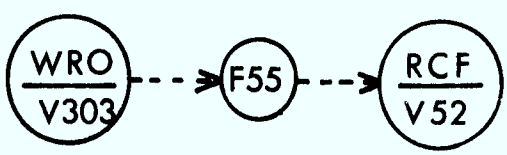
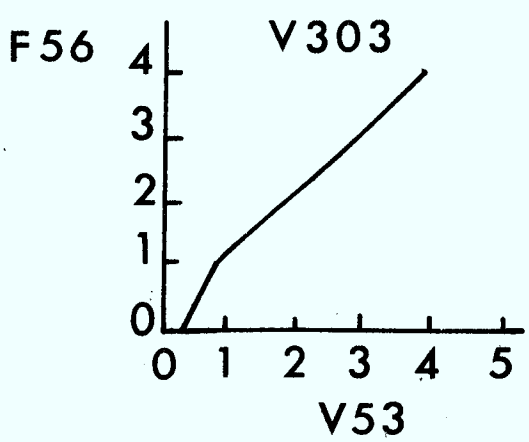
0
0 1 2 3 4
V303


WRO
V303
F55
RCF
V52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1
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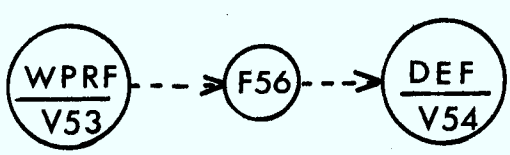
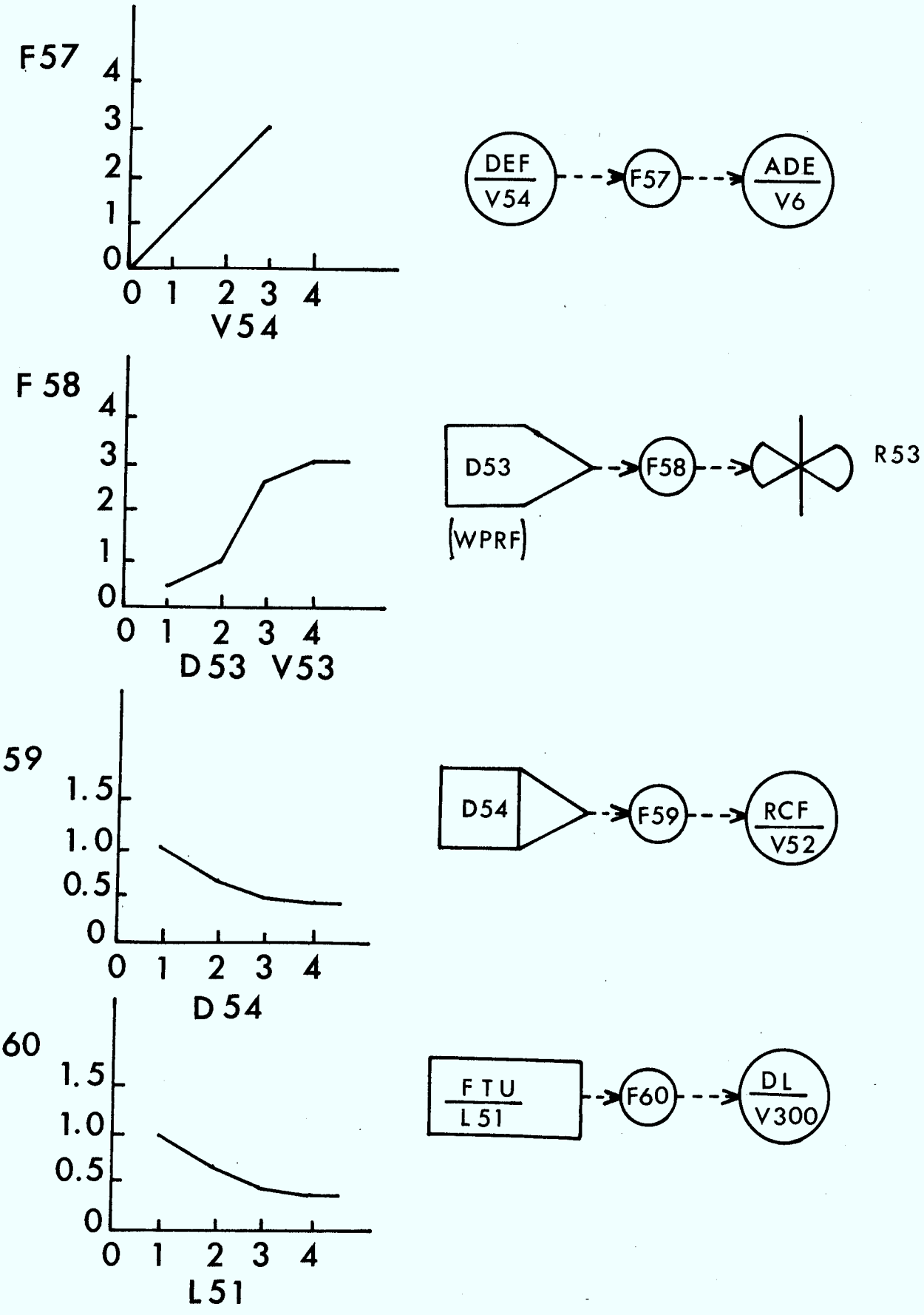
0 1 2 3 4 5
V53


WPRF
V53
F56
DEF
V54


F57
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3
2
1
0
0 1 2 3 4
V54
DEF
V54
F57
ADE
V6
F 58
4
3
2
1
0
0 1 2 3 4
D53 V53
D53
(WPRF)
F58
R53
F59
1.5
1.0
0.5
0
0 1 2 3 4
D 54
D54
F59
RCF
V52
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1.0
0.5
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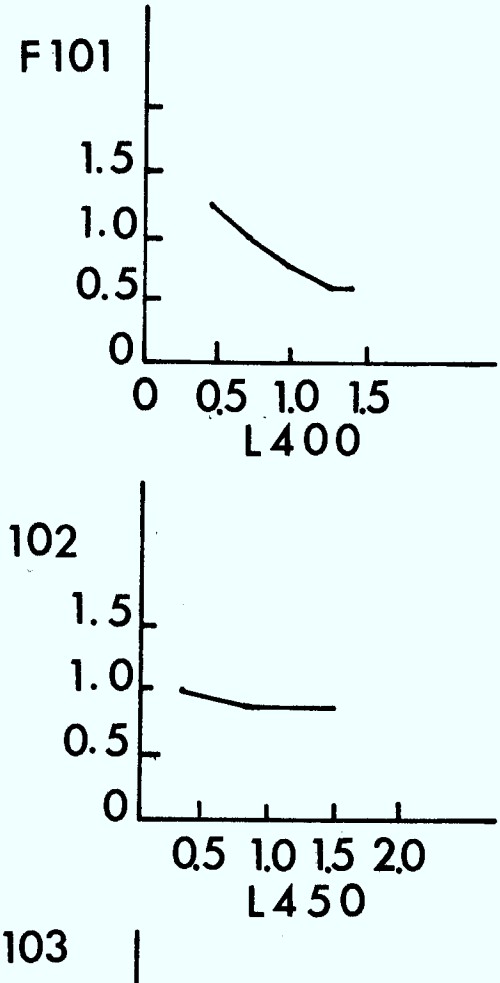
0 1 2 3 4
L51
FTU
L51
F60
DL
V300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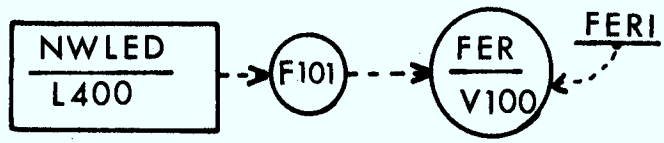
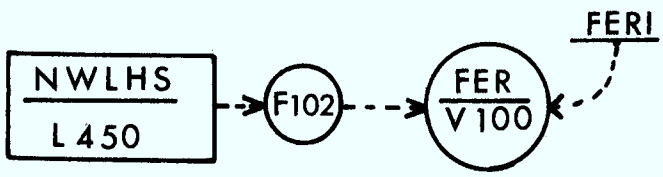
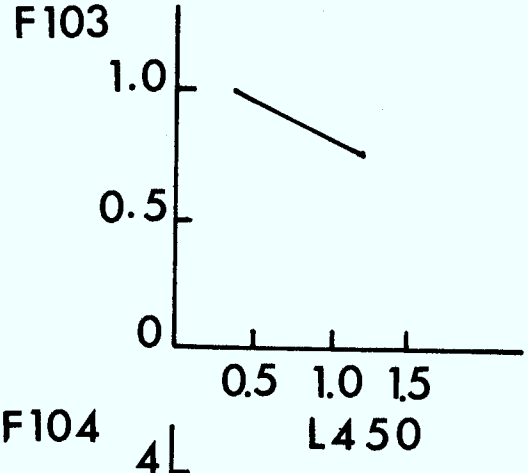
1.0
0.5
0
0 0.5 1.0 1.5
L400


NWLED
L400
F101
FER
V100
FERI

F102
1.5
1.0
0.5
0
0.5 1.0 1.5 2.0
L450


NWLHS
L450
F102
FER
V100
FERI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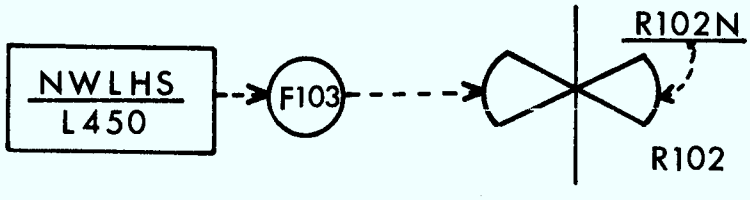
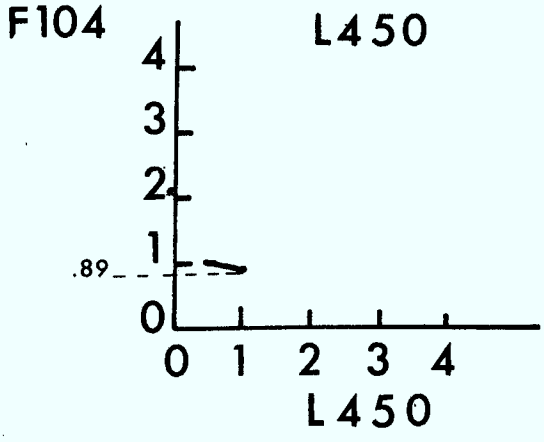
0.5
0
0.5 1.0 1.5
L450


NWLHS
L450
F103
R102N
R102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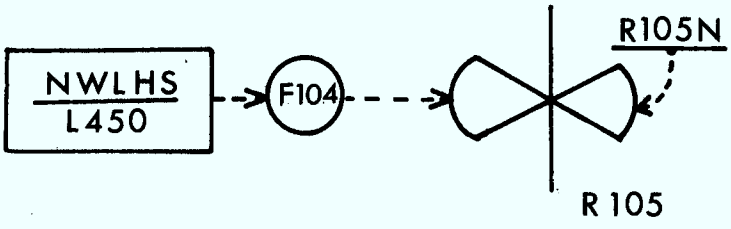
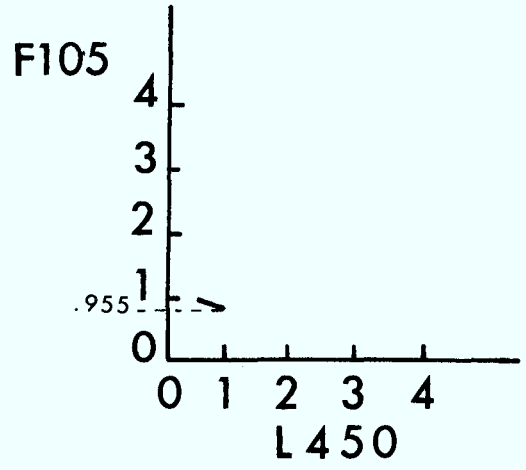
3
2
1
.89
0
0 1 2 3 4
L450


NWLHS
L450
F104
R105N
R 105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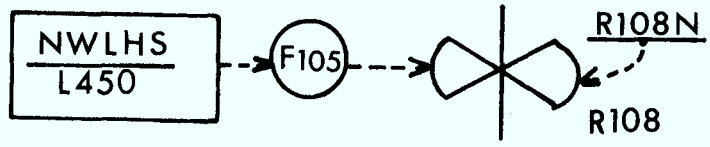
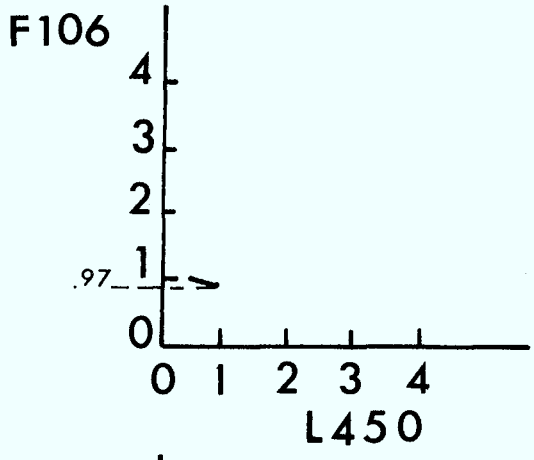
3
2
1
.955
1
0
0 1 2 3 4
L450


NWLHS
L450
F105
R108N
R108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3
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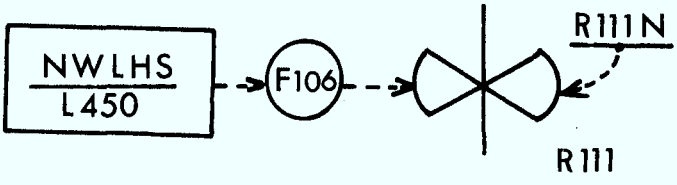
1
.97
1
0
0 1 2 3 4
L450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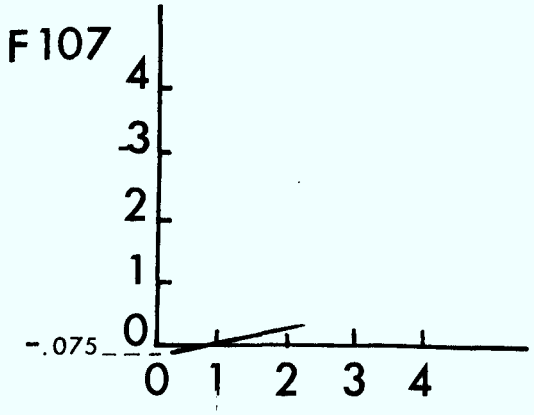
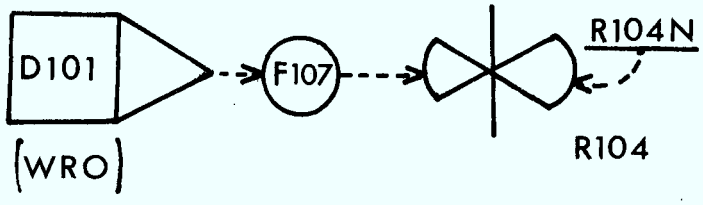
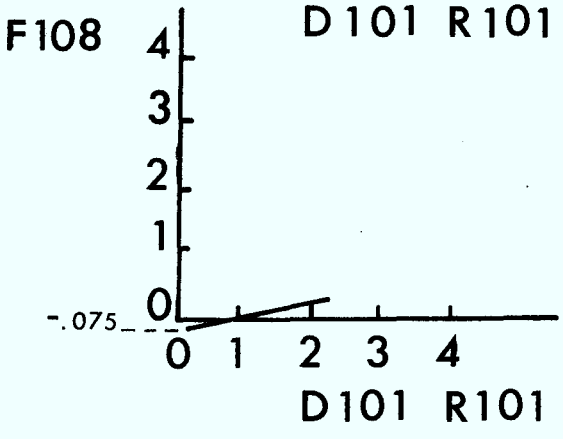
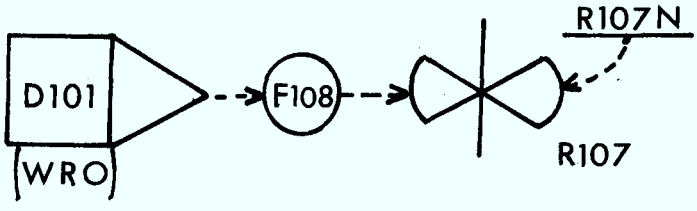
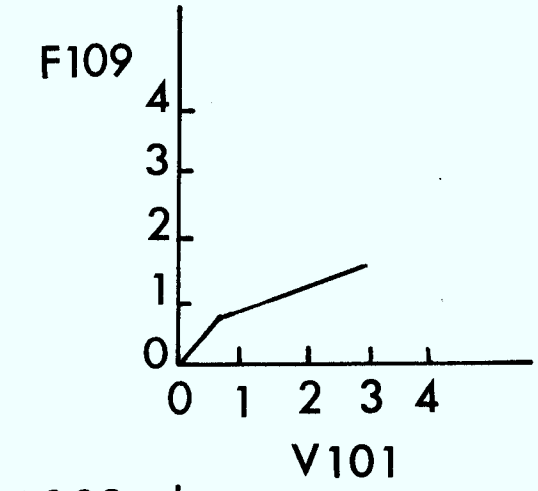
L450
F106
R111N
R111

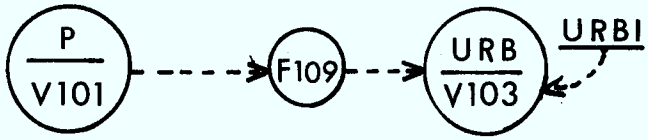

F107
4
3
2
1
0
-.075
0 1 2 3 4
D101 R101

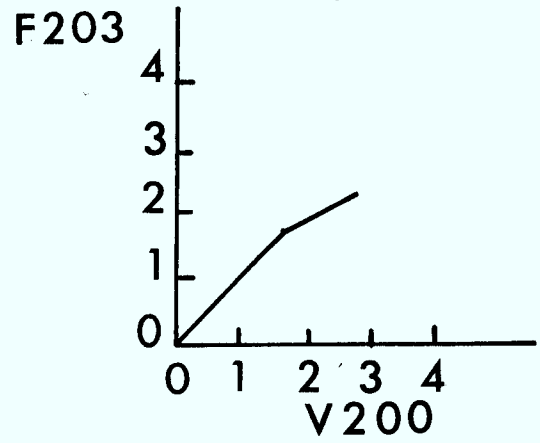

D101
(WRO)
F107
R104N
R104


F108
4
3
2
1
0
-.075
0 1 2 3 4
D101 R101


D101
(WRO)
F108
R107N
R107


F109
4
3
2
1
0
0 1 2 3 4
V101


P
V101
F109
URB
V103
URBI


F203
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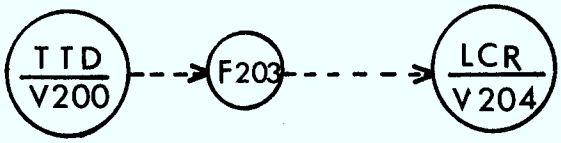
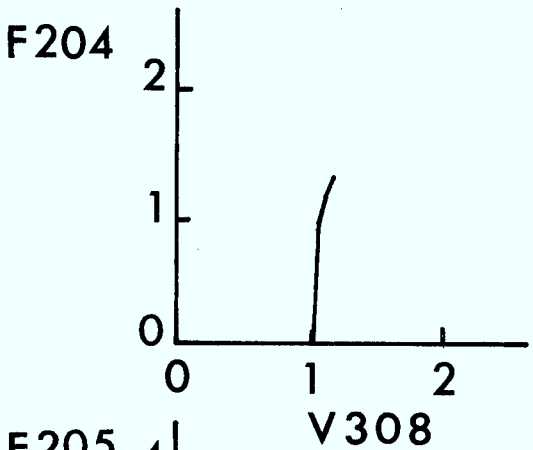
3
2
1
0
0 1 2 3 4
V200


TTD
V200
F203
LCR
V204


F204
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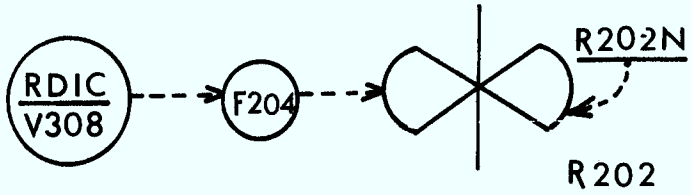
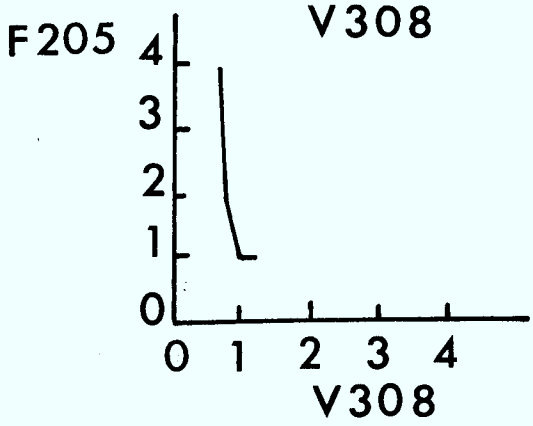
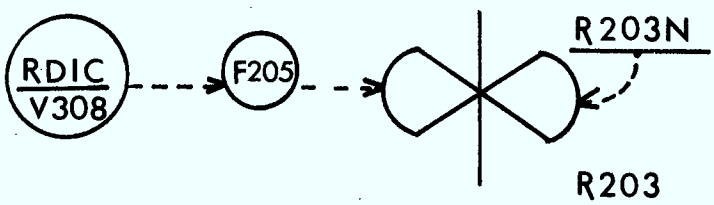
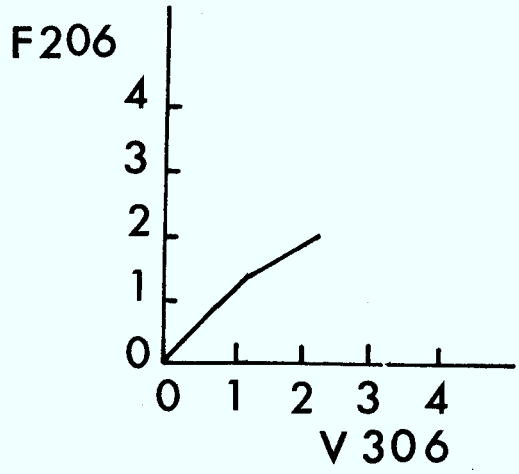
1
0
0 1 2
V308


RDIC
V308
F204
R202N
R202


F205
4
3
2
1
0
0 1 2 3 4
V308


RDIC
V308
F205
R203N
R203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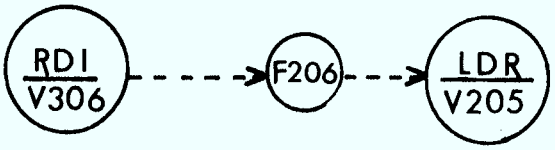
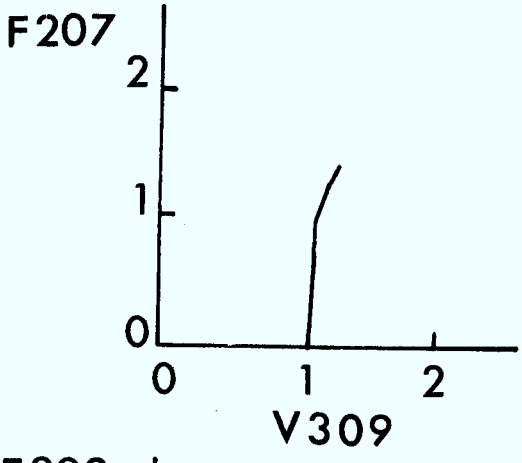
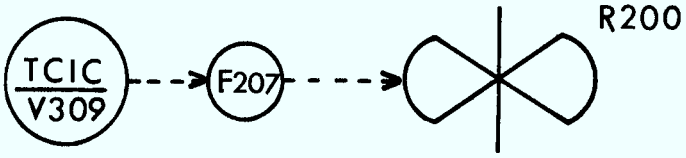
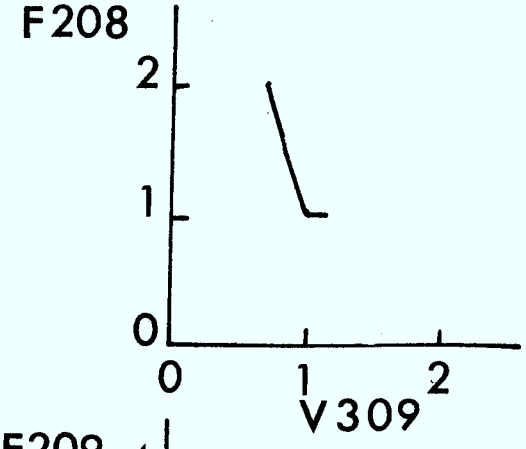
1
0
0 1 2 3 4
V 306


RDI
V306
F206
LDR
V205


F207
2
1
0
0 1 2
V309


TCIC
V309
F207
R200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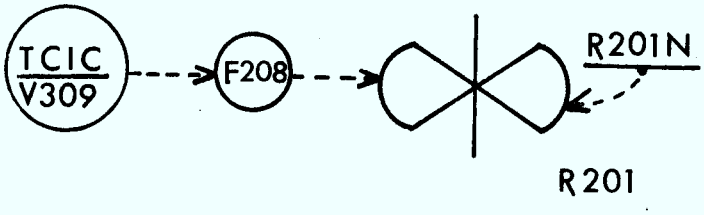
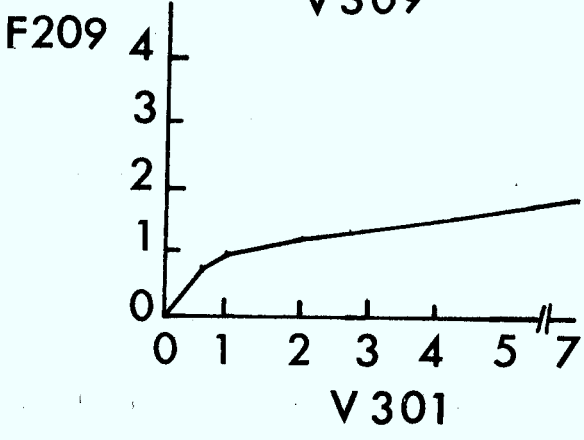
2
1
0
0 1 2
V309


TCIC
V309
F208
R201N
R201


F209
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3
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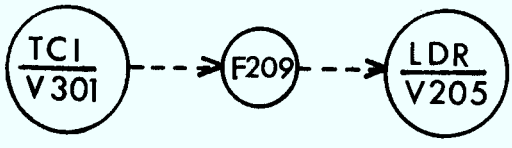
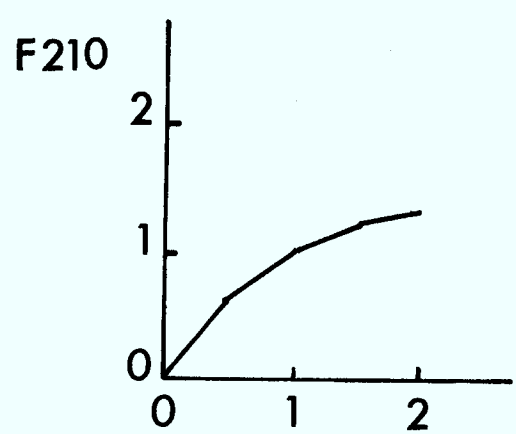
0
0 1 2 3 4 5 7
V 301


TCI
V301
F209
LDR
V205


F210
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1
0
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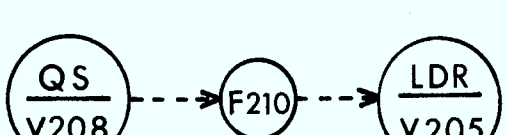
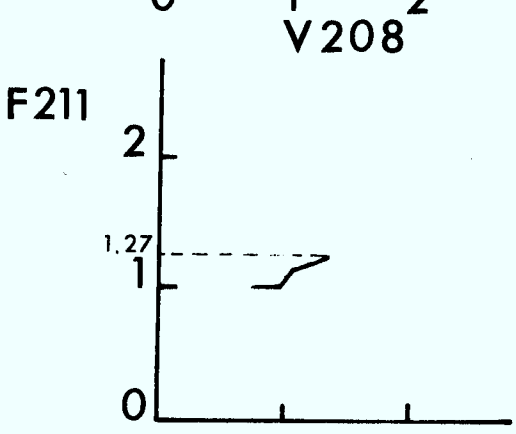
1
2
V208


QS
V208
F210
LDR
V205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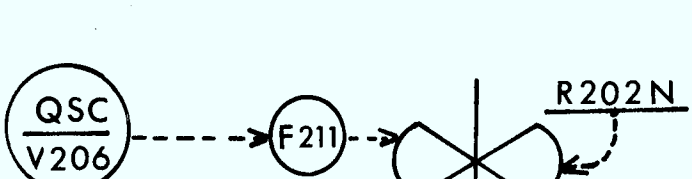
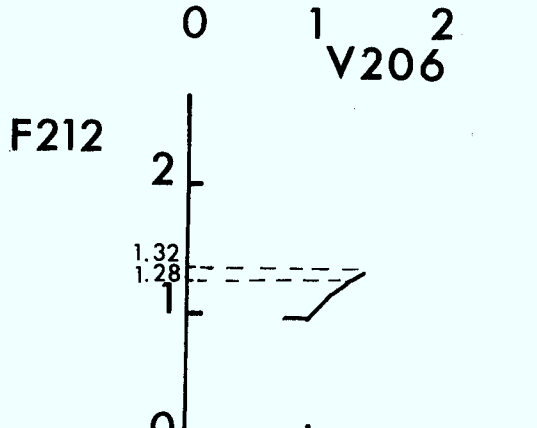
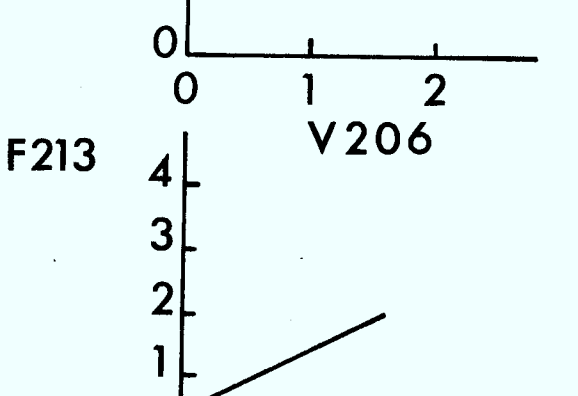
1
2
V206


QSC
V206
F211
R202N
R202


F212
2
1.32
1.28
1
0
0
1
2
V206


QSC
V206
F212
R200


F213
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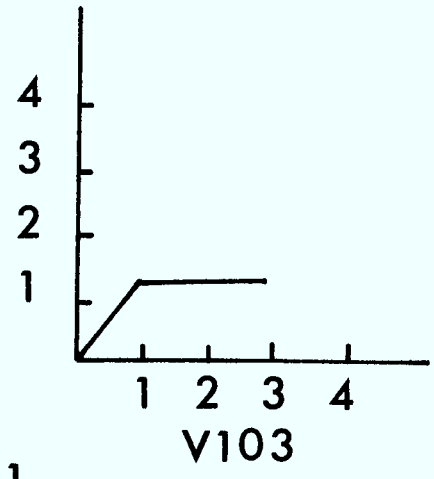
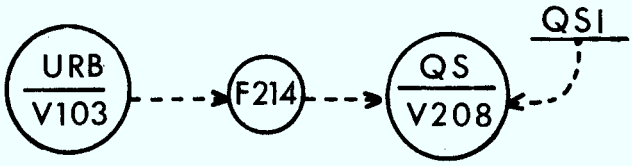
2
1
0
0 1 2 3 4
D200 V209


D200
F213
R200
(TPIC)

F214





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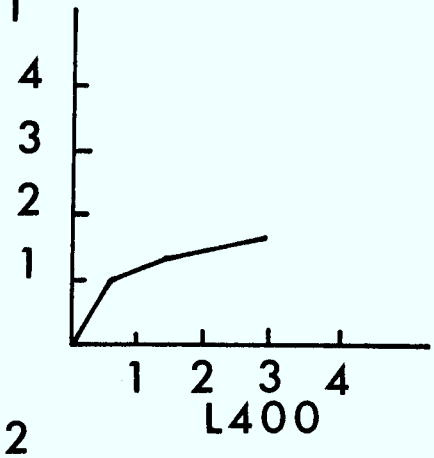

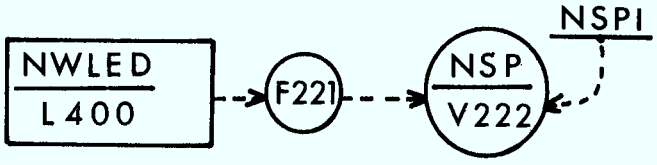

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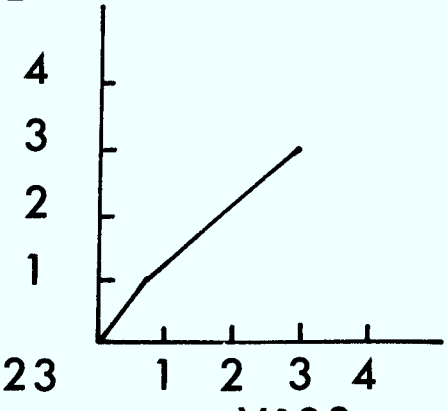

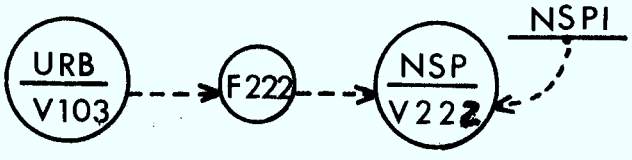

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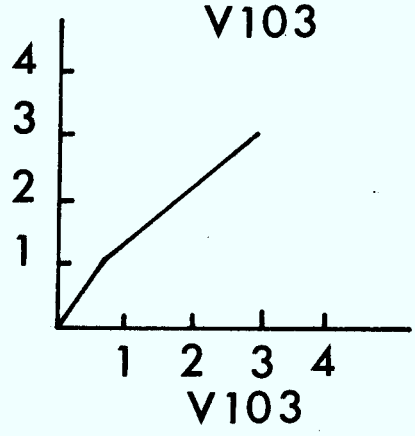

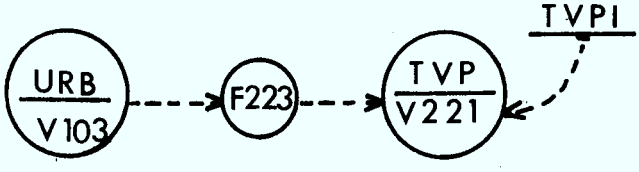

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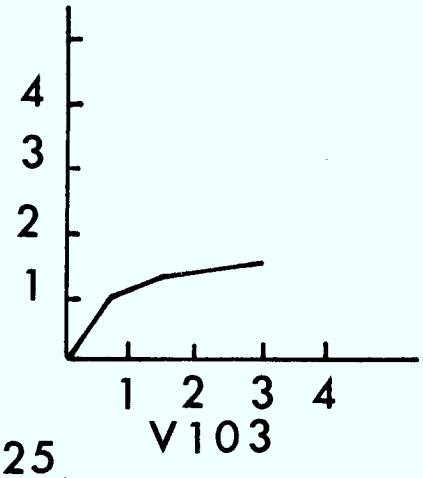

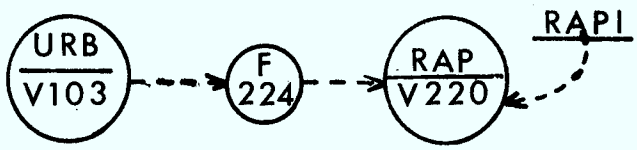

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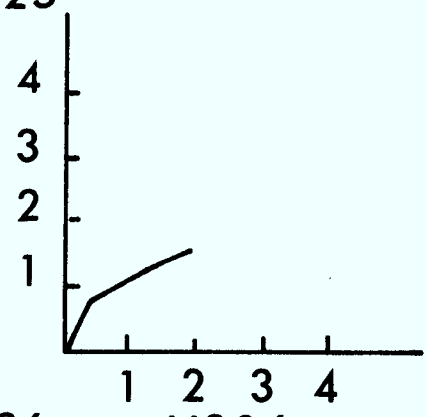

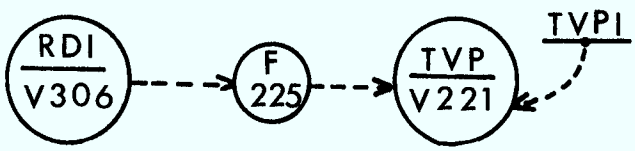

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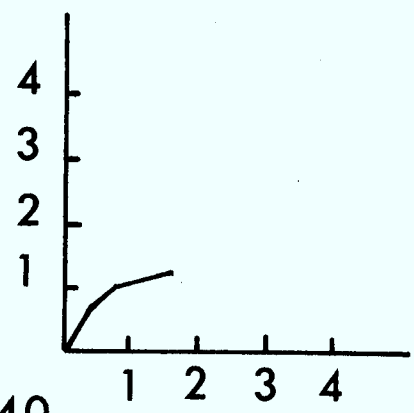

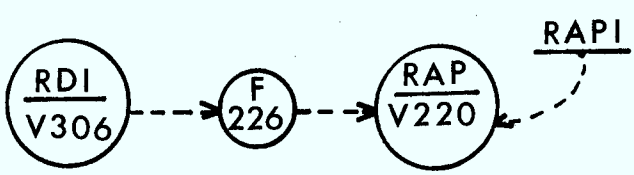

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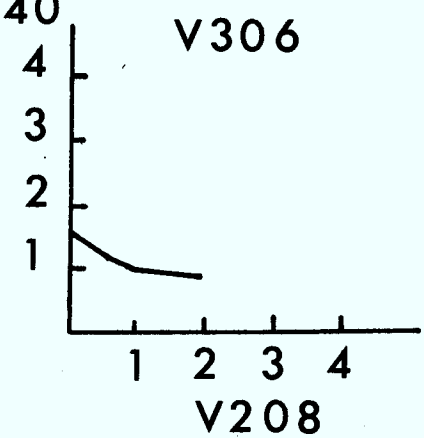

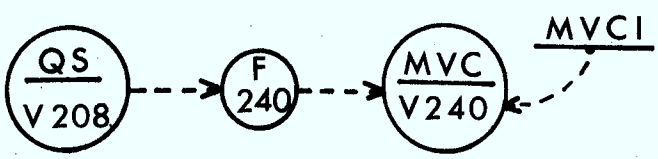

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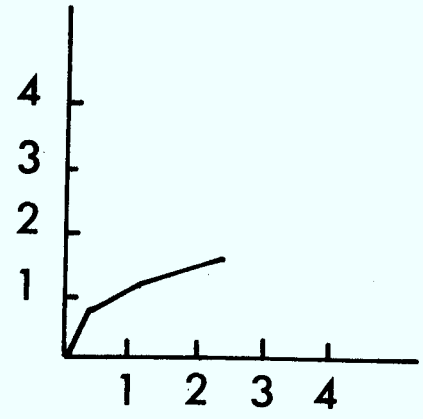

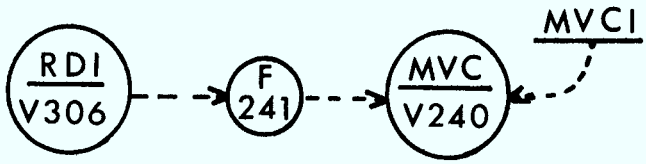

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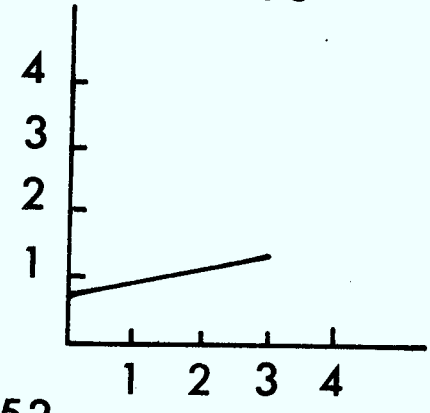

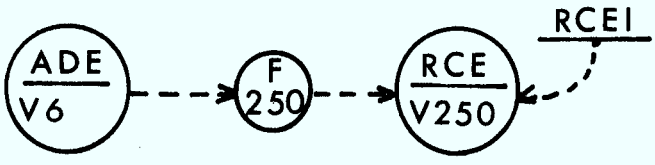

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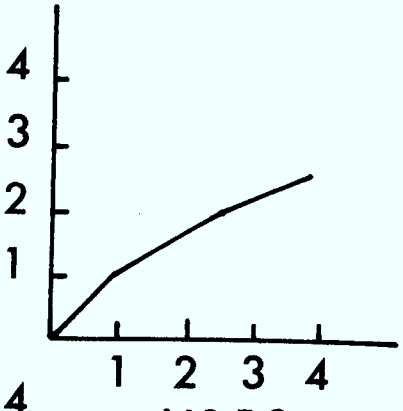

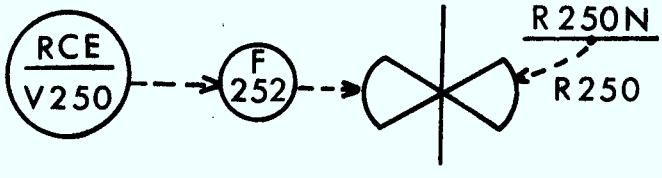

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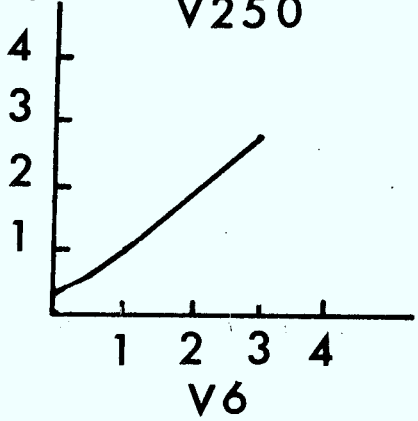

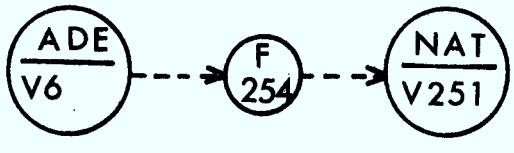

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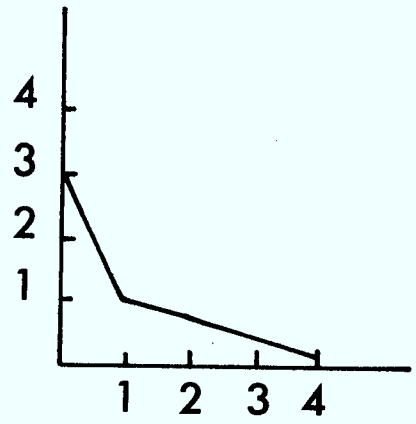

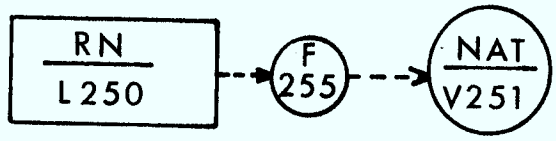

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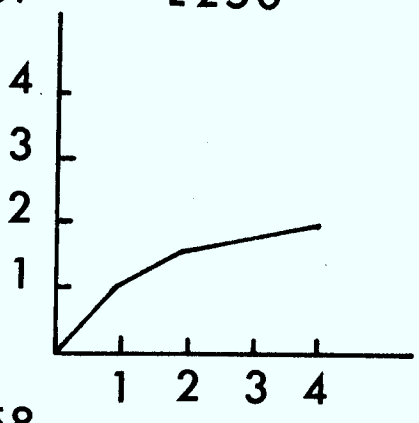

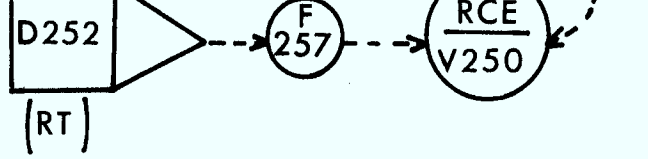

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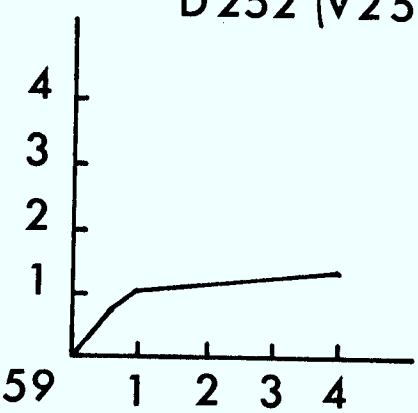

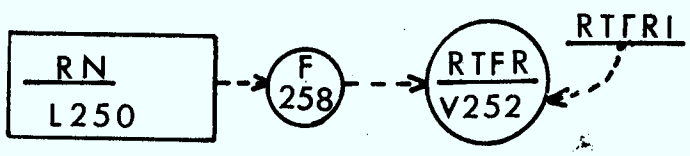

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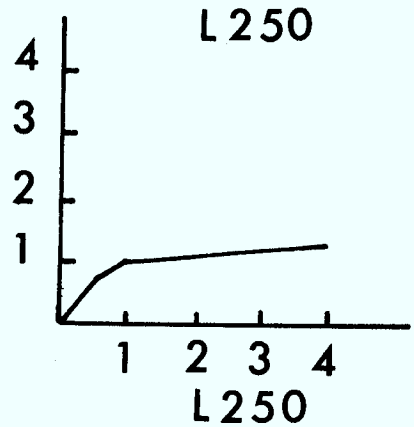

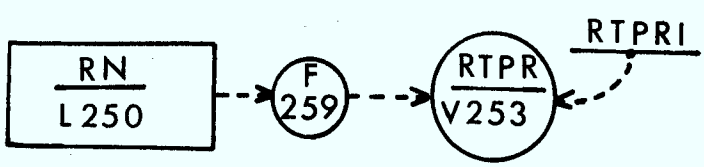

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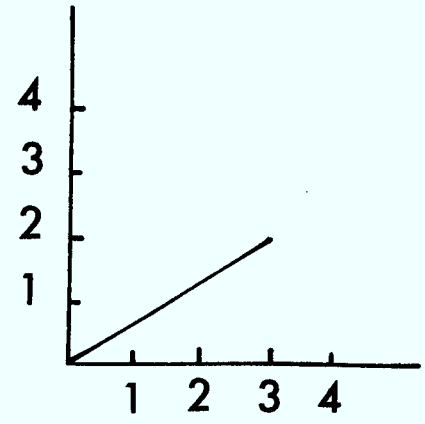

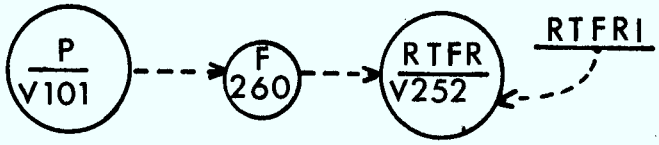

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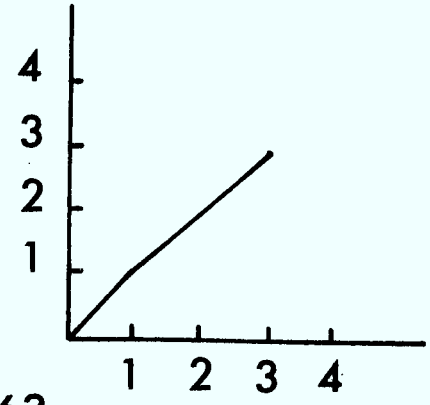

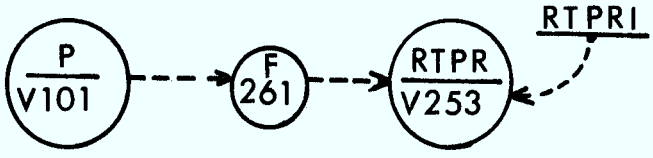

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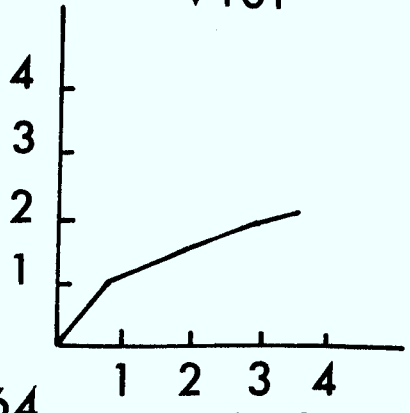

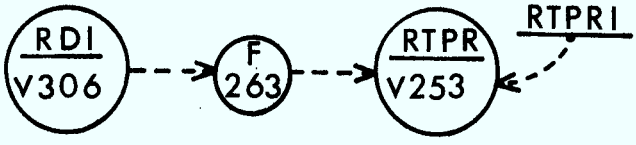

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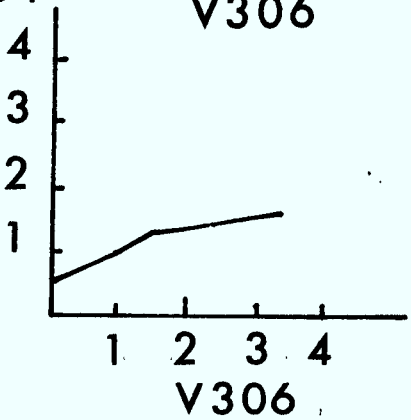

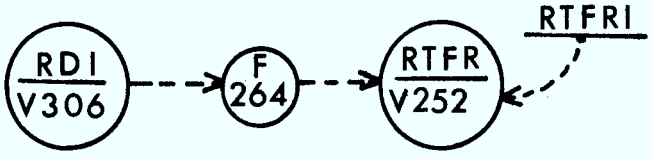

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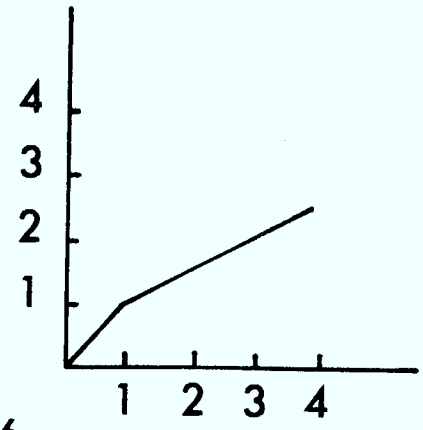
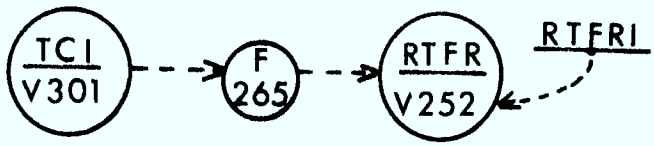
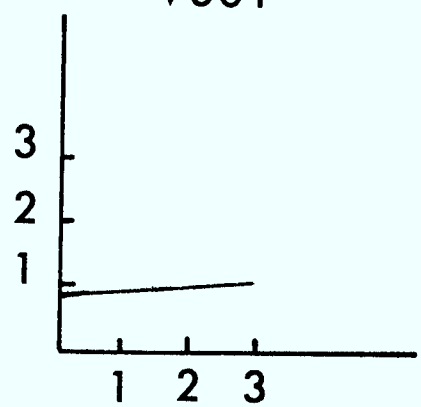
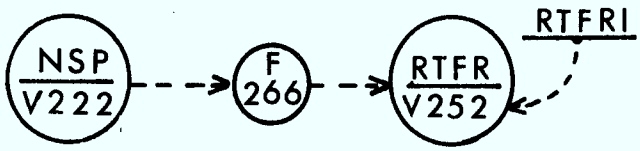




F266





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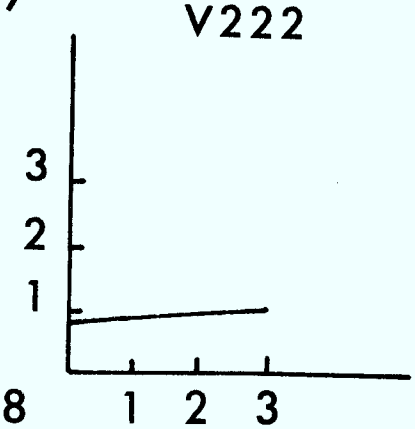

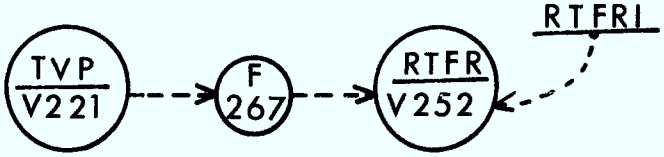

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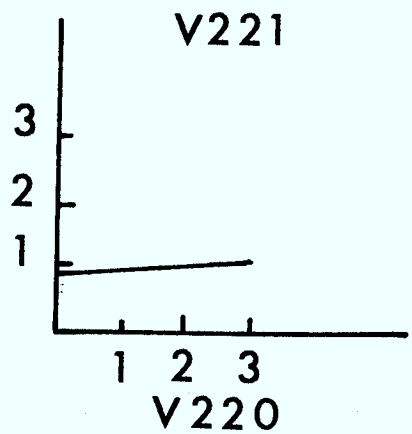

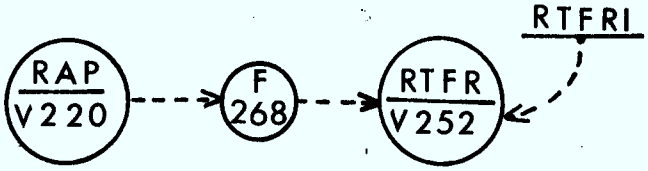

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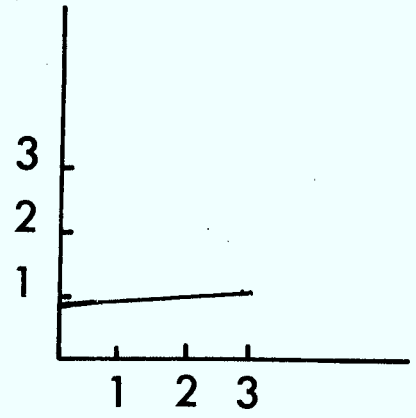

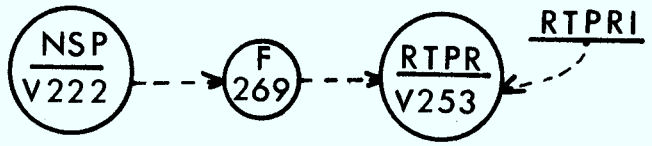

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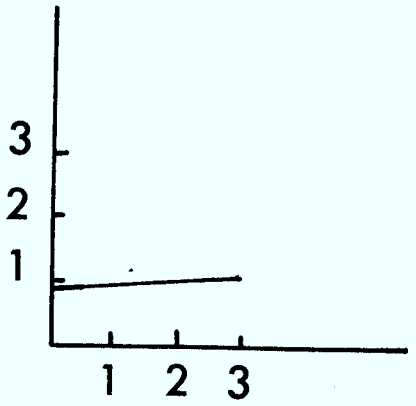

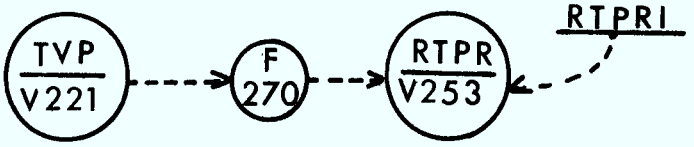

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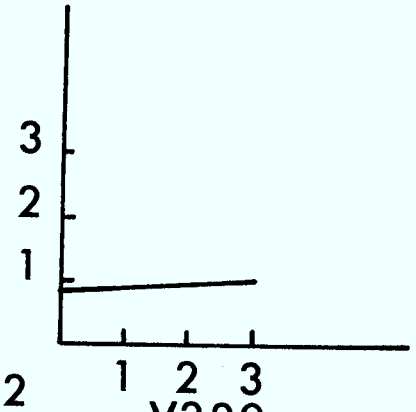

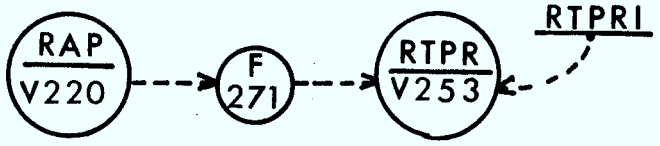

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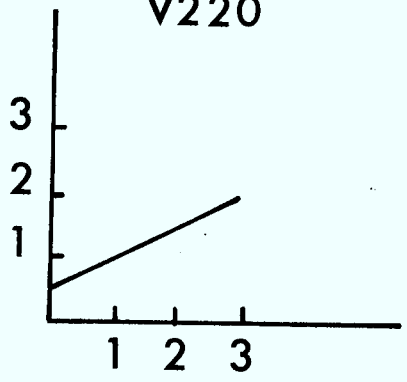

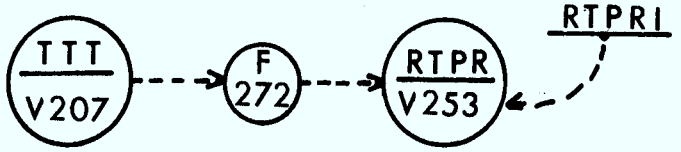

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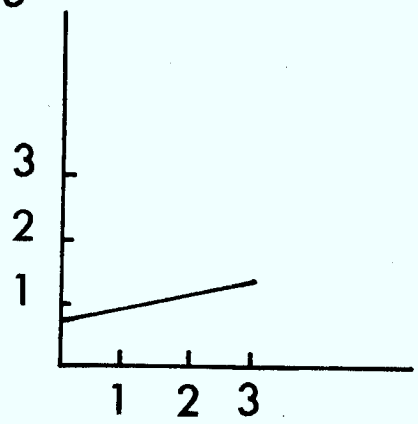

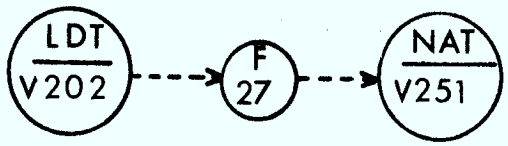

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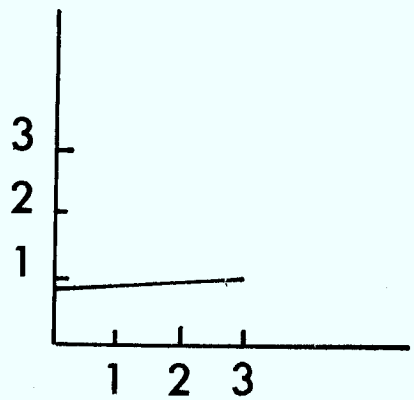

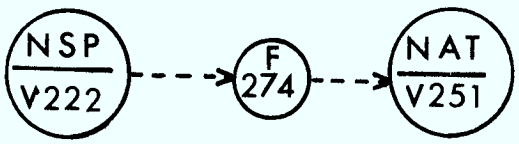

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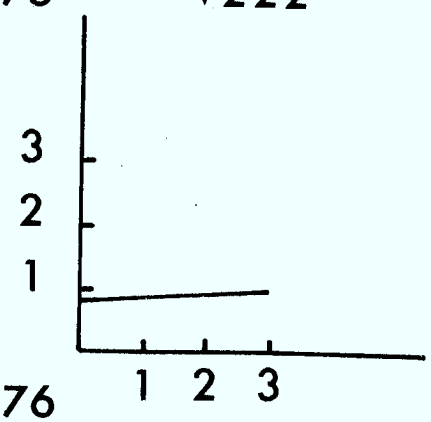

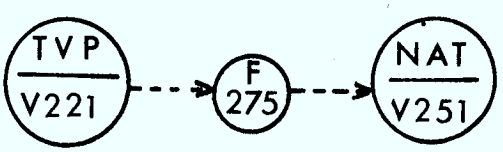

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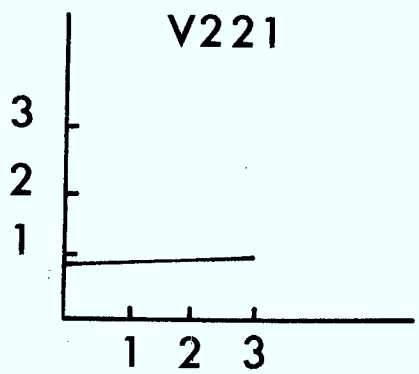

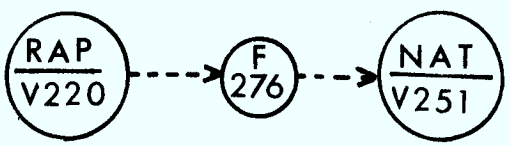

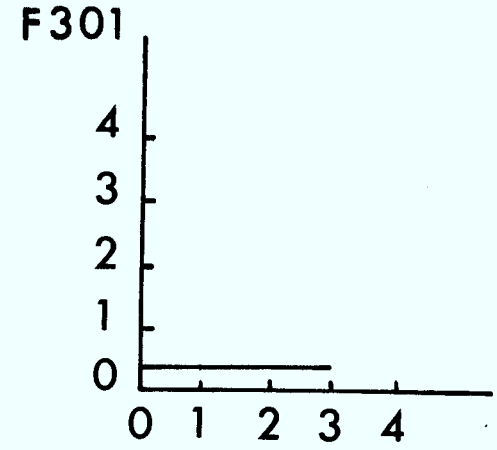
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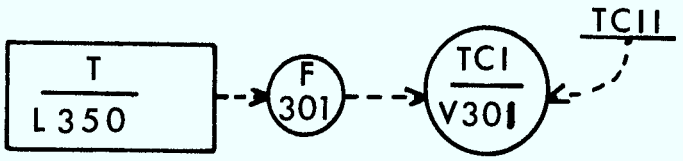
L350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TCI
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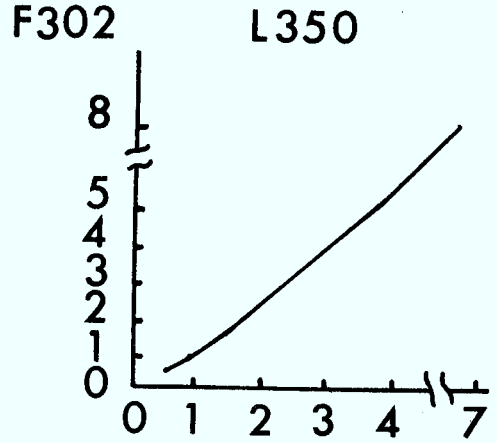
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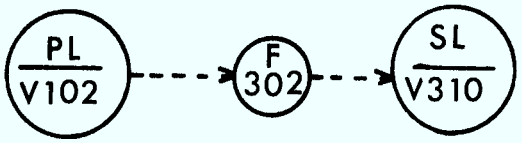
PL
V102
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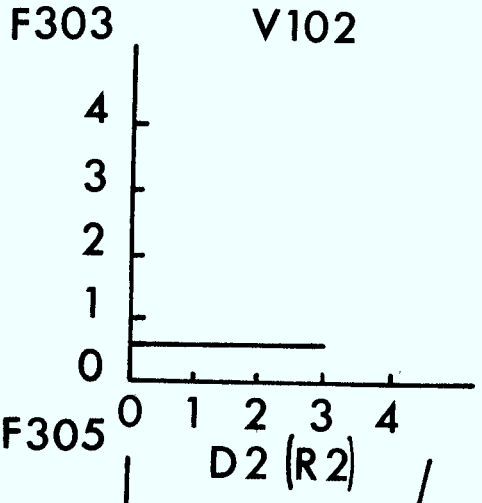
302
SL
V310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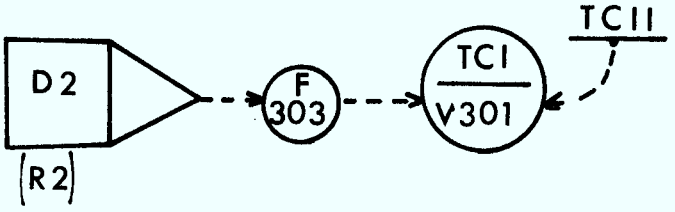
D2 (R2)


D2
(R2)
F
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TCI
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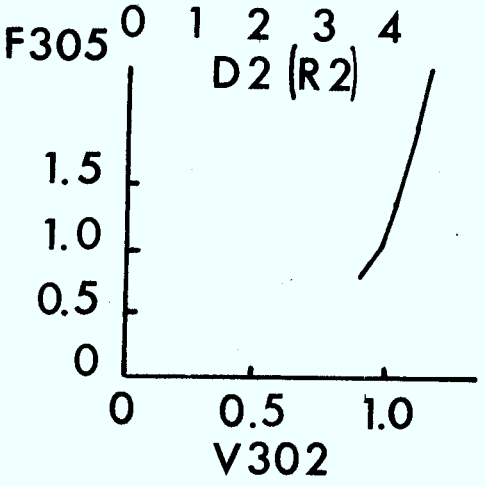
TCII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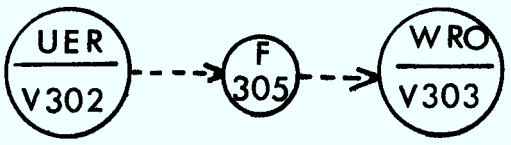
V302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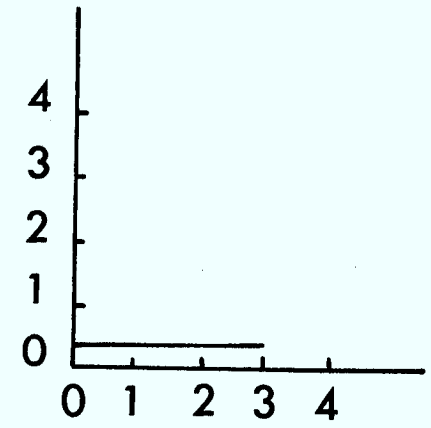
F
305
WRO
V303

F306



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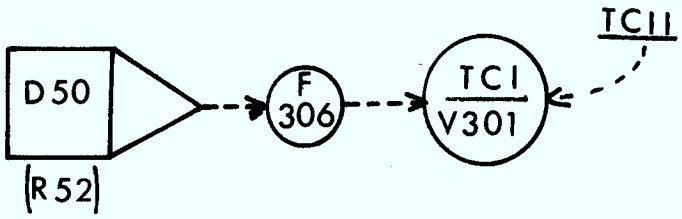

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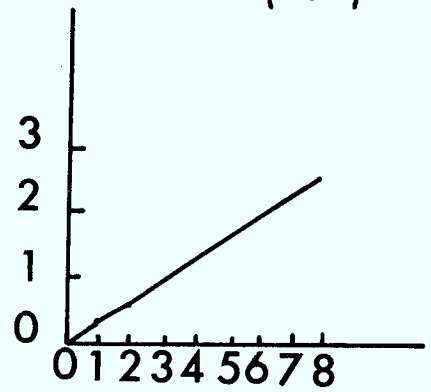

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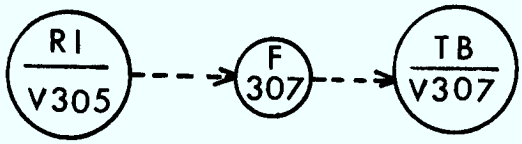

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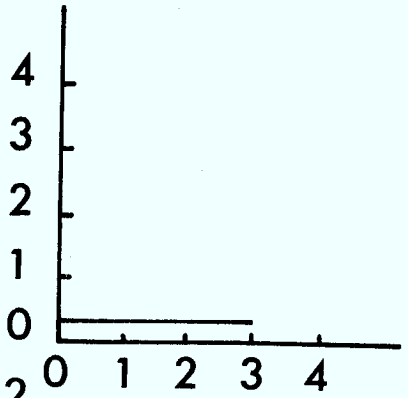
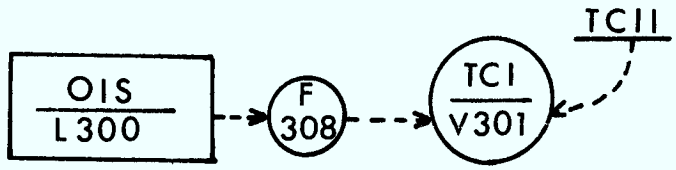


L300



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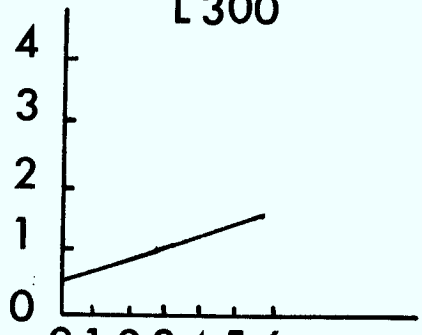
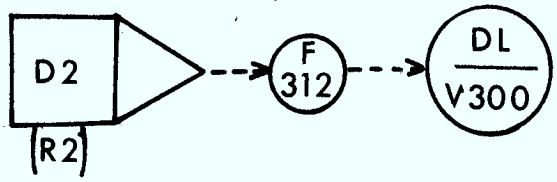


D2 (R2)



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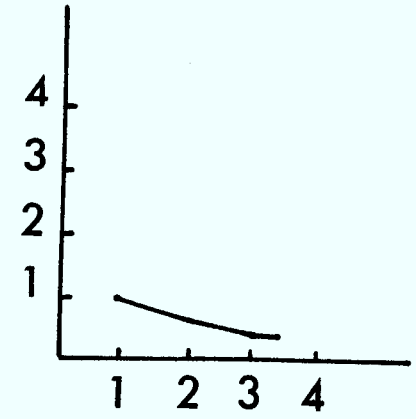

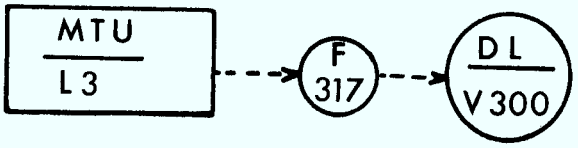

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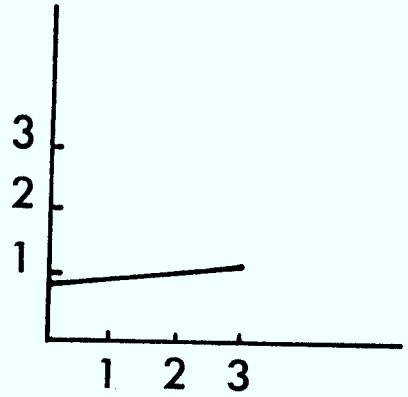

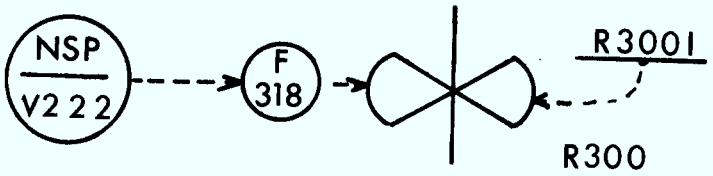

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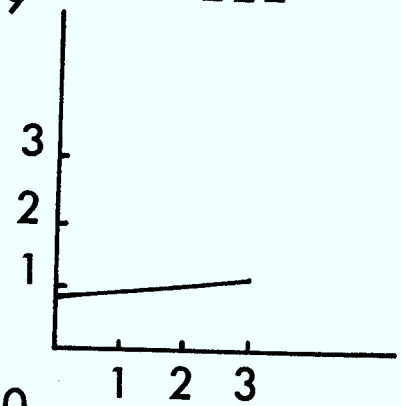

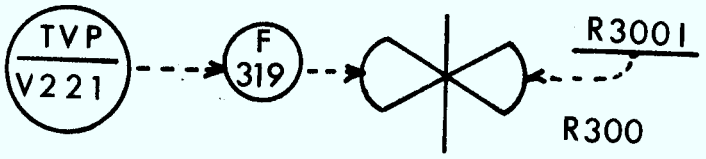

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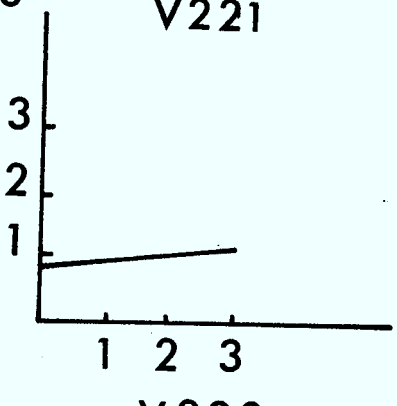

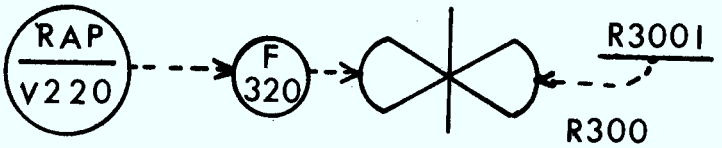

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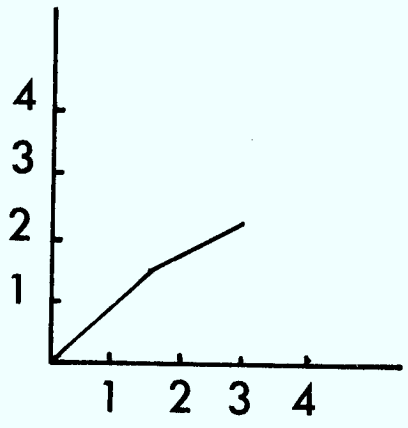

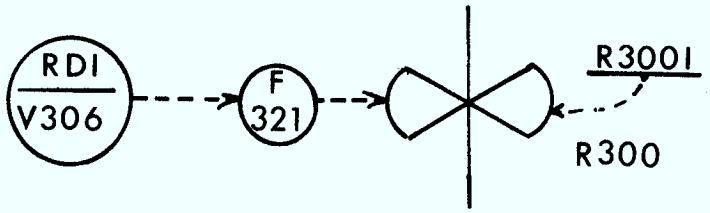

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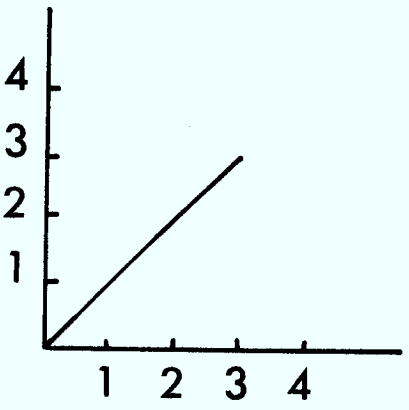

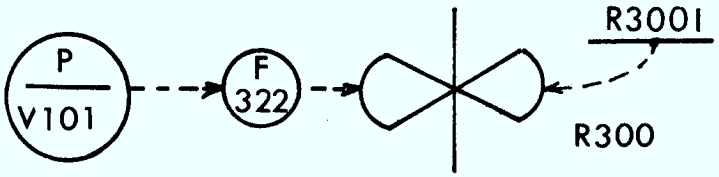

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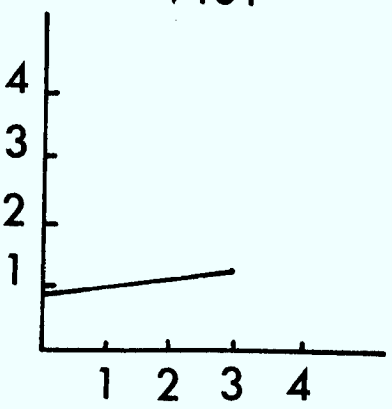

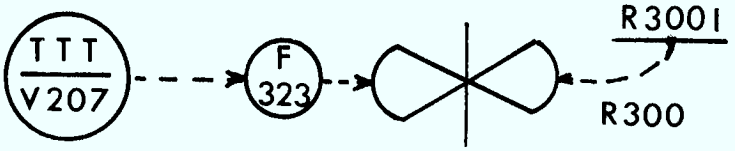

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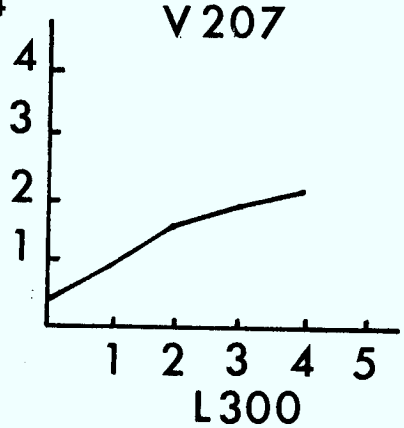

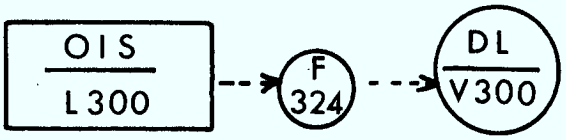

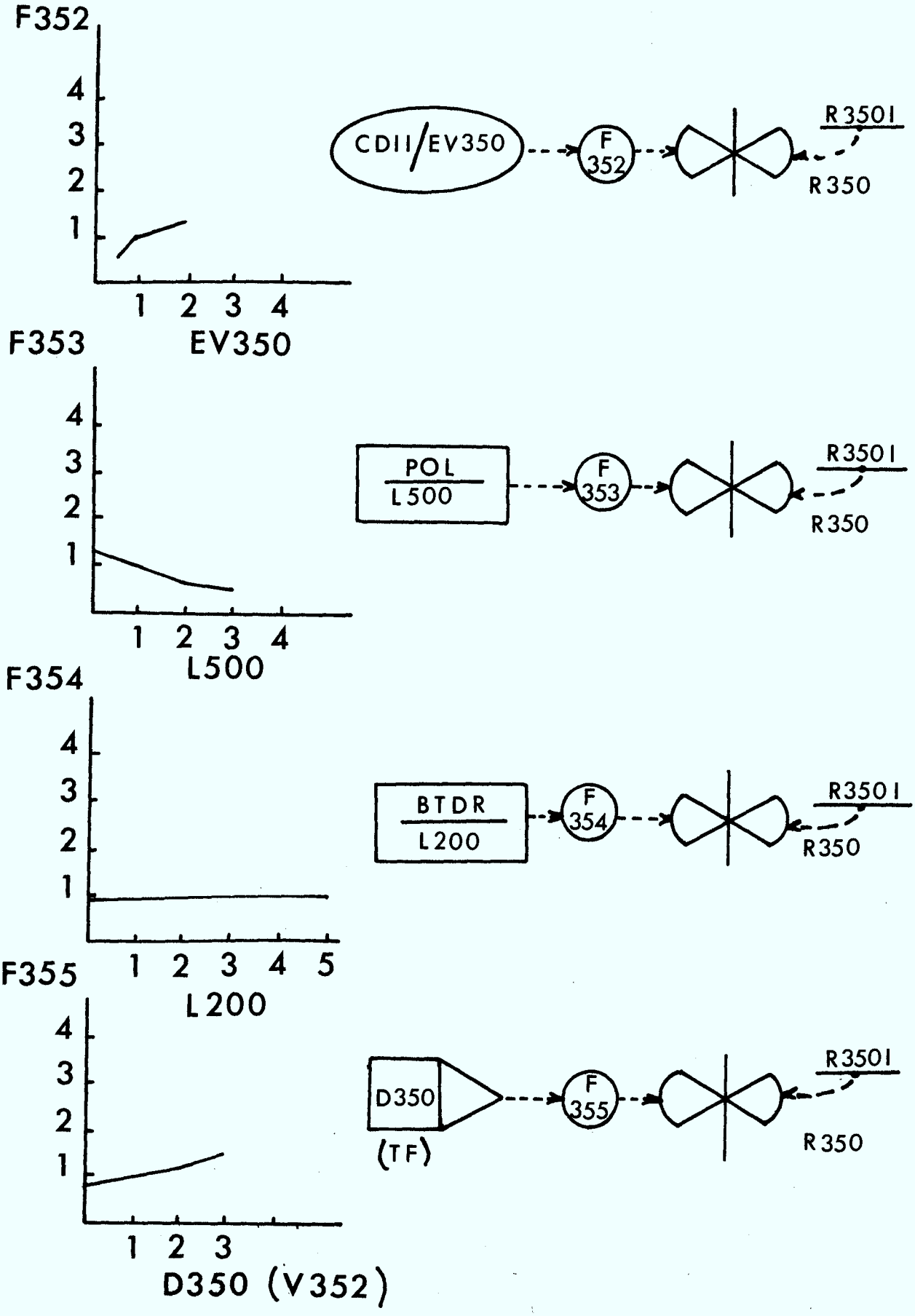
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R3501
R350
F354
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BTDR
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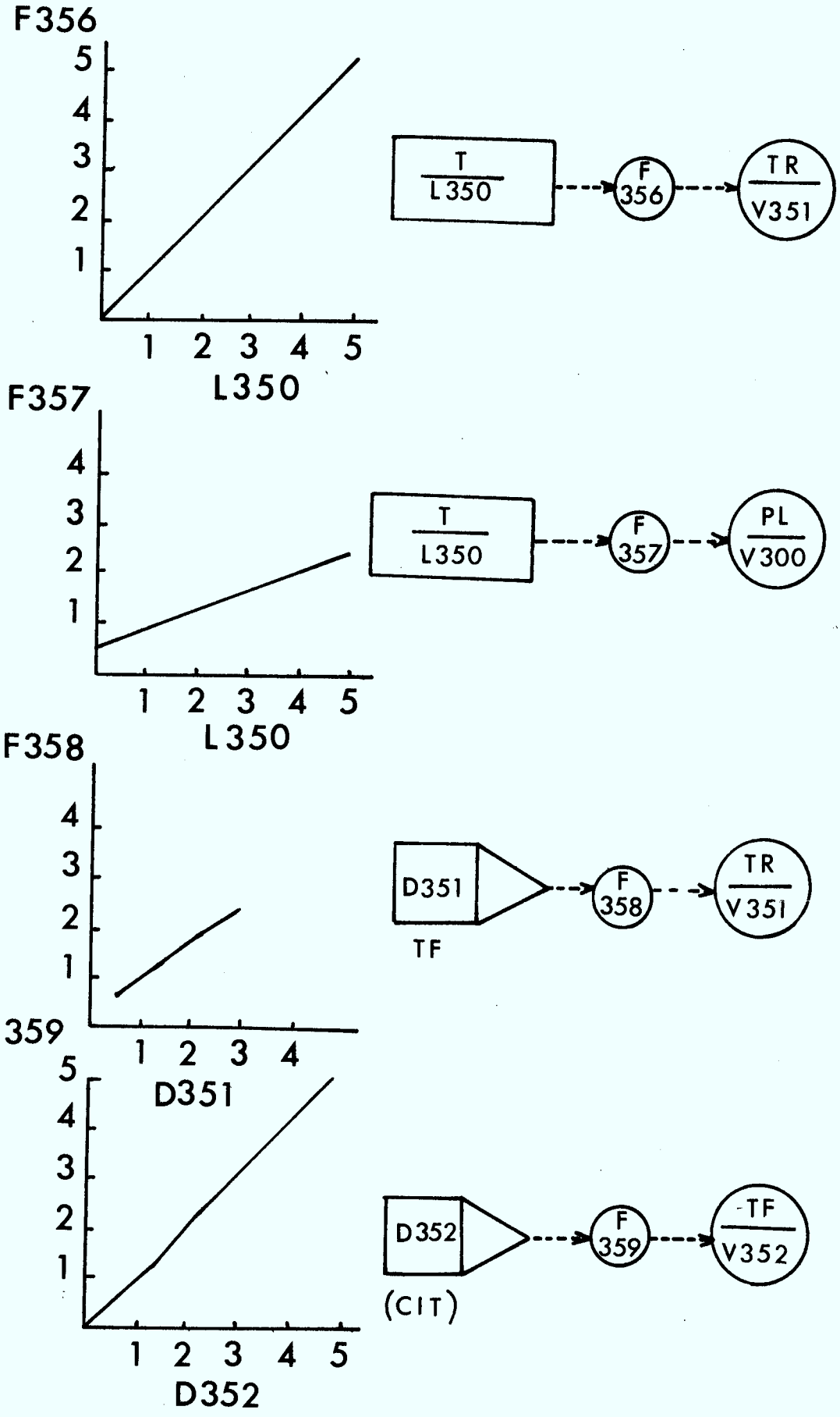
D350
(TF)
F 355
R3501
R350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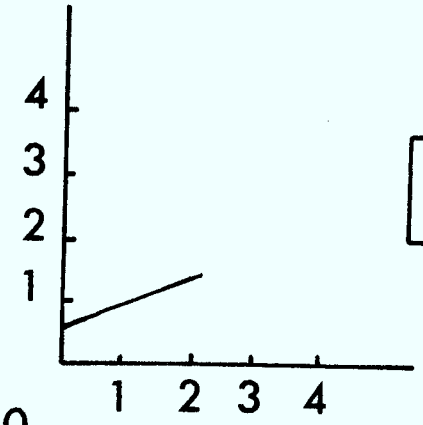

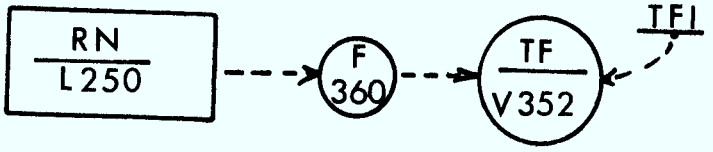

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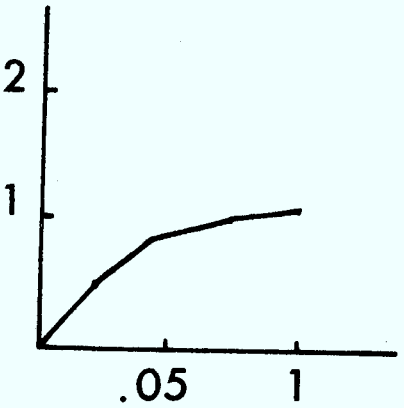

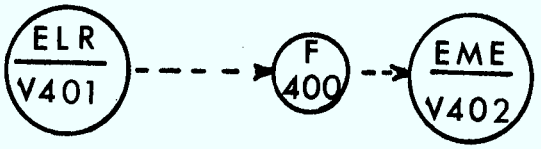

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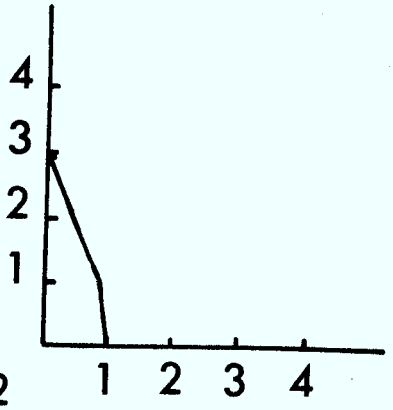

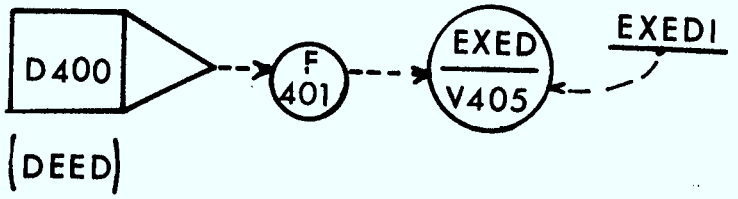

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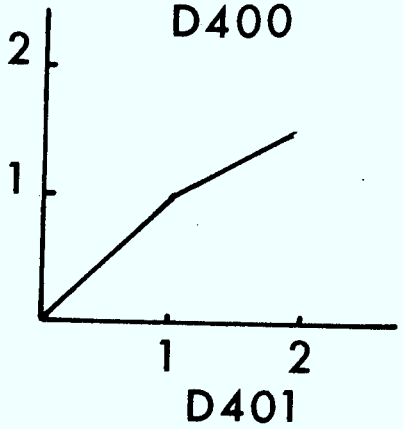

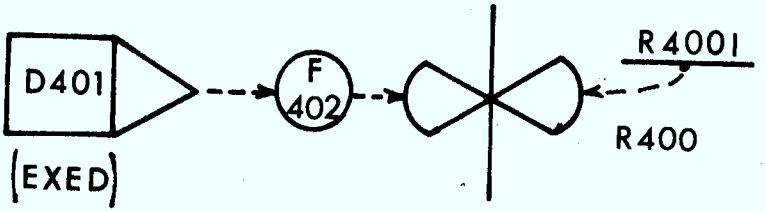

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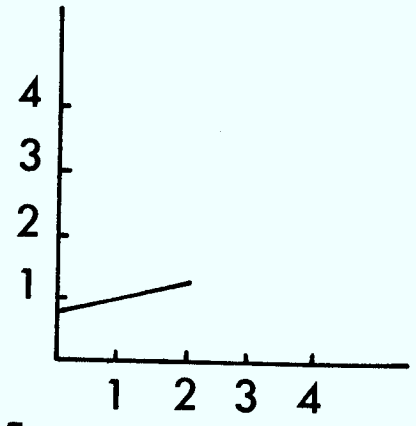

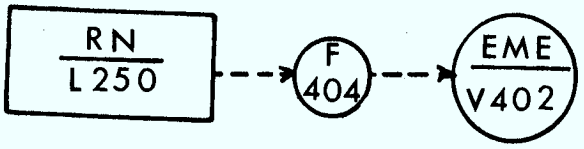

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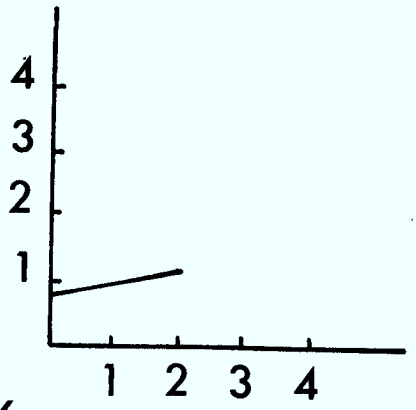

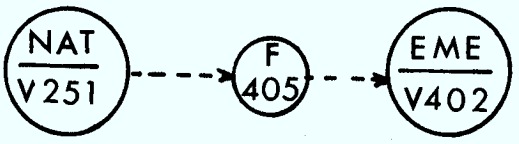

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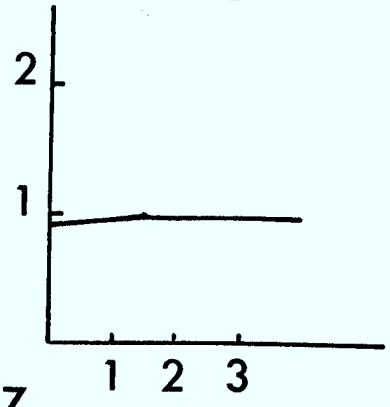

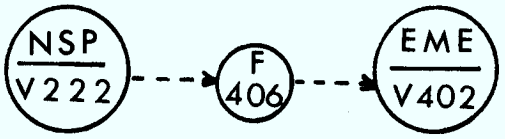

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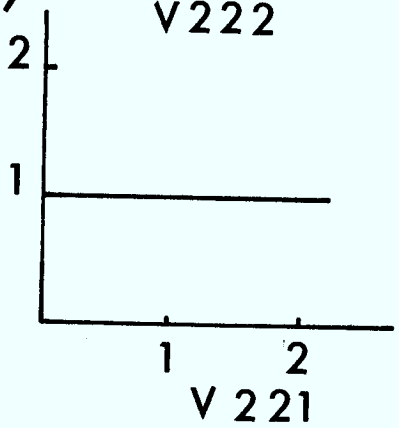

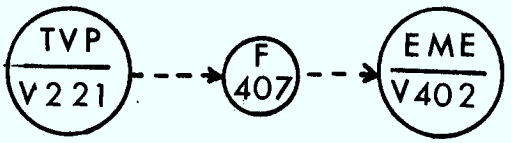

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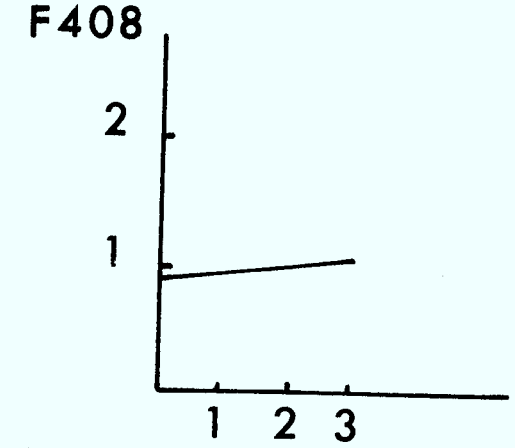

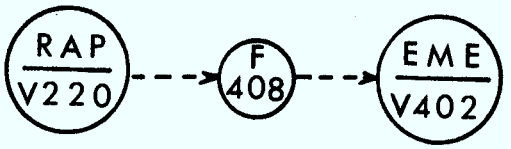

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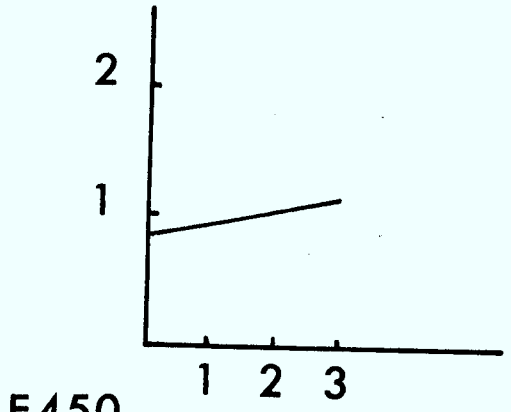

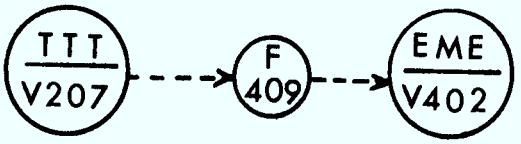

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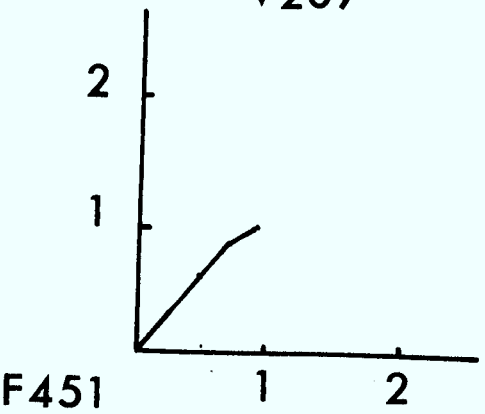

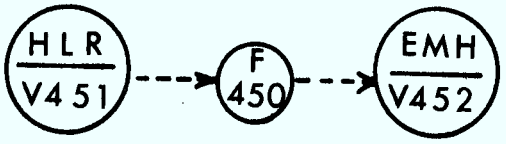

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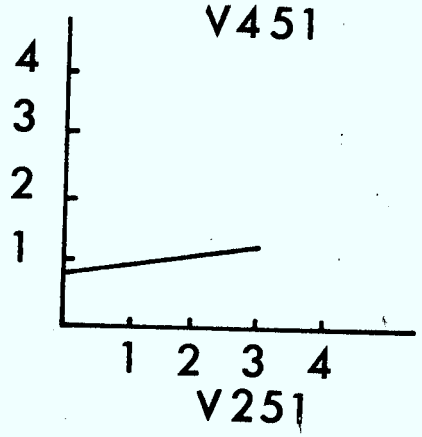

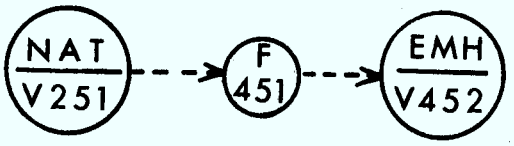

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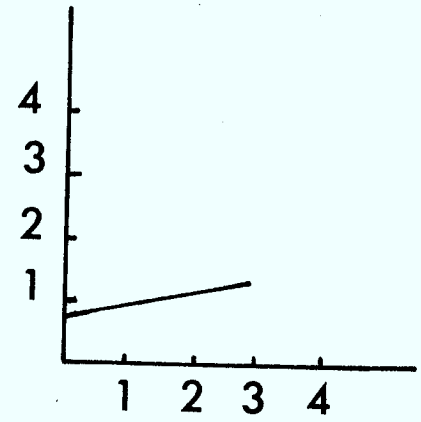

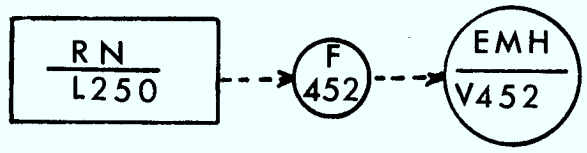

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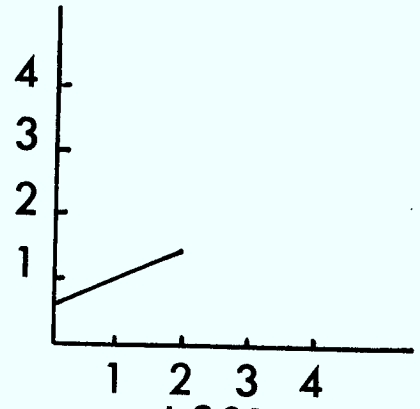

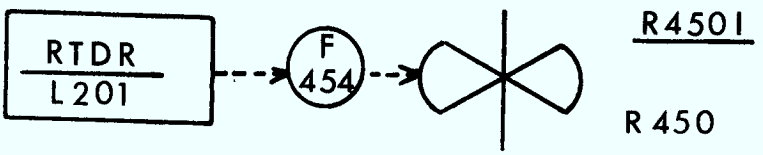

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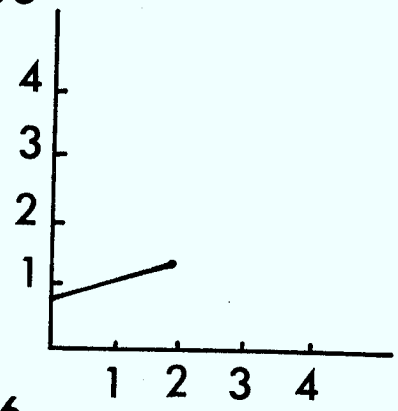

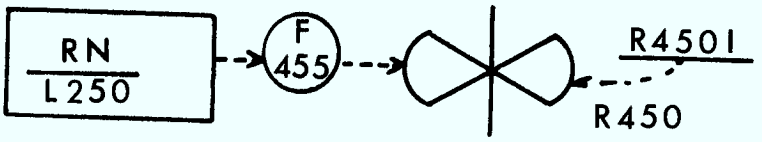

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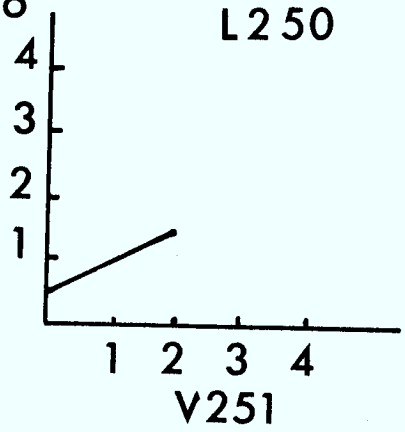

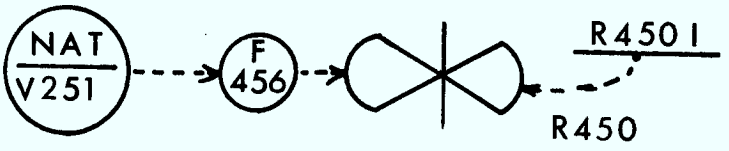

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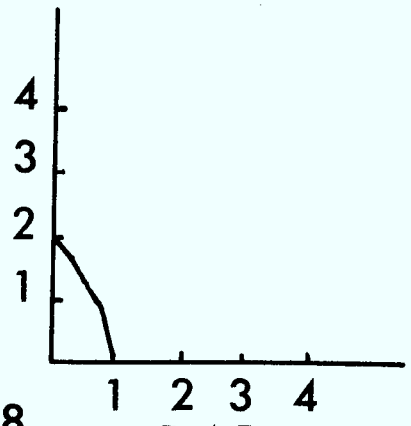

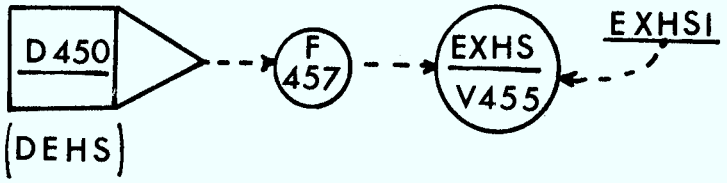

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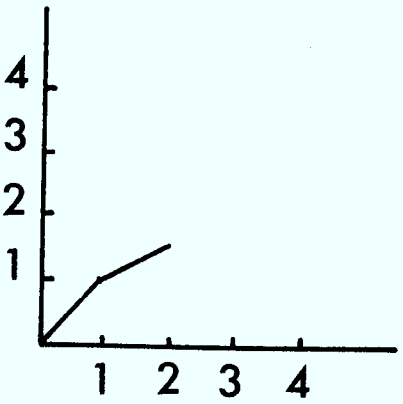

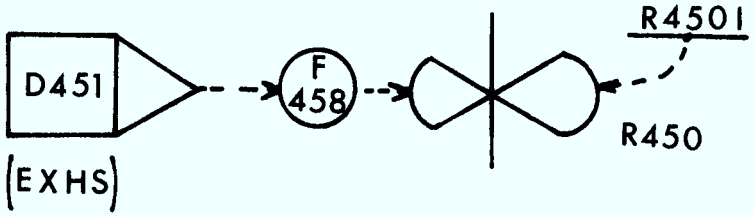

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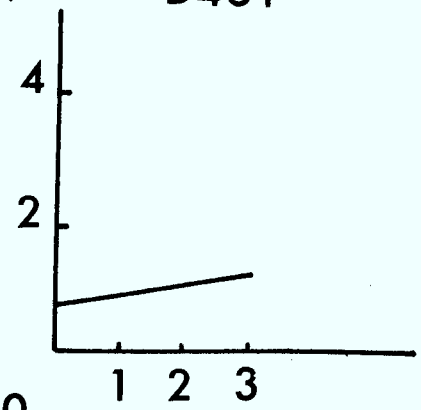

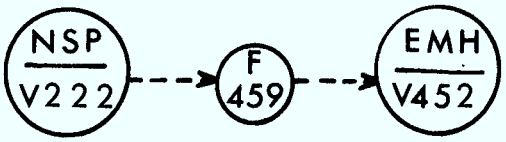

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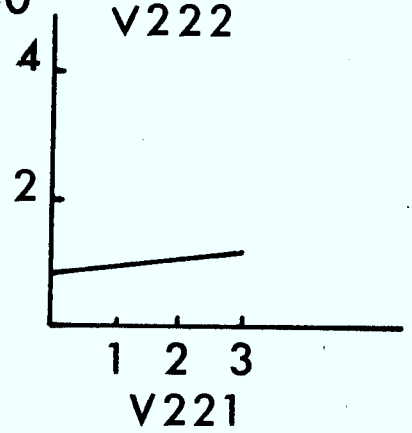

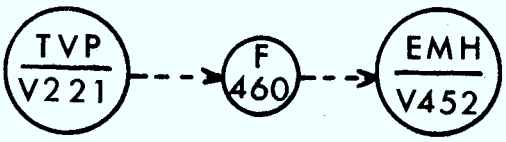

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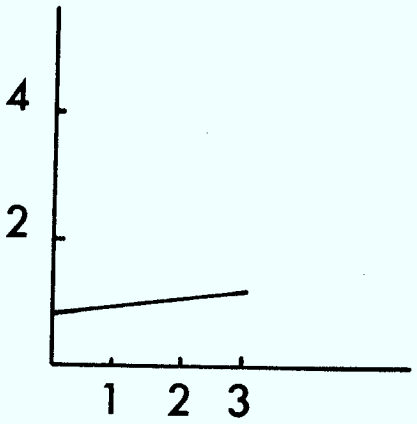

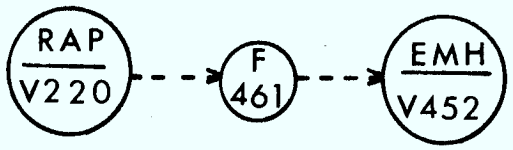

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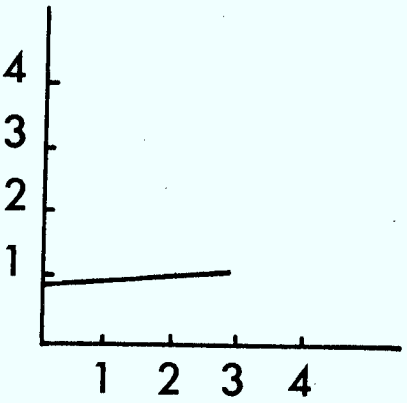

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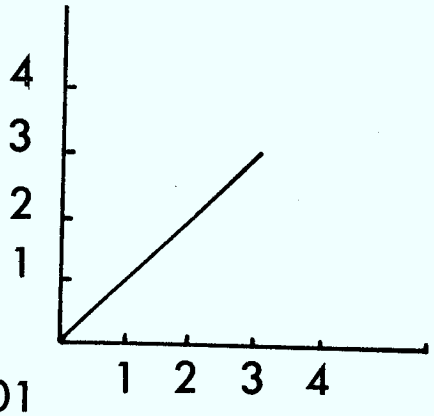

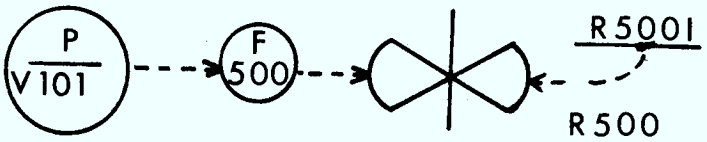

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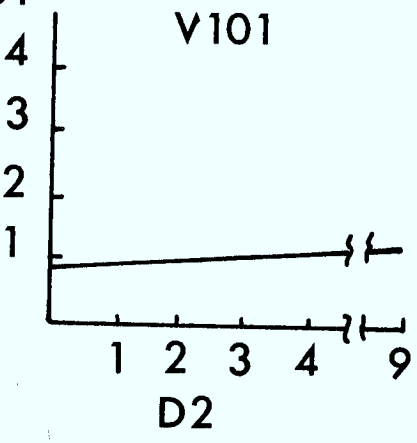

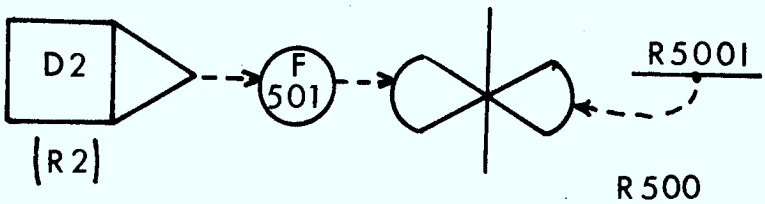

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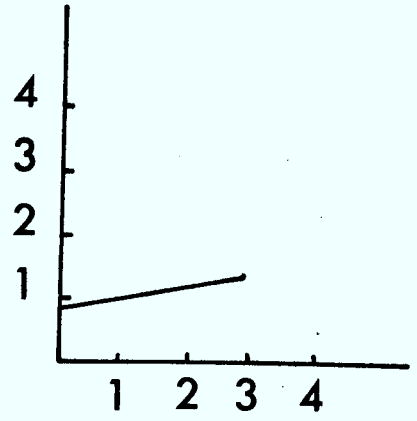

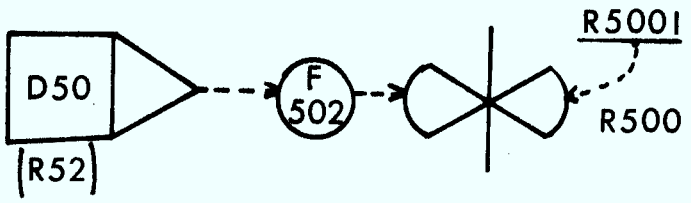

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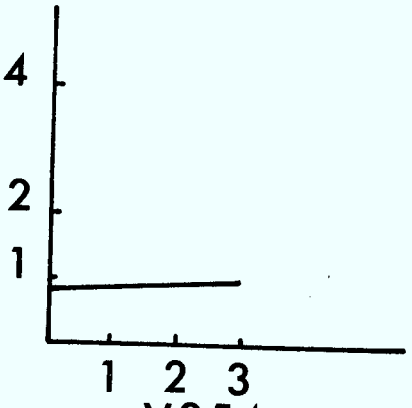

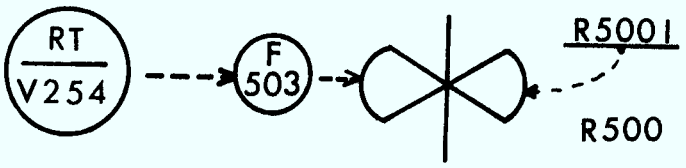

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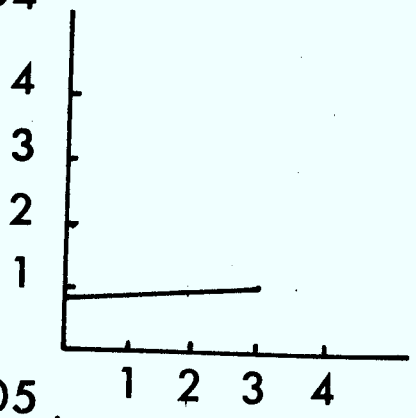

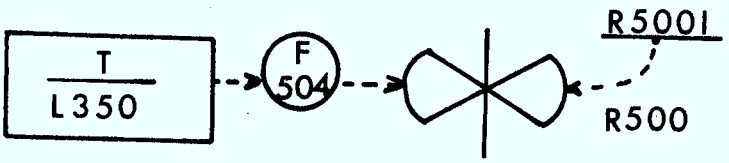

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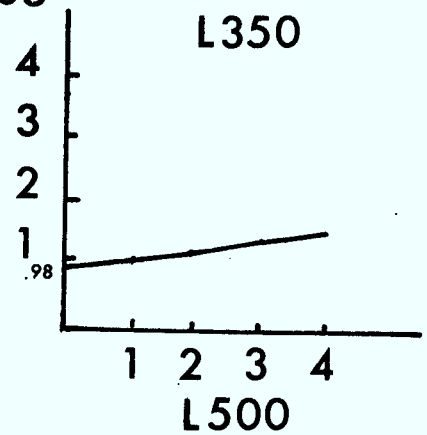

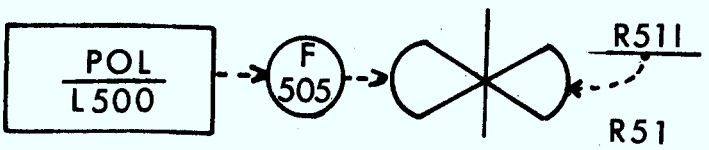

APPENDIX A.3: REGIONAL MODEL SOFTWARE

Listings are given here for the following:

(1) The simulation model equations for each iteration of the main program;

(2) The initial conditions for levels, rates, variables and delayed variables;

(3) The numerical function data;

(4) The function and subroutine software used in conjunction with the main program.

Software for the output of simulation results is not given as this is a matter of choice of the program users. Both graphical and numerical output is desirable and can easily be obtained for each iteration of the main program.

It is evident that a first order integration scheme is used to solve the system differential equations. More sophisticated techniques could be used if the user wished. However, by choice of an appropriate step size, the Euler scheme used here provides the required accuracy and stability, given the relatively long system time constants.

Simulation Model Equations for Each Iteration of the Main Program for the Regional Model

```
D2=LAG(D2,R2,2.)
D4=LAG(D4,L3,2.)
D50=LAG(D50,R52/R521,3.)
D54=LAG(D54,L51,3.)
D100=DELAY(D1005,R101,15,R102/L100,R100,15.)
D352=LAG(D352,L351,2.)

V1=L1/L11
V2=(L1+L2)/(L11+L21)
V101=(L100+L101+L102+L103)/V1011
V102=(L101+L102)/(L1011+L1021)
V200=(L200*V2011)+L201*V2021
V209=EV201/EV201L
EV201L=EV201
V401=L400/EV400
V451=L450/EV450

CALL FUNC(3,F10X,F10Y,D4,F10,NSF10)
CALL FUNC(3,F50X,F50Y,L350,F50,NSF50)
CALL FUNC(2,F51X,F51Y,V200,F51,NSF51)
CALL FUNC(3,F52X,F52Y,V101,F52,NSF52)
CALL FUNC(2,F53X,F53Y,D50,F53,NSF53)
CALL FUNC(4,F59X,F59Y,D54,F59,NSF59)
CALL FUNC(4,F60X,F60Y,L51,F60,NSF60)
CALL FUNC(4,F101X,F101Y,L400,F101,NSF101)
CALL FUNC(3,F102X,F102Y,L450,F102,NSF102)
CALL FUNC(3,F103X,F103Y,L450,F103,NSF103)
CALL FUNC(2,F104X,F104Y,L450,F104,NSF104)
CALL FUNC(2,F105X,F105Y,L450,F105,NSF105)
CALL FUNC(2,F106X,F106Y,L450,F106,NSF106)
CALL FUNC(3,F109X,F109Y,V101,F109,NSF109)
CALL FUNC(3,F203X,F203Y,V200,F203,NSF203)
CALL FUNC(5,F210X,F210Y,V208,F210,NSF210)
CALL FUNC(4,F255X,F255Y,L250,F255,NSF255)
CALL FUNC(4,F258X,F258Y,L250,F258,NSF258)
CALL FUNC(4,F259X,F259Y,L250,F259,NSF259)
CALL FUNC(2,F301X,F301Y,L350,F301,NSF301)
CALL FUNC(2,F303X,F303Y,D2,F303,NSF303)
CALL FUNC(2,F306X,F306Y,D50,F306,NSF306)
CALL FUNC(2,F308X,F308Y,L300,F308,NSF308)
CALL FUNC(3,F352X,F352Y,EV350,F352,NSF352)
CALL FUNC(4,F353X,F353Y,L500,F353,NSF353)
CALL FUNC(2,F354X,F354Y,L200,F354,NSF354)
CALL FUNC(2,F356X,F356Y,L350,F356,NSF356)
CALL FUNC(4,F359X,F359Y,D352,F359,NSF359)
CALL FUNC(2,F360X,F360Y,L250,F360,NSF360)
CALL FUNC(2,F404X,F404Y,L250,F404,NSF404)
CALL FUNC(2,F452X,F452Y,L250,F452,NSF452)
CALL FUNC(2,F454X,F454Y,L201,F454,NSF454)
CALL FUNC(2,F455X,F455Y,L250,F455,NSF455)
```

```
CALL FUNC(2,F500X,F500Y,V101,F500,NSF500)
CALL FUNC(2,F501X,F501Y,D2,F501,NSF501)
CALL FUNC(2,F502X,F502Y,D50,F502,NSF502)
CALL FUNC(2,F504X,F504Y,L350,F504,NSF504)
CALL FUNC(5,F505X,F505Y,L500,F505,NSF505)


D200=LAG(D200,V209,10.)

V51=F50*F51*F52
V100=V100I*F101*F102
V103=V103I*F109
IF(V103.GT.1.0)V103=1.0
V204=F203
V301L=V301
V301=F306*D50+F303*(D2/3.)+F301*L350+F308*L300
V309=V301/V301L
V352=V352I*F359*F360

CALL FUNC(4,F1X,F1Y,V1,F1,NSF1)
CALL FUNC(4,F2X,F2Y,V2,F2,NSF2)
CALL FUNC(4,F3X,F3Y,D2,F3,NSF3)
CALL FUNC(2,F8X,F8Y,V2,F8,NSF8)
CALL FUNC(2,F54X,F54Y,V51,F54,NSF54)
CALL FUNC(5,F209X,F209Y,V301,F209,NSF209)
CALL FUNC(5,F211X,F211Y,V206,F211,NSF211)
CALL FUNC(2,F214X,F214Y,V103,F214,NSF214)
CALL FUNC(2,F260X,F260Y,V101,F260,NSF260)
CALL FUNC(3,F261X,F261Y,V101,F261,NSF261)
CALL FUNC(3,F265X,F265Y,V301,F265,NSF265)
CALL FUNC(5,F302X,F302Y,V102,F302,NSF302)
CALL FUNC(2,F312X,F312Y,D2,F312,NSF312)
CALL FUNC(3,F317X,F317Y,L3,F317,NSF317)
CALL FUNC(5,F324X,F324Y,L300,F324,NSF324)
CALL FUNC(5,F400X,F400Y,V401,F400,NSF400)
CALL FUNC(5,F450X,F450Y,V451,F450,NSF450)

D350=LAG(D350,V352,2.0)
D351=LAG(D351,V352,1.0)

V201=V204*V101
V208L=V208
V208=V208I*F214*EV200
V206=V208/V208L
V310=F302

CALL FUNC(4,F207X,F207Y,V309,F207,NSF207)
CALL FUNC(4,F208X,F208Y,V309,F208,NSF208)
CALL FUNC(5,F212X,F212Y,V206,F212,NSF212)
CALL FUNC(2,F213X,F213Y,D200,F213,NSF213)
CALL FUNC(3,F355X,F355Y,D350,F355,NSF355)
CALL FUNC(2,F357X,F357Y,L350,F357,NSF357)
CALL FUNC(4,F358X,F358Y,D351,F358,NSF358)
```

```
V205=F209*F206*F210
V220=V220I*F224*F226
V221=V221I*F223*F225
V222=V222I*F221*F222
V240=V240I*F240*F241

CALL FUNC(4,F204X,F204Y,V308,F204,NSF204)
CALL FUNC(4,F205X,F205Y,V308,F205,NSF205)
CALL FUNC(2,F266X,F266Y,V222,F266,NSF266)
CALL FUNC(2,F267X,F267Y,V221,F267,NSF267)
CALL FUNC(2,F268X,F268Y,V220,F268,NSF268)

V202=V205*V101
V207=V202*V202I+V201*V201I
V252=V252I*F258*F260*F264*F265*F266*F267*F268

CALL FUNC(2,F269X,F269Y,V222,F269,NSF269)
CALL FUNC(2,F270X,F270Y,V221,F270,NSF270)
CALL FUNC(2,F271X,F271Y,V220,F271,NSF271)
CALL FUNC(2,F272X,F272Y,V207,F272,NSF272)
CALL FUNC(2,F273X,F273Y,V202,F273,NSF273)
CALL FUNC(2,F274X,F274Y,V222,F274,NSF274)
CALL FUNC(2,F275X,F275Y,V221,F275,NSF275)
CALL FUNC(2,F276X,F276Y,V220,F276,NSF276)
CALL FUNC(2,F318X,F318Y,V222,F318,NSF318)
CALL FUNC(2,F319X,F319Y,V221,F319,NSF319)
CALL FUNC(2,F320X,F320Y,V220,F320,NSF320)
CALL FUNC(3,F321X,F321Y,V306,F321,NSF321)
CALL FUNC(2,F322X,F322Y,V101,F322,NSF322)
CALL FUNC(2,F323X,F323Y,V207,F323,NSF323)
CALL FUNC(3,F406X,F406Y,V222,F406,NSF406)
CALL FUNC(2,F407X,F407Y,V221,F407,NSF407)
CALL FUNC(2,F408X,F408Y,V220,F408,NSF408)
CALL FUNC(2,F409X,F409Y,V207,F409,NSF409)
CALL FUNC(2,F459X,F459Y,V222,F459,NSF459)
CALL FUNC(2,F460X,F460Y,V221,F460,NSF460)
CALL FUNC(2,F461X,F461Y,V220,F461,NSF461)
CALL FUNC(2,F462X,F462Y,V207,F462,NSF462)
CALL FUNC(2,F503X,F503Y,V254,F503,NSF503)

D252=DELAY(D252S,V254,5,0.,0.,1.)

V253=V253I*F259*F261*F263*F269*F270*F271*F272
V254=V252*V254I1+V253*V254I2

CALL FUNC(4,F257X,F257Y,D252,F257,NSF257)

V3=V3I*F2*F3*F6*F10/EV3
V4=EV1/V3
D3=DELAY(D3S,V3,5,0.,0.,1.)

CALL FUNC(5,F9X,F9Y,D3,F9,NSF9)

V7=V4/V4I
```

```
V300=F53*F60*F312*F317*F324*F357
V302=V300/V310
V351=V351I*F356*F358

V312=1. -V302

CALL FUNC(5,F305X,F305Y,V302,F305,NSF305)

V303=F305

CALL FUNC(2,F6X,F6Y,V303,F6,NSF6)
CALL FUNC(2,F55X,F55Y,V303,F55,NSF55)


D101=LAG(D101,V303,5.)

V52=(F55*F59)/EV51
V53=EV50/V52
V305=V300*V303

CALL FUNC(2,F107X,F107Y,D101,F107,NSF107)
CALL FUNC(2,F108X,F108Y,D101,F108,NSF108)
CALL FUNC(3,F56X,F56Y,V53,F56,NSF56)

D53=DELAY(D53S,V52,3,0.,0.,1.)

V54=V54I*F56

CALL FUNC(2,F57X,F57Y,V54,F57,NSF57)
CALL FUNC(4,F58X,F58Y,D53,F58,NSF58)
CALL FUNC(4,F307X,F307Y,V305,F307,NSF307)

D51=LAG(D51,V54,5)

V307=F307
V306L=V306
V306=V305-V307
V308=V306/V306L

CALL FUNC(4,F206X,F206Y,V306,F206,NSF206)
CALL FUNC(4,F221X,F221Y,L400,F221,NSF221)
CALL FUNC(3,F222X,F222Y,V103,F222,NSF222)
CALL FUNC(3,F223X,F223Y,V103,F223,NSF223)
CALL FUNC(4,F224X,F224Y,V103,F224,NSF224)
CALL FUNC(4,F225X,F225Y,V306,F225,NSF225)
CALL FUNC(4,F226X,F226Y,V306,F226,NSF226)
CALL FUNC(4,F240X,F240Y,V208,F240,NSF240)
CALL FUNC(4,F241X,F241Y,V306,F241,NSF241)
CALL FUNC(5,F263X,F263Y,V306,F263,NSF263)
CALL FUNC(4,F264X,F264Y,V306,F264,NSF264)
```

```
CALL FUNC(2,F4X,F4Y,V7,F4,NSF4)

V5=F4

D1=LAG(D1,V5,5.)

CALL FUNC(2,F7X,F7Y,V5,F7,NSF7)

V6=F7*F8*F57

CALL FUNC(4,F254X,F254Y,V6,F254,NSF254)
V251=V251I*F254*F255*F273*F274*F275*F276

CALL FUNC(2,F250X,F250Y, V6 ,F250,NSF250)

V250=V250I*F250*F257

CALL FUNC(2,F405X,F405Y,V251,F405,NSF405)
CALL FUNC(2,F451X,F451Y,V251,F451,NSF451)
CALL FUNC(2,F456X,F456Y,V251,F456,NSF456)

V402=F400*F404*F405*F406*F407*F408*F409
IF(V402.GT.1.0)V402=1.0
V452=F450*F451*F452*F459*F460*F461*F462
IF(V452.GT.1.0)V452=1.0

V403=EV401*V402
V453=EV451*V452

CALL FUNC(4,F252X,F252Y,V250,F252,NSF252)

V404=L400/V403
V454=L450/V453

D400=LAG(D400,V404,4.)
D450=LAG(D450,V454,4.)

CALL FUNC(4,F401X,F401Y,D400,F401,NSF401)
CALL FUNC(5,F457X,F457Y,D450,F457,NSF457)

V405=F401*V405I
V455=F457*V455I

D401=LAG(D401,V405,10.)
D451=LAG(D451,V455,4.)

V406=V405*V101
V456=V455*V101

CALL FUNC(3,F402X,F402Y,D401,F402,NSF402)
CALL FUNC(3,F458X,F458Y,D451,F458,NSF458)
```

```
R1=R1I*F1*EV4
R2=R2I*D1
R3=F9*(EV2-L3)
R50=R50I*(1.05-L50)
R51=R51I*F505*F54
R52=R52I*D51
R53=F58*(EV52-L51)*R53I
R101=L101*V100
R102=R102I*F103*L100
R103=D100
R104=R104I*F107*L101
R100=R104
R105=R105I*F104*L101
R106=L101*R106I
R107=R107I*F108*L102
R108=R108I*F105*L102
R109=L102*R109I
R110=R110I*L103
R111=R111I*F106*L103
R200=R200I*F207*F212*F213*L200
R201=R201I*F208*L200
R202=R202I*F204*F211*L201
R203=R203I*F205*L201
R250=R250I*F252*L250
R300=R300I*F321*F322*F323*F318*F319*F320*EV300*L300
R301=R301I*L300
R350=R350I*F352*F353*F354*F355
R351=EV351*R351I
R352=R352I*L351
R400=R400I*F402
R450=R450I*F458*F455*F454*F456
R500=R500I*F500*F501*F502*F503*F504
R501=R501I*L500
```

```
L1=L1-R1*STEP
L2=L2+(R1-R2)*STEP
L3=L3+R3*STEP
L50=L50+(R50-R51-R52)*STEP
L51=L51+R53*STEP
L100=L100+(R100+R101-R102-R103)*STEP
L101=L101+(R104-R105-R106+R103)*STEP
L102=L102+(R106+R107-R108-R109)*STEP
L103=L103+(R109+R110-R111)*STEP
L200=L200+(R200-R201)*STEP
L201=L201+(R202-R203)*STEP
L250=L250+R250*STEP
L300=L300+(R300-R301)*STEP
L350=L350+R350*STEP
L351=L351+(R351-R352)*STEP
L400=L400+R400*STEP
L450=L450+R450*STEP
L500=L500+(R500-R501)*STEP
```

Initial Conditions for Levels, Rates, Variables and Delayed Variables for the Regional Model

```
L1=100.
L1I=100.
L2=100.
L2I=100.
L3=.8
L3I=.8
L50=1.
L51=1.
L100=74900.
L100I=74900.
L101=93800.
L101I=93800.
L102=43500.
L102I=43500.
L103=17500.
L103I=17500.
L200=1.
L200I=1.
L201=1.
L201I=1.
L250=1.
L250I=1.
L300=1.
L300I=1.
L350=1.
L350I=1.
L351=1.
L351I=1.
L400=.8
L400I=.8
L450=.4
L450I=.4
L500=1.
L500I=1.
```

```
R1I=5.
R2=3.
R2I=3.
R50I=.04
R51I=.001
R52=.005
R52I=.005
R53I=.04
R100=-3760.
R101=4500.
R100=-250.
R102=.00808
R102I=.00808
R104I=1.
R105I=.00808
R106I=1./30.
R107I=1.
R108I=.00808
R109I=1./20.
R110I=-.05
R111I=.2
R200I=.05
R201I=.01
R202I=.06
R203I=.01
R250I=.005
R300I=.05
R301I=.04
R350I=0.05
R351I=.1
R400I=.02
R450I=.02
R352I=0 10
R500I=0.12
R501I=.05
```

```
V3I=.9
V4I=1.111111
V51I=.15
V54I=1.
V100I=.0581
V101I=229700.
V103I=0.8
V201I=0.05
V202I=0.95
V208=1.
V208I=1.0
V220I=1.
V221I=1.
V222I=1.
V240I=1.
V250I=1.
V251I=1.0
V252I=1.0
V253I=1.0
V254I1=1.
V254I2=.3
V301=1.
V306=.8
V351I=1.
V352I=1.
V405I=1.
V455I=1.
EV200L=1.
EV201L=1.


D1=1.
D2=3.
D4=.8
D50=1.
D51=1.
D54=1.
D101=1.
D200=1.05
D350=1.
D351=1.
D352=1.
D400=.89
D401=1.
D450=.5
D451=1.
```

Numerical Functions Data for the Regional Model

```
DATA F1X    /0. ,1. ,5,2./
DATA F1Y    /0. ,.5,1. ,1./
DATA F2X    /0. ,.25,1. ,2./
DATA F2Y    /10. ,1.5,1. ,1./
DATA F3X    /0. ,1.5,3. ,8./
DATA F3Y    /10.,1.2,1.0,.9/
DATA F4X    /0. ,10./
DATA F4Y    /0. ,10./
DATA F6X    /0. ,3./
DATA F6Y    /.5,2./
DATA F7X    /0. ,3./
DATA F7Y    /0. ,3./
DATA F8X    /0. ,3./
DATA F8Y    /0. ,3./
DATA F9X    /1. ,1.25,1.75,2. ,2.5/
DATA F9Y    /0. ,0.1,0.5,0.8,1.0/
DATA F10X    /0.8,2. ,2.8/
DATA F10Y    /1. ,.75,.375/
DATA F50X     /0. ,2. ,4./
DATA F50Y     /.8,1.2,1.6/
DATA F51X    /0. ,3./
DATA F51Y    /1.1,.80/
DATA F52X    /0. ,1. ,4./
DATA F52Y    /.6,1. ,1.8/
DATA F53X    /0. ,4./
DATA F53Y    /0.5,2.5/
DATA F54X    /0. ,4./
DATA F54Y    /0.6,2.2/
DATA F55X    /0. ,3./
DATA F55Y    /.6,1.8/
DATA F56X    /.2,1. ,4./
DATA F56Y    /0. ,1. ,4./
DATA F57X    /0. ,3./
DATA F57Y    /0. ,3./
DATA F58X    /1. ,2. ,3. ,4./
DATA F58Y    /.2,1. ,2.5,3./
DATA F59X    /1. ,2. ,3. ,4./
DATA F59Y    /1. ,.6,.4,.3/
DATA F60X    /1. ,2. ,3. ,4./
DATA F60Y    /1. ,.6,.4,.3/
DATA F101X    /.5,.8,1. ,1.2/
DATA F101Y    /1.2,1. ,.8,.7/
DATA F102X    /.4,1. ,1.2/
DATA F102Y    /1. ,.8,.8/
DATA F103X    /.4,1. ,1.2/
DATA F103Y    /1. ,.88,.8/
DATA F104X    /.4,1./
DATA F104Y    /1. ,.89/
DATA F105X    /.4,1./
DATA F105Y    /1. ,.955/
DATA F106X    /.4,1./
```

```
DATA F106Y   /1.,.97/
DATA F107X   /.2,2.2/
DATA F107Y   /-.075,.1/
DATA F108X   /.2,2.2/
DATA F108Y   /-.075,.1/
DATA F109X   /0.,.5,3./
DATA F109Y   /0.,.9,1.4/
DATA F203X   /0.,1.7,2.8/
DATA F203Y   /0.,1.7,2.2/
DATA F204X   /1.,1.05,1.1,1.15/
DATA F204Y   /0.,1.,1.25,1.3/
DATA F205X   /.8,.9,1.,1.1/
DATA F205Y   /4.,2.,1.,1./
DATA F206X   /0.,.8,1.2,2.4/
DATA F206Y   /0.,1.,1.4,2./
DATA F207X   /1.,1.05,1.1,1.15/
DATA F207Y   /0.,1.,1.25,1.35/
DATA F208X   /.9,.95,1.,1.05/
DATA F208Y   /2.,1.5,1.,0./
DATA F209X   /0.,.5,1.,2.,7./
DATA F209Y   /0.,.8,1.,1.2,1.8/
DATA F210X   /0.,.5,1.,1.5,2./
DATA F210Y   /0.,.7,1.,1.25,1.35/
DATA F211X   /.9,1.,1.1,1.2,1.3/
DATA F211Y   /1.,1.,1.2,1.25,1.27/
DATA F212X   /.9,1.,1.1,1.2,1.3/
DATA F212Y   /1.,1.,1.2,1.28,1.32/
DATA F213X   /0.,3./
DATA F213Y   /0.5,2./
DATA F214X   /0.,1.,3./
DATA F214Y   /0.,1.25,1.3/
DATA F221X   /0.,.8,1.5,3.0/
DATA F221Y   /0.,1.,1.25,1.5/
DATA F222X   /0.,.8,3./
DATA F222Y   /0.,1.,3./
DATA F223X   /0.,.8,3./
DATA F223Y   /0.,1.,3./
DATA F224X   /0.,0.8,1.50,3.0/
DATA F224Y   /0.,1.,1.2,1.3/
DATA F225X   /0.,0.4,1.2,2.0/
DATA F225Y   /0.,0.8,1.2,1.4/
DATA F226X   /0.,0.4,0.8,1.6/
DATA F226Y   /0.,0.8,1.0,1.1/
DATA F240X   /0.,.5,1.,2./
DATA F240Y   /1.5,1.2,1.,.8/
DATA F241X   /0.,.4,1.2,2.5/
DATA F241Y   /0.,.8,1.2,1.5/
DATA F250X   /0.,3./
DATA F250Y   /.8,1.4/
DATA F252X   /0.,1.,2.5,4./
DATA F252Y   /0.,1.,2.,2.5/
DATA F254X   /0.,.5,1.,3./
DATA F254Y   /,2,.7,1.,2.7/
DATA F255X   /0.,1.,2.,4./
```

```
DATA F255Y   /3.,1.,.6,.2/
DATA F257X   /0.,1.,2.,4./
DATA F257Y   /0.,1 ,1.5,1.75/
DATA F258X   /0.,.5,1.,4./
DATA F258Y   /0 ,.8,1.,1.4/
DATA F259X   /0.,.6,1.,4./
DATA F259Y   /0.,.8,1.,1.6/
DATA F260X   /0.,3./
DATA F260Y   /.5,2./
DATA F261X   /0.,1.,3./
DATA F261Y   /.1,1.,2.9/
DATA F263X   /0.,.8,2.,2.75,3.5/
DATA F263Y   /.2,1.,1.5,1.8,2./
DATA F264X   /0.,.8,1.6,3.2/
DATA F264Y   /.5,1.,1.2,1.5/
DATA F265X   /0.,1.,4./
DATA F265Y   /0.,1.,2.5/
DATA F266X   /0.,3./
DATA F266Y   /.95,1.10/
DATA F267X   /0.,3./
DATA F267Y   /.95,1.1/
DATA F268X   /0.,3./
DATA F268Y   /.95,1.1/
DATA F269X   /0.,3./
DATA F269Y   /.95,1.1/
DATA F270X   /0.,3./
DATA F270Y   /.9,1.2/
DATA F271X   /0.,3./
DATA F271Y   /.95,1.10/
DATA F272X   /0.,3./
DATA F272Y    /0.5,2./
DATA F273X   /0.,3./
DATA F273Y   /.8,1.4/
DATA F274X   /0.,3./
DATA F274Y   /.95,1.10/
DATA F275X   /0.,3./
DATA F275Y   /.95,1.10/
DATA F276X   /0.,3./
DATA F276Y   /.95,1.1/
DATA F301X   /0.,5./
DATA F301Y   /.2,.2/
DATA F302X   /.5,1.,1.6,4.,7./
DATA F302Y   /.25,1.,1.6,5.,8./
DATA F303X   /0.,1./
DATA F303Y   /.4,.4/
DATA F305X   /.93,1.,1.06,1.12,1.18/
DATA F305Y   /.9,1.,1.3,1.7,1.9/
DATA F306X   /0.,3./
DATA F306Y   /.2,.2/
DATA F307X   /0.,1.,2.,8./
DATA F307Y   /0.,.2,.5,2.7/
```

```
DATA F308X   /0.,1./
DATA F308Y   /.2,.2/
DATA F312X   /0.,6./
DATA F312Y   /0.5,1.5/
DATA F317X   /1.,2.,3./
DATA F317Y   /1.,.5,.2/
DATA F318X   /0.,3./
DATA F318Y   /.95,1.1/
DATA F319X   /0.,3./
DATA F319Y   /.95,1.1/
DATA F320X   /0.,3./
DATA F320Y   /.95,1.1/
DATA F321X   /0.,1.5,3./
DATA F321Y   /0.,1.5,2.3/
DATA F322X   /0.,3./
DATA F322Y   /0.,3./
DATA F323X   /0.,3./
DATA F323Y   /0.9,1.2/
DATA F324X   /0.,1.,2.,3.,4./
DATA F324Y   /.4,1.,1.6,1.9,2.1/
DATA F352X   /0.6,1.0,2.0/
DATA F352Y   /0.8,1.0,1.2/
DATA F353X   /0.0,1.0,2.0,3.0/
DATA F353Y   /1.2,1.0,0.6,0.4/
DATA F354X   /0.0,5.0/
DATA F354Y   /.95,1.2/
DATA F355X   /0.0,2.0,3.0/
DATA F355Y   /0.6,1.4,1.6/
DATA F356X   /0.0,5.0/
DATA F356Y   /0.0,5.0/
DATA F357X   /0.0,5.0/
DATA F357Y   /.67,2.33/
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DATA F359X   /0.0,1.4,2.2,5.0/
DATA F359Y   /0.0,1.4,2.4,5.2/
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DATA F404X   /0.,2./
DATA F404Y   /.9,1.1/
DATA F405X   /0.,2./
DATA F405Y   /.8,1.2/
DATA F406X   /0.,1.5,3./
```

```
DATA F406Y   /.9,1.,1 /
DATA F407X   /0.,3./
DATA F407Y   /1.,1./
DATA F408X   /0.,3./
DATA F408Y   /.95,1.1/
DATA F409X   /0.,3./
DATA F409Y   /.95,1.1/
DATA F450X   /0.,.2,.4,.7,1./
DATA F450Y   /0.,.5,.8,.95,1./
DATA F451X   /0.,3./
DATA F451Y   /.8,1.4/
DATA F452X   /0.,3./
DATA F452Y   /.8,1.4/
DATA F454X   /0.,2./
DATA F454Y   /.6,1.4/
DATA F455X   /0.,2./
DATA F455Y   /.7,1.3/
DATA F456X   /0.,2./
DATA F456Y   /.5,1.5/
DATA F457X   /0.,.3,.5,.8,1./
DATA F457Y   /2.,1.3,1.,.6,0./
DATA F458X   /0.,1.,2./
DATA F458Y   /0.,1.,1.5/
DATA F459X   /0.,3./
DATA F459Y   /.95,1.1/
DATA F460X   /0.,3./
DATA F460Y   /.9,1.2/
DATA F461X   /0.,3./
DATA F461Y   /.95,1.10/
DATA F462X   /0.,3./
DATA F462Y   /.95,1.10/
DATA F461X   /0.,3./
DATA F461Y   /.95,1.1/
DATA F500X   /0.,3./
DATA F500Y   /0.,3./
DATA F501X   /0.,9./
DATA F501Y   /.90,1.20/
DATA F502X   /0.,3./
DATA F502Y   /.8,1.4/
DATA F503X   /0.,3./
DATA F503Y   /.9,1.2/
DATA F504X   /0.,3./
DATA F504Y   /.95,1.10/
DATA F505X   /0.,1.,2.,3.,4./
DATA F505Y   /.98,1.0,1.1,1.4,1.6/
```

Function and Subroutine Software Used in Conjunction with the Main Program for the Regional Model

```
      REAL FUNCTION LAG(X,Y,TAU)
      LAG=X+(Y-X)/TAU
      RETURN
      END



      FUNCTION DELAY(V,A,L,P,D,X)
      DIMENSION V(1)
      NN=L-1
      DELAY=V(1)
      DO 2 I=1,NN
    2 V(I)=V(I+1)*(1.-P)+D/X
      V(L)=A
      RETURN
      END



      SUBROUTINE FUNC(N,FX,FY,X,F,NSEG)
      DIMENSION FX(5),FY(5)
      I=NSEG+1
      J=N-I
      IF(X-FX(I)) 1,2,3
    1 DO 10 II=1,NSEG
      L=I-II
      LL=L+1
      IF (X.GE.FX(L)) GO TO 11
   10 CONTINUE
      F=FY(1)
      NSEG=1
      GO TO 15
   11  F=FY(L)+(FY(LL)-FY(L))*(X-FX(L))/(FX(LL)-FX(L))
      NSEG=L
      GO TO 15
    3 IF (X.GT.FX(N)) GO TO 12
      DO 13 JJ=1,J
      MM=I+JJ
      M=MM-1
      IF (X.LE.FX(MM)) GO TO 14
   13 CONTINUE
   12  F=FY(N)
      NSEG=N-1
      GO TO 15
   14 F=FY(M)+(FY(MM)-FY(M))*(X-FX(M))/(FX(MM)-FX(M))
      NSEG=M
      GO TO 15
    2 F=FY(I)
   15 RETURN
      END
```

APPENDIX A.4: SUMMARY OF HISTORICAL DEMOGRAPHIC TRENDS IN NORTHWEST ONTARIO

In this appendix only a brief summary is given of the most important demographic trends in northwest Ontario.

Since 1956 the crude birth rate for northwest Ontario has been declining. The largest decrease for all districts occurred between 1961 and 1966 when all districts except Kenora approximated the provincial average. The crude birth rate for Kenora peaked in 1961 and fell drastically by 1966, but remained higher than the provincial average. (See Table A.4.1.) General fertility rates show a similar decline from the peak period of 1956-61 to the low point of 1966. (See Table A.4.2.)

The declining birth rate has obvious consequences for the 0-14 age group. This can be seen from Figures A.4.1 - A.4.4 which project numbers of population in each age group to 1971. All computer runs are based on 1931-1966 trends, using 1971 figures as a check. The 1971 crude birth rate for these districts taken from the Province of Ontario, Vital Statistics, 1971, shows that birth rates have continued to decline in 1971. The crude birth rate for northwest Ontario in 1971 was 19.9 compared to 19.0 for the province as a whole.

Table A.4.3 shows that in 1966, for the first time, all three districts have a negative net migration. Figures A.4.1 - A.4.4 seem to indicate that the largest proportion of out-migration is occurring amongst the 15-44 age group. This would seem to indicate that the labour market in northwest Ontario is either not sufficient or diversified enough to meet the needs of the population. The out-migration of the 15-44 age group will substantially affect the members in the 0-14 age group since this is the fertile age group and the group most likely to have young children who follow their parents in out-migration. Of course, a decrease in any age cohort will eventually be carried through to successive cohorts, barring a substantial reversal of migration patterns.

NOTE: The foregoing demographic trends are based on the population of northwest Ontario as a whole. It had been hoped to divide the population component by ethnic origin into native and non-native segments but it has been impossible to obtain vital statistics data for the native population of the particular districts being considered. Victor Piche, in a report prepared for Statistics Canada, sums up the situation well:

> Little is known on the demography of North American Indians living both in Canada and the United States. A bibliographical research which attempted to put together relevant demographic materials pertaining to Canadian Indians until recently confirmed the non-existence of any important studies in this area.*

Certain assumptions can be made using data obtained from the Department of Indian Affairs for the whole province, but this creates difficulties when one considers that a legal definition of "Indian" and a cultural definition do not always coincide.

* Victor Piche and M.V. George, Vital Rates for Canadian Indians 1960-1970, Statistics Canada, Jan. 1973, p.1.

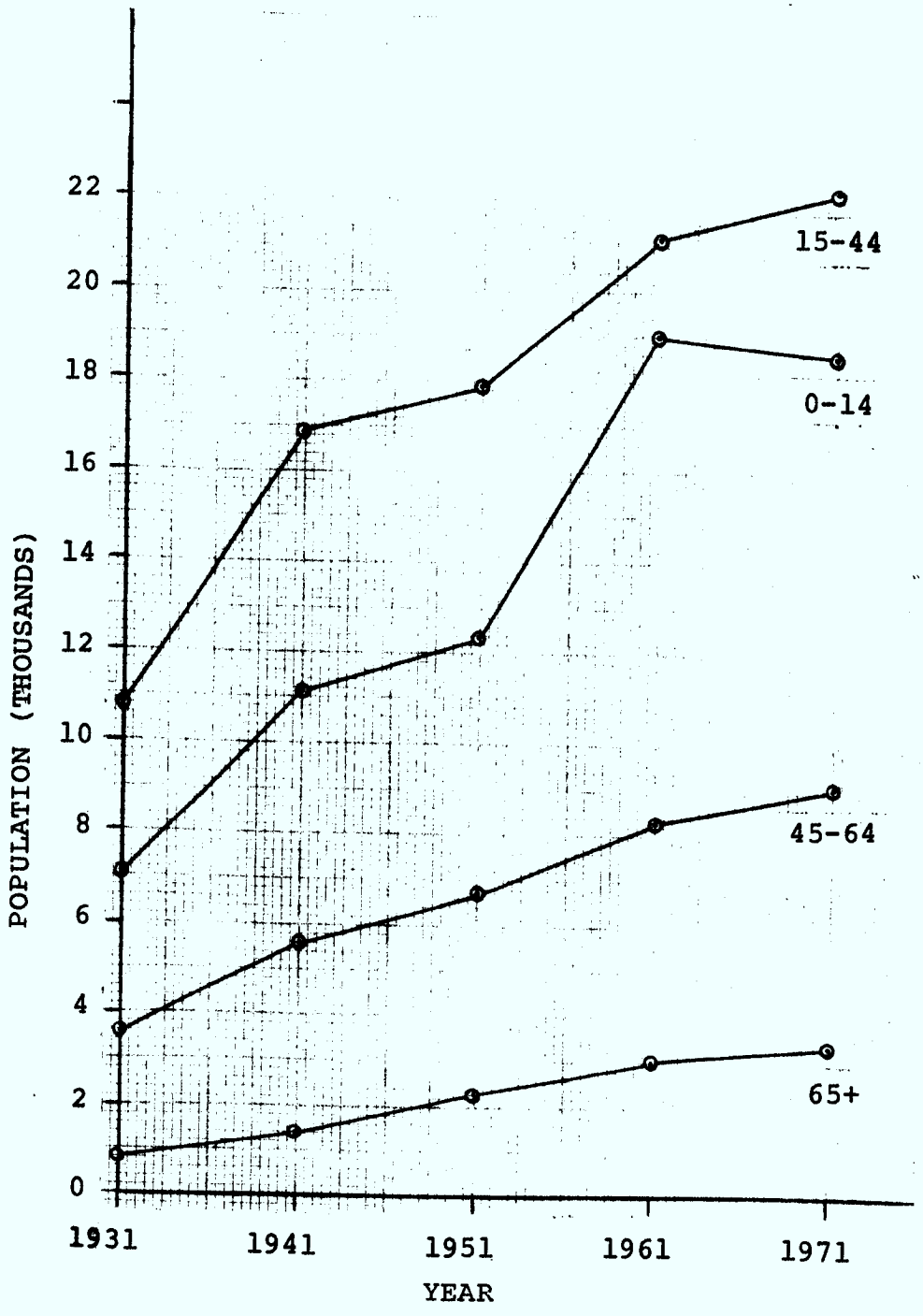

FIGURE A.4.1 POPULATION BY AGE GROUP: REGION OF KENORA

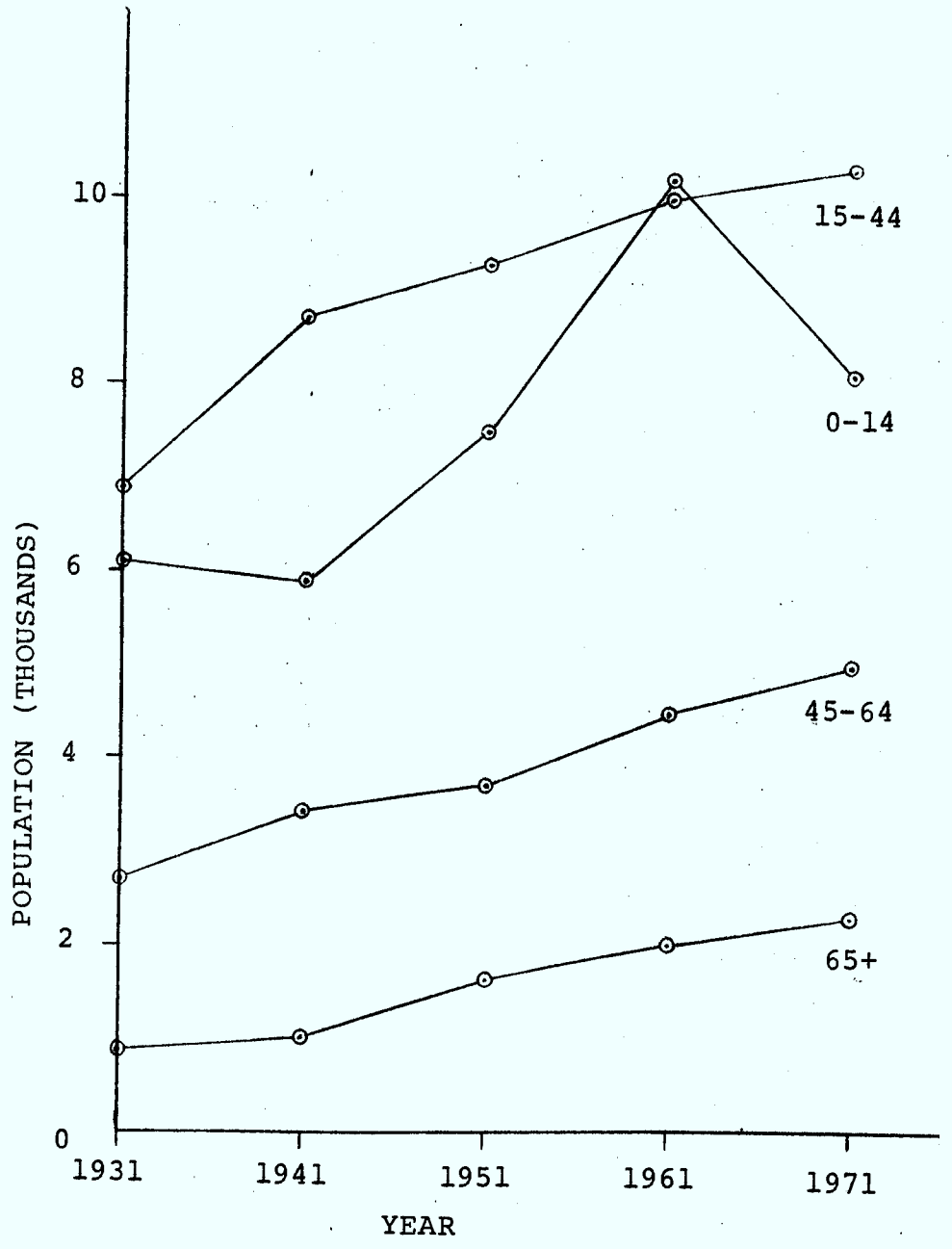

FIGURE A.4.2 POPULATION BY AGE GROUP: REGION OF RAINY RIVER

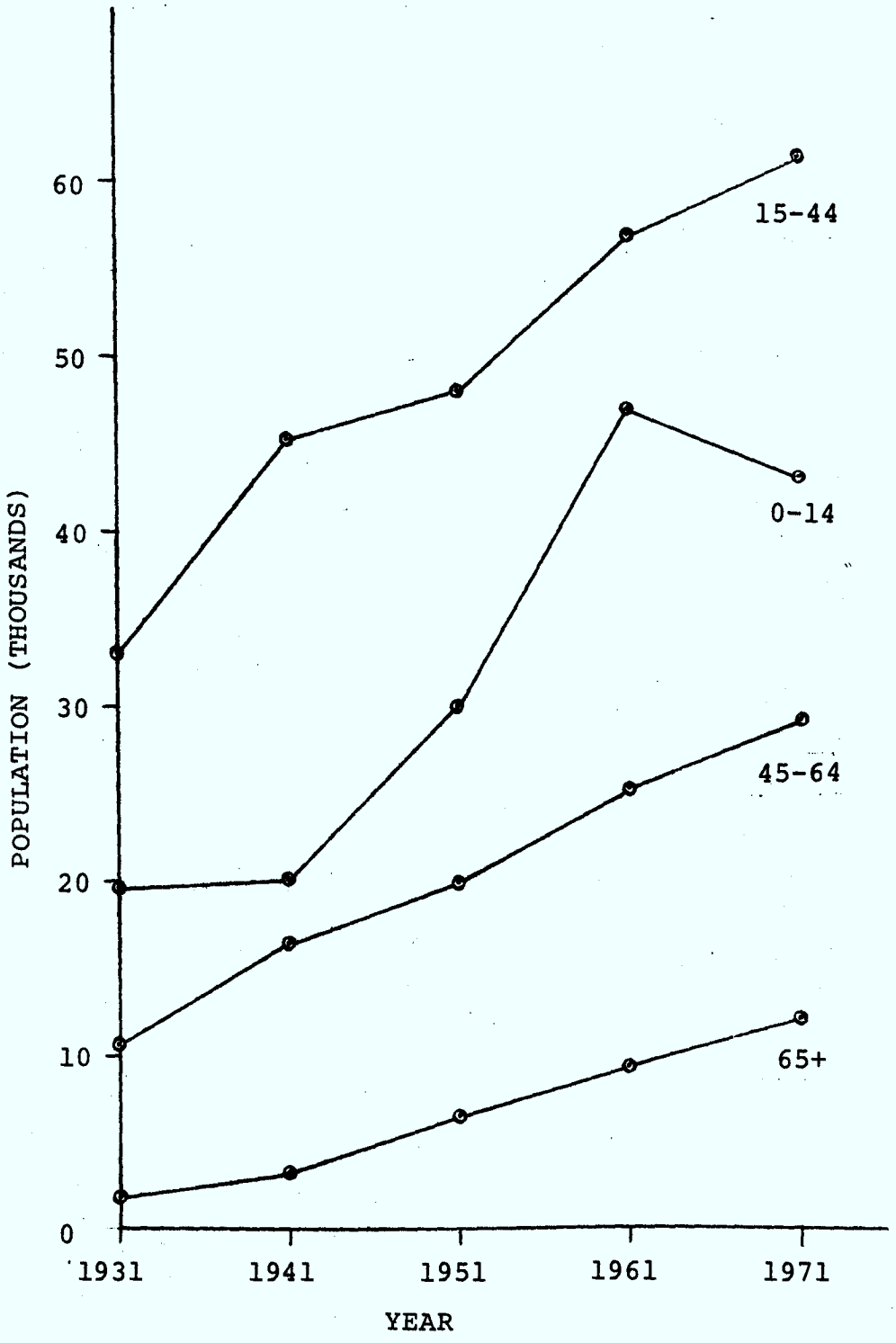

FIGURE A.4.3 POPULATION BY AGE GROUPS: REGION OF THUNDER BAY

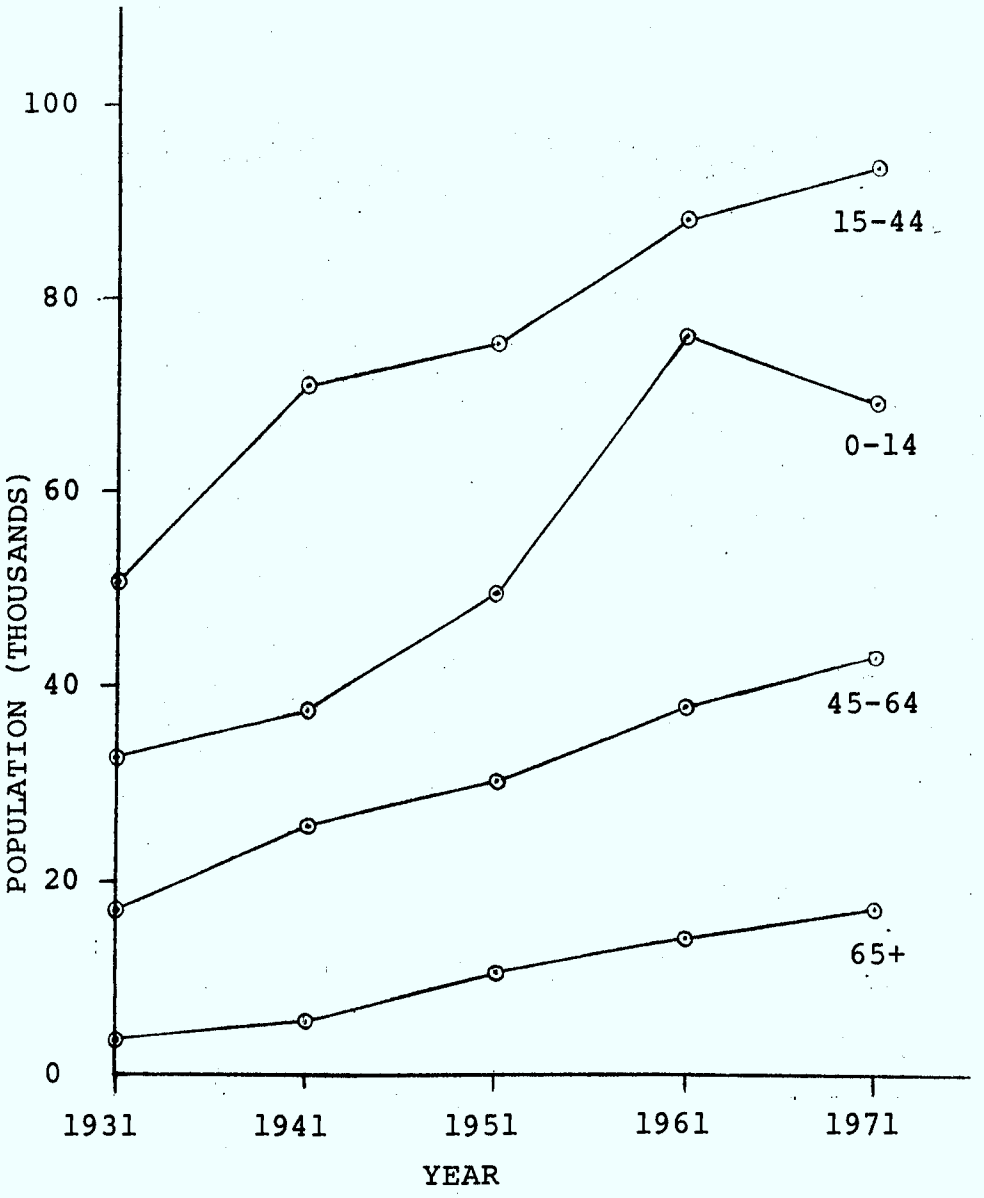

FIGURE A.4.4 POPULATION BY AGE GROUP: NORTH-WEST ONTARIO

TABLE A.4.1

Crude Birth Rates for Northwestern Ontario 1931- 1966*

Year	Districts				
	Kenora	Rainy River	Thunder Bay	Total Region	Ontario
1931	17.9	22.0	20.8	20.3	20.2
1941	17.1	22.1	20.5	19.1	19.1
1951	28.9	30.8	26.6	27.7	25.0
1956	31.1	31.8	26.8	28.5	26.6
1961	35.5	29.5	26.6	28.5	25.3
1966	25.0	20.4	18.6	20.4	19.0

* Computed from Statistics Canada, Vital Statistics, 1931, 1941, 1951, 1956, 1961, 1966 and Province of Ontario Vital Statistics, 1931, 1941, 1951, 1956, 1961, 1966.

TABLE A.4.2

General Fertility Rates for Northwestern Ontario 1931-1966*

Year	Districts			
	Kenora	Rainy River	Thunder Bay	Total Region
1931	94.8	99.0	84.0	88.4
1941	71.8	94.2	82.5	81.6
1951	129.3	136.7	110.1	117.9
1956	141.5	144.8	117.3	126.5
1961	154.0	138.1	117.7	128.5
1966	115.3	95.1	82.4	91.7

*Computed from Statistics Canada, Census Reports, 1931, 1941, 1951, 1956, 1961, 1966 and Statistics Canada, Vital Statistics, 1931, 1941, 1951, 1956, 1961, 1966.

TABLE A.4.3 Net Migration* for Northwestern Ontario and % Change 1931-1966

1931-1941[1]

Census Division	1931 census	1941 census	population change 1931-1941		natural increase 1931-1941		net migration 1931-1941	
			number	% of total	number	% of total	number	% of total
Kenora	25,919	33,372	7,453	28.7	3,361	13.0	4,092	15.3
Rainy River	17,359	19,132	1,773	10.2	2,974	17.1	-1,201	-6.9
Thunder Bay	65,118	85,200	20,082	30.8	8,822	13.5	11,260	17.3
Total Region	108,396	137,704	29,308	27.0	15,157	14.0	14,151	13.0
1941-1951								
	1941 census	1951 census						
Kenora	33,372	39,212	5,840	17.5	5,354	16.0	486	1.5
Rainy River	19,132	22,132	3,000	15.7	3,660	19.1	-660	-3.4
Thunder Bay	85,200	105,367	20,167	23.7	14,697	17.3	5,470	6.4
Total Region	137,704	166,711	29,007	21.1	23,711	17.2	5,296	3.9

[1] Tables for 1931-1941 and 1941-1951 computed from Statistics Canada, Census Reports, 1931, 1941, 1951 and Vital Statistics, 1931-1951.

*Net migration has here been computed by the vital statistics method whereby: intercensal change - natural increase = net migration. This includes immigration from abroad as well as inter-provincial migration.

TABLE A.4.3 Cont'd.

Net Migration for N-W Ontario and % Change 1951-1961[2]

Census Division	1951 Census	1961 Census	Population Change 1951-1961		Natural Increase 1951-1961		Net Migration 1951-1961	
			number	% of total	number	% of total	number	% of total
Kenora	39,212	51,474	12,262	31.3	10,762	27.4	1,500	3.9
Rainy River	22,132	26,531	4,399	19.9	5,769	26.1	-1,370	-6.2
Thunder Bay	105,367	138,518	33,151	31.5	28,819	22.6	9,332	8.9
Total Region	166,711	216,523	49,812	29.9	40,350	24.2	9,462	5.7

Net Migration for N-W Ontario and % Change 1961-1966

Census Division	1961 Census	1966 Census	Population Change 1961-1966		Natural Increase 1961-1966		Net Migration 1961-1966	
			number	% of total	number	% of total	number	% of total
Kenora	51,474	53,995	2,521	4.90	5,724	11.12	-3,203	-6.22
Rainy River	26,531	25,816	-715	-2.70	2,112	7.96	-2,827	-10.66
Thunder Bay	138,518	143,673	5,155	3.72	10,257	7.40	-5,102	-3.68
Total Region	216,523	223,484	6,961	3.22	18,093	8.36	-11,132	-5.14

[2]Tables for 1951-1961 and 1961-1966 are taken from Betty Macleod et.al. Patterns and Trends in Ontario Population, OISE, 1972, Table 4, p. 213.

APPENDIX A.5: REPORT OF FIELD WORK IN AROLAND AND LONGLAKE 58 RESERVE

A.5.1 Introduction

The proposal to develop a community sub-model in parallel with the regional macro-model was made because we realized that aggregated demographic data, much of it collected for other purposes, can tell us little about the dynamics of social change at the local level. For this we needed to obtain relevant ethnographic data on social networks, systems of authority, patterns of social interaction, and value orientations in different modal types of communities, and from such data the dynamics of change could be inferred. Our original plan was to select three communities for such intensive study, each representing a different stage in the acculturation process.

Unfortunately for our purposes, our choice of communities was limited because of the presence in the area of the Northern Pilot Project. Fears were expressed that any intrusion on our part into any of the communities that had been selected for present or future inclusion in the NPP might jeopardize the success of that project. We had to select native communities outside the area. Finally, after considering the possibilities and after a visit to the area in 1973 to talk with native leaders, we settled on two communities: Aroland and Longlake 58 Reserve. Native leaders in these communities agreed to cooperate and gave their consent to having two research assistants (from sociology and psychology) live in the communities for a period of from five to six weeks each, for intensive field study.

As it turned out, the work in Aroland was much more satisfactory for the sociologist than that in Longlake. Living accomodation in the heart of the community was provided in Aroland and the researchers came to be much more fully accepted; they participated in the full life of the community and were well accepted by the residents. In Longlake, the field workers had to live off the reserve and they remained socially outside it as well; their presence was never fully understood, recognized or accepted. This should be born in mind when reading this report: the Aroland study is much more complete and, we believe, more authentic than that of Longlake 58. The field work was done between May 16 and August 10, 1973.

A.5.2 Aroland: General Description

The village of Aroland is located on the CNR line about 15 miles west of Nakina and 55 miles north of Geraldton. The land is crown-owned with the Aroland Indian Association holding a 99-year lease on it. The Association has been in existence for approximately eight years and functions as a type of local government for the village. It consists of a Chairman of the Board, Manager, and various committee members. Its most obvious function is the local co-operative store, though the various committees such as education and entertainment are intended, at least theoretically, to meet regularly for the purpose of thrashing out a position of policy on matters of importance to the village.

People have lived in the area around Aroland for centuries, though it has only developed into a permanent community in the past fifty years or so. Originally it was a summer camping ground of the Ojibway because of its position on the water route south from the Albany, and the abundant supply of fish available. In the early 1930's it was a collection of shacks on the north side of the railway tracks. It was at this time that the Arrowland Sawmill Company was in operation. It supplied year-round employment to some of the native population who then took up permanent residence in the area. It closed in 1939 leaving behind only its name, in abbreviated form. During the 1940's the Hudson's Bay Company built a trading post at Aroland, presumably because of its advantageous geographical position on the Kowkash River. This post was a further catalyst in drawing families to more permanent residence in Aroland. Since the 1950's, when the Hudson's Bay Post was shut down, the village gradually moved south of the railway line, where it is presently located.

In general appearance, Aroland is a hodge-podge of randomly placed houses and shacks, connected by dirt roads and foot paths. The houses were constructed by the residents themselves, apparently from scraps of lumber and other odds and ends. The only "modern" structures in the village are a trailer, formerly owned by a white store owner and now owned by the Association, and the day school operated by the Department of Indian Affairs. There are two interesting canvas-covered "tipi-like" structures in the village; both are owned and built by elderly women who use them for storage and drying fish.

Outwardly the houses appear to be in poor condition, few are painted, and windows are often covered with cardboard. The interior of most houses reveals that conditions

are crowded: it is not unusual for a family of seven or eight people to live in two rooms. Nevertheless, the women generally keep the houses clean and tidy. Despite the difficulty in obtaining water, enormous amounts of laundry are done daily, as can be testified by walking through Aroland any day of the week. In fact, the interviewer found that most of the time the only way to talk to the women was to follow them back and forth from laundry tubs to clothes lines.

There is no running water and sewage system in the village, though two houses have pumps to draw water from adjacent wells. There are two usable community wells in the village, though only one is working at present. Many families go to the lake for their drinking water, which is considered fresher-tasting. The water is not chemically treated or boiled before use, though no one seems to suffer any ill-effects because of this.

Ontario Hydro was brought into the village in 1970 and every occupied dwelling now has electricity. This innovation brought with it several changes, especially in terms of the now widespread ownership of such items as television sets and freezers. More will be said later about the advent of widespread TV ownership. As for the now abundant use of freezers, this has had a very interesting result.

Before electricity, food was kept cold in summer by keeping it in a deep pit in the ground. Obviously this was not a particularly efficient method of preventing spoilage and as a result there was much sharing of game. One informant reported that only a few years ago, a man who had killed a moose would take it down to the river to butcher it and each family in the village would come to get its "share". Now, a man butchers his meat and it all goes into the deep freeze for the future use of his own immediate family. There is little sharing.

A.5.3 Aroland: Demographic Characteristics

According to the list of residents for September 1971, the population of Aroland is 267. Although there have been additions and deletions since that time, this figure is still relatively accurate. Of this population, approximately 65% are Status Indians, being registered for the most part at the Longlake 77 and 58 reserves. The remainder are either Metis or enfranchised Indians but in everyday relationships, the fact of being status or non-status is totally irrelevant.

There are seven whites living in the community: an

elderly man who has lived there for over 40 years and who is married to an Indian woman; a Roman Catholic priest (now retired) who has ministered to the area for almost 50 years; four teachers - two nuns and two men, one married.

A.5.3.1 Birth Rate

It is impossible to determine accurately the birth rate for the village of Aroland, but certain assumptions can be made from the number of children per completed family. Inferences can also be made about future trends from opinions expressed about limiting family size by young married and unmarried individuals who will be producing the next generation of Arolanders.

Eight couples in the age bracket of 35 to 50 have eight or more children, including one family with eleven children. The age-spread of children is obviously quite great; it is not unusual to find families with both older children married or otherwise absent while at the same time there are very young children in the household. It is difficult to estimate median number of children per family, since many couples in the fertile bracket have not completed their families.

There seems to be some desire, even among the older women to limit family size. There is little evidence that this desire is reflected in successful practice, and it is difficult to say whether this lack of success can be attributed to inadequate information, the influence of the Roman Catholic Church, shyness in discussing such matters with a doctor, or a combination of these factors. One 35-year old mother of 10 children mentioned that she really didn't want any more children, but her doctor took her off the contraceptive method she had been using and apparently didn't instruct her in any alternative means.

If one looks back a generation to the parents of those now in the fertile age bracket, one finds one family with 16 offspring (8 of whom died in childhood). The median number of children for families of this generation was five, but one can probably assume that actual number of live births per family was considerably higher since the informant was vague on childhood deaths occurring in that period.

It is probably safe to assume that the birth rate in Aroland is higher than the national or provincial average, and to predict that it will decline only slightly in the next decade. Many of the relatively young couples (late twenties) already have four or more children and these women rarely gave any indication that they intended to

limit their families. Again, the reason for this can only be speculated upon, and so one might wonder what kind of effect a family-planning education programme might have on the community. It is possible that such a programme might have a good deal of impact if it is well organized and run by one of the local people. Already one young woman in the community has had training as a nurse's aide; it was expected that she would initiate such a program on her return to the community but to date this has not happened in any effective way.

It is obvious that communications media might be used in such a way as to encourage people to limit family size. Not only could TV and radio be used as an educational tool, supplying information about contraceptive methods, but exposure to the type of life-style one sees protrayed in most television programmes might have the same effect. Already some of the younger people are questioning the value of large families. They feel that a large number of children places too great a strain on family finances; it doesn't allow one to get ahead or to provide enough for each individual child.

A.5.3.2 Death and Morbidity Rates

Here again, in the absence of hard data, one can only speculate on actual rates, while identifying the factors which might contribute to higher death and morbidity rates.

(i) Infant Deaths (under one year): We heard directly of only two infant deaths in the recent past, though this may not be accurate. One of the major factors which undoubtedly contribute to infant death and miscarriage is the difficulty in obtaining medical help. The nearest full-time clinic is in Geraldton, a distance of 55 miles over rough roads. A public health nurse and doctor from the Department of Indian Affairs hold clinics in the village every couple of months where children are given shots and TB tests are administered. This clinic is generally well attended, the time and place being announced regularly over Radio Kenomadiwin. There is also a public health clinic in Nakina, attended by a doctor twice weekly, but only one respondent mentioned using this service.

Two obviously pregnant women who were interviewed admitted that they should see the doctor but it was just too much trouble, especially when there were very young children in the household. One of these women also complained that she couldn't afford all the pills the doctor prescribed for her, so there was no point in seeing him. These two particular women had access to their husbands'

cars; for those who have to rely on others' cars or taxi, a trip to the doctor is even more prohibitive.

All babies are now delivered in the hospital at Geraldton and most women make it to the hospital in time. Only one case was reported of a woman giving birth in an ambulance on the way to the hospital. There is one woman in Aroland who used to act as midwife, but her services are no longer used.

(ii) General Death and Morbidity: One rather simple way of investigating deaths in a small community such as Aroland is to have a look at the local cemetery. The cemetery at Aroland is only about 10 years old, and contains about 15 graves. The graves are extremely well-kept with a profusion of plastic flowers and other ornaments; unfortunately they are not marked with the name or date of death and it was necessary to rely on an informant for a rundown of who was buried there and the cause of death. There were six accidental deaths: two children killed in a fire, two children killed in car accidents, one drowning and one death on the job. Death by natural causes was attributed to TB or other "lung trouble", perhaps pneumonia, in almost all cases.

This brings one to the rather startling realization that tuberculosis has in no way been eradicated in the north. Not only is it one of the leading causes of death, but several informants reported having spent various periods of time in the TB sanitorium in Thunder Bay.

As in infant deaths, accessibility to health services plays a role in death and morbidity rates. Other factors which might contribute to the prevalence of lung diseases are nutrition and crowding. Observation of the eating habits of Arolanders reveals that food intake is very high in carbohydrates and low in fresh fruits and vegetables. The local store carries fresh produce only occasionally, and the price is often prohibitive even at the Hudson's Bay store in Nakina. The effect of crowding and lack of sanitary facilities is instrumental in spreading highly contagious diseases such as influenza and colds which are quite prevalent during the winter and tend to be in epidemic form, sweeping the whole village at once.

It is therefore likely that birth, death and morbidity rates for Aroland follow the pattern typical of native peoples in the north. Statistics available for Ontario in 1970 indicate that birth rate of the Status Indian population remains more than 13% higher than the provincial average. Indian death rates are now almost on par with rates for the whole province, though infant mortality rates

remain higher. Certainly it is safe to assume (though no figures are available to back this up) that death rates in northern, more isolated settlements would be higher.

A.5.3.3 Migration

One highly noticeable feature of the migration patterns in Aroland is the ease with which people enter and leave. It is not unusual for a single person to move to Geraldton or Thunder Bay for employment or educational reasons and then return to Aroland, either to set up permanent residence or as a summer hiatus from city life.

There are 13 family names associated with Aroland and this has apparently been the case for some time. If you go back two generations to the grandparents of the present generation, you can find most of the established family names already present. Nevertheless, in each generation certain individuals and families are lost to the community. Nakina has the largest number of ex-Arolanders with seven families in which at least one of the spouses was from Aroland. Women are often lost to the community through marriage with men from outside. However, women are also brought into the community through marriage. In three recent cases, local men married women from Red Lake, Ogoki, and Fort Hope and residence was set up in Aroland, presumably by reason of the husband's employment.

Employment is probably the most important factor drawing families and young married couples away from Aroland. Almost all of the emigrants have taken up residence in nearby towns or cities. Two families are in Thunder Bay, three in Geraldton, and one in Sudbury. Close ties are usually maintained with these relations; visiting is the preferred mode of contact, rather than telephone or letter writing, presumably because they live in centres which have other attractions.

These figures refer to families more or less permanently settled in other areas and does not take into account the fluctuation of the younger and unattached population which floats in and out of Aroland as educational and employment opportunities seize them. There is always a relative who will provide one with accomodation while in Aroland so that for this group Aroland remains home, even while new experiences and life-styles are experimented with in the larger urban centres.

It is likely that the population of Aroland will remain relatively stable barring some shift in the employment situation. Should Kimberly Clark begin laying off workers, there is likely to be an exodus from the area in search of new employment.

A.5.4 Aroland Economics and Natural Resources

Aroland is typical of most of northwest Ontario in that the economic base of the area is dependent on the availability and utilization of its natural resources.

The most obvious natural resource for exploitation is timber. Kimberly Clark is presently engaged in cutting operations in the Aroland area and it provides the majority of jobs for the working population of Aroland. About three-quarters of the male employable population of Aroland, 24 men, are employed by K-C in some capacity. Relations between K-C and its employees are perceived by Arolanders to be very good. The pay is high: an experienced cutter on piece work can make as much as $600 every two weeks.

There were no serious complaints voiced about K-C's treatment of its workers, though there was some disaffection with K-C's practice of bringing in forestry students from Lakehead University as foremen during the summer.

Few men from Aroland work as foremen for K-C. One man assumed this position recently, upon his return to K-C after a two year stint with the Association. The other man is what might be called an "acting foreman". He told us that his boss was pleased with the way he had been handling the job, but he couldn't take on the work permanently as he can neither read nor write.

If the Anaconda Mine reopens or Kimberly Clark goes ahead with the planned sawmill in Aroland, some families and individuals could return from Geraldton or Nakina to take up residence in Aroland once more. Should the employment situation drastically improve, it would be interesting to note whether outsiders, white or Indian, would move in, en masse, from other areas. In the past there has been almost no in-migration (aside from teachers and priests) by total outsiders and the structure of the community, not only in terms of physical relationships but in terms of social and kinship relationships as well, would be severely altered should this occur.

The other major source of employment is forestry. Nine men in Aroland are employed by the Department of Natural Resources in the capacity of fire fighting and park maintenance; two men work at the Air Base near Geraldton; and the rest go into Nakina each day to be transported to areas where there is work to be done. This is strictly seasonal work, though the length of employment depends on seniority and ability. A foreman might work from May to December, while younger, less experienced men might work for only a few months in the summer.

This leads us to the question of how the rest of the population supports itself and how men in seasonal employment support themselves during the winter months. For the past several years Aroland has had a LIP grant which employed many of the seasonal workers during the winter, at such activities as house repairs and carpentry work. In the Spring of 1973, Aroland became ineligible for LIP grants because it is "too affluent". What effect this will have on the working patterns of the people is difficult to say at this point. However, it seems likely that funds for projects such as housing repairs and construction can be obtained from other sources. Ontario Housing Corporation is presently financing the construction of 10 new houses at a site across the highway from the old village. The Community Development Branch is another possible source of funds for projects which would be of benefit to the whole community.

In the past two summers (1971 and 1972), Aroland has received an Opportunity for Youth grant from the federal government. This past summer (1973) the high school-aged young people have been working on cleaning up garbage, fixing up the Association store facilities, and in writing a village newspaper. This project provides needed income and activity for the young people, especially the girls, who would otherwise find themselves idle and dependent on parents for money.

Employment opportunities for the women of Aroland are extremely limited. Lack of education is not the only drawback. Difficulties in transportation to centres such as Nakina and Geraldton where jobs in shops or restaurants could be found is also a deterrent. None of the women in Aroland are presently employed in wage-paying jobs; however, some did report having worked at such seasonal jobs as cone-picking, tree-planting, and as domestic help in summer tourist camps. It is difficult to see how this situation could change unless work is available for these women right in the community.

Another source of income which has important cultural as well as economic implications lies in hunting and trapping. While it is almost impossible to maintain even a subsistence standard of living through traditional pursuits, a large proportion of Arolanders take to the trap line for various periods during the winter months. Animals most often trapped are beaver, lynx, otter, muskrat, martin, and mink. Prices vary from year to year depending on the demand; for the past few seasons they have been good, with a beaver pelt bringing as much as $40 in the winter of 1972-73. Furs are usually sold to the Hudson's Bay in Nakina.

The Department of Natural Resources in Geraldton

controls the allocation of trapping areas, though this is not done arbitrarily: a man will usually be given a traditional trapping area. Once a trapping ground is registered with the Department it has very definite boundaries which must be respected.

Trapping not only brings in a much needed supplement to wages or social assistance, but is often seen as a recreational activity as well. Often the whole family will go out on the trap line for weeks at a time - a practice which the local school teachers find disturbing, as it takes the children out of school.

Old people, who can no longer work at regular full time employment, often see trapping as a way to keep themselves busy and maintain their sense of usefulness. One cannot ignore the intrinsic satisfaction that is gained by living in the bush. It is in many cases a release from the confinement of permanent village life. It is also seen by some elderly people as an escape from the wild parties which are sure to occur every Kimberly Clark payday.

Even more, hunting and fishing function as recreational activities. Killing a moose not only provides a man and his family with a good supply of meat, but it is an exciting and sometimes dangerous activity. Recounting one's hunting exploits is a favourite pastime, and one that is sure to heighten the prestige of the hunter.

Moose is the only large animal specifically hunted for food. It is hunted year round despite formal legal restrictions, and it is generally understood that no action will be taken as long as the game is reserved for personal use. There are numerous black bears in the area but they are never hunted. Whether this is a recent phenomenon or one that goes back to traditional avoidance of harming the symbol of one's totem is difficult to say. Certainly we never saw nor heard of one incidence of a bear ever being killed.

The numerous lakes in the vicinity of Aroland are ideal fishing grounds for pike, pickerel, and white fish. When fishing is considered a recreational activity or a contest of skill, casting rods are used. If a man is simply interested in getting a large supply of fish to feed his family, then nets are set up at strategic points in the river. Several of the old women we talked to still walk down to the Kowkash River regularly to set their nets.

Guiding is another traditionally related occupation that supplements income. The Association runs an Outfitters Operation in the bush north of Aroland and guiding

is one aspect of this operation. Some men have also worked as guides for various tourist operations in the area, though this type of employment is strictly seasonal and often undependable.

A.5.5 Aroland: Education

Education in Aroland will be considered from two perspectives: level of education attained by the population, and prospects for the future in terms of level of service and possible changes in educational level achieved.

Of those interviewed in Aroland, it was found that 5 individuals (all of whom were over 60 years old) cannot speak any English. Another three respondents speak some English, but with difficulty. An interesting point about Aroland is that almost the total population is fluent in their native language and it is this language that the children learn first. However, most people under 50 years have a reasonably good grasp of English and the young people are actually quite fluent. Ojibway is in almost all cases the language of the home, so that often a child's first real introduction to the English language comes in school. That this creates some problems for the teachers is undeniable and more will be said of this later.

Out of forty respondents it was found that 12 are illiterate in the English language and three are semi-literate. Their average age is 54 years, with the youngest being a female of 24 who never attended school because she always lived in the bush with her family. Of those who are illiterate in English, four can read and write in Indian syllabics.

For the over 40 group, there are no males who have attended school and only one female who went to residential school for two years. Not all of this group is illiterate, however, as two individuals reported that though they had never been to school their father, a white, had taught them to read and write. This lack of education is not surprising in the over 40 group since the school in Aroland only began in the late forties and prior to that time, residential school was the only facility available. Several of these respondents reported that they lived in the bush as children and their parents wouldn't allow them to go so far away to residential school.

For the 26 to 39 age group the average number of years of education is 7 for males and 5.5 for females. No one in this age group went beyond public school.

The youngest age group (16 to 25 years) has substant-

ially improved on this educational level, at least for the males. The average number of years of education for males of this group is 11 years, with 10 being the median. Included in this group are three who have attended a community college for at least one year. For the females in this group, the average number of years of education is 7.5, the median being 8.5. These figures are artificially low since not all individuals in the youngest age group have completed their education. Last winter all the high school students quit, but many are considering returning in the fall.

The level of education attained by the people of Aroland is considerably lower than the Ontario average, though the younger group is catching up. In the older generation there are two basic factors which have influenced this low educational attainment: low level of service and competing life-styles.

Residential schools, besides being such a distance from home were often highly authoritarian and punitive. For the child with exceptional ability and motivation they could provide a rigorous academic education, but this applied only to a very small number and hardly suited him for the kind of life he knew back home and so severe conflict was generated, not only within the individual, but between child and parents. Parents were therefore reluctant to allow their children to go to the residential school. It was not only a matter of not wanting to be without the child for so long a period but the parents could see no tangible results from this type of education, especially in terms of preparing the child for a specific occupation. Education didn't give the child a well-paying job and at the same time it robbed him of the chance to learn traditional skills.

In some ways this notion of the "uselessness" of education is prevalent today. Parents are very ambivalent about how much education they would like their children to receive. When questioned directly on this point, many at first paid lip service to the notion that education is "good" and that everybody should get as much as possible. But there was also the qualifying statement that "around here people get along O.K. without education". Since they have no experience of one of their own getting ahead specifically because of education, the ideal and the practical sides conflict. Most parents maintain that how much education their child gets is the child's decision. They will help all they can but they won't push.

It is difficult to assess the existing level of educational service available in Aroland. There is a modern

three classroom school in the community, staffed by four teachers, two of whom are nuns. From interviews with the nuns, who teach the lower grades, it is obvious that they have a good understanding of the difficulties involved in teaching native children, especially in terms of mastering the Ojibway language.

This same kind of understanding of the problems involved in teaching Indian children is not evident in the two other teachers, both of whom are men in their twenties. The principal of the school is totally cut off from the rest of the community, physically and socially. He lives in a modern house beside the school which creates quite a contrast to other houses in the community. He says, "You can't get too friendly with these people or they'll take advantage of you". He is so cut off from the life of the community that he maintains that the children don't really speak Ojibway fluently; they know a few phrases and that is all. We don't know where he got this notion but it is obviously false.

In terms of the education provided for the children, the principal sees his role as someone who tries to push as much Math, English, etc., as possible into the children for the time he has them, but if they aren't prepared for high school when they leave Aroland, then it really isn't his fault. He blames the parents of the children for not providing a stimulating home atmosphere and for not giving enough discipline to ensure that the children attend regularly and get there on time.

Our conclusion would be that the educational service provided in Aroland is adequate in terms of physical facilities, but it is inadequate in terms of the teaching methods. While the teachers are undoubtedly adequately trained with respect to southern standards, there is, with the exception of the nuns, a lack of understanding of the special needs of Indian children. It is not only the teachers who are responsible for this difficulty, however. The curriculum set out by the Department of Indian Affairs follows the provincial guidelines and therefore makes no provision for the cultural background of the children. No attempt is made to give the students special instruction in Ojibway history or language.

It is probably true, as one of the teachers maintained, that the children are not interested in their cultural history; their main interest is cars and sports. Certainly no mention of this issue was ever made to the field worker by either parents or students. This is one area where communications media could fulfil a function: If TV, radio, and newspaper (especially native newspaper)

make the people conscious of the various Native Rights movements and the resurgence of traditional culture, then demands could be generated.

The people of Aroland are at present relatively apolitical. Their isolation and the retention of certain aspects of the "old life" have accompanied their relative affluence and have kept the people protected from the extreme social disorganization and feeling of cultural loss which is evident in so many other Indian communities. They are for the most part content with their lives in Aroland and see no need for any organized effort to improve their condition.

The Ojibway are traditionally an individualistic people to whom organized action, even on a community level, is foreign. The Association therefore finds itself in the position of being called into action only to cope with a crisis situation. Such an incident occured two years ago when the women became dissatisfied with the school principal's treatment of their children. Their complaint was brought to John Therriault, the manager of the Association, who in turn registered the complaint with a personal contact he had in the Union of Ontario Indians. Indian Affairs speedily responded and the principal was replaced. It is obvious then, that while the people themselves are unaware of the governmental structures, they know where and whom to go to when they want something done. It is the community leaders who must direct these demands through the proper channels.

The future trends of educational attainment in Aroland do not look very bright. Of the three young people who made it through high school, two had their public school education in residential schools and their high school in Thunder Bay, and the other boarded with a family while attending high school in Geraldton. Presuming that the majority of children will finish their public school in Aroland, it is doubtful whether pushing them into Geraldton for high school will have any more success in the future than it has had in the past.

A.5.6 Aroland: Health Services

The availability of health services has been outlined in the section on demographic trends. What has not been analysed is the use made of these services and the attitudes expressed about the quality of service. Of 35 respondents who gave detailed information on their use of health services, it was found that all but five had visited the doctor in the last year. Without exception, medical help was sought at one of the two clinics in Geraldton.

Of those who hadn't been to the doctor in the past year, three were under 25 years of age and maintained they simply had not needed to see a doctor. It is apparent, then, that health services are highly utilized but this should not be construed as meaning there is a ready acceptance of medical advice. There is evidence that there is a lack of understanding of the use of prescribed medicines, especially among the older people. One respondent reported taking some pills the doctor had prescribed, but when they didn't seem to have any visible effect, she threw them away. Others reported running out of medicine but not going back to the doctor for more because they just found the cost prohibitive. However, if the symptoms return, the individual then feels there is a good reason to see the doctor and the cost and time involved is well expended.

This attitude towards the seeking of medical help is typical of a people who cope with a situation as it arises. It is similar to the attitude towards concerted community action: let well enough alone until a crisis occurs then lay the problem at the door of the man most qualified to deal with it.

In terms of the effect of communication media (or any other contact with the wider society) on attitudes towards health care, the largest influence would probably occur in the area of preventive medicine. People are aware of where to get medical help and they utilize this service readily enough when illness strikes. The main focus of any educational programme for the betterment of health levels in the community should focus on aspects such as proper nutrition and sanitary standards, care of the teeth, importance of inoculations, and the need to follow through on medical advice.

The hospital in Geraldton is well used by the population of Aroland. All respondents but three (young people under 20) reported having been in hospital at some time in their lives. Nine people reported having been in hospital within the past year. Most cases are first taken to Geraldton, usually by cab or private car, unless the situation is an emergency at which time an ambulance is called in from Geraldton. The hospital at Geraldton is considered by Arolanders to provide excellent service and this is sometimes expressed as: "they really treat Indians well there". Any patient with a serious or unusual illness is sent to the hospital in Thunder Bay to see a specialist.

Though medical facilities are a good distance from Aroland (an hour and a half drive over rough roads) they are not perceived by the people to be inadequate. There

is a realization of the difficulties and expense involved in getting to the doctor or a hospital, but it is accepted as part of the price one pays for living in a relatively isolated community. The doctors and the hospital are always highly praised; any deficiency in health services provided to Aroland is only a matter of geographical distance.

A.5.7 Aroland: Religion

We were not able to get much information on the religious activities of Arolanders. Ostensibly, all are Roman Catholic. The Jesuit priest who has ministered to the entire area for almost half a century, is now retired in the community. Mass is held regularly but, our observations suggest, poorly attended except for weddings and funerals. Nor were we aware of a strong attachment to traditional religion though we heard of at least one instance of a resident visiting the shaman at Longlake 77 during the time we were doing our fieldwork.

A.5.8 Aroland: Social Control

Aroland is an orderly community; privatization is great and for the most part, people mind their own business. Events do occur, of course, but then are handled as much as possible from within the community. It is very rare to have the police called in. Gossiping is an effective method of social control, as is ostracism. On one occasion, a woman (from outside the community) who had taken someone else's husband, was put upon, beaten, and driven from the community by the other women. Another time, the children vandalized the school severely; however, the principal of the time was so much disliked that the elders of the community did not consider it an unjustified misdemeanour (in fact, the decision was made to have the principal replaced!). Drunkenness occurs, and fighting, but these are seen as normal, and therefore tolerated. It is very rare for any member of the community to run so afowl of the law as to be charged in the courts.

A.5.9 Aroland: Communications*

A.5.9.1 Telephone

Aroland has four pay-telephones of which two are readily accessible to the community. All calls in and out of Aroland are long-distance and must be made through the

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*The data presented in this section are taken from 45 unstructured interviews conducted over a 2-month period. The figures are presented to show trends only and cannot be viewed as hard data. No random sampling technique was used and some interviews were incomplete in certain areas.

Footnote Cont'd. *The major impressions were gained from direct observation and casual conversation. This type of approach was found necessary because of the problem of gaining relevant information from a long and elaborate interview schedule which left many areas of interest untouched and which respondents could often not understand.

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operator. Use of the telephone in Aroland is not very high. Six respondents (N=45) reported using the telephone once a week; eight use it occasionally (about once every two weeks); eight seldom use it; and seven reported they never use the phone. Of this last group all are aged 60 years or over, and maintained that they would not know how to operate the telephone. Over half the respondents reported that service calls, i.e. to doctor and taxi, constitute their main use of the telephone. The rest were divided between business and personal calls.

Some factors which might affect this relatively infrequent use of the telephone are: cost, inconvenience in getting to the phone, difficulty with English, lack of friends and relatives outside the community who have phones.

In the past year a petition was organized and sent to the government and to Bell Canada requesting personal phones in Aroland. As yet this demand has not been met though there is speculation that dial phones are soon to be installed in Nakina and that this service will be extended to Aroland. Despite the fact that a petition was successfully organized, the people I talked to seemed either indifferent or opposed to the idea of having personal phones. "Children would misuse them", it was said, or "Large bills would be run up and then the phones would be taken out, just as happened in Longlake 58".

If phones were installed in private homes it seems likely that usage would increase, but the incidence of long-distance calls would probably not increase radically. Better contact with friends and relatives in Thunder Bay would probably be increased but since many Indian families in Nakina and Geraldton have no phone and can be easily contacted in one of the many trips into those centres, this kind of personal or kinship call would probably not increase.

The level of service at present is adequate in terms of the time it takes to put through calls, voice quality, and so on. An increase in quality of service either through individual phones or by some other means will not

substantially improve the level of service in other areas. The phones are likely at present being used to capacity in the area of calls for cabs and doctor's appointments.

A.5.9.2 Newspapers, Magazines and Books

Reading material of any description is not readily available. Not only does the local store not carry magazines or newspapers, but most people do not bother to obtain them in Nakina or Geraldton. About 40% of respondents revealed that they never read magazines and 60% stated that they never read a newspaper. Included in this group, obviously, are some of those who can neither read nor write, but this certainly cannot account for the whole group. In fact, some individuals who are illiterate in English receive subscriptions to Nakina magazines written in syllabics.

The major reasons for this lack of use of reading materials is the difficulty in obtaining them and the low literacy level. When magazines become available as in the case of a departing teacher who left behind his collection of "Time", they are quickly snatched up. Year-old magazines were read cover to cover, or at least the pictures were well studied.

A.5.9.3 Television

It is probably safe to say that every household in Aroland has at least one TV; some having two or more. Three respondents had colour TV. Television viewing in Aroland is focused on certain specific programs. One seldom finds the case of the set being turned on in the morning and left on regardless of what the program is and who is watching. Naturally each individual has his or her own particular preferences, but respondents often reported they watched one or two favourite programmes a week and nothing else. Television watching is therefore quite restricted, with the largest number of respondents reporting that they seldom watch TV.

Among the women, the soap opera "Edge of Night" was mentioned by almost everyone. The men were interested most in sports with the news and late movies being other choices named. Four respondents reported listening to the news on a regular basis.

This low level of TV watching can probably be attributed to a lack of choice in programme (with only the one station available) and the time spent in other pursuits. Few people complained about the lack of choice; they more or less accepted it as an inevitability in a community such as Aroland. Yet it is still true that this lack of choice restricts television viewing.

What probably takes people away from the TV set more than anything else is the availability of other activities. There is the possibility of fishing in the summer and hunting and trapping in the winter. Many individuals enjoy this kind of activity for its own sake, apart from the food and revenue it provides. Therefore there is entertainment and enjoyment to be found outside of watching television.

A.5.9.4 Radio

Radio ownership is also quite widespread, though not as universal as TV ownership. Six respondents had no radio but they availed themselves of friends' or relatives' radios. Radio listening is a much more casual affair than television viewing because other activities such as housework can be done while the radio is playing in the background. The majority of respondents reported listening to the radio occasionally (at some time during each day if only for a few minutes). Rock and Country and Western music are the favorites, though a substantial portion reported listening to the news regularly.

Radio Kenomadiwin* was known and listened to by all respondents. It seems to be very popular in the community because it plays the kind of music the people like. It airs requests and people of all ages avail themselves of this service. The "teaching" aspect of Radio Kenomadiwin is not very evident at the moment except for some announcements about civil rights. There are few complaints about this lack of genuine community radio, except among some of the younger people who are aware of the original purpose behind Radio Kenomadiwin and deplore its failure to live up to expectations. Thus, not only lack of resources and personnel keep Radio Kenomadiwin from becoming a community radio; the complacency of the people and their acceptance of it as a medium designed solely for entertainment are significant as well.

A.5.9.5 Letters

Letter writing is an activity which basically requires two things: 1) an ability to use language in written form; 2) somebody with whom to correspond. This may seem like an obvious assumption but it is these two factors which keep letter writing at a low level in Aroland. We are looking here at letter writing as a social activity: keeping friends and relatives informed of one's activities. We make this distinction because everyone in Aroland sends and receives business mail such as cheques, bills, premium notices, etc., as a matter of course.

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*Radio Kenomadiwin is a low-power, experimental community radio station that was active at various times, in various communities, during the period of this study.

About half the population pick up their mail in Aroland, where it is delivered three times a week via the local taxi. The others go into Nakina to pick up their mail. This seems to be a desire for privacy since mail coming into Aroland is scrutinized by the local postmaster and anyone else who happens to drop in at the community store.

Only 13 respondents reported ever writing letters for other than business purposes. Of these, four who reported writing often (within the past 2 weeks) were under 22 yrs. of age. It is not unreasonable to expect that younger people, being more at home with written English and having a wider range of experience outside the community, would be the more prolific letter writers. It was found that younger people write to friends as opposed to relatives more often than their elders. Many reported having pen pals as far away as New York and London with whom they maintained a regular correspondence. Also these young people had made friends while going to school in Thunder Bay or elsewhere and their friendships are maintained by correspondence.

Those over 25 who reported some letter writing revealed that they corresponded occasionally with relatives outside Aroland, usually Thunder Bay. The large majority of respondents reported no letter writing at all, usually because of illiteracy. Three older respondents reported that sons or daughters helped them to handle their business mail.

A.5.10 Longlake 58: General Description

This report on the reserve community of Longlake 58 is presented for the purpose of comparison with Aroland, which is a non-reserve community. This report on Longlake 58 will be briefer than that on Aroland with only the interesting points of comparison made and some explanations given of the similarities and differences. This approach is necessitated by the shorter length of time spent on the reserve and the way in which the research was conducted. There was no accomodation available for us on the reserve and so we were forced to live in the town of Longlac, about 1½ miles away. We do not feel we got to know Longlake 58 as intimately as we did Aroland; most of the activities of interest occurred at night and on weekends when we were away from the reserve. Our report on Aroland is a much more complete ethnographic account, with most of the information obtained through participation in the full life of the community, and supplemented by data from more structured interviews. Most of the data presented in this part of the report was obtained almost entirely from 35 interviews which were slightly more structured than the Aroland interviews, but basically covered the same area.

Longlake 58 reserve is situated on the northern route of the transcontinental highway (Ont. 11). The town of Longlac, which is a regular stop on the CNR main transcontinental line, is about 1½ miles away on the other side of the road.

In appearance, Longlake 58 is a fairly neat, attractive community, laid out on a street plan. The frame houses, built by DIAND in the recent past, have been freshly painted in bright colours with the help of a LIP grant last winter. Some of the more affluent residents have quite large and well-furnished homes. There is a well-built community centre which has just been enlarged, a skating rink, and baseball diamond. A new Roman Catholic church is being built (with the help of a LIP grant); the Jesuit priest lives in a new house in the community. There is a public school on the reserve, but no high school. Students are bussed to Geraldton for high school.

The Indian agent lives in Geraldton, about 23 miles away. The management of the reserve is in the hands of the band chief and a band manager, who acts as welfare officer as well.

A.5.11 Longlake 58: Demographic Characteristics

The total population of the Longlake 58 band according to DIAND figures for 1971 is 623. Only a portion of those registered with this band actually live on the reserve, however. (Indeed, most of the status Indians in Aroland are registered at Longlake 58, though they have never lived there.) The on-reserve population at Longlake 58 is estimated at 369.

Birth and death rates are almost impossible to estimate, though large families of more than five children are quite common. There is no evidence that even the younger women are attempting to limit family size. Three female respondents under 25 already had three or more children.

There is widespread drinking, and this has effects on the morbidity and death rates, both directly and indirectly. Money needed for groceries is often spent on liquor or beer, and this is especially true for pregnant women. Informants told of two cases where women either miscarried or lost the baby at birth, allegedly because they drank excessively during their pregnancy.

Drunkenness also plays a part in some injuries and deaths. During the five-week period of our fieldwork one person drowned while drunk; one person died in a car accident because he was driving while impaired; and several injuries occurred during drunken fights.

Even though Longlake 58 has closer proximity to facilities than Aroland, the widespread social and personal disorganization appear to mitigate against any reduction in morbidity or mortality rates, (see Section A.5.15 below).

A.5.12 Longlake 58: Economics

The major sources of employment for men on the reserve are the Weldwood plant in Longlac, Kimberly Clark, forestry, and work on the reserve such as carpentry, etc. In actual fact, few of the men are employed full-time. Only one man interviewed reported being employed and he had some technical training and worked for Weldwood.

It is difficult to assess what exactly is at the root of this unemployment problem, though it is likely several factors are at play. First, there is the absence of jobs for unskilled workers: few young people have more than a few years of high school and the older men are in an even worse position. Second, there is the poor work record of some of the men. Two respondents reported that they lost their jobs because of continual absenteeism, drinking on the job, and so on. These men both expressed their regret at having been so foolish and were trying to find work again with the hope that they might fare better next time. It is not difficult to understand how even those with the best intentions could be drawn into the nightly drinking parties with the resulting damage done to their ability to cope with their job. No doubt there are other reasons as well.

These unemployed men seemed to want to find work. All reported that they went daily or made phone calls to Longlac to look for work but with no results. This brings up the question of why they don't relocate in Geraldton or some place where jobs are available. With the exception of some of the younger men, it was apparent that there was a deep attachment to the reserve where they had grown up and where their friends and relatives lived. Then there is the added problem of financing this type of move. A man who is unemployed simply does not have the funds to relocate, not to mention the benefits which would have to be forfeited. As long as he stays on the reserve, he has a house and DIAND assistance; once he leaves he is more or less on his own.

It is difficult to see an end to the unemployment situation in Longlake 58. Even if a new industry were to enter the area and open its doors to the reserve population, it is difficult to see that patterns of life would change drastically. The idleness, the drinking, and the violence are part of the way of life on the reserve and the lack of

work reinforces this pattern. But whether simply changing the employment situation would bring an end to the social instability and disorganization is another question.

A.5.13 Longlake 58: Education

The prevalence of illiteracy in Longlake 58 seems about the same as that for Aroland, with those over 40 years of age having low literacy levels. Again this is a function of the educational system of an earlier age as those who are illiterate report never having attended school.

One surprising factor about the people of Longlake 58 in contrast with Aroland, is the disappearance of Ojibway as the everyday language. Only one woman interviewed spoke mostly Indian and only two others reported they were fluent in Indian. Most people know a few words and phrases in their native language but maintain that they use English almost 100% of the time.

From the interviews conducted it would appear that the level of education is lower in Longlake 58 than in Aroland, though one has to be careful in making these assumptions since those interviewed in no way represent a random sample. In the 16-25 year age group, average years of education are 9 for males and 7 for females. In the 26-39 age group it is 7 and 6.5 for males and females respectively, and in the 40 plus group the females fare better with an average of 2 years of education while the males have none.

The figures for the youngest age group are undoubtedly artificially low since all those interviewed in that age group had quit school. There is a sizeable group of students under 16 who are still at school and one can only speculate on the level they might reach. Distance to the high school in Geraldton might play a role; the Longlake students have a much shorter trip than Aroland students and so they might be more disposed to stay in school longer. Home conditions will also play a role with factors such as crowding, fights, and other disruptions interfering with a student's ability to do well. In Aroland crowding is a universal problem, while family instability is more highly evident in Longlake 58. In the most part, there is little encouragement from the parents in either community, and this too has a negative effect on the child's motivation to stay in school.

A.5.14 Longlake 58: Health

One factor which would seem to work to raise the level of general health in Longlake 58 is the proximity of health services. There is a clinic in the town of Longlac and a health unit trailer on the reserve where the doctor from

town visits twice a week. The trailer is also staffed by an Indian who has some training in emergency health care. There is the added factor that the hospital in Geraldton is only 23 miles away as compared to the 55 miles which the people from Aroland must travel to get to the same facility.

Almost half the respondents (12) had been to the doctor in the past month: half to the clinic in Longlac and half to the trailer on the reserve. There does not seem to be any reluctance to use the health services available and many people reported seeing the doctor for minor ailments such as colds, upset stomach, etc. Easy access to the doctor was mentioned by several respondents and is no doubt an important factor in this high level of use.

With the exception of three young people everyone interviewed had been in the hospital at some time, most in the past year. There were three respondents who had gone to the hospital in Thunder Bay, two to hospitals in Winnipeg, and the rest to Geraldton. Just as in Aroland, lung ailments, especially pneumonia, are a major reason for hospitalization. I heard no reports of anyone confined to the sanitorium for tuberculosis, though possibly there are some cases.

It is safe to assume therefore, that accessibility of health services plays a role in their use though not necessarily in their effectiveness. It is impossible to say whether the general level of health is any higher in Longlake 58 than in Aroland or whether once they get to the doctor either community receives better treatment or at least follows through their treatment with more diligence.

A.5.15 Longlake 58: Social Control

One does not have to be in Longlake 58 for very long before one realizes that there is extreme personal and social disorganization there, which is in stark contrast to Aroland.

Marital and family instability is a feature of life in Longlake 58 and this is apparent at every turn. There were several instances of common-law relationships, separations, and divorces, and a higher incidence than in Aroland of single women with one or more children.

Drunkenness and associated vandalism and violence is a weekly, if not daily, occurrence. During one memorable weekend party we witnessed fist fights, hysteria, destruction of personal property, and child abuse. This type of

occurrence is apparently not at all unusual if one is to believe the reports which drifted in every Monday morning.

There is also a high incidence of juvenile delinquency, usually involving theft, vandalism, and automobile infractions. The police and social workers are frequently called to the reserve to settle fights, remove children, and make arrests. The day the court is in session usually sees a large number of Longlake residents up before the judge.

One is hard put to find the kind of inner and informal control mechanisms at work that are so much a part of the Aroland control structure. It is therefore appropriate that some comment be made about this difference between Aroland and Longlake 58. Doubtless, several factors are involved but one of the main ones would seem to be the difference in economic level. It is not only that most men in Aroland are employed and most men in Longlake unemployed, but it is the meaning given to making a living. In Aroland there is a feeling of pride associated with one's work. A man knows he can provide well for his family by sticking to his job and he is extremely reluctant to let anything, including illness, keep him from that job. There is also the factor of outside activities which keep the people occupied and provide them with entertainment and satisfaction. Families in Aroland are more likely than those in Longlake 58 to go out in the bush for the weekend and this is sometimes directly motivated by a desire to stay away from the drinking parties back home. Also, it is a family activity, whereas drinking parties either at home or in the bars are a more or less male pursuit; and Arolanders appear to value their family structure highly.

A.5.16 Longlake 58: Communications

A.5.16.1 Telephone

About half the households in Longlake 58 have telephones. At one time this proportion was higher, but several families have lost their telephone because of failure to pay the bills. Because access is easier and immediate payment not necessary, more use is made of phones in Longlake 58 than in Aroland.

Ten respondents reported using the phone at least once a day and eight of these owned their phone. Of the eight respondents who said they seldom use the phone (less than once a week) six had no phone of their own. As opposed to the predominantly service nature of the phone calls in Aroland, Longlake 58 residents use the phone most

often for personal calls, and most of these are to friends and relatives on the reserve. Some respondents reported that this was their primary means of visiting other people on the reserve. Service calls came after personal calls in frequency; with calling the police being mentioned most frequently. For those without phones the usual practice is to use neighbours' or relatives' phones, and here the phone calls are usually restricted to service and business purposes.

Only four respondents reported making long-distance calls in the recent past and in all cases these were calls to relatives in Thunder Bay or elsewhere. There is some concern over the indiscriminate use of the phone for long-distance calls, and this was sighted as a major reason for people not having their phones.

It would seem that Longlake 58 residents have adapted to the use of the telephone as an instrument for casual conversation much along the same lines as occurs in any southern community. There exists the ability to "visit" via the phone so that face-to-face communication is apparently not a necessity. A very different situation exists in Aroland where not language but sheer presence of the individual is a requirement for interpersonal communication. This is in keeping with the different demeanor easily observable in the two communities. Longlake 58 residents seem on the surface at least to be more talkative and outgoing as opposed to the more quiet and reserved aspect of Arolanders. Whether the advent of phones in Aroland would change this characteristic or not is an interesting question. One wonders what visiting and communication patterns were like in Longlake 58 before the advent of phones.

A.5.16.2 Newspapers, Magazines and Books

Only one individual reported having a subscription and this was for the "Indian News". However, magazines and newspapers are frequently bought in Longlac with about 70% of respondents reporting that they read magazines at least some of the time. The types of magazines most frequently mentioned were comics, true stories, and detective stories, with Maclean's and women's magazines mentioned fewer times.

Three respondents reported reading newspapers often (every day). In all cases this was the Thunder Bay newspaper. Six respondents reported reading the paper only occasionally and six seldom read a newspaper. The newspapers mentioned were the papers from Thunder Bay, the Geraldton paper, and the Toronto Star. Fourteen of the 35 respondents said they never read a newspaper.

Three respondents mentioned having read a book recently and in all cases these were pocket books of the detective or mystery type. Only one respondent claimed ownership of books. He said he owned about three books, one of which was a book on improving one's English.

Use of reading materials is apparently higher in Longlake 58 than Aroland though it is of a different nature. Whereas Arolanders read native newspapers and news magazines, Longlake 58 residents tend more towards the comic and true-confession type of material which is more of a purely entertainment as opposed to informative type of reading.

A.5.16.3 Television and Radio

Television viewing is much more prevalent in Longlake 58 than in Aroland. Over one-half of the respondents reported watching TV for over 3 hours a day. Their television viewing is also not as selective as it is in Aroland. Most homes visited during the course of interviewing had a TV set operating regardless of the time of day. Choice of favourite programmes is also much broader in Longlake 58, though here again soap operas and movies are popular.

Detective shows were mentioned by nine respondents; the fascination with these types of shows lying in their violent nature. One can speculate to what extent this is a reflection of the extreme preoccupation with aggression which is characteristic of reserve life. The young men are especially sensitive about their physical prowess: who can beat up whom and how this can be accomplished (in graphic detail). The young man watching detective shows on television identifies with the virile, aggressive hero who can handle all opponents with his fists and do so with style. Being able to handle oneself physically is a great source of personal pride and satisfaction.

Radio listening follows a similar pattern to that which exists in Aroland, though there is a greater interest in music, especially country and western, and less interest in news and public affairs programmes. Only one respondent reported listening regularly to the news on the radio. Nor was this deficiency taken over by TV, since only six respondents said they watched the television news regularly.

In this regard, the greatest difference between Aroland and Longlake 58 is in the critical comment made on the quality of TV and radio broadcasting in the north. Arolanders accept the limitations, but Longlake 58 residents are vocal in their complaints. Each respondent was asked whether he was satisfied with the type of TV and radio he received, but often even before the question was asked

criticisms would be voiced. The most common complaint was the limitation of choice. With only one channel, people feel they are compelled to watch programmes in which they are not really interested. This is interesting, since it does not seem to occur to them to find an alternate form of entertainment when programs they do not like are on. This is in contrast to the approach to television viewing prevalent in Aroland: choose the programmes you like and find different activities for the rest of your free time.

Television viewing is the major form of entertainment in Longlake 58. Few families take to the bush in the evenings or on weekends and with the high unemployment rate, many people have unlimited spare time to fill. It is therefore not surprising that they are critical of the TV they receive.

A.5.16.4 Letters

Two-thirds of the respondents reported that they never write letters for other than business purposes; half of this group never write letters at all. This is surprising when one considers that many respondents have relatives in Thunder Bay and elsewhere with whom they are in contact by phone or visits. Writing seems to be used only when other methods are impractical, as when a relative or friend is confined to a hospital or jail in Thunder Bay. There is a greater dependency of Longlake 58 people on telephone and personal contact, which is easier for them since they are not as isolated as Arolanders. There is good bus service from Longlac to points east and west, as well as a local bus running twice daily between Longlac and Geraldton. The only way that one can get out of Aroland is by private car or taxi.

A.5.17 Implications for Telecommunications Policy

This ethnographic account of two Indian communities has been presented in considerable detail for the implications it has for telecommunications policy, particularly with respect to native peoples. That policy will be informed, in part at least, by the more general policy and goals concerning the position of native peoples in Canadian society: goals that are defined not solely by the Canadian government and by white society but, increasingly, by native peoples themselves. We assume that Canadians are committed to the value of cultural pluralism, and that it is this value that shapes our national policy with respect to all cultural groups within the society, including native peoples. The corollary of this assumption is that cultural assimilation and social homogeneity are

rejected as overarching political goals. The conclusion to be drawn from these assumptions is that communications technology is a resource available (though not necessarily equally available) to native peoples to be used in the satisfaction of their needs and aspirations as they define them.

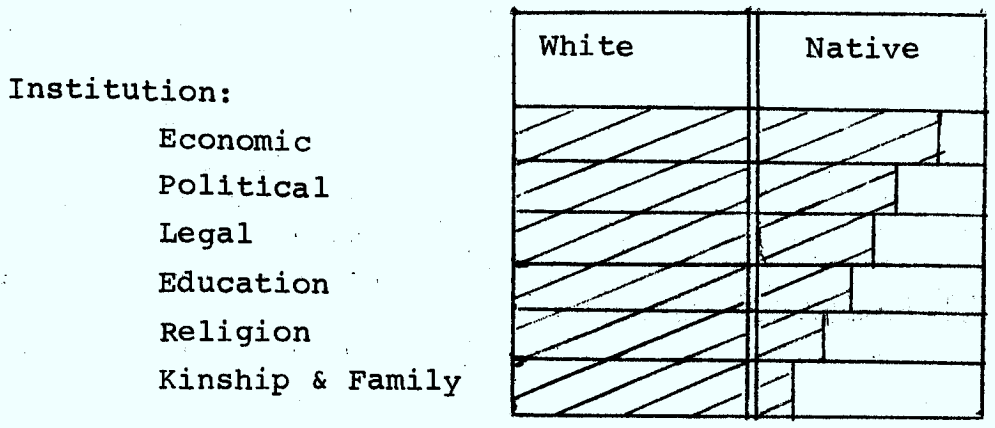
Our study of the Aroland community suggests to us that this particular group of people, at least, has been able selectively to take some institutions from the surrounding white society and adapt them to their own needs and purposes, while rejecting others.

This process of institutional selection is almost complete in the economic sector: entrepreneurial activity, full-time employment, a wage economy, purchase and use of consumer goods (cars, freezers, TV, etc.), and participation in public, long-term, financial assistance programs (e.g. Ontario housing). But even in this institution the assimilation process has not been total; traditional ways of obtaining food supply are used extensively.

Less total but still considerable is the acceptance of the legal and political institutions of white society: the formal structure of the Community Association, for example, is that of a legal-rational organization, although its informal operation derives at least as much from traditional native patterns of individualism and privacy. These same values make traditional modes of social control effective except in extreme situations when the white man's institutions of the police and the law are accorded some level of legitimacy.

Acceptance of the education and religious institutions is much more partial and superficial; while the traditional institutions of kinship and the family have remained more or less intact.

This pattern of penetration of white into native institutions can be diagrammed thus:



Note that "private" institutions appear to be less susceptible to cultural penetration than those that functionally are more "public". Telecommunications can hasten or impede this process.

If this analysis has any validity, then the implications for policy are as follows. Community control of communication systems (particularly TV and video because of the high visual orientation of native peoples) will further reinforce cultural values and normative structures in the "private" sector, particularly with respect to cultural belief systems and the primary institutions of socialization, the family, religion, education. At the same time, community involvement at ownership, management, and program levels of communication media, because of the logic of the organizational structure required, reinforced by our hypothesized propensity to adapt "foreign" technological, political, and managerial knowlege and adapt it to their own needs, would facilitate the further integration of native and white institutional structure in the more "public" sector.*

On the other hand, where the process of cultural loss has been more extensive, as in the case of the Longlake 58 reserve, but with the limited assimilation of the group into white society, community control of communication media could well hasten the process of social and cultural disorganization.

Selective experimentation in different types of communities would test these hypotheses.

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*Our use of the public/private dichotomy to characterize institutions closely parallels the external/internal classification of Parsons, "Pattern Variables Revisited", American Sociological Review, Vol. 25, August 1960.

APPENDIX A.6: REPORT OF FIELD WORK IN SIOUX LOOKOUT

A.6.1 Sioux Lookout: A Descriptive Background.

The town of Sioux Lookout is a thriving community in northwest Ontario, which was established around 1910-1911. Individuals, and later families, were attracted to the community because of the many employment opportunities it offered, largely in unskilled occupations with the Canadian National Railway and the pulp and paper industries that were developing in the region. From its beginning, it was a highly ethnically assorted town and this situation still persists though affiliation to ethnic tradition is significantly less today. Ethnic groups, excluding the English who represent the majority of the populace, presently include Italian, French, Ukrainian, Polish, and Scandinavian minority groups. Ojibway native Indians constitute another sub-sector of the population as both local community residents and frequent out-of-town visitors. Hence, the community of Sioux Lookout presents itself today as a settlement of individuals primarily assimilated, but many with widely divergent personal backgrounds.

Sioux Lookout is approximately 200 miles northwest of Thunder Bay, 42 miles off the Trans-Canada Highway at Dinorwic, and directly on the Canadian National's main railway line. It is therefore conveniently off the main stream of cross-Canada traffic, and has managed to retain many small town qualities. The nearest large centre is Dryden, Ontario, a city of approximately 60,000 population, 60 miles southwest. Though situated in Ontario, with Thunder Bay as the closest metropolis, there is a definite orientation towards Winnipeg for facilities unavailable within the community. However, since Sioux Lookout is itself a comparatively major communications centre, linking the further north, predominantly Indian, villages to the south, its facilities and institutions are numerous for a town of its size.

With a population of 2826 in 1973, Sioux Lookout is a spreading community amidst a dense region of woods and lakes. The small business sector of the town is primarily situated on one side of four blocks of the main street, across from which runs the railway line, making a very linear spatial arrangement. Housing developments are arranged in a grid-pattern behind the frontal business street and, more recently, across the railroad tracks, forming a small community along Pelican Lake. For the most part, the roads in residential areas are unpaved. Since the connecting

road to the Trans-Canada Highway was constructed, the town has expanded considerably. Despite the four trailer courts which have sprung up on the outer peripheries of the town, housing is still greatly in demand to meet the needs of the increased numbers of individuals migrating into the area.

There are six major categories of economic activity in the town which provide employment for most of Sioux Lookout's labour force. These are: forest resource development, railway maintenance and operation, government services, tourism, industrial goods and services, and retail goods and services. Out of these are generated a number of agencies, institutions, organizations, clubs, and associations, which provide the basis for community interaction and sustenance.

As an orientation centre, Sioux Lookout is serviced with facilities that provide dual functions, supplying both the needs of community residents and occupants of the outlying areas and northern communities. There are two hospitals, a community general and a federal one operated by the Dept. of Indian Affairs and Northern Development; one secondary and three elementary schools for the entire region; three small airways for transporting people and supplies north; an Indian Friendship and Communications Centre often used as a home-base for out of town Indian residents; and numerous churches and recreational facilities. It is also well served by transportation and communications networks: the railway, the highway systems, and the airlines provide easy access into and out of Sioux Lookout. The town receives C.B.C. radio and television broadcasting, a central radio-telephone system establishing communications links with over 25 northern communities, to each other and to Sioux Lookout; and recently the town has introduced its own volunteer operated community radio network. Thus, Sioux Lookout is a well-endowed, bustling community, and one well suited to the purposes of the Queen's University study. The material included in this report is a delineation of our investigation there.

A.6.2 Methodology of the Study

In order to obtain as complete a portrayal of the community as was possible, given the short time available for the study and the limited human resources, a variety of sociological research methods and techniques were employed. First, various government documents, including demographic and social statistical reports, were consulted so that the researchers had a fairly extensive knowledge of the community prior to the actual fieldwork. Then, once in the field, survey research methods were combined

with the more subjective anthropological approach of participant observation. As social scientists we were concerned not to place so much emphasis on quantification as to obscure the social reality of the community as it is experienced by the people who live there. Such qualitative or "soft" data cannot be obtained from a solely statistical study. The research team lived in the community for two months and during that time, took part in many of its activities. As well, during the team's residence in the town, it conducted unstructured interviews with many of the town's officials and professional people. The "hard" statistical data was obtained from structured interviews with 106 persons in 60 households, which represented a random sample of the town's predominantly Euro-Canadian population. In addition, there was random interviewing of a portion of the local Ojibway Indian fringe population, but this was conducted in a far less structured manner.

The report that follows draws upon the information gathered from these diverse sources and methods.

A.6.2.1 Household Interviews

The field work reported here was conducted from May to August 1974. The approach to interviewing was altered considerably from the individual interviewing method used in the 1973 studies of Aroland and Longlake. We attempted in Sioux Lookout, to study entire households rather than single individuals, recognizing that, in most instances, households represented nuclear families.* An active attempt was made to interview each of the adult members of the household, or, if this was not possible, to obtain the required factual data about those members. In this manner, we were able to attain a more complete overview of the entire household's history with respect to origins, mobility, ethnic affiliation, education, employment, kinship, etc., from which we were able to draw conclusions about community attachment and sentiments, population patterns and characteristics, opinions and expectations in relation to telecommunications, and so forth. By interviewing the household as a unit rather than single individuals, we were in a more advantageous position to determine ideal community types and to predict probable future attitudes and movements.

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*A household, for our purposes, was delineated according to the census definition as "a person or group of persons occupying one dwelling. It usually consists of a family group.... However, it may consist of a group of unrelated persons, of 2 or more families sharing a dwelling, or of one person living alone." A dwelling is designated as a "structurally separate set of living quarters, with a private entrance".

A random sample of 100 households was selected from the available 1974 Taxation Assessment Forms. An alternative list of 100 households was also compiled to be used in the cases of refusals or rejections. From our initial sample there were ten refusals and two households had to be eliminated because of language difficulties. These names were replaced by random selections from the alternative list. From this list as well, we were able to alter a somewhat imbalanced proportion of people over 45 years of age, which was discovered after some interviewing had been conducted. An allowance for 13 extra households in the under-45 category was made, with substitution of them for 13 random names from the over-45 category of the original list. The result of this alteration was an increase in the proportion of respondents under 45 years of age to 63% of the sample. We considered the over-representation of this age group necessary to obtain the required qualitative information regarding local education institutions, current employment situations and aspirations, entire family community participation, etc. Of the finally selected sample of 100, and with the assistance of two hired local residents, 59 household interviews were accomplished, comprising 106 respondents (52 males, 54 females).*

We regret that our sample is devoid of any employees of the Canadian Armed Forces, but permission for such interviewing was refused by the local army authority. Hence, we were compelled to nullify three completed interviews and to withdraw four other Canadian Armed forces household names, selecting substitutes from the alternative list. This means that there is in our study, an under-representation of this highly mobile sector of the community which must be taken into account when considering mobility and attachment to the community, as well as other important factors such as external correspondence and communications. Our assumption is that the highly mobile, especially younger, population will be less attached to the community and less concerned with local

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*According to a recently published article by John D. Kasarda and Morris Janowitz in American Sociological Review, June 1974: "involvement in the social fabric of communities declines with advanced life-stage. Most affected by older age are participation in informal social activities, local kinship ties, and membership in formal organizations." (p.334). Hence, we find adequate justification in allowing our sample to contain a larger percentage of under 45 people.

affairs*. A cross-tabulation of length of residence of our sample with community attachment, verifies this assumption, as shown later in this report. Thus, leaving out the Canadian Armed Forces personnel from our study probably decreases significantly our statistics on low community involvement, local political awareness and concern, and disaffection with local services and facilities.

The interview schedule administered to each respondent in our sample was an extensive inquiry into factual and subjective opinion information concerning personal backgrounds and community life, (Appendix A14). We were concerned with areas of personal information such as household data - composition, number, ages and marital status of individuals, ages and location of children of the dwelling, type of dwelling; mobility data - previous geographical residences and birthplaces of family members and their predecessors, length of residence in Sioux Lookout, attachment, and future mobility intentions; education and employment history of all individuals in dwelling; ethnic affiliation; political awareness and interest, community participation; health facility usage and evaluation; kinship location and attachment; and communications data such as use of television, telephone, letter correspondence, newspapers and other publications, etc. Diverse data such as these then were accumulated to obtain a multi-dimensional quality in our community analysis.

A.6.2.2 Aggregate Community Statistics: Comparability to Sample

If we discount the exclusion of the Canadian Armed Forces personnel, the remainder of the community's minority segments (age groups, ethnic groups, occupational groups, etc.) are adequately accounted for in our sample. 46% of the populace is under 20 (calculated on the 1966 Census Population break-down), and these are purposely omitted from our sample.**

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*Kasarda and Janowitz (1974): repeated studies have indicated that length of residence in a community is a crucial and central factor in developing a sense of belonging, an interest in a particular community, and establishing strong social bonds which contribute to a strong attachment to that community.

**Age 20 was the most convenient cut-off point for our calculations to coincide with census statistical categories; hence we chose this age as the arbitrary figure to indicate adulthood.

The remaining 54% constitute Sioux Lookout's adult population, the universe from which our sample was drawn. Of those, 29% are under 45 - 25% are 45 and over. Thus there is a slightly larger adult population in the town. As has been indicated, our intention in interviewing a community sample was to allow for additional representation of individuals in the under 45 age group. It is thus that 63% of our sample was 20-45, while 55% of the total adult Sioux Lookout community was in that age category.

Based on the 1966 town population figures, there were 800 individuals within the ages of 20-44, and 667 over 44. Of the 800 in the 20-44 age group, we interviewed 67, representing a ratio of one in twelve. Because we interviewed fewer individuals 45 and over, our ratio is higher for the older adult population. Of 667 in this age range, we interviewed 39, a ratio of one in 17. Table A.6.1 illustrates the age group distribution for both the sample and the total community.

TABLE A.6.1

Age Distribution

Age	Sample	Town (1966)
20-24	17.8%	9.4%
25-34	34.0	20.9
35-44	11.3	24.3
45-54	14.2	19.5
55-64	12.3	12.3
65+	10.4	13.6

Source: Census of Canada, 1966.

The sex distribution compares favourably between sample and actual population. In both cases females outnumber males by less than 2%.

There were 730 households in Sioux Lookout in 1971, an increase of 21.5% over the decade (Statistics Canada, 1971). It can be assumed that this figure has increased slightly to coincide with the population increase. In 1971 the average household size was 3.4 persons, a decrease of .5 from the 3.9 average in both 1961 and 1966. It must be pointed out that this figure is the entire town's average and would probably not pertain to the Indian sub-section of the population which comprised the second half of our study. Statistics are not avail-

able for average household or family size of specific ethnic groups, but from observation it can probably correctly be assumed that the sizes of households and families for the Indian population are considerably higher than the average aggregate town figures. In our sample (which excludes the Indian families), the average household size was 3.3.

Of the 730 households in 1971, 500 or 68% were owned and 230 or 32% were rented. In our sample 72% were owned and 28% rented (see Table A.6.2). Again, this slight discrepancy may be accounted for by our sample not including the Indian population at this point, while the census figures include all dwellings in the town.

TABLE A.6.2

Sioux Lookout:
Owned/Rented Dwellings 1961-71 + Sample

	Total	No. Owned	(%)	No. Rented	(%)
1971	730	500	68%	230	32%
1966	679	458	67%	221	33%
1961	601	483	80%	118	20%
Sample 1974	59	42	72%	17	28%

Source: Census of Canada 1971, Table 3 Occupied Dwellings by Tenure.

Table A.6.2 illustrates the large increase in Sioux Lookout households in the 1961-71 ten-year period, especially in rented dwellings where almost a 100% growth has taken place. There has been a 21.5% overall household increase consisting of a 94.9% increase in rented dwellings and only a 3.5 percentage change in owned dwellings.

The rising number of rented households in the town is consistent with the large number of transient or highly mobile persons in Sioux Lookout. It also exemplifies some indication of the town's inability to keep up with the increasing demand for permanent housing, due to the rapid influx of people. The fact that even the four local trailer parks for mobile homes all have waiting lists of potential residents also seems to support the apparent trend of highly mobile in-migrants.

The majority of our household interviews in Sioux Lookout culminated in family respondents. There were in our sample 42 nuclear families (36 with children), 6 extended families (all with children), and 11 non-family units which included 9 single households of widows, divorcees, or unmarrieds, for a total of 59 households.* Of the 730 households in Sioux Lookout in 1971, 604 or 82.7% were family units. In our sample 81% of the households were nuclear or extended families. Computing average family size to be the average of the total number of members, parents and children only, of all nuclear and extended families in the community, the census has determined that Sioux Lookout had an average of 3.7 persons per family in 1971. This figure represents a decrease over the 1961 average of 3.8 and 1966 average of 4.0. Such a trend is indicative of the tendency in Sioux Lookout, as elsewhere in Canada, to reduce family size.

The average family size of our sample was 3.7, which also compared exactly with the 1971 total community figure. Verification of the tendency to limit family size was ascertained when our sample was queried about family planning and ideal family size estimates (see later in this report).

TABLE A.6.3

Sioux Lookout Households and Families, Number and Size + Sample

	Population	Household Number	Persons per Household	Family Units	Persons per Family
1971	2530	730	3.4	604	3.7
1966	2667	679	3.9	598	4.0
1961	2453	601	3.9	566	3.8
Sample	106	59	3.3	48	3.7

Source: Census of Canada 1961, 66, 71, Vol. 11, Part 1 Households, Households by Size and Vol. 11, Part 11 Families, Families by Size and Type.

Our sample of 106 respondents consisted of 52 males and 54 females. 82% of these were married individuals, 9% were widowed, divorced or separated.

*Our definition of family unit is that used by the Canadian census: "A husband and wife (with or without children who have never been married regardless of age) or a parent with one or more children never married, living in the same dwelling".

A.6.3 Sioux Lookout: Demographic Characteristics

Sioux Lookout is experiencing a very gradual population increase, with a more rapid influx in the past few years. The official census figures for the past 25 years are:

1951	2,364
1961	2,453
1966	2,667
1971	2,530

In 1973 the population was estimated to be 2,826. In the ten-year period between 1961 and 1971 the population increased by 3.1%. Such a trend is dependent upon two factors; natural increase and migration to and from the community. Natural increase figures, that is the differences between births, and deaths, were easily calculated from data in provincial vital statistics reports and through interviews with hospital administrators of both Sioux Lookout hospitals. However, migration statistics for communities the size of Sioux Lookout are not readily available and we have been able to derive only estimates of net migration using the formula:

Net Migration = Total Population Increase minus Net Natural Increase (Births - Deaths).

In our field work we endeavoured to discover mobility patterns and migration tendencies to supplement the deficient information available through library research.

This chapter will present first,the statistical information about birth, death, and infant mortality rates. Then, in the second section of the chapter, we deal with migration and mobility patterns, both social and geographic, using data from the field interviewing.

A.6.3.1 Birth Rate

Because Sioux Lookout operates as a service orientation centre for communities in the north and for local towns along the railway line with minimal hospital facilities, the number of actual births occurring in the town's two hospitals is very high. The General Hospital is utilized mainly by town residents and residents of nearby communities. The Zone Hospital functioned until 1971 chiefly as a hospital for Treaty Indians. Since that year, its policy has expanded to allow for treatment to whites as well as Indians; but as late as 1974 most local residents (non-treaty Indians and whites included) were still using the General Hospital most

frequently. Therefore, in analyzing birth and death statistics for the town itself, we will mainly be referring to occurrences at the General Hospital, even though in most statistical records differentiation between cases at the two hospitals is not specified. Government records are usually compiled in such a manner as to combine all data pertaining to town residents, regardless of where the events occurred. From our interviews with the administrators of both hospitals, we were able to supplement, but not completely clarify these information gaps. It is evident that utilization of the Zone Hospital by whites has increased steadily since 1971. In 1971 for example, only one white birth occurred there, while in 1972 there were 13, and in 1973, 22 white births. We do not know how many of these births occurred to white residents of the town of Sioux Lookout itself, since the Zone Hospital is used by neighbouring communities as well.

Rates calculated on the basis of low numbers of actual occurrences in a small population, can fluctuate sharply and must be interpreted with caution. An increase of only one or two cases can dramatically affect the rate in a small population base, and this must be taken into consideration when comparing rates over time or between groups. Consistently high rates, however, cannot be altogether discounted by small population levels. Both these factors then, must be weighed in accounting for the high rates of births and infant mortality.

Sioux Lookout's birth rate, while still considerably higher than the average for Ontario, is declining steadily and this is in keeping with national and provincial trends. In 1971, Sioux Lookout's birth rate was 26.1* compared with a provincial rate of 16.9; the comparable figures for 1966 were 24.0 and 19.0; and, for 1961, 44.8 and 25.3. It is obvious that the birth rate of Sioux Lookout dropped much more dramatically over this ten-year period than it did in Ontario as a whole (a drop of 18.7 for Sioux Lookout as compared with 8.4 for Ontario). This is consistent with modernization trends generally. When asked their opinions about limiting family size, our respondents were 86% unequivocally in favour of some form of family planning; 7% were opposed, and 7% were undecided. When questioned about "ideal size" family; 21% considered three children ideal; and 22% favoured four or more children. The remaining 13% considered this decision to be dependent on personal

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*Birth rate = number of live births per 1,000 population.

as well as external circumstances, such as family income or personal preference. In the majority of cases, economic considerations were cited as the chief reason for limiting family size, although frequently ecological concerns were referred to as well.

We can compare these results with two Gallup polls released in 1957 and 1970, which asked respondents how many children per family were ideal. The 1957 poll compared results of two surveys conducted in 1945 and 1957, and reports: "In 1945, 29% of respondents thought 5 or more children ideal. In 1957, that had dropped to 21%. Thus 79% of the respondents had an ideal family size of up to 4 children."* By 1970 this ideal family size figure had dropped dramatically as Table A.6.4 illustrates.

TABLE A.6.4

Ideal Family Size:
Gallup Polls Compared with Sioux Lookout

	Gallup Poll			Sioux Lookout
	Canada 1945	Canada 1957	Canada 1970	1974 (N=86)
2 or less children	17%	22%	34%	44%
3 children	23	23	33	21
4 or more	60	55	33	22
Depends	-	-	-	13
	100%	100%	100%	100%

Source: Lorna R. Marsden (see footnote below).

We suspect that the marked rise in preference for the two-child family in our Sioux Lookout sample as compared with the national figures in the 1970 Gallup Poll can be accounted for by the four-year time difference in data collection. Since 1970 there has been a substantial decline in fertility rates throughout Canada; Sioux Lookout residents are probably just reflecting a marked change in Canadian attitudes generally.

Other factors are significant in considering ideal

*Lorna R. Marsden, "Population Probe: Canada", The Copp Clark Publishing Company 1972, p. 81.

family size opinions. Age of respondent, for example, might determine the attitude towards childbearing. Since in modern times the childbearing age has dropped substantially, the vast majority of women have completed their childbearing by age 35. In examining our sample's stated ideal family size, we have designated this age as the dividing line between childbearing and non-childbearing people.

TABLE A.6.5

Percentages of Sioux Lookout Sample: Ideal Family Size by Age

Ideal Number of Children	AGE Under 35 (N=47)	Over 35 (N=39)	
2 or less	43%	46%	(38)
3 or more	49	36	(37)
Depends	8	18	(11)
			(86)

It appears that those under 35 are slightly more disposed towards larger families than are those who are over 35. Given that the over 35 age group is under-represented in our sample, this may mean that our results are skewed in the direction of more than 2 children per family. Two observations are suggested by reponses to our ideal-family-size question. First, the generally expressed desire to limit family size is probably a consequence of the diffusion of modern urbanized ideas into rural areas, via improved communications channels. This gradual revision of social thinking will continue to be reflected in future population and birth rate trends. Second, the disposition of the childbearing age respondents to consider three or more children ideal is interesting. Of 19 respondents who considered four or more children per family ideal, 11 were under 35 years old. These attitudes are reflected in Sioux Lookout's presently high birth rate. Though the birth rate is declining, it is still higher than the provincial average, and if these statistics are any indication, it will likely continue to be so until at least the present childbearing population reaches beyond the childbearing age range.

Another important influencing factor in this opinion is level of education. Indirectly this takes into con-

sideration the influence of the mass media and "zero population growth" advice, with the assumption that the higher one's education, the more well-read one is and the more aware of contemporary issues. This leads to the hypothesis that the higher one's education, the more likely one is to agree ideally with Zero Population Growth (2 children per family). Data from our sample confirms the hypothesis, as shown in Table A.6.6.

TABLE A.6.6

Percentages of Sioux Lookout Sample: Education by Ideal Family Size

Ideal Number of Children	Years of Education 1-10 (N=49)	11-13 (N=28)	Post Secondary (N=7)
2 or less	39%	43%	57%
3 or more	55	32	43
Depends	8	25	-

As education increases so does the view that two or fewer children constitute the ideal family size. Since educational achievement for the younger population (as illustrated later in this Appendix) is steadily rising, it is plausible to predict a sharp decline in the birth rate once the age cohort that is now in school is having its families.

A.6.3.2 Infant Mortality

Sioux Lookout's infant mortality rates show a very gradual decline, as well as a high degree of fluctuation within figures consistently steeper than the provincial rate. Once again, the same caution with respect to calculated rates for a small population base is in order. In 1971 Sioux Lookout's resident infant mortality rate was 45.5,* considerably steeper than the provincial rate of 15.3. This in part can be explained as an artifact of calculation as suggested above. In 1971 for instance, only three infant deaths actually occurred, but in view of the fact that only 66 resident births took place, the rate logically appears quite high. In 1966, Sioux Lookout's infant mortality was 31.3, considerably lower than its 1971 rate, but still well above the provincial rate of 20.2. The actual number of infant deaths that

*Infant Mortality Rate = Number of deaths, infants under one year of age, per 1,000 live births.

year was only 2, within the context of 64 births. Similarly, in 1961 the town had an infant mortality rate of 63.6, while Ontario averaged 27.2. In each of these cases Sioux Lookout's birth rate is significantly higher than the provincial birth rate. Other than the low population, low actual occurrence explanation, we are not in a position to explain these trends, behond pointing out that rural rates are generally higher than those in highly urbanized areas.

A.6.3.3 Mortality Rates

Sioux Lookout's 1971 mortality rate was slightly higher than the provincial average. In 1971, Sioux Lookout's death rate was 10.7,* somewhat higher than its 1966 rate of 6.7. The provincial rates for these years were 7.4 and 7.8, respectively, but with consideration again of the town's low population and consequent vacillating statistical rates, these figures appear standard for the situation. Most of the deaths occur in the General Hospital owing mainly to its higher utilization by local persons. Most of these hospital deaths are adults, and of these, somewhat more than half are patients over 70 years of age.** Lack of availability of nursing homes and senior citizens homes has been cited as one reason why many elderly persons are retained at the General for long periods of time; shortage of auxiliary facilities results in increased hospital usage and, in this case, increased deaths of elderly persons in hospitals. The fact that 70% of all Sioux Lookout deaths in 1971 occurred in hospitals supports this observation. This proportion appears to be a fairly stable percentage in the history of Sioux Lookout's hospitals.

The very high number of hospitalized elderly in the General Hospital, as compared with the almost nil representation in the Zone Hospital is worthy of note. The adminstrators of both hospitals attributed this to the difference in cultural attitudes between whites and Indians in caring for their old people. In the past in Sioux Lookout, and elsewhere as other studies indicate, whites have exhibited the tendency to prefer institutional care, whereas Indians have shown a preference to be cared for, and eventually to die, in their home communities. These cultural traditions are reflected in the statistics

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*Death Rate = Actual Number of deaths per 1000 population.

**Mr. L. Johnston, Sioux Lookout, June 13, 1974.

of deaths occurring in the two hospitals. The Zone, serving all of the 18 predominantly Indian northwest Ontario cummunities plus outlying areas, had a total of only five hospital deaths in 1971, while the General, serving mostly white local residents had 20 - most of these, as previously stated, being persons over 70 years old.

Unaccounted for in these statistics are Sioux Lookout residents who died in places other than Sioux Lookout hospitals. Of these some would have died in hospitals elsewhere, mostly referred cases that required specialized treatment that could not be obtained in Sioux Lookout. Also included would be accidental or violent deaths not occuring in hospital.

TABLE A.6.7

Deaths and Deaths in Hospital by Place of Occurrence and Place of Residence - Sioux Lookout 1971.

TOTAL DEATHS

Total by Occurrence	Total by Residence	By Occurrence Residence Elsewhere	By Residence Occurrence Elsewhere
37	27	16	6

DEATHS IN HOSPITALS

Total by Occurrence	Total by Residence	By Occurrence Residence Elsewhere	By Residence Occurrence Elsewhere
27	19	12	4

Source: Vital Statistics for 1971, Province of Ontario.

In 1971, there were 27 deaths of Sioux Lookout residents; four of these occurred in hospitals outside the community and two were non-hospital violent deaths of Indian residents.

Another mortality figure which enters the official vital statistics for Sioux Lookout are deaths of persons in the local hospitals who are not residents of the town. Almost half of the 27 hospital deaths in Sioux Lookout in 1971, and well over half of the 32 hospital deaths in

1966, were people whose homes were elsewhere. It is likely that most, if not all, of the Zone Hospital deaths occurred to outside residents, owing to the hospital's function as the representative medical centre for all of northwest Ontario. The General as well, though not nearly as frequently, is sometimes utilized by residents of communities in local railway towns, mostly whites.

Of direct influence on mortality and morbidity rates is the quality of sanitation facilities of the community. Here we have only observational data. We would estimate that services to most of the population, especially the white sector of the community are quite adequate. Every home in our white sample had running water and indoor sewage facilities. The Indian sector of the population, however, was not as well serviced; many had only outhouse sewage facilities, and cold running water, or no running water at all.

A.6.3.4 Migration and Geographic Mobility

It was noted above (at the beginning of Section A6.3) that the population of Sioux Lookout is gradually increasing. Natural increase accounts for almost the total of this population increase, since it is greater than the fairly high loss through migration. From 1961-65, there was an estimated net loss of 106 persons and from 1966-70, 313 persons, through migration.* This high outflow is typical of the trend displayed in the whole northwest Ontario Region, comprising the Thunder Bay, Kenora, and Rainy River Territorial Districts.

According to one investigator who analyzed a random sample of telephone directories for the 6-year period 1966-1972, Sioux Lookout had an overall mobility rate of 28% for that period, and an annual rate of 21%.**

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*To arrive at these net migration figures we subtracted deaths from births for the two 5-year periods. We then calculated what the actual population would have been had there been no migration, by adding the net natural increase to the original population figures for 1961 and 1966; and then subtracting actual total populations for the years 1966 and 1971. This final figure represents the population change through migration (the difference between in - and out-migration). Thus: Net Migration = Total Pop'n. increase minus net natural increase (births minus deaths).

**D. Stymeist unpublished Ph.D., University of Toronto, 1975.

The proportion of Sioux Lookout's population that is transient is probably even higher than these figures would suggest. Not accounted for in any of the crude calculations (and unavailable from statistical sources) are numbers of individuals who enter Sioux Lookout, stay for less than a year and move on to another locale.

We are not able to predict from these aggregate figures who these out-migrating people are. The population pyramids for 1961, 1966, and 1971 (Figure A.6.1) indicate an underrepresentation of both males and females in the 20-24 age group. One of our hypotheses then, was that a high degree of the out-migration comes from this segment of the population. This hypothesis was not confirmed in our analysis of the sample data. More extensive information would be needed to explain this trend.

TABLE A.6.8

Sioux Lookout Sample:
Age by Intentions of Moving

	Age			
Intentions	Under 25 (N=19)	25-34 (N=36)	35-55 (N=27)	Over 55 (N=24
Staying in Sioux Lookout	48%	44%	52%	83%
Depends on Job Opportunities	36	33	37	4
Leaving Sioux Lookout	16	22	11	13

In an endavour to determine which age group is most likely to leave Sioux Lookout, we correlated age with intentions of moving. Table A.6.8 indicates that the under-35 age group accounts for the largest percentage of persons planning to leave Sioux Lookout. 65 percent of those planning to leave were under 35. The 25-34 age group shows the largest percentage intending to leave.

Those respondents with probable or definite intentions of moving from Sioux Lookout in the near future represent 16 percent of our sample. Another 28 percent expressed that they would leave for a better job opportunity whether with the same or a new employer. Thus, 44 percent of the respondents are disposed to leave Sioux Lookout. The other 56 percent expect that they will be long-term residents, and almost half of this group strongly proclaim their definite

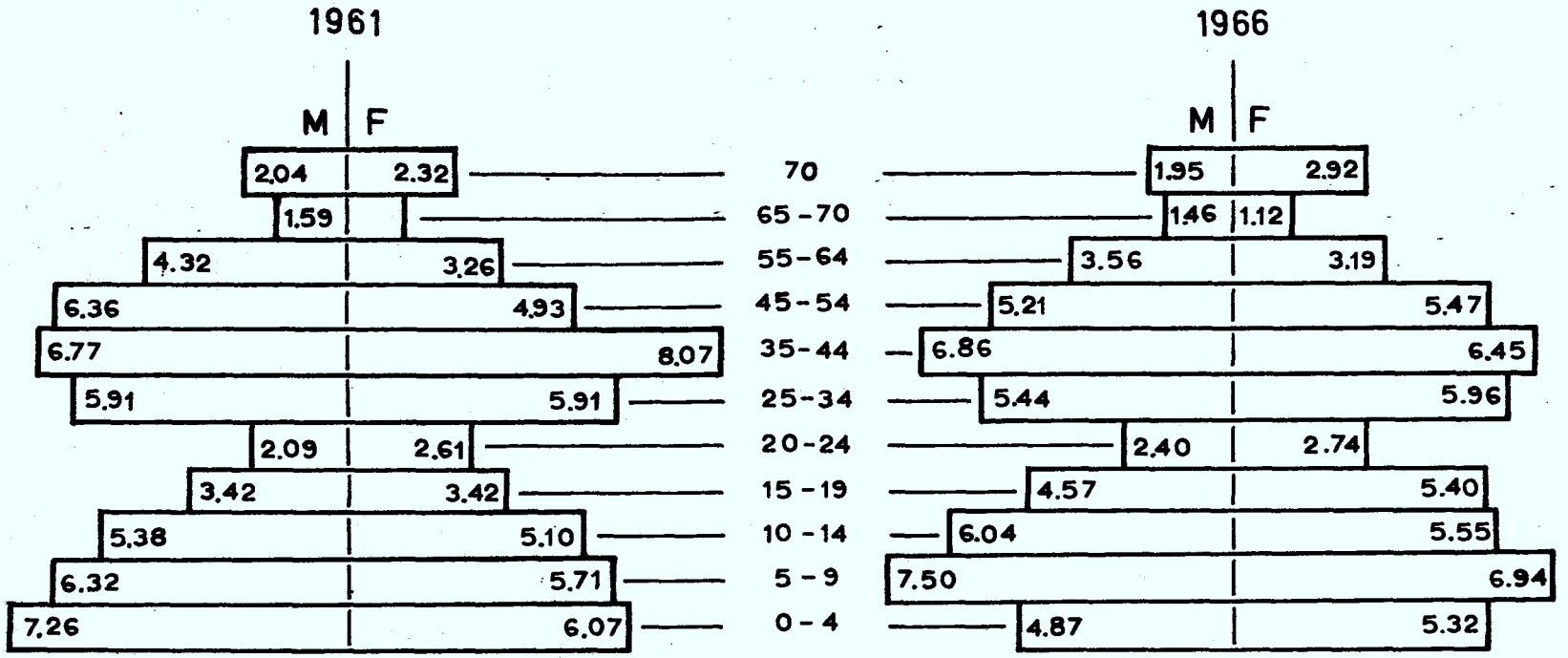

Fig. A.6.1a POPULATION PYRAMIDS, SIOUX LOOKOUT

Source: Census Canada (1961, 1966), Population by Specified Age Groups and Sex, for Census Subdivision.

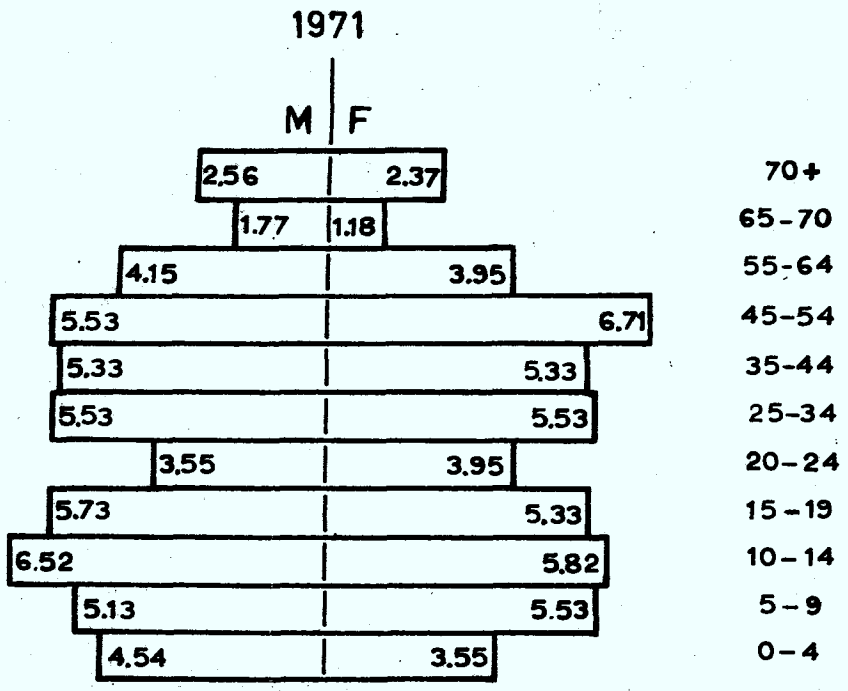

Fig. A.6.1b POPULATION PYRAMIDS, SIOUX LOOKOUT

Source: Census Canada (1971), Population by Specified Age Groups and Sex for Census Subdivision.

intentions of remaining. This verifies our observation that the town is composed primarily of three types of residents: the core group of long-term "established" individuals with a strong attachment to the community and a strong local system of interaction, the "transient" type of resident with little community involvment and low community attachment, and a middle sector with little commitment to the community, but little incentive to move elsewhere. Table A.6.9, which relates length of time in Sioux Lookout to attachment to community illustrates that 67 percent of our respondents who had been in Sioux Lookout ten years or over (our "established sector") had a strong community attachment.

TABLE A.6.9

Years of Residence by Attachment to Community

	Length of Time in Sioux Lookout		
Attachment to Community	Less than 2 yrs. (N=19)	2-10 yrs. (N=21)	More than 10 yrs. (N=70)
Low	58%	52%	10%
Medium	26	10	23
Strong	16	38	67

Attachment appears to be greater the longer one has resided in the town. Not surprisingly, a majority (58%) of individuals who had lived in Sioux Lookout less than two years (our "transient sector") had low community attachment. It must be noted, of course, that it is difficult to determine the direction of the relationship between these two variables. In other words, is attachment to the community a function of length of residence, or do people choose to stay, or even elect to move into the community in the first instance, because of their strongly positive sentiments towards it? Most probably this is a case of regional interactive effects which would require much more intensive probing if they are to be adequately understood.

Length of time in Sioux Lookout is also correlated with number of other places lived (Table A.6.10). One would expect that individuals with highly geographically mobile backgrounds (arbitrarily we have selected three or more previous places lived to indicate this) would be more apt to stay less time in Sioux Lookout, and indeed our data seems to support this supposition. Half the respondents had lived in three or more places other than Sioux Lookout, and a large proportion of these (80%), had lived less than 10 years in Sioux Lookout. On the other hand, the majority

of individuals who had lived in two or fewer other communities (70%) had lived in Sioux Lookout for more than 10 years. It is interesting that the percentage of people who stated their intentions of probably or definitely remaining in Sioux Lookout is almost 70% (in fact, 69%). 65% of those who were planning to move, or would move for job reasons were individuals who had lived more than three places before moving to Sioux Lookout.

TABLE A.6.10

Years of Residence by Number of Places Lived

Number of Other Places Lived in	Length of Time in Sioux Lookout: Under 10 yrs. (N=41)	10 yrs. & Over (N=63)	Total
0, 1, 2	20%	70%	50% (52)
3 or more	80	30	50 (52)

In considering geographic mobility for any locale, it is important to investigate the areas where respondents were raised, and the types of communities and regions where they have lived previous to their present residence. This analysis is useful in establishing migration trends and mobility patterns. In Sioux Lookout, there appears to be some consistency in that a slight majority of town residents illustrate a definite regional orientation in their mobility patterns. 55% of our respondents were raised in northwest Ontario. Of those raised elsewhere (N=48), most were brought up in scattered towns across Canada, with the largest single group (10) coming from southern Ontario; a very few came from the United States; and 12 were raised outside of North America. 86% of the sample were raised in locales with populations of under 60,000, and the vast majority of these (Table A.6.11) were in small towns or villages. Only 14% of the respondents were raised in large cities, half of these in Winnipeg or Thunder Bay.

Over half (51.2%) of our respondents who had lived elsewhere before coming to Sioux Lookout, had been residing in northwest Ontario immediately prior, 26% of these in either Thunder Bay or Winnipeg.* Further, 56% of those who had lived elsewhere had come from farms, villages,

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*In this particular aspect of the study we have designated the area of northwest Ontario to include Winnipeg, Manitoba, since it appears to be a significant aspect of regional orientation. Winnipeg is the main source of telecommunications for the area.

TABLE A.6.11

Region and Type of Place Raised

Region Raised (N=106)		Type of Place Raised (N=106)						
						Large City		
N.W. Ontario	Other	Farm	Village	Town	Small City	Thunder Bay	Winnipeg	Other
55%	45%	7%	14%	44%	21%	2%	5%	7%

TABLE A.6.12

Previous Region and Type of Place Lived

Previous Region (N=101)		Previous Type of Place (N=100)							
						Large City			
N.W. Ontario	Other	Farm	Village	Town	Small City	Thunder Bay	Winnipeg	Other	Other
51.5%	48.5%	2%	16%	29%	9%	11%	15%	15%	3%

TABLE A.6.13

Parents' Region and Type of Place Raised

	Region Raised					Type of Place Raised							
										Large City			
Parent	N.W. Ont.	Other Canada	United States	Outside N.America	Don't Know	Farm	Village	Town	Small City	Thunder Bay	W'peg	Other	Don't Know
Father (N=106)	18%	36%	8%	31%	7%	14%	12%	32%	15%	2%	3%	7%	15%
Mother (N=106)	22	35	6	32	5	14	13	33	12	3	3	10	11

towns or small cities. This fact, perhaps, offers us some insight into why the majority of respondents have a geographic preference for northwestern Ontario, it being less densely populated than a great many other regions.

It is useful to examine the parents' migration history to get some insight into the settlement pattern of Sioux Lookout, especially since the majority of our present generation residents are established northwest Ontario dwellers. Table A.6.13 illustrates that about 20% of both the mothers and the fathers of our respondents were raised in the region. 80% of all parents were raised in very small cities, towns, villages or farms, a percentage correlating with the large number of respondents raised in places of similar type. Approximately one-third of the parents had been immigrants from outside of North America. Around the time that the majority of these individuals were migrating, the 1920's and 30's, the Canadian frontier was being settled by European immigrants from rural backgrounds. It is not surprising that such a high proportion of immigrants would have been attracted to northwest Ontario, where unskilled labour was in demand, and land was available for relatively low prices. The high percentage of descendants of these immigrants in Sioux Lookout can be expected to affect many community attitudes and opinions.

Additional information collected for this trend analysis concerned the respondents' adult children living away from home. We interviewed 48 families in Sioux Lookout; 12 had 31 children between them who were not living at home. One of these families had 9 children away; one family had 5; and the other ten families had 3 or fewer away from home. Extensive data was collected for the two oldest who had left home, a total of 20 individuals. Again the trend here is that most of them (almost half) remain in northwest Ontario. The next largest group includes those children who have left Sioux Lookout to live elsewhere in Ontario, primarily the southern section. Another group has migrated to Manitoba; and a few have left for eastern and western Canada. Significant as well, is the fact that the majority of these children away from home are living in small cities, towns or villages. Of the minority group who migrated to big cities, two-thirds went to either Winnipeg or Thunder Bay (both designated as northwest Ontario locales for this purpose). The statistics of three generations, our respondents, their parents, and their grown children, then exemplify a trend of being regionally oriented in their residence habits.

At this point it might be worthwhile to examine the

reasons respondents cited for coming to Sioux Lookout. As would have been expected, most of them came for economic reasons: Sioux Lookout has an abundance of high-paying jobs, primarily in the unskilled, semi-skilled and skilled categories. A fair percentage of those who came for economic reasons had no choice in the selection of the community because their job transfer dictated the move. Another substantial segment of the community expressed that they had previously lived in Sioux Lookout, but had left for a variety of reasons, only to return to stay because they considered it simply their "home". Implied in their connotations of "home" are a whole range of factors, predominantly sentimental, such as friends, family, locale, etc. A small percentage of the sample singled out one specific reason, relatives for example, or better family opportunities, but for the most multiple reasons were given.

In terms of degree of liking the Sioux Lookout community, our respondents replied 79% positively, 11% indifferent, and 10% negatively. It has already been established that 56% declared their intentions of remaining in Sioux Lookout; 28% would leave for employment opportunities; and 16% are, or will probably be, leaving the town in the near future. It should here be emphasized that the latter figures are intentions only, and that frequently they vary widely from actual occurrences. The only sociological method of avoiding this misleading category, however, is by conducting a longitudinal community study at two or more different time periods in order to verify if, in fact, the respondents acted as they had intended. The measure though, is a good indication of how people feel about a community. It is interesting that though 79% feel positively about the town, only 56% stated that they are likely to remain. Such a statistic probably illustrates a greater likelihood in the differing 23%, to place a higher priority on economic or factors other than personal attachment, in the decision whether to remain in or leave Sioux Lookout. When queried about why they stay in Sioux Lookout, respondents replied primarily either because of economic reasons or because they were firmly settled into the community. Again this seems to verify the three modal types of community people, then: the established, stable individual who will not be persuaded to leave Sioux Lookout, even for better job inducements; and the uncommitted and transient types who require far fewer attractions elsewhere to induce them to leave the town.

Residents like Sioux Lookout for a number of reasons. Cited most frequently was the town's proximity to an expansive, natural environment, geographically situated away from any big centres or major highways. It has already

been noted that most residents were raised in low density communities. It is not surprising, then, that many respondents said they liked the community because they liked small-town living, and the type of people one meets in this situation. One reason community size was mentioned so often was that many individuals felt the town was appropriate for raising a family. Others liked it because of its slow, less competitive pace, again a factor of size. Still others mentioned features unconnected with the community itself, for example, the large number of relatives residing there.

Far fewer dislikes were stated by the respondents, as would be expected given that 79% were favourably disposed to the town. The complaints that were registered were directed primarily towards the service sector, especially the health, education, entertainment, and shopping facilities of the town. The "uncommitted" and "transient" types of respondents expressed dislikes of the size of Sioux Lookout and "its small-town mentality". Only a few disliked the geographic location. All these complaints, however, are factors that affect stability of residence.

Many integral factors should be weighed in considering transient residency and out-migration in Sioux Lookout. The availability of housing, the local employment situation, the quality of health, education, and communications services are all important attracting or detracting features of any town. At this point, we feel it important to mention the state of housing in Sioux Lookout, since some believe that the current housing shortage is preventing many potential habitants from settling in the town. Four local mobile trailer lots have recently been developed and they are filled to capacity, many by residents who would prefer permanent homes in the town but are unable to find or afford such dwellings. According to the Town Clerk, employment within the community is readily available, but there exists a very definite lack of available permanent housing in town, and substitute mobile home lots are not expanding quickly enough to meet the demand.* The Town Council's chief concern in this regard is its inability to provide reasonably priced public utilities services for the land already available. Over the two years 1972-1974, Mr. Hovi claims, property lots alone have increased by $3000. to $4,000. In addition, inflationary costs of land servicing, i.e. roads, sewage, hydro, etc., combine to make the new housing prices prohibitive. There presently is no low-cost housing available except for three Ontario Housing Units and a Senior Citizens' Apartment block constructed around 1971. Though Ontario Housing Corp. is proposing six more units for the town, the Council had not been informed at

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*Interview with Alan Hovi, Town Clerk, June 11th, 1974.

the time of our study of the commencement date. A number of privately-contracted homes have recently been erected, although it is impossible to determine the exact figure, since the Town Office does not retain a record of housing permits issued.

During the course of the summer of 1974, a housing feasibility study was conducted by the Company of Young Canadians (CYC) in Sioux Lookout. The programme, which was in operation until mid-September of that year, was intent on disclosing the actual housing situation prevalent in the community. By spreading awareness of available programmes and group alternatives to interested people in the town it was hoped somewhat to alleviate the housing shortage. From an observer's point of view, though CYC tried energetically to promote public support and instigate community interest, it found itself confronted with a widespread confusion of the townspeople concerning its own identification and aims. Though CYC's first two public meetings were well attended, interest dwindled with the third meeting and, in all, little progress was made. Lack of concern then, together with lack of awarenesss of the housing situation and attempts to improve it, contribute to maintaining this housing shortage. There is definitely a housing need in Sioux Lookout which is not adequately being met by any source and as long as this state continues, high geographic mobility and high outmigration will directly be affected. More, or better, utilization of telecommunications in the town would be a possible method of extending community awareness.

A.6.4 Sioux Lookout: Education

The education section of this report will consider specifically two aspects of education in Sioux Lookout: the available facilities and resources in the community, their utilization, and general town sentiment in this regard; and secondly, the educational levels obtained by respondents, respondents' parents, and aspirations for children.

In this manner it will be possible to obtain a comprehensive perspective on past uses of educational facilities, present demands of the system and expectations for the future.

A.6.4.1 Facilities, Usage, and Community Opinion

In Sioux Lookout there exist two public elementary schools, one of which offers Grades 1 to 6; the other, Grades kindergarten to 8; and one separate elementary school, teaching from kindergarten to Grade 8. The one high school

located in the town serves the general district of Sioux Lookout-Hudson and surrounding small communities. Facilities for 17 mentally retarded children are also offered in a detached temporary building on the high school grounds, funded, as are the public schools, by the Dryden Board of Education.

All of the schools, as well as the Hudson elementary school, provide services for Indian students from northern communities, the majority of whom reside in Pelican Residence, 5 miles outside of Sioux Lookout, for the 10-month school term. Other Ojibway students (usually of high school age) are boarded by Indian Affairs in private homes of Sioux Lookout residents for a small remuneration. There are about 12 community homes which board 2 or 3 Indian students each and approximately 150 students reside at Pelican Residence.

Elementary schools in Sioux Lookout for the 1973-74 school year enrolled approximately 935 students. This enrolment figure fluctuates annually with the mobility patterns of the community and is especially affected by the Canadian Armed Forces personnel who undergo major employee exchanges every two years. About 130 Indian grade school students from Pelican Residence attend the elementary schools, primarily the two public grade schools. (Most of the Sioux Lookout area's Ojibway population are Anglican, thus the separate school has few Indian students enrolling.)

The grade schools have on the average about a 24:1 student/teacher ratio. Regular weekly health services and innoculations are offered at all of the schools by the Northwest Health Unit. In addition, a new programme has commenced, conducted by the Thunder Bay Psychiatric Hospital, consisting of the sending out of a visiting social worker and psychometrist to Sioux Lookout schools. However, owing to its very recent origin, principals were unable to evaluate its success rate. French instruction is offered by the Sioux Lookout schools, in some cases as a compulsory course, but some community opposition appears to exist in regard to its usefulness. Previously it was a required subject in high school, but because of the high failure and truancy rate, it was changed to an optional course. Presently the enrolment is so low that grades 11 and 12 French have to be combined.

There is no regular counselling service available in any of the elementary schools, a lack that concerns all three principals. Where possible they themselves attempt to offer students academic, emotional and vocational guidance. Wellington Public Elementary School provides an Indian teacher's aide to assist Ojibway children in adjusting to

the English language. Central Public used to offer a similar service, as well as informal Ojibway language and culture classes, but this practice discontinued when the instructors involved left the school. The desire was expressed that at some point in the future, the classes could be renewed. Pelican Residence is attempting to meet some needs of the Indian students in this regard. The residence employs three counsellors, connected with the Education branch of the Dept. of Indian Affairs, as well as 11 child-care workers, four of whom are native, to assist residence students with problems of a diverse nature. Residence child-care workers act as representatives for parents in educational matters. The director expressed concern about students losing touch with their culture through being away from their homes in the north such a significant period each year. It was his intention to introduce Indian cultural programmes into the Residence in the near future. However, like the schools in the town, budgetary restrictions severely limit the development of resources considered important to young people's needs. Elementary schools are lacking adequate library and gymnasium facilities, and a need was expressed for more text supplies and special education (e.g. slow learner) facilities. It is quite apparent that the provincial government's cut-back on education has its affects on small-town operations.

Similarly, the Department of Indian Affairs is limiting many needed improvements at the Pelican Residence. Though they recently constructed a reasonably sized gymnasium on the property, there is no funding for equipment. The residence itself is an outmoded building constructed in 1929 on 243 acres of property. It has six large open dormitories with 25 children to each, and very little private space. There is a newer separate cottage on the property for the high school students, but the small rooms are crowded with two bunkbeds each and only one desk. The only other available study space is a large open room in the basement which also contains the lounge and television area. There is virtually no reading material available through the Residence. Conditions do not seem to be conducive to quiet study. Nevertheless, the Residence is in a better situation than it was before the Department of Indian Affairs took charge of provincial residential schools from the churches in 1969, quadrupling the budget in the first year. The current policy is towards phasing out residences completely. In 1974 there were only 3 Indian residences left in Ontario, with the one in Fort Francis expected to close that year. There are already 18 settlements in northwest Ontario with schools of their own up to Grade 8 at least, and a few with Grade 9 and 10 facilities as well. Indian children are boarded

in private homes or residential institutions only if their communities have no schooling facilities or if their families do not have a permanent residence. From the northwest Ontario district alone there are approximately 400 students to be boarded in the province yearly, some of whom choose to go as far away as Toronto and Stratford.

Concern was repeatedly expressed regarding the future of Indian children who received an education but are faced with unemployment on the reserves. At a meeting in Big Trout Lake investigating the low emphasis placed on education by parents, one elderly Indian man told an Indian Affairs representative that his daughter having received nursing training in Winnipeg 8 years before, had not returned to the community since. Thus, Indian parents are reluctant to encourage their children to receive an education which will induce them to leave their northern homes. Other factors, such as the students' difficulty in adjusting to urban life, contribute to the high dropout rate for Indian children. Though there seem to be few problems arising between Indian and white students, it was remarked that there is little social interaction between them. This may be due in part to the fact that the majority of Indian students are bussed into town daily and back to the Residence immediately after school; hence their contact with the other students is at a minimum.

Indian students, however, are not the only ones who suffer from a low priority level placed by parents on education. Each year there is a very high dropout rate from the secondary school - 17% in 1973-74, (including the Indian students, of whom a maximum of 50 each year enrol). It was expressed that there is a consistent problem in keeping students in school beyond Grade 10, when this level is the usual qualification required for local unskilled high-paying labour. The high school annually loses many students (primarily males) who have completed Grade 10 only, to the Canadian National Railway and the Hudson sawmill. This is understandable when viewing the student's earning potential, coupled with the strong likelihood of not being socialized into perceiving high education as a necessity.

The Grade 13 enrolment is generally a fairly stable figure of approximately 25, or only about 6% of the total high school enrolment. Usually these 25 students continue on to University, community college, nursing school, or teacher's college. It appears to be the case that the post-secondary education orientation focuses on either Winnipeg or Thunder Bay.

On the property of the Sioux Lookout high school,

is located the Lakeview School for the Mentally Retarded. In 1973-74, there were 17 students attending mainly from the Sioux Lookout-Hudson region, though five individuals originally came from the north and have been boarded in Sioux Lookout by Indian Affairs. Another five students qualified through evaluation testing for admission to the school but could not be accepted because of the shortage of instructors and facilities. There are two teachers, one instructing students at the primary level, and one teaching older students practical courses (e.g. woodwork, gardening, simple money transactions, etc.). About half the parents are active members in the town's Association for the Mentally Retarded and assist in educational programmes. This group presented a brief to the Ministry of Community and Social Services in June 1974 requesting funding for a residence for mentally and physically handicapped individuals in the area. In July 1975 under funding from that Ministry, in the former Sioux Lookout convent building, operations commenced for a home and workshop residence, employing a staff of five. To date the Residence has received enthusiastic community interest and support.

At the elementary school level, parent cooperation was found to be fairly good. One public school has incorporated volunteer parental assistance in the classrooms on a twice-weekly basis, with a fair degree of success. At the secondary school level, however, less interest seems to be generated in education. At the two parent-teacher nights held at the high school in 1973-74, only 38% of the potential parents attended the first meeting and 7% the second meeting. These statistics were quoted to indicate the town's minimal interest in education.* Many respondents in our interviewing expressed a desire to activate greater community interest in education, but claimed that overall community apathy in this regard was too great an obstacle to overcome.

Of those respondents in our sample who had direct contact with the educational system in Sioux Lookout, the majority expressed a negative opinion about it. Many felt a change in courses was required: an increased selection in areas of music and fine arts and a greater concentration on technical and practical courses and on regional awareness. More freedom was recommended in the secondary school system and a more selective teacher hiring programme was urged for all schools. The recreation and physical education programmes of the elementary schools drew a fair number of complaints and the need for increased parent-teacher communication was stressed. In all, the desire

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*This information was received from Mr. G. Sobchuck, Queen Elizabeth High School Principal, June 4, 1974.

for change in the educational system is strong but the feeling of efficacy is low and the attempts to organize to affect change have all been aborted.

In regard to other educational services in the community, most respondents felt that for a town of its size, Sioux Lookout offered adequate facilities. Almost a third of the sample, however, did not have an opinion about this issue. A fair percentage did respond that night courses in the town, offered by Confederation Community College in Thunder Bay, could be increased with a greater selection and with lower enrolment regulations. Presently the minimum number of individuals required for a course to be offered is 15.

A.6.4.2 Community Education Levels

In a typical northern community where a relatively high proportion of well-paying unskilled jobs are available, it may well be expected that emphasis on education and educational attainment will be low. Though a fair number of community respondents expressed an interest in the educational system, those by far were a minority, and very often they were individuals with a relatively short residence history in Sioux Lookout. It might be deduced from this that long-term Sioux Lookout residents are satisfied with a lower level of education or perceive the need for education less strongly than residents who have lived in Sioux Lookout a short period of time, especially those from larger urban centres. In any case, personal backgrounds seem highly related to priority placed on education. One family from a smaller northern community moved to Sioux Lookout because of "the better educational facilities" for their numerous children, whereas a number of incidents were cited where families from Sioux Lookout moved out to larger population centres to meet the educational needs of their children not satisfied in Sioux Lookout.

Analysis of the sample data indicates that slightly less than half the respondents received over Grade 10 level of education. Approximately 22% completed Grade 8 or less. Only 12% entered some form of post-secondary schooling upon completion of high school. However, a little greater than half the respondents had some additional training beyond their initially completed education (not necessarily high school completion), with by far the greatest tendency towards practical or vocational fields. This type of educational experience includes not only teaching and nursing training, but apprenticeship periods and company courses of much shorter duration. This apparent concentration on practical and applied types

of training may be an indication of why academic education at the higher levels receives low priority.

It is important,however, in analyzing educational levels to consider other variables which might have a bearing. Sex, age, and parents' achieved educational levels seem highly related to the level of schooling attained. Other social variables (community attachment, length of residence, intentions of remaining, etc.) seemed to be correlated as well, but we are not able to discern whether there is a causal relationship.

Our statistics indicate that a greater number of males than females finish their education before completing high school. This may perhaps be attributed to the demand for male unskilled labour. A percentile difference of 10% males as compared with females quit school by the end of Grade 8. Male and female completion of post-secondary education however, is about equal.

Age is another important social variable to examine when considering educational levels attained. Such is the case because cultural expectations are changing and employment requirements of education are increasing. An individual in the early stage of the life cycle today experiences more societal pressure to attain a high level of education than an older person received at the same stage in his life. A job with the Canadian National Railway which required a Grade 8 education a number of years ago, today requires a Grade 10 level.* This change in educational expectations is reflected in the level of achievement noted in our sample (Table A.6.14). Of those aged 35 and under, well over half had gone

TABLE A.6.14

Age by Educational Level

Educational Level	Age Under-35 (N=55)	35 and Over (N=51)
Grade 10 and Under	38%	71%
Grade 11 and Over	62	29

*It must also be considered that there is a greater likelihood of younger individuals to return to formal schooling than there is of older folk.

beyond Grade 10, while little more than a quarter of the respondents over 35 had attained that same level. If we look at the over-55 age group we find that 83% of them had less than 10 years of schooling. It is not surprising, of course, to find that each generation is better educated than the preceding one and this applies here as well. Parental educational achievement was lower on the average than respondents' achievement. Where the completion of Grade 10 emerged as the point at which our sample was almost equally split in half, for our respondents' parents Grade 8 was the breaking point. Male and female parental educational attainment levels were very close, with female attainment again slightly higher than male. Just under half of both mothers and fathers completed Grade 8 or less.

Respondents' educational attainment appears to relate significantly to parents' level of attainment. As illustrated by Table A.6.15, in almost two-thirds of the cases where parents had attained Grade 8 or less, respondents reached Grade 10 or less. However, in those cases where their parents had received a Grade 9 or higher level of education, 62% of respondents attained Grade 11 or above. Further, over 80% of those respondents who had attended post-secondary education had parents who had higher than a Grade 8 education. These statistics,

TABLE A.6.15

Parent's Educational Achievement by Respondent's Educational Achievement

Respondent's Education	Father's Education		Mother's Education	
	Grade 8 or Under (N=37)	Grade 9 or Over (N=40)	Grade 8 or Under (N=37)	Grade 9 or Over (N=45)
Grade 10 or Under	65%	37.5%	65%	38%
Grade 11 or Over	35	62.5	35	62

then, appear to illustrate the perpetration of an educational cycle: that is, if one's parents received a high education (by their standards at the time), one is almost two-thirds more likely to receive what is considered a high education by current standards. Similarly, if one's parents underachieved educationally, one is two-thirds as likely to follow the same pattern.

Many other variables undoubtedly are related to educational achievement and interest in the educational system; personal and socio-economic backgrounds being probably the most significant. However, as was hypothesized at the beginning of this section, community sentiment seems to be important as well in that long-term residents place a lower priority on academic achievements and a higher priority on practical or vocational training. Table A.6.16 illustrates that 69% of long-term residents (10 or more years) achieved

TABLE A.6.16

Years of Residence by Educational Attainment

	Years of Residence		
Educational Level	2 yrs. or less (N=21)	2-10 yrs. (N=19)	10 yrs. or Over (N=64)
Grade 10 or Under	24%	38%	69%
Grade 11 or Over	76	62	31

Grade 10 or less. It is important again to note age as a factor here: long-term residents are apt to be older individuals and cultural expectations were lower at the time they received their education. The table also indicates that newcomers to Sioux Lookout, those who have resided there less than two years, are generally better educated than those who have lived there longer. Perhaps again this is a function of age, and indeed it seems probable that newcomers would be younger owing to the kinds of employment available (economics being the most common reason for coming to Sioux Lookout).

If it is the case that younger and better educated individuals are being attracted to Sioux Lookout, this could result in important changes in community sentiment regarding education, at least if these individuals planned to remain in the community. A cross-tabulation of education by intentions of staying in Sioux Lookout, however, indicates a tendency for the better educated to have intentions of leaving the community, or at least they would consider leaving for job opportunities. Those most probably committed to staying generally are the individuals with a lower level of education.

As previously stated, 16% of the population is planning to leave Sioux Lookout. Of this group, 65% were under 35 years of age; 71% had resided in Sioux Lookout under two years; and 82% had Grade 11 or above. We perceive then one

TABLE A.6.17

Intentions of Moving by Educational Level

Educational Level	Intentions		
	Staying (N=59)	Would Leave for Job Opportunities (N=30)	Leaving (N=17)
Grade 10 or Less	74%	34%	18%
Grade 11 or Over	26	66	82

ideal type of Sioux Lookout resident: the young relatively well-educated transient who comprises 16% of the town's population. Another ideal type (described earlier as the "established" core population) is the older, less-educated individual who has resided in the community a lengthy time period and definitely intends to remain.

TABLE A.6.18

Educational Attainment by Present Occupation

Present Occupation	Education			
	8 or Less (N=20)	9-10 (N=31)	11-13 (N=38)	Post-secondary (N=10)
Professional, Managerial, Owner	15%	23%	21%	60%
Sales, Clerical, Service	15	13	26	-
Skilled	-	6	8	10
Semi- & Unskilled	40	29	18	10
Houseworker	30	29	26	20

Table A.6.18 illustrates the distribution by education and occupation of the sample. As could be expected, with increased education, the professional class grows larger and the semi- and unskilled occupational category decreases.

TABLE A.6.19

Educational Attainment by Interest in Federal, Provincial and Municipal Affairs

Percentage of Respondents Fairly-to-Highly-Interested in Governmental Affairs

Educational Level	Federal	Provincial	Municipal
Elementary (N=16)	44%	44%	50%
Secondary (N=56)	43	38	59
Post-Secondary (N=9)	82	44	33

Respondents with higher education exhibited specific tendencies in regard to interest and attention levels shown towards governmental affairs. Post-secondary educated respondents expressed a far greater interest in federal politics than in provincial or municipal. Conversely, elementary and secondary educated respondents showed more interest in local affairs than provincial or federal concerns. Our interviewing coincided with a federal election campaign with the resultant heavy media exposure to political issues at this level. This undoubtedly, would skew the results somewhat.

TABLE A.6.20

Education by Club Involvement

	Education			
Club Involvement	Grades 1-8 (N=22)	Grades 9-10 (N=33)	Grades 11-13 (N=35)	Post-secondary (N=10)
Low	82%	45%	49%	60%
Medium-High	18	54	51	40

As would be expected, club involvement shows a positive correlation with education (Table A.6.20). There appears to be no relation between education and exposure to the media (TV, newspapers; Table A.6.21). Similarly, there was little difference among those with different levels of education and the sentiments expressed about liking the community, (Table A.6.22).

TABLE A.6.21

Education by Exposure to Media

Amount of Time Spent Watching TV	Education: Grades 1-8 (N=22)	Grades 9-10 (N=31)	Grades 11-13 (N=29)	Post-Secondary (N=10)
2 hrs. per wk.or less	18%	10%	10%	20%
1-2 hrs. per day	50	55	55	50
3-4 " " "	18	35	31	30
7-8 " " "	14	-	3	-
Frequency of Newspaper Reading	(N=21)	(N=34)	(N=35)	(N=11)
At least 1 x day	57%	73%	57%	55%
" " 1 x week	14	12	26	18
" " 1 x month	10	9	6	9
Less than 1 x month	19	6	11	18

TABLE A.6.22

Educational Attainment by Degree of Liking Community

Degree of Liking Community	Educational Level: Grade 10 or Less (N=54)	11-13 (N=33)	Post-Secondary (N=11)
Positive	80%	79%	73%
Indifferent	13	9	9
Negative	7	12	18

Aspirations that parents would hold for their children's education is, of course, highly associated with the priority they place on the need for education. About half the respondents who had growing children expressed the desire that their children attain a university or other post-secondary level of education. Very few, however, were

insistent about this, and in fact most of them specified that their children's education should be entirely their own decision. Similarly, almost 70% of the sample stated that their children's employment future is completely "up to them" and "whatever makes them happy". Only about 20% expressed the aspiration that their children reach a professional working level and an additional small percentage preferred that they work in some specialized field. In all, Sioux Lookout parents were mainly concerned that their children be happy in whatever education and employment they attain.

A.6.5 Sioux Lookout: Economy and Employment

A.6.5.1 Employment

Northwest Ontario's economy is primarily dominated by the mining, pulp and paper, transportation and tourist industries.* Sioux Lookout's economic base appears standard for the region, except that, in addition, it operates as a major communications and orientation centre for the northern communities and as such has attracted numerous government agencies to the town. Its chief employing industries can be classified into five main fields: transportation; resource development; tourism and recreation; governmental activities; and local small industries and tertiary services.

The transportation industry in Sioux Lookout is composed of many systems, but is dominated by the Canadian National Railway, an employer of two hundred and forty-five individuals in the town (June, 1974), plus an additional one hundred and twenty on the payroll living elsewhere in the territory.** In our sample, fifteen percent of all respondents were employed in the rail industry field. Employees comprise numerous occupational strata within the corporation, requiring varying levels of educational and training experience, and receiving a wide range of salary levels. By far the largest group of employees is that of trainmen and conductors, comprising slightly over half of the C.N. payroll. This employee category earns approximately $15,000 annually and currently requires a minimum of Grade 10 education. The Canadian National Railway yearly recruits many high school students who have just completed Grade 10. It has been claimed that the high earning potential from the C.N. with this level of education is one major reason for the high secondary school drop-out rate. The non-operative employees are the second largest

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*Design for Development Northwest Ontario Region Phase 2, Policy Recommendations Provincial Department of Treasury and Economics Regional Development Branch, October 1970.

**Interview with Mr. J. Borthwick, Canadian National Administrator, June 21, 1974.

group, comprising approximately one-third of the payroll. These individuals are employed primarily in office positions (i.e. they do not work directly on the train cars) and are in the $9-10,000. wage bracket. The smallest employee-category of the Canadian National is that of the skilled enginemen with a salary potential of approximately $18,000. The Canadian National employee wage-earning potential, then, is very high for a comparatively low level of education. This factor may account for Canadian National's low staff turnover rate and seemingly high degree of penetration into Sioux Lookout's fibre of community life.

Canadian National daily supplies crews to operate freight and passenger trains east to Armstrong, west to Winnipeg and north to Griffins Mines at Bruce Lake. It provides an essential link for mining and forestry companies to transport their raw materials and finished products south. Within the recent past, Canadian National has introduced a more mechanized "service centre concept", according to which they intend to close down their Minaki, Red Lake Road, Hudson and Redditt agencies, centralizing all offices in Sioux Lookout. Similar services will still be available to these communities, but information will be conveyed by telephone rather than on a person-to-person basis. This will mean a somewhat more important role for the Sioux Lookout Canadian National office, and will expand Sioux Lookout's already significant communications and orientation centre functions.

Because it is a service centre, Sioux Lookout also attracts substantial air traffic transportation industry. One local ground airport provides regular DC3 daily flights (weather permitting) along a northern circuit of four towns: Pickle Lake, Sandy Lake, Big Trout Lake, and Red Lake, alternating the order of the stops each time. In addition, three private airways operate charter seaplane trips transporting individuals and supplies primarily to the northern communities. This service is frequently used by tourists in the area, especially hunters and fishermen seeking more isolated locales. It is also used extensively by government agents requiring transportation into northern settlements for service purposes. Recently, the provincial government expressed intentions of establishing air services on a regular basis in Sioux Lookout (Nor-Ontario). Of those respondents in our sample who expressed an opinion on this issue, three-quarters were in favour of the proposal and about ten percent felt it to be unnecessary.

The resource development sector of the economy has long been a substantial regional source of employment, especially in the mining and forestry industries.

Indirectly, Sioux Lookout is influenced by mining operations conducted in the northern areas; Canadian National, for example, is considering the feasibility of railway construction to Lake St. Joe. A possible mine-opening there is under investigation and a community might have to be set up, again using Sioux Lookout as a service and resource centre. Sioux Lookout is directly affected primarily by the pulpwood cutting and processing industry in Hudson, fifteen miles away. The Hudson sawmill, originally operated by Pope and Talbott, but sold to Abitibi Mines in 1974, employs approximately 130-135 individuals. Within its recent past, the company has changed policy in order to allow women to be employed in factory operations. Wages in this sector are usually high. Approximately seven percent of our sample were employed in the resource development field.

Tourist-oriented employment caters mainly to southerners vacationing in the northwest Ontario region. Facilities such as restaurants and hotels, and outdoor recreation businesses such as canoeing and outfitting agencies, fishing camps, and the like, do a steady tourist business. This industry then, though seasonal, employs a sizeable proportion of the labour force, including many Indians, in positions such as guides and camp help. The municipal government provides community recreational facilities such as a curling rink, skating programmes, baseball and hockey leagues, swimming instruction, and a supervised swim area at the lake.

Governmental agencies in Sioux Lookout are numerous and are employers of large numbers of people. In our sample, twenty-three percent were engaged in government work. The Department of Natural Resources is the largest single employing agency, especially in the summertime when many fire crews are required to control regional forest fires. The federal Zone Hospital is another major employer of community residents, both in Sioux Lookout itself and in the northern communities where it has responsibilities for providing some considerable degree of health care. The Zone Hospital has a staff of approximately 175 people, including those based in northern hospital stations. Almost one-quarter of these employees are of native birth and are bilingual in English and Ojibway. Many government agencies provide services, to a large extent, specifically to the Indian population both in town and in the north, (e.g. Indian Affairs, Department of Communications, Social and Family Services, etc.). There are many other government offices established in the town serving local and northern residents. This sector of the economy employs a large number of the professionals employed in the town as well as many clerical and service personnel. A higher

degree of education or level of skill is frequently required, and this is often accompanied by a higher staff turnover and transfer rate. The tendency is, therefore, that those in blue-collar occupations (usually those with less than Grade 10 educational attainment - see above) are more likely to remain in Sioux Lookout. Those in white-collar jobs are more geographically and socially mobile, since many would move for job opportunities.

TABLE A.6.23

Intending to Move or Willing to Move for Job Opportunities by Type of Occupation

White-Collar (N=21)	Blue-Collar (N=10)
54%	32%

The final employment classification involves primarily consumer services which exist to meet the needs of the community population: banks, stores, tertiary services, and smaller industries such as construction companies. Employed in this economic sector are many clerical, service and sales personnel, and numerous owners and managers of small shops and firms. This is a relatively stable sector of the economy but depends on many external factors for its expansion.

In our sample, 67 percent of respondents were actively employed in one of these five fields outside the home. The remaining respondents were classified as: unemployed (five percent), retired (seven percent), or housewives not working outside the home (twenty-two percent). Though this employment rate appears low, it is actually substantially higher than the general participation rate in the labour force for northwest Ontario (54.5 percent in 1961). This has been largely attributed to the relative lack of employment opportunities for women in a resource-oriented economy.* Only recently, for example, have women been hired for factory work in the Hudson sawmill, and this policy change entailed about six months of managerial discussion. By the summer of 1974, approximately thirty women were employed there full-time in a company of about 135 employees. Most of the other major employing industries in Sioux Lookout hire even fewer females; Canadian National Railway, Ministry of Natural Resources, and Department of National Defence for

*Design for Development, op. cit.

the most part employ women for mainly clerical positions, constituting only a small percentage of their personnel. This is due primarily to the general type of occupation performed by these industries. Women appear most frequently on the labour force in sales, clerical, and service positions; less frequently in professional positions, though often employed in government agencies such as the General and Zone Hospitals (Indian Affairs), the educational system, and sometimes as semi- and unskilled workers usually in local service industries.

As is the case in general for the region, most individuals migrating into Sioux Lookout do so for employment opportunities, usually within a narrow range of resource-based industries. Our respondents indicate that the largest single drawing factor attracting them to the town was economic opportunity. A common regional phenomenon, however, seems to be that "the younger age-groups of the labour force (20-44) are most prone to leave northwest Ontario in search of better job opportunities elsewhere".* Our sample data seems to verify this; 65 percent of those definitely intending to leave Sioux Lookout (for all reasons, but the majority are economic), and 63 percent of those who would consider leaving for employment opportunities, are under 35 years of age (see Table A.6.8). The majority of respondents committed to staying in Sioux Lookout are 35 years of age and older. 40 percent claimed employment to be the main reason for remaining in Sioux Lookout. This figure fluctuates according to type and level of occupation. We divided our employed respondents into four occupational categories. The largest classification was of semi- and unskilled employees which constituted 35 percent of working respondents. The next classification - professionals, managers, and owners - represented 33 percent. Sales, clerical and service personnel made up 24 percent, and skilled workers 8 percent, of the employed respondents. Those in the professional class show a slightly higher tendency towards retaining the same occupation for a longer period of time than the other working categories. It is interesting that so many professionals have remained in Sioux Lookout for a lengthy time period (25 percent between 5-10 years and 38 percent over 10 years). This is counter to what one might expect of a professional group of workers. The pattern established elsewhere seems to be that professionals will commence their career in a hinterland and will later advance in the field to a larger city with more opportunity. The other three classes of workers have a far greater proportion of individuals who have held a position for under two years. (See Table A.6.24.)

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*Design for Development, op. cit.

TABLE A.6.24

Holding Present Occupation Less Than 2 Years by Type of Occupation

Professional, Managerial, Owner (N=4)	Skilled (N=3)	Sales, Clerical & Service (N=8)	Semi- & Unskilled (N=9)
17%	50%	47%	41%

However, they also have over 30 percent who have retained their jobs for more than 10 years. This suggests that there is a higher initial staff turnover rate in these three occupational classifications. It is also the case that these workers may be upwardly mobile; that is, they may commence at one occupational level and rise in the scale to a skilled, professional, or managerial position.

Income levels are difficult to estimate according to occupation in Sioux Lookout because of the high wages allotted to semi- and unskilled workers. However, on the average, it seems that salaries are relatively high. Our statistics show that 50 percent of those employed in blue-collar jobs, as well as about 40 percent of those in white-collar occupations, earn over $10,000. annually.* A slightly higher proportion of individuals in the $7,500.-10,000. income level have white-collar jobs, and conversely a higher proportion of blue-collar workers are in the $5,000.-7,500. range.

An investigation of occupational field by income illustrates a clear picture of which economic sectors are contributing to this seemingly high wage-earning potential in Sioux Lookout. The rail industry, an employer of about 23 percent of our working respondents, paid approximately 87 percent of these individuals over $10,000. annually.** Salaries of government and service-oriented industries, however, are more evenly dispersed throughout the various income categories, with government employees generally earning more. Service employees are in the lowest-earning economic sector in Sioux Lookout. Approximately two-thirds of those individuals employed in this field earn less than $7,500. a year. This, then, is a good indication of the relative importance of the various industries in the economic sector of Sioux Lookout: the rail and resource fields

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*White-collar income is relatively low here due to the sales, clerical, and service group, who earn considerably less than the professional, and managerial workers.

**The resource industry, as well, pay high wages, with about two-thirds of our sample employed in this sector earning over $10,000. annually.

dominate the sector; government agencies play an important role; and tourism and service industries employ many individuals, but (perhaps owing to their being seasonal) remunerating their employees far less.

Welfare payments are administered through the Town Hall on a temporary, short-term assistance plan, to those with some residence established in Sioux Lookout. For the first three months of 1974, employables only made up this list and the trend seemed to be towards a slight increase of both single persons and family heads. In past years the welfare rates have been higher in the summer months,* possibly owing to the greater number of transients in the town at this time of year. If financial aid is required on a longer basis it is transferred to the provincial clerk under the Community and Social Services Branch. This office also handles payments to Indian recipients in the unorganized areas of northwest Ontario. Indian Affairs in Sioux Lookout is responsible for welfare recipients living on reserves in the north.

Actual figures for welfare recipients and unemployed persons in Sioux Lookout were unobtainable from Canada Manpower or the Unemployment Insurance Commission in Kenora. Information is generally accumulated on a regional basis, and not released for towns as small as Sioux Lookout. The only indication we have of these rates is from our interviewing which disclosed an unemployment rate of 5% for the white population. No respondents claimed to be receiving welfare benefits.

A.6.5.2 Social Mobility

Social mobility refers to the movement of people from one social stratum or level into another. A very rough measure of this movement is to compare the social class level of the son or daughter with that of the parents: intergenerational mobility is a common feature of industrial countries, and the evidence is that "the average likelihood that the son of a blue-collar (skilled or unskilled manual) worker will enter a white-collar (non-manual) occupation is about 29%, and the average likelihood that the son of a white-collar worker will enter a blue-collar occupation is about 30%."** Since the blue-collar category contains more people than the white-collar category, this means that there is a slight balance in favour of upward mobility, with the net upward movement

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*Interview with Mr. B. Hanchyruk, Welfare Administrator, Town Hall, June 11, 1974.

**Lorne Tepperman, Social Mobility in Canada, Toronto: McGraw-Hill Ryerson Ltd., 1975, p. 35.

in any given generation being about 4-1/2 to 6-1/2%. One would expect the net upward mobility to be greater than this overall average in a developing area such as northwest Ontario and, indeed, our data from Sioux Lookout suggests that this is the case. From Table A.6.25 we note that while downward mobility (from white- to blue-collar) for males is close to the average for most industrial countries, the upward movement (from blue- to white-) is much greater (46% as compared with the average of 29%).

TABLE A.6.25

Comparison of Son's Occupation with Father's Occupation: 47 Male Respondents in Sioux Lookout

Son's Occupation	Father's Occupation	
	White-Collar (N=12)	Blue-Collar (N=35)
White-Collar	67%	46%
Blue-Collar	33	54

For females, the movement is much more dramatic (Table A.6.26). Since women have not been included in most analyses of social mobility we cannot comment on how typical (or atypical) this is.

TABLE A.6.26

Comparison of Daughter's Occupation with Father's Occupation: 53 Female Respondents in Sioux Lookout

Daughter's Occupation	Father's Occupation	
	White-Collar (N=10)	Blue-Collar (N=43)
White-Collar	90%	74%
Blue-Collar	10	26

Net upward mobility of sons* is .255; that of daughters is .585. This disparity is a reflection of the

*Net upward mobility is calculated as: (the number of blue-collar sons or daughters who enter white-collar jobs, minus the number of white-collar sons or daughters who enter blue-collar jobs) divided by the total number of white-collar and blue-collar sons or daughters who hold a white- or blue-collar job. See Tepperman op. cit. p.35.

division of labour in this country where most women in the labour force are found in the lower echelons of such white-collar jobs as clerks and stenographers, or in the lower-ranking professions (teachers and nurses).

It is of some interest to note that while there is considerable intergenerational mobility of both sons and daughters, nevertheless almost half the population remains occupationally stable; i.e. they remain in the same social stratum as their parents. A glance at Table A.6.27 confirms this: 47% of the total Sioux Lookout sample were in the same occupational category as their fathers, and 51% were in the same occupational category as their mothers.

TABLE A.6.27

Summary of Mobility Patterns: Sioux Lookout

Child's Occupation Compared with that of Parent

Mobility	Father			Mother		
	Son (N=47)	Daughter (N=53)	Total* (N=100)	Son (N=49)	Daughter (N=54)	Total* (N=103)
Upward	34%	60.3%	48%	30.6%	38.9%	35%
Downward	8.5	2	5	14.3	3.7	9
No Change	57.4	37.7	47	55.1	57.4	56

*2 sons and 1 daughter failed to report (or did not know) father's occupation; hence the 2 N's are not the same.

The literature on social mobility suggests that upwardly mobile persons tend to be more conservative in their social attitudes than those who remain in the same class as their parents, or those who are downwardly mobile.** Downwardly mobile persons (especially daughters) tend to have weaker ties with their kin network than do others. Upward mobility, however, does not appear to affect primary kin relations.*** We presume these hypotheses would hold true here as well, but we have not subjected our data to this type of analysis. However it is probably safe to suggest that at least some of the social patterns and attitudes documented throughout this report are a function of the mobility patterns presented here.

** Tepperman, op. cit. pp. 203-204.

***Bert N. Adams, "Kinship in an Urban Setting", Chicago; Markham Pub. Co., 1968.

A.6.6 Sioux Lookout: Kinship

Social scientists are in general agreement that one of the features of modern western society is a relatively narrow and somewhat attenuated kinship network. Relationships with kin, while they continue to exist, compete with non-kin relations for primacy of importance and frequency. The nuclear family (a married couple and their children including adopted children but excluding married children) living in its own dwelling apart from other kin is the modal family type, though a growing body of research suggests that it is not as universal as earlier theorists had suggested.* But, more important, this research has documented that while residential patterns may favour the single nuclear family household, this has not precluded continued close ties with other kin, in particular with parents and parents-in-law and, though to a lesser extent, with siblings. Numerous studies have documented the extent to which social contact with kin is maintained, whether by face-to-face visiting or through telephone calls and/or letters.** One study (Adams, 1968) revealed, for example, that fully 90 percent of the residents of the small city he studied were in some form of contact with parents at least monthly, and many of them even more frequently.

Thus, while modernization has encouraged and legitimated social as well as geographic mobility, its very technology has helped to mute the effects of this mobility by enabling people to maintain kinship ties even when physical distance separates them. These ties are reinforced by reciprocal obligations of both an economic and a friendly nature. The parents give financial and other tangible assistance to their married children, and vice versa; and a caring relationship is maintained which is most visible on special occasions or in times of crisis.

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*Talcott Parsons has been the most influential theorist with this point of view. See Talcott Parsons and Robert Bales, Family Socialization and Interaction Process. Glencoe: The Free Press, 1955, and also Parsons, "The Kinship System of the Contemporary U.S.,",Amcn. Anthropologist XLV (1943), 22-38.

**See, for example, Bert N. Adams, Kinship in an Urban Setting. Chicago: Markham (1968); Howard H. Irving, The Family Myth. Toronto: Copp Clark (1972); Elizabeth Bott, Family and Social Network. London: Tavistock (1957); Peter Pineo, "The Extended Family in a Working-Class Area of Hamilton", in Bernard Blishen et al. (eds.) Canadian Society. Toronto: Macmillan of Canada (1965).

Kinship networks, then, are a function of communication patterns, and these, in turn, are affected by communication facilities. Further, kin relations are an important variable in assessing community attachment since proximity to kin is a factor in determining perceived attractiveness of the community. For these reasons we had wanted to gather data concerning both the extent and intensity of the kin networks. Unfortunately, owing to limitations of time and resources for the field work, we were not able to get much information on the obligations dimension, and the following analysis is limited to the interaction dimension of the kinship paradigm.

In order to determine the extent and quality of kin networks we asked our respondents where their relatives lived, the amount and type of contact maintained, and obligations felt towards other kin members. We also asked more intensive questions about the respondent's relationship with their parents (if living), as we assumed this to be the strongest kinship bond.

We found the majority 71% (42) of households we interviewed to be composed of the nuclear family only. 14% (8) were single-person households (singles, widowed, divorced) and 10% (6) of the households contained the nuclear family plus extended kin. Three other households were included in our sample, but did not fit into the census definition of 'family'. These were 2 households of non-related individuals, and one household of siblings with no parents. It must be remembered that this is a sample of the white residents only; the native sample showed a much different trend.

Of those respondents with parents living, 16 of the males and 18 of the females had at least one parent living in Sioux Lookout. Another 11 males and 9 females had one or two parents living in the northwest Ontario region (including Winnipeg). By contrast 14 males and 15 females had at least one parent residing outside of this region entirely: Of these, 18 parents lived in western Canada, 21 in southern Ontario, and 7 were located outside of Canada.* These figures illustrate a slightly higher incidence of respondents being physically close to their parents: approximately 41% of all respondents with a

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*Though the single person households are included in calculations, it might be interesting to note separately that for the 7 respondents with parent(s) still living, 46% resided outside of the region (primarily in southern Ontario), 39% lived in Sioux Lookout, and 15% lived elsewhere in the northwest Ontario region.

parent(s) still living had at least one parent in Sioux Lookout itself; 24% had parent(s) in the northwest Ontario region and about 35% had parent(s) living elsewhere, with the majority of these out-of-region parents residing in either southern Ontario or western Canada.

For our sample, about 60% of all living parents resided in the region. As may be expected then, this proximity will have important implications for communication patterns. The vast majority of respondents made local telephone calls at least once daily. For women, these calls appeared primarily to be social in nature, to both relatives and friends. Local calls for men were most frequently business oriented, with social calls being secondary. However, for long-distance calls, the primary reason for both males and females was to contact relatives.* Letter writing seemed to fall into the same pattern as local calls. Women wrote more frequently, primarily for social purposes to relatives; for men, letter writing to relatives was secondary to business correspondence. A frequent visiting pattern seemed to be maintained for most respondents with parents in the region. The majority visited at least once a week, with many as high as every day, but it must be noted that Sioux Lookout is a very small community and, in many cases, high contact between kin is hard to avoid. Many parents and siblings are employed at the same job and often parents live across the street or around the corner from respondents. It was interesting, however, to find that a relatively high number of respondents, even though their parents lived in the region, visited only once a month or less frequently. Of those respondents with parents living outside the region almost half visited at least every six months, approximately one quarter visited yearly, and a slightly higher proportion visited less frequently.

Distance, of course, is the primary factor to consider in the latter calculations. We attempted to avoid the assumption of a close kin attachment owing to close physical location. To allow for this we looked at type and degree of contact with all relatives mentioned, including parents, and classified respondents into five types based on closeness of relationships and geographical location of kin. Our close-knit type we defined as one in which there is not necessarily a large number of relatives mentioned but there is close contact by phone and letter writing by those whose relatives are outside the region, or by frequent and regular writing and visiting for those with most relatives in the region. The second type, medium attachment to kin, shows at least some contact with kin mentioned and though regular,

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*77% of our answering respondents made long-distance calls at least once monthly.

it was not frequent or intensive. Where attachment to kin was low, the third type, either few relatives were mentioned, with minimal contact, or contact with kin was stated as being at irregular intervals or non-existent. They kept in touch with relatives only during crisis situations, or perfunctorily, for example, cards at Christmas only. Included in this latter category is the small group of individuals who had conflict relationships with a few of their kin, expressed criticism about these relatives, and had little, if any, contact with them voluntarily.

Each of these types of kin relationships based on closeness we then broke down further according to geographical location of kin as: mostly Sioux Lookout; widely scattered, but a fair number in Sioux Lookout and region; and all or most outside Sioux Lookout and region. This produced the break-down shown in Table A.6.28.

TABLE A.6.28

Location of Relatives by Attachment

Attachment	Most in Sioux Lookout (N=37)	Scattered, but many in Sioux Lookout and region. (N=27)	Most or all outside of region. (N=40)	Total
Close-knit	43%	55%	20%	37%
Medium	32	30	40	35
Low or Conflict	24	15	40	28

The result of our cross-tabulation indicated that individuals with relatives in Sioux Lookout were about twice as likely to have close-knit kinship relations. Of those respondents with relatives living in close geographic proximity, the largest single grouping of them had close familial bonds. It is interesting to note, however, that almost one-quarter in close physical proximity had low or conflict attachment. Conversely, the largest group of respondents whose relatives lived outside Sioux Lookout and the region, had medium and low attachment to kin.

The group of respondents who might best be examined regarding communications patterns is the small number of respondents who maintained a close kinship bond even though most or all of their relatives were located outside the region. A profile of this group (N=8) indicates that all but one respondent were raised outside of the northwest

Ontario region, three being immigrants to Canada. All of these respondents had lived a considerable period in at least three previous communities, with the majority having experience of five or more. The main reason given by each for coming to Sioux Lookout was economic or job related, and for all except one couple this is their primary reason for remaining. The majority had been in Sioux Lookout less than 2 years and future mobility usually hinged on job prospects: one-half were definitely intending to leave Sioux Lookout; one-quarter would leave if a job opportunity arose; and one couple expressed definite intentions of remaining regardless of job promotions elsewhere. All living parents resided at least 1,000 miles from these respondents, but visiting habits were nevertheless relatively frequent. Contact between parents and respondents was kept up usually by either regular letter correspondence or telephoning, with letters being most often used when the distance between relatives was extremely far. Contact was usually maintained at least monthly by these methods. As might be expected, in the group with low or conflict attachment with kin, there is somewhat less regular contact between respondents and their parents. It is interesting to note that where contact is minimally maintained, there is more use of the postal system than the telephone networks, and visiting patterns are far less frequent than those with close kin bonds. Also, a greater attachment to the community and commitment of staying is exhibited by the group with fewer close bonds to relatives elsewhere. The pattern also seems to be that a longer residency in Sioux Lookout has been established by those who do not have a strong kin relationship outside the community: 50% of these respondents had lived over 10 years in Sioux Lookout; whereas none of those with close kin ties outside of the region had remained this long.

The final selection of respondents which merits attention is that group with many relatives physically close but with low attachment to these kin (N=9). These individuals maintain relatively infrequent contact with relatives and for the most part remain in Sioux Lookout despite their kin rather than because of them. They are generally very established in the community, with most of them having been raised in the region and having resided in Sioux Lookout itself 15 years or more. The primary reason cited for remaining in Sioux Lookout is that of being firmly settled, and the majority have a strong attachment to the community. The use made of telecommunications systems was far less for this group because of the lack of kin social contact.

It can be seen, then, that use of communications systems varies proportionately with the degree of family attachment and distance. Visiting patterns are more

frequent for closely knit and geographically close kin as are phoning patterns, and letter writing increases in regularity and frequency for the strongly attached but physically distant relatives. Kin relationships are therefore recognized as an important factor in community attachment, since proximity of kin plays a role in the individual's perceived attractiveness of the community.

A.6.7 Sioux Lookout: Public Participation - Formal and Informal

A.6.7.1 Involvement in Community Affairs

The involvement of individuals in community activities and their concern for matters of interest to the town are manifestations of community cohesion and relate specifically to interpersonal communications, on both the formal and informal levels. Our examination of active participation in the community life of Sioux Lookout, then, concentrated on both of these perspectives.

Formal participation is of two types. First, it refers to tenure of a particular office or position in the community in which the office holder formulates policies having a direct effect on the community. This would include the mayor, councillors, hospital administrators, etc. The second type of formal participation, as we have defined it, includes membership in established clubs and organizations, whether in an executive capacity or not. Degree of formal involvement in community affairs was recognized as wide-ranging, depending on many factors, including types of organizations and their associated activities, frequency of attendance, and reasons for membership. Informal participation refers to willingness to express views on the "state of well-being" of the community, and to awareness of the avenues open to the ordinary citizen to bring about change in what is perceived to be an undesirable situation.

Those holding formal office in the community are therefore individuals with a high level of involvement in community affairs. It is their job to make decisions affecting community life, and in this role they must deal with other levels of government as well as the townspeople in general. The mayor and a majority of the councillors are all long-term Sioux Lookout residents, many with a strong interest in the community from a personal standpoint, as owners and managers of local businesses. The hospital administrators pose an interesting situation, with the administrator of the General Hospital being a long-term resident of the area and the administrator of the Zone Hospital being a relative "outsider". More will be said of this situation in the

section on Health. For present purposes the important point to make is that conflict has developed between the administrations of the two hospitals, based on different orientations. The General hospital deals mainly with only the inhabitants of the town while the Zone hospital has a much wider range of responsibility.

Not the least important area of formal participation is general town membership in clubs and organizations. Sioux Lookout is a community with a great many groups catering to a multitude of varied interests. Social, cultural, recreational, and service clubs and organizations seem more than adequately represented for a town of less than 3,000 population.* One question on our interview schedule inquiring of respondents whether they felt a need for any type of club not now represented in Sioux Lookout, was almost unanimously answered in the negative. It was generally held that Sioux Lookout had a wide enough club selection and, in fact, on a number of occasions it was suggested that there were too many formal groups operating in the town. Paradoxically, more than half the respondents were not actively involved in any formal organization.

In our interviews with town residents, we asked several questions about club membership, attendance, office holding, opinions on club activities, proposals for new activities, and rewards garnered from club membership. 56% of our sample showed either no membership in clubs or membership in name only, where activity and attendance was at a very low level. 21% showed a medium level of involvement, belonging to one or more clubs and attending regularly but not holding an office or taking a very active part in proposing activities. 23% showed a high level of activity. These are the people who hold executive positions in one or more clubs and are very vocal in expressing their concerns over club activity. These figures illustrate that the majority of townspeople in our sample participate very little in community activities. Though there is a large number of clubs and organizations available to community residents, only a relatively small number are very actively involved in them. The same people turn up in several clubs as very active participants, so that this kind of intense

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*The Directory of Services published by the Sioux Lookout and Hudson Area Social Planning Council in February, 1974, a descriptive compilation of all the area's agencies and organizations, reflects this multiplicity of clubs available to the Sioux Lookout residents.

activity in formal organizations is monopolized by a very few citizens.

Correlations of degree of participation by rewards garnered illustrate a definite pattern of involvement. The sample indicates that those with high and medium levels of participation in local organizations take part ostensibly to be of help to the community, i.e. in promoting projects for the betterment of the town, etc. A fair number of respondents with a medium participation rate, as well as the majority of our sample with a low level of club involvement, are active mainly for social reasons or to gain personal satisfaction from their involvement. The trend therefore, seems to be that those respondents highly involved in formal community associations express a more altruistic motive than those with medium and low levels of participation. A possible explanation for this, we suggest, could be that those who participate in clubs so as to bring about some specific change in the community have a particular commitment to Sioux Lookout. They can take some personal pride and satisfaction from seeing their pet projects come to fruition through their own hard work and activities. For those who perceive club activity as having chiefly a social function, one may assume that a large emphasis is put upon acquiring and maintaining friendships within Sioux Lookout.

The question which logically arises is: Who are the individuals actively participating in formal community affairs? An analysis of the respondents with high involvement indicates that they are likely to be part of the 'established' core of Sioux Lookout residents (see Table A.6.29). The majority were strongly attached to the community and had a high interest in its local affairs. High involvement tended to decline after residence had been established longer than two years, but resumed after a considerable time (15 years or more) had elapsed. This could be a function of age: with children grown, individuals may return to formal social pursuits.

Substantiating traditional sociological literature, almost all the highly-participating individuals were in white-collar occupations. According to one sociologist:

"Individuals the least likely to have extended family visits and fewest connections with neighborhood or voluntary associations usually have manual labour jobs and low mobility. By contrast, those who are in upper-class occupations and are also stationary have the highest percentage of participation in family, club, and neighborhood associations."*

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*Melvin M. Tumin, "Social Stratification: The Forms and Functions of Inequality", Prentice-Hall, Inc., Englewood Cliffs, N.J., 1967, p.94.

TABLE A.6.29

Profile of Respondents with High Formal Participation in Community

(N=23)

Sex:	Male	(12)	52%
	Female	(11)	48
Education:	Post-secondary	(3)	13
	Grades 11-13	(9)	39
	Grades 9-10	(9)	39
	Grades 1-8	(2)	9
Occupation:	I Profl., Owner, Mgr.	(7M) (3F)	43.5
	II Clerical, Sales, Service	(3M) (6F)	39
	III Semi- and unskilled	(2M) (2F)	17.5
Length of Residence in Community:	15 or more years	(14)	61
	5-15 years	(1)	4
	2-15 years	(2)	9
	Less than 2 years	(6)	26
Attachment to Community:*	Strong	(12)	60
	Medium	(4)	20
	Low	(4)	20
Degree of Interest in Community Affairs:*	High	(14)	74
	Moderate	(5)	26
	Nil	(0)	
Future Intentions re Staying or Leaving:*	Staying	(10)	48
	Depends on job	(7)	33
	Definitely will leave	(4)	19

*Information incomplete for some respondents; hence N's are less than 23.

Slightly over half the respondents with high participation rates were planning to move from the community, or would do so if a job afforded them the opportunity. These were the individuals who expressed disappointment in community participation. Comments about the "general town apathy" were frequent and came especially from the higher educated group.

A.6.7.2 Political Attitudes

A second aspect of public participation is a less formal involvement, a) at the community level, and b) at the provincial and federal level. Locally, we measured informal involvement in terms of interest shown in community affairs and perception of personal efficacy. Degree of interest in local affairs was a subjective evaluation made by the respondents. Of those answering (N=87), 62% were fairly to highly interested; 23% were slightly so; and 16% were completely uninterested in local matters. This expressed interest does not necessarily manifest itself in formal participation, as illustrated by the 51% rate of low involvement in clubs and organizations by those very interested in community affairs. Thus our interviewing intentions were to discern attitudes and issues of local concern to the citizens.

We questioned respondents for their opinions regarding: The most important thing done for Sioux Lookout in the recent past; what they considered the community needed most and what, if anything, was being done about this; and what the worst decision was that the community had made in the recent past. From the responses we find a relatively high level of interest in community affairs. Only eight respondents had no response when asked what the most important thing done for Sioux Lookout in the recent past was. Only one respondent gave no response to the question on what is needed most in Sioux Lookout. A larger proportion, 18, had no response when questioned about the worst decision. This must be distinguished from an answer that "there haven't been any bad decisions" which five respondents gave. These respondents are not necessarily apathetic. One could assume from "no response" that they are more easily satisfied with things as they are.

Responses to all questions about principal issues of concern in Sioux Lookout were numerous and diverse; and many matters were controversial. General community needs felt by respondents rested in six areas. The need for a shopping centre or more businesses to offer competition to local merchants was most frequently expressed. Other commonly held needs were: Increased recreational activities for young people (in particular a town swimming-pool);

improved roads and sidewalks; housing facilities, as well as an old folks home; and greater economic development to provide more employment for residents. Dissatisfaction was felt in these general areas but when opinions about the "worst decision or action taken on the part of the community in the recent past" were solicited, more specific local undertakings were mentioned. The town's installation of water meters aroused the most unfavourable reaction; many comments were received about the costliness and inefficiency of the new sewage plant; and the actions and attitudes of the Town Council, which tended to discourage or prevent the establishment of new businesses in Sioux Lookout, drew some criticism. Admittedly, these comments are open to disagreement but because they were relatively frequently mentioned, they merit observation.

There were many positive feelings about the town's actions received as well. The majority of answers to the query about the "most important thing done for this community in the recent past" fell within the range of five areas of improvement: Street paving, high school expansion, new sewer construction, and housing projects, especially the building of the senior citizens' apartments, were among those developments most often cited as being an important contribution to improvement of the town. Mentioned, but less frequently, were developments in the service areas: The construction of the curling rink, the new firehall, and the Indian Friendship Centre; arena improvements; the expansion of the airport and the Hudson Sawmill; road plowing; the hiring of a recreation director; and the service to the town by the Ontario Provincial Police.

Questions were specifically asked about a few controversial matters of concern to the public of Sioux Lookout. We inquired about opinions regarding the provincial government's announced plan to establish regular air services to Sioux Lookout (Nor-Ontario). Only 75 individuals responded to this question, 5% of whom were undecided. 71% felt the plan was a good idea; 15% disagreed with the decision; and 9% felt the idea in principle was good, but would be difficult to implement. In response to the question of transportation assessment, again only 75 persons answered, 45% of whom rated facilities poorly; 36% felt they were passable; and 19% considered them good. Train and road services were seen as adequate, but many respondents expressed the need for bus service out of town, especially to the Trans-Canada Highway where connections to other locales could be arranged.

Another issue causing some controversy in the region is the origin of television broadcasting. In 1974, most

of Sioux Lookout's radio and television broadcasting came from Winnipeg, but the C.B.C. was planning a new production centre to be built in Thunder Bay. This would enable television to be transmitted from Winnipeg, Thunder Bay or Toronto. When questioned about their preferences respondents indicated an overwhelming preference for regional broadcasting from either Winnipeg (39%) or Thunder Bay (38%); only 12% specified Toronto as their choice, and 11% were uncommitted.

More important than statements about the "good" and "bad" things done for the town, is the perception of whether anything is being done to correct situations, and the individual's own feelings of efficacy, that is, whether a person thinks there is anything he can do to bring about change. In answer to a question about what is being done to remedy town needs, we received responses by 10 individuals who felt no action was being taken; 13 respondents thought "just talk" of improvements was occurring; 12 said some action was being taken, and 10 respondents had no response. This relatively negative perception of actions implemented to change the community corresponds with the rather low feeling of personal efficacy expressed by the respondents. In answer to the query, "Is there any action an ordinary citizen like yourself could take to get this done?", a large number (13) had no response. Ten respondents said there was nothing they themselves could do; nine felt personal persuasion of other townspeople was one method to produce change; and 9 said going to the Town Hall was a course of action. Other replies were: pressure local employers (such as Canadian National) join local clubs, write the Member of Parliament, offer personal help.

Personal efficacy is directly influenced by political awareness and public participation, even on an informal basis, requires a certain amount of consciousness about governmental operations. To ascertain how aware Sioux Lookout citizens were in this regard, we queried them for recognition of political representatives; their contact with these officials and success rate; their voting patterns; and their expressed interest in all levels of governmental affairs.

Of 81 answering respondents, all were able to identify the town's mayor.* Only 68% of the respondents, however, could name both the provincial and federal members of parliament; 14% could identify neither; and the remainder

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*Mr. Arnold Beebe was Sioux Lookout's mayor until December 1974, when Mr. Tom Moroz won the municipal election.

recognized only one official representative.* These rates of representative recognition correspond roughly to the respondents' voting habits: 65% voted all elections, 23% voted only some; and 12% never voted.

The respondents' ability to identify political representatives is a reflection of the amount of attention paid to all three levels of government. When queried about how closely they followed political affairs, it was not surprising that the majority of respondents were more attentive to municipal politics than federal or provincial, on consideration of the degree of interest expressed in local affairs. (See Tables A.6.30 and A.6.31.)

TABLE A.6.30

Percentage of Respondents Paying Close Attention to Politics

Level of Government (N=81)

Municipal	Provincial	Federal
54.5%	38%	45%

Since a federal election was in progress during the time of interviewing, we suspect that the percentage of persons showing an interest in federal politics is higher than it might have been and this should be borne in mind when reading the accompanying tables.

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* Sioux Lookout's federal Member of Parliament, representing the region since 1965, is Liberal John M. Reid from Kenora. Leo Bernier, a local resident, is the Progressive Conservative provincial Member of Parliament, who was elected in 1971 and received over three-quarters of Sioux Lookout's vote.

TABLE A.6.31

Percent of Respondents Who Pay Close Attention to Politics, by Education and Media Exposure

Level of Political Interest	Level of Education			Frequency of Newspaper Reading			Frequency of Television Watching		
	1-8	9-13	Post-Secondary	Daily	Weekly	Less	2 hrs.wk. or less	2hrs.day or less	3 hrs. day or more
Municipal (N=44)*	50%	59%	33%	58%	64%	35%	33%	48%	69%
Provincial (N=31)*	44	37.5	44	52	40	6	44	43	26
Federal (N=37)*	44	43	67	54	19	44	67	48	32

*This table summarizes a large amount of data; hence a note of caution in reading it is in order. In each instance, the percent figure refers to the proportion of all persons in that category who have indicated an interest in a particular level of politics. Thus, for example, of all persons with a grade school education, 50% expressed an interest in municipal politics, etc. The N's reported in the left-hand column are not mutually exclusive since any one respondent may be interested in more than one political level.

An analysis of Table 6.31 yields a number of intriguing observations. As one would expect, the more highly educated a person is the more he is interested in national and provincial politics, though not necessarily to the exclusion of local affairs. At the same time, it is worthy of note that education in itself is no certain predictor of political awareness, for half of the respondents who had a Grade 8 education or less were interested in municipal politics and 44% of this group were interested in both provincial and federal matters.

Newspaper reading is an influential variable in shaping political attitude: of those persons who read a newspaper (excluding the local weekly news-sheet) less frequently than once a week, only 6% expressed an interest in the provincial political arena. It is difficult to draw any conclusions from the 44% of persons in this category who said they were interested in federal politics because, as has been already noted, a federal election was in progress at the time the interviewing was done and this would undoubtedly skew the results. Nevertheless it is apparent that daily reading of the newspaper appears to have some relation to political awareness. It must be pointed out, however, that one must be cautious in interpreting the extent of this influence, or even whether newspaper reading per se is a causal factor. Without a multivariate analysis, which is difficult when one is dealing with such a small sample, it is impossible to say which of a multitude of complex interacting variables is the most influential in shaping behaviour and attitudes. This observation has particular pertinence here since it is likely that frequency of newspaper reading is itself influenced by level of education.

The same caveat applies to an analysis of the relation between frequency of television viewing and political interest. Yet it does appear that there is some relation. Of the persons who watch television for three hours a day or more, 69% expressed an interest in municipal politics and less than half that many indicated that they were interested at the other levels (provincial, 26%; federal 32%).

Even though the least amount of attention was paid to provincial politics, the M.P.P. was the elected representative who was contacted most by respondents (21%), and from whom the most satisfactory responses were obtained. In contrast, only 18% of the respondents had ever contacted the town mayor about a problem and more than half said they had received an unsatisfactory response. Only a few (N=6) of the respondents had ever contacted their

federal Member of Parliament and half of these reported dissatisfaction with the result. No doubt the fact that the provincial member lives in the nearby community of Hudson and is a Cabinet Minister explains in some measure why he was more likely to be contacted than the federal member. What is interesting here, though, is how few people contact any of their political representatives. The question asked, "Have you ever contacted the mayor, M.P.P., or M.P. about some matter?" and the fact that only 22 of the 75 respondents had ever done so, while at the same time they had admitted to considerable dissatisfaction with matters that fall within one of these political arenas, suggest a fairly high level of alienation from the political process.

A.6.8 Sioux Lookout: Health

Information about the quality of medical care available to the residents of Sioux Lookout came from a variety of sources. Personal interviews with the administrator and director of each of the town's two hospitals were conducted; attitudes and opinions of local residents were obtained through survey research; and news media publications were collected.

The presence of the two hospitals in the town of Sioux Lookout has become an extremely important issue in any discussion of the quality of health care available. Since 1952 there have been discussions of a possible amalgamation of the two hospitals and this has created a good deal of dispute in the town itself and in the higher governmental levels.

Established in 1922, the Sioux Lookout General Hospital serves the town as well as the outlying communities of Hudson, Drayton Reserve, Umphreville, Pickle Lake, Savant Lake, and Collins. It serves a population (numbering about 3,800 persons) with 42 beds and 10 bassinettes*. The General is a budget-controlled, municipally-owned hospital under the provincial Ministry of Health with a local 9-member Board of Directors. Two general practitioners, both of whom have practised in Sioux Lookout for over 20 years, manage the medical functions of the hospital** with the assistance of 63 full-time staff. General Hospital

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*Interview with Mr. L. Johnston, Administrator of General Hospital, June 13, 1974.

**A third doctor arrived at the beginning of July, 1974 to stay for the summer and it was the administrator's hope that this would be extended to a permanent basis.

doctors have admitting privileges at the Zone Hospital, but little occasion has arisen to use these. Only two instances over the two years prior to 1974 occurred where this procedure was necessary. In practically all cases of complicated fractures, eye, kidney, or heart surgery, or rehabilitation, referral is made to Winnipeg or Thunder Bay.

TABLE A.6.32

Admissions, Patient Days and Average Length of Stay at Sioux Lookout General Hospital

Year	Admissions	Number of Patient Days	Average Length of Stay (days)
1971	1,288	10,111	7.8
1972	1,166	8,809	7.5
1973	1,146	9,744	8.5

Source: Mr. L. Johnston, General Hospital Administrator, annual statistics of General Hospital.

The decline in the number of admissions over the past few years is partially a result of government ordered transferral of service for all Canadian Armed Forces personnel to the federal Zone Hospital. Some other residents have shifted from the General Hospital to the Zone Hospital services. According to the General Hospital administrator, the figures for average length of stay are high because of the lack of auxiliary facilities available. There are a large number of chronic cases, especially in the older age groups, which could be cared for in a nursing home, but the closest such facility is located in Kenora and many local residents are loath to travel so far for this kind of care.

General medical care and hospital after-care for a majority of the town population takes place at the General Hospital clinic, situated on the main street of the town. The clinic is served by the two general practitioners four days a week. There are no appointments available; service is on a first-come, first-served basis. Both the clinic and the hospital are geographically situated so as to be highly accessible to those living in town. For most they are within walking distance. For the outlying areas, transportation to these health facilities is, of course, more difficult. Residents of Hudson can use road or rail transportation; Pickle Lake is connected by a road; while communities along the railway line, such as Savant Lake must rely on rail transportation.

There is a second hospital within the town limits, the Sioux Lookout Zone Hospital established in 1949 by the Department of National Health and Welfare to meet the medical needs of the Treaty Indian population of the northwest Ontario region. The Sioux Lookout Zone stretches from Hearst, Ontario, on the east to the Manitoba border on the west, and from the main line of the Transcontinental Canadian National railway line on the south to Hudson Bay on the north*. The Zone Hospital is responsible for six nursing stations and 17 satellite communities in the north, which service a population of 7,873, consisting mostly of Treaty Indians. It is also responsible for communities along the Canadian National tracks and Red Lake Road which has a total population of 2,305**, though these other communities do not rely solely on the services of this hospital. (See Fig. A.6.2.)

The Zone Hospital has an 80-bed capacity plus bassinettes. Zone Hospital staff, including those in the field, number approximately 175, about 40 of whom are native employees fluent in Cree or Ojibway. There are five regular staff doctors (including the Zone Director) and two dentists.

In 1969, in collaboration with the Medical Services Branch of the Department of National Health and Welfare, the faculties of medicine and dentistry of the University of Toronto and the Toronto Hospital for Sick Children commenced a programme to supply medical specialists to the hospital. Visiting consultant teams (in such areas as obstetrics and gynaecology, ophthalmologist, psychiatry radiology) come for one week each month. Part of this time is spent in travelling to nursing stations and their satellite communities in the north. A physiotherapist and pediatric resident is supplied continuously by the University of Toronto Medical School.*** Lists of the visiting personnel are sent regularly to: the General Hospital doctors and administrators; the Sioux Lookout Public Health nurse; the Health Units in Kenora and Red

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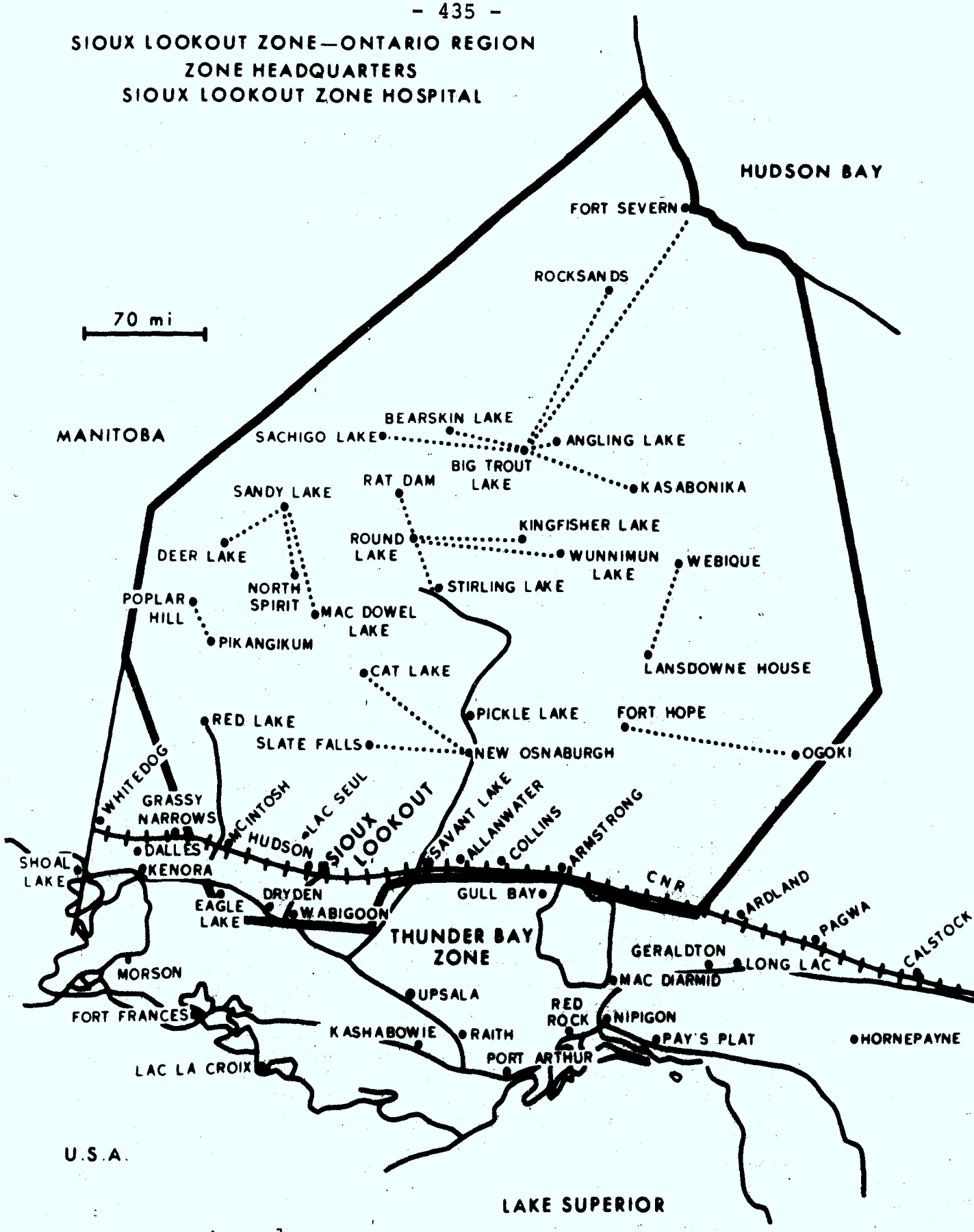
*Drs. H.W. Bain and G. Goldthorpe, "The University of Toronto 'Sioux Lookout Project' - a model of health care delivery", C.M.A. Journal, Sept. 23, 1972, Vol. 107, p.523.

**Figures of June 30, 1973.

***Interviews with Dr. G. Goldthorpe, Director of Zone Hospital, June 13th and 14th, 1974.



Source: Bain and Goldthorpe (1972)

Fig. A.6.2

Lake; the Dryden, Armstrong and Thunder Bay Hospitals; and the Department of Community and Social Services. This is done so that others may avail themselves of this medical expertise. According to the Zone Director, this service could be better utilized than it is presently by medical practitioners in other areas.

One very important aspect of the service provided by the Zone Hospital to northern Indians is obstetrical care. Women who are experiencing pregnancy complications or who live in isolated areas come to the Zone often months in advance of the expected birth. There is a hostel on the hospital grounds which accommodates these women until they are hospitalized. The hostel is also used to house discharged patients awaiting a flight home; outpatients from northern communities; and, occasionally, family members visiting the inpatients.

Though the hospital was originally established to provide medical care to native peoples in the north, since the appointment of Dr. Gary Goldthorpe as Zone Director in 1971 the hospital has been opened up for use by all residents of the area. This is reflected in the change of name occuring at this time, from Sioux Lookout Indian Hospital to Sioux Lookout Zone Hospital. The hospital facilities and the services of the visiting specialists are available to all residents. As well, there is a clinic in the hospital building, served by the Zone general practitioners, which has the same open-door policy. Appointments can be made at the Zone with a particular doctor, though he or she is not present in the clinic every day.

Since the change in offering services to the general public in 1971, statistics indicate a steady increase of other than Treaty Indians for both inpatient admissions and outpatient treatment (Table A.6.33). The 'other' figures refer to non-status Indians as well as the white population and includes the Canadian Armed Forces personnel who are now compelled to use these facilities; though they represent a minority.

The number of referrals to other hospitals is also on the increase: in 1971 and 1972 there were 207 referrals; in 1973 there were 313. The majority of cases for referral are sent to Winnipeg because of easy access by rail, with Thunder Bay, Toronto, and Dryden used secondarily. No referrals have been made to the General Hospital.

Despite the increased usage of the Zone Hospital by other than Treaty Indians, the controversy and confusion over the actual availability of these services to the

TABLE A.6.33

Inpatient and Outpatient Treatment, Patient Days and Average Length of Stay at Sioux Lookout Zone Hospital

Year	Inpatient Admissions*			Number of Patient Days	Average Length of Stay	Outpatients		
	Total	Treaty Indian	Other			Total	Treaty Indian	Other
1971	1,636	1,617	19	16,606	10.1	1,836	1,298	538
1972	1,953	1,795	138	19,117	9.8	4,569	2,336	2,233
1973	2,036	1,806	230	16,274	7.9	7,450	4,202	3,248

Source: Dr. G. Goldthorpe, Director, Sioux Lookout Zone Hospital, Annual Admissions Statistics.

*Including newborns.

general public remain on the part of many townspeople. The issue was complicated during the federal election campaign in 1974 when accusations of discriminatory health practices were made by the local Progressive Conservative candidate, (who was also the Mayor and the Chairman of the Board of Directors for the General Hospital). Recommendations for coordination of services were made to the Provincial Minister of Health, Frank Miller, at a public Social Development Policy field meeting on June 3, 1974.

The situation would seem to indicate that representations of both the General and the Zone Hospitals are agreed that closer coordination and eventual amalgamation of services would be a good move. The goal would seem to be the same, but misrepresentations or misunderstandings as to the actual state of health care delivery in Sioux Lookout, and how such desired changes should be brought about, are the major stumbling blocks.

An important question to be asked here is how the townspeople of Sioux Lookout perceive this issue. From our interviews, we found that the quality of health care in the community is a subject of utmost concern to most respondents. While many respondents had little interest in the education system or other local issues such as sewer and road improvements, health care is one area where almost everyone had experienced some direct contact and opinions on the subject were often quite emphatic.

The use of both medical facilities in Sioux Lookout, as expressed by the respondents, is extensive. 38% of the adult sample, and 42% of their children living at home, received medical attention within the year. Serious illness had struck 30% of the respondents at some point during the previous three years. 60% of the respondents had been hospitalized in one of Sioux Lookout's two hospitals 44% of these within the past five years.

We found that the majority of our respondents (77%) used the General Hospital facilities. 9% used the Zone Hospital and 6% went elsewhere, usually to Thunder Bay, Winnipeg, or Dryden, for medical care. Since most respondents had no contact with the Zone, opinions on the service obtained there were few and then based largely on hearsay. It is interesting to note the kinds of people who chose these three avenues when seeking medical care. Of those who use the General Hospital on a regular basis, 50% have lived in Sioux Lookout less than 2 years (Table A.6.34). This figure increases sharply with residence over 2 years (90% for those who have resided in town 2-10 years; 85% for those who have lived there over 10 years). The probability

TABLE A.6.34

Health Facilities Utilized by Age, Mobility Intentions and Length of Residence in Sioux Lookout

Health Facility Utilized	Age			Mobility Intentions			Length of Residence in Sioux Lookout			
	20-34	35-54	55+	Leaving	Depends on Job	Staying	Less than 2 years	2 yrs. to 5 years	5 years to 10 years	More than 10 years
	(N=52)	(N=27)	(N=21)	(N=15)	(N=28)	(N=58)	(N=18)	(N=15)	(N=6)	(N=62)
General (N=81)	75%	81%	90%	40%	96%	83%	50%	93%	83%	85%
Zone (N=11)	17	4	5	27	-	12	22	7	17	8
Other (N=9)	8	15	5	33	4	5	28	-	-	7

is that those who have resided for many years in the community use the General Hospital and Clinic, the only services that were available to the public before 1971. When the transition from the Indian Hospital to the Zone Hospital occurred, most long-term residents had established medical histories with General Hospital physicians and were unlikely to change. For many there was a perceived complication because they thought the procedure for switching hospitals was complex. One respondent expressed the desire to transfer to the Zone Hospital, but was embarassed about offering an explanation to the General Hospital physician.* Responses from the sample indicate that only 5% transferred to the Zone Hospital from the General. The steady increase in white patients being treated at the Zone Hospital, therefore, consists mainly of new residents in Sioux Lookout and out-of-town residents with unestablished treatment histories. This observation is supported by the fact that a much greater percentage of the sample who used the Zone facilities were younger (Table A.6.34). Sample data also illustrate that there is a greater stability tendency in the General Hospital users than in respondents who use the Zone Hospital or other facilities.

When questioned directly on their opinion of the quality of medical care, there was a wide variety of comments from our respondents. Most often mentioned (by 17 respondents) was the need for more doctors at the General. The doctors were seen as being overworked and too rushed to provide adequate care. Six of these respondents were of the opinion that the General doctors were attempting to dissuade other doctors from establishing practice in Sioux Lookout. Another 7 respondents felt that the doctors were doing a good job, but that, again, more doctors were needed so that there would be greater accessibility to them. A definite area of discontent was the long waiting period at the clinic. Ten respondents complained that because no appointments could be made, one had to wait up to two hours to see a doctor at the clinic. A wide variety of other comments was made by respondents, such as: prescriptions are too easily obtained; improper diagnosis of diseases; medical records improperly kept; doctors are not up to date; not enough specialists; they do not give thorough check-ups. All these comments were made by at least three different respondents. On the positive side, the view was expressed by two respondents that one got more personalized treatment at the General Hospital clinic than in other clinics.

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*In fact, the procedure for changing from the General to the Zone Hospital simply involves signing a consent form so that medical records can be transferred. In this way it is hoped that individuals will not switch back and forth from the General to the Zone, but make a reasonably permanent commitment to one or the other of the health care centres.

It is interesting to note here that the critical comments on service at the clinic are for the most part of a service oriented and instrumental nature: concern lies with accessibility of the service or with the expertise of the professionals dispensing the service. The favorable comments are of an affective nature: concern with the personal manner of the physicians and how he relates to the patient as an individual.

Despite the large number of negative comments, one finds an equal split between those who label the service at the general clinic as good or adequate (18), and those who label it as barely adequate, poor or very poor (18). This is probably due to the fact that those who were critical of the service were much more vocal than the satisfied respondents. Those with a favorable impression made statements such as: "I'm happy with it"; "It's all right"; "It's good compared to other small towns"; without giving the specific qualities which they found good.

Another indication of the attitude towards services at the General clinic are the numbers of respondents who sought medical help outside of Sioux Lookout without being referred by a local doctor. 32 respondents went on their own to out-of-town facilities, usually to Dryden, Kenora, Thunder Bay, or Winnipeg. As previously stated, few (5) respondents sought medical help at the Zone when they became dissatisfied with the General Hospital services.

Very few comments were made about the quality of health care at the Zone Hospital, again because few respondents had any contact with it. Comments were made by six respondents that they liked having so many specialists available at the Zone Hospital. Two respondents mentioned that the Zone Hospital was more willing to give referrals than the General. One respondent claimed that Zone Hospital doctors were more impersonal and professional than those at the General, feeling this to be a good quality. Another respondent made the same assertion but was critical of this attitude, saying that the doctors lacked "a personal touch". Only four respondents could make any evaluation of the quality of health care at the Zone Hospital and all these respondents labelled the service as "good".

Evaluations of the hospitals themselves were not quite so critical. A large number of respondents (15), were pleased with the nursing care at the General and this was often expressed in such affective terms as: "They're nice to you". Two respondents praised the "personal" treatment they received. Critical comments included such

things as outmoded facilities, too much noise due to crowding, doctors not always avilable, and the more generalized comment made by four respondents: "The doctors are the only problem". On assessment, 17 respondents said the service at the General was good, 13 labelled it adequate, 4 called it barely adequate, 5 saw it as poor, and 5 had no contact and so felt that they could not voice any opinion.

The Zone Hospital also came in for some critical comment, though often by those who had no direct contact with it. One respondent critized it on the grounds that it was not clean, another because it was too crowded. Two respondents did not like the idea of rotating doctors because of the impossibility of developing a relationship with any one doctor. On the other hand two respondents praised the large number of visiting specialists and another two were favourably impressed because a doctor would always be available when needed. Overall, the Zone Hospital was evaluated by 5 respondents as giving good service, while two labelled it as poor. There was no intermediate position taken. For those who knew anything about the Zone Hospital at all, it was either praised or damned.

Interest was expressed by the mayor (in 1974) and the Zone Director about town opinion on the hospital amalgamation issue. We therefore queried the respondents in this regard. Results showed that the majority (78%) of the 82 answering respondents agreed with the amalgamation, although 21% of these acknowledged the possibility of problems arising; 12% of the sample opposed the union; and 10% were indifferent to the issue. It is interesting that the largest percentage of those disagreeing with the amalgamation were Zone users (non-Indians) and the largest percentage in favour of the combination were individuals who went out of town for treatment. The General Hospital users, who represented in actual numbers the biggest segment of the sample, were 78% in favour of the proposed amalgamation. Individuals opposing the combined hospital plan were more often over 34 years old and intending to remain in Sioux Lookout, or only planning to move if a better job opportunity arose. The more established group, those who had lived in the community longer than two years, had larger percentages opposing the amalgamation. In general, the population having resided in Sioux Lookout less than two years, the group under 35 years of age, and the respondents with strongest out-migrating intentions, were those most in favour of the combination. (Table A.6.35)

A further area of confusion was uncovered when we attempted to discover the public attitude towards prospective administration should the hospital amalgamation occur.

TABLE A.6.35

Opinions on Hospital Amalgamation Issue by
Age, Mobility Intentions and Length of Residence in Sioux Lookout

	Age			Mobility Intentions			Length of Residence in Sioux Lookout		
	20-34 (N=42)	35-54 (N=18)	55+ (N=18)	Leaving (N=11)	Depends on Job (N=19)	Staying (N=48)	Less than 2 yrs. (N=11)	2-10 yrs. (N=16)	More than 10 years (N=51)
Yes (N=61)	90%	61%	67%	100%	73%	75%	91%	75%	76%
Indifferent (N=7)	5	11	17	-	11	10	9	6	10
No (N=10)	5	28	17	-	16	15	-	19	14

In general the respondents were unaware of the process of hospital financing in Sioux Lookout, though most recognized the Zone Hospital as federal. There was little concern expressed about administrative and financial details of the combination. Many commented that they did not care how it was operated as long as medical service was improved.

In general, there is a lack of awareness on the part of the townspeople of the availability of the services at the Zone Hospital. A large number of those who were highly critical of the General made no comment about a desire to switch to the Zone to see if the service was better there. They either went out of town for their medical care or stayed with the General despite their complaints. In fact when asking about their assessment of hospital services, most respondents assumed we were referring only to the General, as this was "their" hospital, and the Zone was for Indians only.

It was also found that respondents were often quite surprised to hear that there were discussions underway about amalgamation of the hospitals. Our questionnaire seemed to make people think, for the first time, about the kind of effects such a change would have on health care in the community. We also found surprisingly little objection to amalgamation on racial grounds.

What, then, can be said about the level of health care in Sioux Lookout? Certainly the health facilities are geographically located as to be easily accessible to the public. But actual accessibility is seen as a problem by many residents. Difficulties in getting to see the doctors at the General when they are needed is expressed as a major concern. Misunderstanding as to who may receive service at the Zone has prevented use of this service on the part of the general public. It must be concluded that only a reorganization of the health care facilities in Sioux Lookout, coupled with an educational program to inform the residents of services available to them, will bring about the improvement in the level of health services which so many residents perceive as badly needed. We found a situation of controversy and conflict between the two hospitals and the three levels of government. This conflict has yet to be resolved and we see that the residents of the town are themselves plagued by confusion and misunderstanding on this subject. Here is one significant area where use of the communications media would prove invaluable. There is a lack of information flow between the levels of government and the townspeople, and between those directly responsible for administration of the hospitals and the townspeople. Moreover

there seems to be a lack of communication between the two hospitals. Efforts have been made through the medium of the local newspaper to explain the situation. A series of articles in the form of a letter to the Editor by the Board of Directors of the General appeared in June 1974; however, not only its content but also its style and clarity in setting forth the position of the Board left the problem as clouded and confused as ever.

The use of local broadcasting might be the best medium to bring both sides together for meaningful discussions, while at the same time clarifying the situation for the general public. Interviews with appropriate ministers in the Federal and Provincial cabinets is one area to consider. Talk-shows where residents could phone in and have their concerns aired over the radio might be a valuable vehicle for the articulation of demands. The mayor and the administrations of both hospitals must make themselves more accessible to public query with the hope that cooperation and understanding will result.

A.6.9 Sioux Lookout: Communications

To accomodate the purposes of the overall interdisciplinary study, we endeavoured to ascertain through survey research the community's utilization of telecommunication and the postal service. Respondents were asked about their use of television, telephone, newspapers, periodicals, books, and about their correspondence habits. Opinions were sought regarding improvements to these communications networks.

We were interested also in methods by which people kept abreast of news affairs. When questioned about information sources for current affairs, the responses reflected a small-town life-style. The majority of the sample regarded personal experience (including family background and religious affiliation) as one of their principal information sources. Printed media was the second most frequently cited source, followed closely by television and, lastly, radio. (See Table A.6.36)

TABLE A.6.36

Number of Persons Citing Three Chief Information Sources (N=84)

Information Source	#1	#2	#3
Personal Experience, Church, Personal Interactions	29	22	26
Television	26	25	12
Nespapers, Magazines, Books	21	27	20
Radio	8	8	15

A.6.9.1 Telecommunications

Nearly every white household interviewed had at least one TV and the majority of these indicated possession of a colour-receiver. Respondents were about equally divided into three groups in terms of time spent watching TV. 27 of the respondents viewed television for one hour per day or less; another group of 36 watched between one and two hours on a typical day; and the third group of 35 spent more than three hours a day watching television, and most of these averaged three to four hours daily. Eight respondents did not reply to this question. Table A.6.37 is an investigation into the type of individuals who watch TV. In each working status category, the majority watch over an hour a day and those not employed generally view more than those engaged in occupations outside the home. Housewives constitute the largest group (83%) watching television over an hour daily. This explains to some extent the large percentage of individuals (50%) with no income, or less than $5,000. annual income (housewives are included in this category), who view three or more hours of television daily. In the $5,000. - $10,000. wage bracket, the largest group (64%) watches 1-2 hours daily and in the over $10,000. wage bracket, the largest single viewing group watches an hour of TV a day or less. This suggests an inverse relation between television viewing habits and economic status. In terms of formal participation in organizations, it was discovered that half of those with high involvement, watched three or more hours of TV daily.

TABLE A.6.37

Percent of Television Viewers, Amount of Television Watched by Working Status, Income and Formal Club Participation

		Working Status			
Amount of Television Watched	Total Respondents (N=98)	Employed (N=65)	Unemployed (N=5)*	Houseworker (N=23)	Retired (N=5)*
1 hr. or less daily	28%	32%	(2)	17%	-
1-2 hrs. daily	36	35	(1)	43	(2)
3 or more hours daily	36	33	(2)	40	(3)

*Percentages not calculated for so few cases.

TABLE A.6.37 Continued

Amount of Television Watched	Income: Below $ 5.000. (N=38)	Income: $ 5,000.- 10,000. (N=25)	Income: $10,000.+ (N=27)	Involvement in Clubs: Low (N=51)	Involvement in Clubs: Medium (N=21)	Involvement in Clubs: High (N=22)
1 hr. or less daily	16%	16%	48%	24%	33%	27%
1-2 hrs. daily	34	64	19	41	38	23
3 or more hours daily	50	20	33	35	29	50

Having ascertained the amount of time spent watching TV, we asked our respondents to rate their preference as to types of programmes (see Table A.6.38). For the 87 men and women who responded by specifying their two or three favourite viewings we ranged programmes in the following order: News (59), Comedy (46), Movies (38), Drama (35), Sports (31), Music (27), and Soap Operas (9). There was a surprising consistency between the sexes in preferences. An overwhelming majority of both men (69%) and women (67%) mentioned news as one of their programme choices. Females have a slight edge over males in preferring fiction (drama, comedy, movies), but it is interesting to note the high number of males who specified this type of programme. As might be expected, a greater number of males expressed an interest in sports programmes: 52% of the men listed this as one of their three choices, as opposed to 20% of the women. A surprisingly small number of women (20%) listed soap operas as one of their programme preferences. This is interesting because, if the answers are reliable, it may be an indication that television networks have over-estimated the interest women have in soap operas.

TABLE A.6.38

Number of Persons Who Prefer Selected Types of Television Programmes

	Males (N=42)			Females (N=46)		
	1st Choice	2nd Choice	3rd Choice	1st Choice	2nd Choice	3rd Choice
News	22	3	4	20	3	7
Comedy	2	7	11	7	10	9
Movies	3	8	4	6	10	7
Drama	7	3	6	5	8	6
Sports	6	14	2	2	6	1
Music	2	4	3	3	6	9
Soap Operas	-	-	-	2	3	4

When queried about changes they would like to see in television programming, the most frequent response was more variety. Other suggestions which were mentioned by three or more respondents were: more good films, better children's shows, earlier movies, more music programmes, more sports, more drama, and more Canadian content.

Sioux Lookout presently receives the majority of its television programmes from the Canadian Broadcasting Corporation in Winnipeg. Respondents indicated that if they had any choice over CBC broadcasting centres, 39% would remain with Winnipeg, 38% would prefer Thunder Bay, and 12% would switch to Toronto. 12% could not decide or were indifferent to the matter. An overwhelming number of respondents did mention that they would like to see more stations receivable in Sioux Lookout.

We collaborated with a local group funded by a Local Initiatives Project grant to collect data on radio listening and programme preferences. It is regrettable that these data were not properly gathered, and hence we cannot report it here. Our only contact in this regard with the people of Sioux Lookout was our general impression of a high level of interest in setting up a community radio station. This interest culminated in the summer of 1975 when "Community Radio" commenced operations a few hours a day on a volunteer basis. Its studio is shared with, and was constructed by, Wa Wa Tei in the Indian Friendship Centre. Wa Wa Tei, formerly the Ottawa Department of Communication's Northern Pilot Project, is a radio-telephone network supplying a communications system to 25 northern communities. For some of these reserves and villages this is the only link they have with the outside world. Wa Wa Tei is now funded by the Secretary of State.

We also asked respondents questions about local and long-distance telephone use. All white households except one had their own telephone in the home. The majority made local calls daily, women more often for social reasons, men for business purposes. Only two respondents who owned a phone made local calls less than once a week. For the answering sample, reasons for phoning locally were (in rank order): social calls, information seeking, saving time, work related, and seeking help.

Two-thirds of the respondents (64) made long-distance calls at least once monthly. The overwhelming majority of these were social calls to relatives. A substantial number of long-distance business calls were made, as well as many information calls. A minority of long-distance calls were made to friends.

When questioned about desired improvements to the Sioux Lookout tlephone system, responses were: increased number of long-distance circuits, decreased deposit on telephone line, and decreased service charges. The majority indicated satisfaction with the telephone network.

A.6.9.2 Printed Media

As indicated, newspapers, magazines and books represent the most frequently cited information source, aside from personal experience, specified by the respondents. Sioux Lookout prints its own small daily newsletter to which most of the community subscribes. The Dryden Observer is the most local newspaper in the region supplying a regular, though weekly, news coverage. Twenty respondents subscribed to this. The most frequently read newspapers were the Winnipeg Tribune, with 29 subscribers in the Sioux Lookout sample, and the Winnipeg Free Press with 23 subscribers. Eleven respondents indicated regular reading of Toronto papers, which arrive in Sioux Lookout one day late, and a few subscribe to The Thunder Bay Chronicle. Discounting the local newsletter, 62% of the sample read the newspaper daily; 19% ready weekly; and the remainder read less frequently.

Magazine reading was far more infrequent than that of newspapers. 37% of the respondents indicated that they read magazines often; 32% answered sometimes; and 31% seldom or never read magazines. About half of the magazine subscriptions were of a current affairs nature (Time, Newsweek, Macleans). Women's magazines were often mentioned and Reader's Digest is a popular, regularly-read periodical. Other magazines mentioned were hobby- or job-related.

The Sioux Lookout library, a small building located just off the centre street, was rarely used by the sample. 75% of the respondents indicated that they never use the building; 5% seldom use it; 9% use it sometimes; and only 10% of the sample often and regularly use it. Comments indicated that many respondents were too busy to read; 23% of the respondents did not read any books. Many read their own books and a few people mentioned that they have a group of friends in Sioux Lookout with whom they trade books. About one-third of the respondents reported that they read less than 10 books a year; 15% read between 10 and 20; and over 30% said they read more than 20 per year.

A.6.9.3 Correspondence

The final area of communications we examined was letter-writing. Almost half the sample indicated that they write letters weekly, about 20% write monthly, and slightly less than one-third write less frequently. As

might be expected, the principal reason for correspondence is social contact between relatives, especially for the female respondents. Males indicate a greater incidence of business correspondence. Women also tend to be the family correspondent, often writing to the male's relatives as well as their own. As was indicated in the kinship section, telephone calls are frequently substituted for letters as the chief method of social contact, especially with kin in the region. Letter-writing persists in being the most common form of contact between respondents and their relatives who live a great distance away.

The above discussion suggests that the people of Sioux Lookout maintain reasonably firm ties with the world outside both through the media (electronic and printed) and through the spoken and written word. Although geographically distant from the metropolis, it is by no means socially isolated. A vigorous community, it displays many of the elements of an urban life-style.

A.6.10 The Indians of Sioux Lookout

Mainly on the periphery of town and just outside the town limits, in small pocket populations, live Sioux Lookout's Indian residents, a very noticeable sub-section of the town's inhabitants. Figures released by Census Canada on the number of Natives living in Sioux Lookout are misleading: from 1911-1941 there were no reported native residents in the town; and in 1961, only 40 were accounted for in the official statistics. In fact, these numbers are far lower than is actually the case. One reasonable estimate of the town's Indian population in 1974 was approximately 200.* The discrepancy in numbers can be accounted for partially because many Indian residents dwell just beyond town limits and so would not be included in residence lists. A further explanation for the under-reporting is the general transient nature of many of the Indians. As mentioned earlier in this report, Sioux Lookout operates as a service centre for northern communities. It is therefore the drawing centre for many northern residents seeking education, specialized health care, seasonal jobs, general supplies, or simply a temporary respite from their home communities. Also Sioux Lookout is situated about 15 miles from Hudson, a village of some few hundred individuals, predominantly Indian, who frequent the town regularly to shop, use Sioux Lookout's services, or sometimes to visit kin, many of whom reside there. The close proximity of Hudson to Sioux Lookout means the jaunt is made often; the number of Indian people having contact with the town is thus considerably higher than the small minority who live there more or less permanently.

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*This estimate was made by Dr. G. Goldthorpe, Director, Zone Hospital, Sioux Lookout, Ontario.

It would be difficult to classify the Indian residents and transients of Sioux Lookout as a 'community', since this term connotes a certain degree of social cohesion. In the sociological literature the association of oneself as a member of a particular group or community assumes an environment which fosters a shared culture, enabling similar values and patterns of behaviour to develop through social interaction. It also assumes a 'psychological identification' with an area, its institutions, and its people. It is posited that this type of atmosphere does not exist among the Indians of Sioux Lookout. Indians are often seen in groups in the streets and in the local establishments, and some residents associate regularly with their local kin. However, there appears to be no appreciable communication network maintained by the majority of town Indians. Most Indians know at least the family name of all the other Indian people in Sioux Lookout, but apart from kinship relations and chance encounters in the town, a high degree of interaction does not seem to occur; neither do these individuals as a group appear to possess a strong attachment to Sioux Lookout. As one local white professional stated, there does not seem to be a 'community' of Indian people in Sioux Lookout but, rather, an aggregate of isolated individuals and families.

David Stymeist's study*, "Ethnics and Indians" conducted in Sioux Lookout in 1972-73, noted this same trait. He states:

> "The Indian population of the area is not one undifferentiated whole. The differences are noted by the Indian pople themselves and by some whites who have jobs in the various bureaucratic organizations involved with Indian people. Secondly, there is a certain nesting of the categories of residence that is similar in many ways to the nesting of white ethnic categories within the town."

In Stymeist's estimation, there is a particular 'self-differentiation' in terms of residence and culture made amongst the Indian people themselves. Only certain white people are in a position to recognize this differentiation. The majority of white residents categorize the Indians as one homogenous ethnic group. Whether this is the cause or the result of the town's customary spatial segregation between whites and Indians is difficult to determine. In any case, there appears to be a specific

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*David H. Stymeist, "Ethnics and Indians: Social Relations in a Northwestern Ontario Town", Peter Martin Associates Ltd., Toronto, 1975, p. 74.

segment of the town's business establishments which caters primarily to Indian customers. Such merchants are situated at the east end of the town's main street. Even in Sioux Lookout's major bar, Indians and whites customarily occupy different spatial locations within the same room. In these locales, Indians tend to associate along previously-formed residence or kinship patterns.

The social interaction between Indians and whites appears to be even less than the minor Indian social networks. We observed many friendly white professional/Indian client relationships, but only with a few of these white people did such friendships appear to extend into their private lives. From our perspective little overt discrimination was witnessed, but hostility towards the Indian sub-section of the population appeared to be prevalent in the attitudes of many of the white townspeople. Conversations with many Indian individuals, especially the Indian women, revealed that quite a few felt the townsfolk of Sioux Lookout to be "unfriendly". One young Indian woman who married a white man considered town residents to be definitely hostile, though her husband disagreed with her. A high degree of intermarriage takes place, primarily between white men and Indian women. Of the 17 family units we interviewed, 6 were mixed marriages, and only one of these was between a white woman and an Indian man. Social networks for partners in mixed marriages tended to be associated with one particular culture, almost to the exclusion of the other. In many cases respondents referred to parental resentment of their marriages, which generally led to a disassociation with that side of the family. The price of adjustment seemed high for these people. One white woman of a mixed marriage was cut off from all contact with her relatives because of conflict over her marriage and experienced considerable resentment from her husband's Indian kin as well.

Indian kinship patterns in Sioux Lookout differ markedly from the habits of the white respondents. Relationships seem far less formal: written correspondence was rare, even between very closely-knit families; phoning was relatively infrequent. Most individuals had some kin in Sioux Lookout, but formal visiting arrangements did not seem to occur regularly. Frequent spontaneous meetings in the streets or in local shops were more common. Chance encounters often occurred at places of employment: many employees at the Zone Hospital would see their out-of-town kin only when they paid sick visits to the hospital. Though in traditional white norms, this would indicate an attenuated kin relationship, no similar correlations can be drawn for the Native population. It is far more common

for a young married Indian couple to reside with one of their parents than for their white counterparts. Similarly, it is generally accepted that parents or siblings will always be welcome to reside with their kin while in town, without forewarning, even if they intend to remain for a considerable length of time. This happens fairly often. Relatives from northern or neighbouring communities come to stay in Sioux Lookout, whether for a holiday or for job hunting; some have time between fighting forest fires, trapping, or hunting, or guiding in the bush. Almost always they would be assured of a place to sleep. Overcrowded homes were more the norm for Indian dwellings, and inhabitants seemed unaffected and unconcerned about the matter. Children, both legitimate and illegitimate, are often raised by grandparents and long-term babysitting is not uncommon. One Indian woman explained that she had a personality conflict with her young daughter, so she sent the child to her mother to live. Another was raising the several children of a sibling whose marriage had broken up. These types of kinship obligations are expected of Indian families and occur far more freqently than they do in white kin relations.

In addition to out-of-town relatives coming to Sioux Lookout to stay, there are many town Indian residents who have established patterns of visiting northern communities regularly. Unlike those who come to Sioux Lookout for various reasons, but usually secondarily to see their kin, Indians who visit their northern community homes usually do so expressly for this purpose. Many, however, have lost direct contact with the reserves and their relatives living there. It was frequently claimed by Indian respondents that they did not know where certain of their siblings were, or had not contacted some nuclear family members in many years. A pattern of leaving the reserves has been created, initially to attend school and later to search for employment, during which time many siblings lose contact. In a few instances, Indian children had been separated in childhood to be raised by various relatives or foster parents and never regained acquaintance.

The majority of the Indian residents we interviewed were born and raised elsewhere than Sioux Lookout. Most were from northern communities, "in the bush" as they referred to it, many from Lac Seul, the largest nearby Indian reserve. A high number of these individuals, especially the younger ones, disliked Sioux Lookout and expressed their desire to move. The women were more inclined to voice their discontent and, more often than the men, mentioned their preference to move closer to their first home and family. A lack of employment opportunities up north kept many in Sioux Lookout.

Even amongst those born elsewhere who stated that they liked the town, relatively little attachment was expressed. For those individuals, who comprise a substantial minority, who were born and raised in Sioux Lookout or the neighbouring Hudson, a different pattern is evident. Almost every one of these individuals conveyed a liking for the town, and an intention of remaining. Most had never travelled very far afield nor even entertained the possibility of a displacement. Their reasons given for enjoying the town usually were associated with the natural elements: accessibility to the bush with its hunting and fishing possibilities. No Indian respondents mentioned qualities of the town itself as reasons for liking Sioux Lookout, though a couple said the people there were nicer than in specified other communities, particularly Kenora. One woman from a mixed marriage commented that Sioux Lookout residents were more likely to "accept you for what you are".

It is interesting that no older Indian residents were encountered in our Sioux Lookout interviewing. About half the respondents were under 30. Of those over 30, the majority were between 30 and 40 years of age, and no one over 50 was interviewed. It is posited that these older individuals are more likely to remain in the north following the traditional Ojibway pursuits of hunting, trapping, fishing, and rice harvesting. Probably fewer of these persons had attended school off the reserves, and hence, had had less contact with southern Canada and therefore less incentive to move "to the city".

In recent years more schools have been constructed in the northern communities. As of 1974, 18 northwest Ontario communities had grade schools and a couple offered junior high. The majority of Indian children currently, therefore, do not come south for educational reasons until they enter high school. Some youngsters, however, who for family reasons cannot attend the school in their northern communities, attend the Sioux Lookout elementary schools and live in Pelican Residence, 8 miles outside of town. Established in 1929, and until 1972, this institution had been a residential school for Protestant Indians from the north before regular school facilities were offered there.

A small number of high school students are accomodated at the Residence in separate living quarters from the elementary children. Most older students, however, are boarded in town with community families, usually white people, arranged through Indian Affairs. Whether this is a detrimental or a rewarding experience depends on the student and the white family. One high school student's five years boarding at four different homes was relatively smooth, though he spoke of many friends who suffered a lack of

communication flow with their house parents. His experience was that sharing a family home with another Indian student usually helped alleviate his lonely and shy feelings. On the other hand, one boarding-home mother who had lodged 2 or 3 Indian adolescents per year for several years expressed preference for only one child at a time because "they mix in better with home life that way". Sioux Lookout has about 11 white families who accomodate annually 2 or 3 high school students for Indian Affairs at a fee of $120. each per month.

The secondary district school reserves places for 50 Indian Affairs students, though rarely do this many complete the school year. A major 'problem' often vocalized is the extremely high drop-out rate for Indian students. An Indian Affairs agent expressed concern over this matter, stating that she realized that there was something wrong with a system which encouraged young people to attend school, but offered nothing for them back on the reserve with a high education level. In one year 20 out of 23 high school students from one community did not complete their school year. This was a community which offered elementary schooling and so most of the students had attained their previous education in their home community. This lends support to the opinion of one boarding-house parent who felt the students who adjusted more readily to the southern classroom situation were those who had been taken from their homes at an early age for elementary school. These, however, are more often the individuals who do not return to their home communities, having adopted the life-style of a different culture. One elderly Indian man from the north acknowledged this as his reason for not encouraging young Indian people to value education highly.

Nevertheless, the educational level for Indians is increasing. Our interviewing revealed an average educational attainment of grade 6 for those 30 years of age and over, and an average of grade 10 for those under 30. Most respondents related a highly geographically mobile education history. With one exception, all the older individuals who had received any schooling at all had attended residential schools. The one exception recounted an interesting story of studying with her siblings one week a month in a train car which stopped near her parents' trap line. The younger respondents more frequently obtained part of their elementary education in their northern homes, another part in residential schools, usually in Sioux Lookout, Fort Francis, or Sault Saint Marie; and their high school education boarding with families in many different towns or cities. One young person went to high school for 3 years in 3 different locales: Kitchener, Dryden, and Red Lake. It is not infrequent for students to go as far as Ottawa or Stratford, Ontario, for one year of school, funded by Indian Affairs. Prior to 1969,

when the churches were responsible for Indian education, the decision as to which school one would attend was made according to religious affiliation. Presently it appears to be the almost unlimited decision of the student.

David Stymeist's description of the Indian employment situation in Sioux Lookout seems fairly accurate in terms of our observation and is worthy of repetition at length:*

> "Only a handful of Indians work in Crow Lake (Sioux Lookout) on a full-time basis. Many more women than men are employed most often in non-managerial capacities. A few work as nurse's aids and ward clerks in the Zone Hospital; others as clerical assistants in the Department of Indian Affairs or the Ministry of Natural Resources; and some work as cooks, waitresses, cleaning staff, maintenance men, and orderlies. At the time of writing (1972-73) there were some thirty-two Native people permanently employed in the town. Others are able to work seasonally on fire-fighting or tree-planting crews based in Crow Lake. .....Other sources of work for Native people are the timber camps located ten or twenty miles from town, and the area's tourist and resort camps which employ them as guides, cooks and domestic staff. These jobs are usually temporary and fluctuate in terms of numbers required, as do the seasonal jobs offered by the various larger administrative agencies in town."

Our examination of the employment pattern of Sioux Lookout Indians mirrors this description. It must be stated that a high number of Indians interviewed (housewives excluded) were full-time unemployed. Many of these individuals declared that they were seriously in pursuit of jobs, but opportunities were limited; claims of discrimination by employees were often referred to.

Indian respondents illustrated an almost equal split in hospital usage. Slightly over half indicated that they use the Zone Hospital, a few of whom recently had transferred from the General Hospital and clinic facilities. Few respondents were overly pleased with either of the hospitals' services. Most were noncommittal in their opinions, but more voiced discontent about the General facilities, and especially the doctors there, than about the Zone Hospital. Those who replied to questioning

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*David H. Stymeist, ibid, p.66.

about the hospital amalgamation proposition were unemphatic, and about equal numbers were in favour and against the combination idea.

The Indian communication network patterns are quite different from those of the white respondents. As previously stated, few Indian people, less than one-third of those interviewed, write letters even irregularly. Those who do correspond by mail do so generally to nuclear family members, especially parents. Phoning patterns are similar: those who have phones usually call locally daily and long-distance perhaps a little more frequently than letter writing. Indians were much more stringent in their long-distance calling than white townspeple. In fact, a large number did not have phones in their homes and none of these stated that they would like one.

Most of the Sioux Lookout Indians interviewed read the local newsletter almost daily. Other newspapers were not often subscribed to, though a few would occasionally read them at work. The weekly Dryden newspaper seemed the most popular. Little interest was expressed in political matters and the majority of respondents maintained little or no voting patterns. The most common opinion was that voting would do little to change the state of current affairs.

More women than men occupied themselves by reading books. As with the white sample, few used the library services, most preferring to purchase their own light reading material at the local stores. Detective stories, mysteries, crime and adventure novels were the most popular books specified. Magazines read by many of the Indian women were of similar content: True Confessions and movie periodicals were most frequently read.

Use of the electronic media by Indian residents more often paralleled white respondents' patterns. About one-third of the Indians interviewed watched a great deal of television, usually 3 or more hours per day. Many families, especially ones with children, claimed the television was on all day. The remaining two-thirds were relatively uninterested in television, except for a few specific programmes and often news. The majority of women were firm followers of the "Edge of Night". Invariably comments were made about Sioux Lookout's "lack of channels", and the poor selection available. Indian people were also quite vocal about the bad reception of the Dryden radio station. Many listened daily to the radio, usually to country and western, or rock and roll, music. Many favourable comments were made about CBC, especially in the context of their native issues coverage.

Generally, then, the profile of the Indian Community of Sioux Lookout is one of a somewhat atomized, alienated population; one that has lost close ties with their native communities and distant kin but that has not forged strong bonds of attachment to the urban community in which they now live. They reveal a sense of detachment, of isolation, of powerlessness, and of the stigmatization which has been characterized by one writer as "the urban dilemma" of the Indian.*

A.6.11 Summary and Conclusions

From the foregoing detailed discussion a few summary observations can be made. Sioux Lookout is a modern urban community that functions as "metropolis" to a vast northern "hinterland".** At the same time it is itself part of the whole northwestern Ontario hinterland for which Toronto is the metropolitan centre. It is there that major political, economic and social welfare decisions are made that affect the lives and the future of those living in the hinterland. It is from this metropolitan centre that the professionals and administrators come and to which many of them will return in the course of their career mobility. While in the hinterland community they function from a position of considerable influence and prestige within their own professional jurisdictions as well as within the ongoing life of the community generally. Our data suggest that it is these cosmopolitans who are the most involved in the organized activities of the community yet, paradoxically, it is they who have the least firm attachment to the community. The potential for conflict is never far beneath the surface, as our brief sketch of the hospital debate suggests.

But it is not only between "cosmopolitans" and "locals"*** that the potential for conflict exists. It is obvious that the Indians who live in the town are not integrated into the ongoing life of the community; in fact they constitute a

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*Edgar J. Dossman, "Indians: The Urban Dilemma", Toronto: McClelland and Stewart, 1972.

**For more detailed discussion of the metropolis - hinterland model as it applies to Canadian society see, Arthur K. Davis "Canadian Society and History as Hinterland versus Metropolis" in Richard J. Ossenberg (ed.) Canadian Society, Toronto: Prentice Hall, 1971.

***The cosmopolitan-local dichotomy has been suggested by Robt. K. Merton in his Social Theory and Socal Structure, Glencoe: Free Press, 1957.

separate community with very little social intercourse with the Anglo-Saxon majority. Another paradox suggests itself here: since Sioux Lookout functions as the metropolis to the vast northern hinterland which is populated for the most part by Indians, its economic and political raison d'être is dependent on them.* The professionals and administrators who live in the town are there to render services, directly or indirectly, to the far-flung hinterland population. The dialectic in this anomalous dependence relationship is obvious. As communications with the hinterland improve, as for example through such government-initiated activities as the Wa Wa Tei radiotelephone network, it is probable that new political alliances will be formed which will seek to alter the imbalance in the dependency relationship.

Still using the metropolis-hinterland model, yet another set of relationships is evident from our data. We refer here to the most significant orientation that the people of Sioux Lookout have to the minor metropolitan centres of Thunder Bay and Winnipeg. Kin networks, for the most part, extend to these two metropolitan centres and not much further. Geographic and career mobility, except for the cosmopolitan professionals described above, is most vigorous within the area for which these cities function as metropolitan centres. Communication networks are strongest within this more narrow area and it is not surprising that when questioned about their use of and preference for the mass media (newspapers, radio, television) most of the people wanted even stronger links forged with both Thunder Bay and Winnipeg, rather than with Toronto.

Sociologically Sioux Lookout is an interesting and intriguing community. In many ways it is highly urbanized and modern; in other ways it has characteristics that are usually associated in the sociological literature with more traditional and rural societies. Perhaps that is its appeal - and most of the residents have very positive feelings about it. They like the community and feel a strong attachment to it; yet almost half of them would be ready to leave for economic reasons. Thus, a large segment of the population is geographically very mobile, though for the most part this mobility is contained within the region. Kin attachments remain strong, and this is facilitated by the good transportation and communication

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*See also David Stymeist, Ethnics and Indians, Toronto: Peter Martin, 1975.

facilities enjoyed by the community. Intergenerational social mobility is minimal, and parental aspirations for their children are restrained. Kin networks in the future, then, are likely to remain fairly firm and close. Modern values relating to the family, as reflected in the falling birth-rate and opinions about ideal family size, are apparently contradicted by the more traditional values that put a low evaluation on education as a necessary means for getting ahead. Low parental aspirations for the upward mobility of their children are reflected in the high drop-out rate at the end of grade 10, and in the quite minimal interest expressed in alternate educational facilities. Yet the community does not appear to be able to hold its young adults; the 20-24 age group is markedly underrepresented in the population.

There are some deficiencies in our data that should be noted. Other than questioning residents on matters of political awareness and political efficacy, and on organizational affiliation, we did not look specifically at the political organization of the town. Nor did we gather sufficient data to comment on the extent (if any) of social disorganization; such data as crime statistics and unemployment statistics would have been useful, but unfortunately these were not readily available.

The dialectical model sketched in this concluding section has been suggested by the more detailed descriptive data presented in the main body of this report. The logic of this model focuses the analysis on the contradictions inherent in social arrangements, in the resolution of which there is the potential for (but by no means the certainty of) conflict. The contradictions we have singled out for particular comment are those that inhere in the interlocking and cross-cutting sets of metropolitan-hinterland relations; the opposing forces that derive from a mix of modern and traditional elements; and the principal ethnic dichotomy. In applying this model to this brief discussion we see Sioux Lookout as a vigorous, dynamic community with strong social bonds that give it a sense of continuity in the face of continuous change.

APPENDIX A.7: DATA ON TELEPHONES IN NORTHWEST ONTARIO

Telephone density and call data for northwest Ontario as pertaining to Bell Canada installations are shown in Table A.7.1. Two factors reduce the usefulness of these data for the purpose of parameter identification: the short time span involved and the discontinuity caused by Bell's annexation of existing telephone networks in 1969. To supplement this limited data, further data for all of Canada has been used, as tabulated in Table A.7.2. Regression and correlation analyses of these data have been carried out. Both local and long distance calls per capita per year correlate highly with the total telephone density. The results are as follows:

TTD and LCR Correlation coefficient: 0.9975
regression equation: LCR = 33 + 1.53 (TTD)

TTD and LDR Correlation coefficient: 0.9776
regression equation: LDR = 2.33 + 0.0476 (TTD)

An attempt was also made to correlate local and long distance calling rates with business and residential densities. The results are not considered reliable since the two independent variables RTD and BTD are highly correlated (correlation coefficient = 0.9973).

It should be pointed out that analysis such as that described above is not necessarily of utility in identifying model parameters since the relationships described by the regression equations are not in general causal. In order to be useful in testing policy alternatives, the model structure as well as behaviour should parallel that of the real system. These relationships can be useful, however, in comparing model response with that predicted from regression analysis.

From Table A.7.2 it can be seen that the rates of increase of both business and residential telephone density depend on changes in "quality of service". To isolate the elements of "quality of service" that are highly correlated with telephone density, the data shown in Table A.7.3 were analyzed (data pertain to all of Canada). Data on percentage of stations with DDD are also available from 1963 onward. The results are as follows:

Variables	Correlation Coefficient
LCR and miles of wire/phone	0.8813
LCR and % on auto. switchboard	0.9876
LDR and miles of wire/phone	0.8537
LDR and % on auto. switchboard	0.9254
RTD and miles of wire/phone	0.8798
RTD and % on auto. switchboard	0.9831
BTD and miles of wire/phone	0.8777
BTD and % on auto. switchboard	0.9728

In general, there is a high correlation between both calling rates and telephone densities and % of phones connected to an automatic switchboard. The quality of service variable QS (EV200) can be taken to reflect this quantity which in turn represents the degree of privacy available. With data on regional disposable income, it is possible to identify functions F212, F211 and F204 (see Figure 3.2) using results of regression analysis.

YEAR	POPULATION	TTD	LCC	LDC	LCP	LDP
1966	223,484	339	745	14	2200	41
1967	-	356	910	15	2570	42
1968	-	372	945	17	2550	46
1969	-	416	1015	25	2440	60*
1970	-	435	1100	26	2510	60
1971	224,370	456	1090	28	2400	64

TABLE A.7.1 TELEPHONE DATA FOR N.W. ONTARIO

Source: Bell Canada.

* Increase due to annexation of part of Northern Telephone System by Bell Canada.

Code: TTD - Total telephone density per 1000 population.

LCC - Local calls per capita per year.

LDC - Long distance calls per capita per year.

LCP - Local calls per phone per year.

LDP - Long distance calls per phone per year.

YR.	POPULATION	BTD	RTD	LC/CAPITA	LD/CAPITA	LC/PHONE	LD/PHONE
41.	11494300.	43.	93.	259.	3.	1902.	25.
42.	11668800.	44.	96.	253.	4.	1815.	27.
43.	11824600.	45.	98.	248.	4.	1731.	30.
44.	11955000.	47.	100.	247.	5.	1687.	32.
45.	12114000.	48.	104.	260.	5.	1701.	35.
46.	12314900.	53.	112.	283.	6.	1720.	37.
47.	12600900.	56.	121.	298.	7.	1686.	37.
48.	12866300.	61.	130.	313.	7.	1642.	38.
49.	13569200.	62.	137.	328.	8.	1650.	39.
50.	13847000.	65.	146.	353.	9.	1678.	40.
51.	14025700.	68.	154.	367.	11.	1653.	41.
52.	14420800.	70.	162.	380.	9.	1635.	38.
53.	14766600.	73.	171.	403.	9.	1650.	37.
54.	15185500.	76.	178.	409.	9.	1608.	36.
55.	15608700.	79.	187.	436.	10.	1640.	37.
56.	15977300.	84.	198.	475.	11.	1688.	38.
57.	16577700.	85.	206.	487.	11.	1673.	37.
58.	17040400.	87.	213.	500.	11.	1663.	38.
59.	17453200.	90.	222.	518.	12.	1663.	38.
60.	17839600.	94.	227.	525.	12.	1635.	38.
61.	18441800.	98.	232.	549.	12.	1683.	37.
62.	18764490.	100.	240.	563.	13.	1668.	40.
63.	19093690.	101.	249.	580.	13.	1662.	39.
64.	19445200.	103.	257.	600.	14.	1661.	40.
65.	19808700.	113.	267.	613.	15.	1630.	41.
66.	20260800.	113.	277.	634.	16.	1628.	40.
67.	20631600.	122.	288.	633.	17.	1562.	43.
68.	20933900.	121.	299.	668.	19.	1587.	44.
69.	21260200.	131.	309.	687.	20.	1570.	47.
70.	21567500.	132.	318.	716.	21.	1583.	47.

TABLE A.7.2 TELEPHONE DATA FOR CANADA

Source: DBS Telephone Statistics.

CODE: BTD - Business telephone density per 1000 population.

RTD - Residential telephone density per 1000 population.

LC/CAPITA - Local calls per capita per year.

LD/CAPITA - Long distance calls per capita per year.

LC/PHONE - Local calls per phone per year.

LD/PHONE - Long distance calls per phone per year.

YEAR	TOTAL TELEPHONE (millions)	MILE OF WIRE PER TELEPHONE	% ON INDIVIDUAL LINE (X10)	% ON PARTY LINE (X10)	% ON PRIVATE BRANCH XCHANGE AND EXT. (X10)	% ON AUTOMATIC SWITCH BOARD (X10)
41.000	1.562	3.770	3.620	4.260	1.920	5.500
42.000	1.628	3.690	3.440	4.450	1.920	5.700
43.000	1.692	3.580	3.350	4.530	1.930	5.700
44.000	1.752	3.490	3.280	4.610	1.920	5.600
45.000	1.849	3.430	3.240	4.720	1.860	5.600
46.000	2.026	3.340	3.090	4.850	1.890	5.500
47.000	2.230	3.270	2.910	4.970	1.960	5.600
48.000	2.452	3.230	2.740	5.110	1.990	5.700
49.000	2.700	3.230	2.640	5.180	2.030	6.000
50.000	2.917	3.250	2.660	5.150	2.040	6.200
51.000	3.114	3.230	2.650	5.120	2.080	6.400
52.000	3.352	3.360	2.710	5.040	2.100	6.700
53.000	3.606	3.410	2.830	4.900	2.130	6.900
54.000	3.860	3.460	2.950	4.750	2.160	7.200
55.000	4.152	3.550	3.130	4.500	2.230	7.400
56.000	4.499	3.650	3.270	4.290	2.310	7.700
57.000	4.827	3.760	3.470	4.050	2.350	8.000
58.000	5.118	3.960	3.700	3.780	2.400	8.200
59.000	5.439	4.190	3.870	3.526	2.480	8.500
60.000	5.728	4.420	4.040	3.280	2.560	8.800
61.000	6.014	4.500	4.220	3.120	2.640	8.900
62.000	6.329	4.600	4.400	2.770	2.710	9.200
63.000	6.656	4.700	4.550	2.560	2.780	9.330
64.000	7.019	4.800	4.680	2.370	2.850	9.480
65.000	7.445	4.900	4.800	2.170	2.930	9.570
66.000	7.893	5.100	4.910	1.990	3.000	9.650
67.000	8.358	5.300	4.980	1.840	3.080	9.730
68.000	8.818	5.500	5.050	1.680	3.180	9.820
69.000	9.296	5.700	5.100	1.550	3.250	9.850
70.000	9.750	5.800	5.140	1.460	3.310	9.890

TABLE A.7.3 QUALITY OF SERVICE DATA FOR CANADA

Source: DBS Telephone Statistics.

APPENDIX A.8: SOCIOECONOMIC EFFECTS OF THE MEDIA

A.8.1 Introduction

In view of the fact that this project is basically a study of telecommunications, it is only natural that media be emphasized. However, at one stage the regional model was entirely lacking in causal outputs from the media submodel. It is the purpose of this discussion to treat methods considered for the extension of the media submodel and, in addition, to examine the earlier status of telecommunications in the regional model and possible improvements in the modelling of its impact.

Initially the task of adding outputs to the media submodel was viewed as relatively straightforward. The tacit assumption was that a social factor as pervasive as media must surely have a definite impact on societal functioning. While there is no reason to suppose that such an assumption is completely invalid, it is certainly not borne out by most studies made in the field of mass communications. In general (we will go into more detail later) media appear to affect some of the population under certain conditions in particular, indeterminate ways. There are no simple, clear-cut effects whatsoever on society as a whole.

As a spin-off of research into the effects of media certain ancillary facts were discovered which seem to have special relevance to the study of the impact of telecommunications. Those receiving attention here are: the relationship between transportation and telecommunications; the interactions between urbanization, transportation and telecommunications; the economy's role in the above two situations; and the role of "expectations" in the functioning of the region, especially with regard to the aforementioned factors.

A.8.2 The Effects of Media

A.8.2.1 The Evidence

Quite simply, in the case of the media we are dealing with a hung jury. As yet "the results do not permit the making of statements which would attribute to the media widespread changes in attitudes, interests, opinions or behaviour". (Halloran, 1970, p. 12.) Further, this inconclusiveness does not seem to be due to the problem of insufficient data or a lack of academic scrutiny and

analysis. A great many mass media studies have been conducted and, if anything, researchers have been eagerly poring over the results looking for effects of whatever kind. The results have been both surprising and disappointing: rather than indicating general trends, the results have supported first one hypothesized trend, then its opposite, and then yet a third possible trend.

The equivocal nature of the findings may well be due to the action of hidden, mediating variables. As Klapper has said, in Smith (1966, p. 538), "Mass communications ordinarily does not serve as a necessary and sufficient cause of audience effects, but rather functions among and through a nexus of mediating factors and influences". It would appear that mass media is one area where the would-be modeller must tread with extreme caution, doubting his every assumption.

Twenty years of research into mass communications have not been entirely bereft of worthwhile results. Unfortunately, most of the results have little relevance to the regional model's structure (though they may be of some use in possible community models). One of the typical, and often substantiated, findings is that "reinforcement is more likely to occur than change..." (Halloran, 1970, p. 13) whenever media are involved in persuasion. As a partial corollary of this hypothesis, "the media would appear to be much more effective in creating opinions on matters about which individuals are unlikely to have pre-existing opinions". (Halloran, 1970, p. 13.) Another general conclusion has been that the media in developing countries tend to foster a "revolution of rising expectations" and, in general, "desires for new things" (Dexter and White, 1964, p. 431.) In some cases "the educational consequences of mass communications, together with their cultural effects, are to create aspirations for a different and better life-style". (Gerbner et al., 1973, p. 347.)

This hypothesized trend, in particular, has been the centre of some controversy. The impact of telecommunications on "aspiration", particularly the aspirations associated with economic development, and its supposed tendency to spread Western economic values has been termed "diffusion". Those who feel that this is a necessary trend, with more radios causing more economic aspirations and thus effecting inevitably greater economic prosperity, have been termed Diffusionists. The two main spokesmen for Diffusion are Lerner and Schramm (1967).

Diffusionists view the mass media as an indicator of social change and as a causal factor in social change. The

assumed direction of social change is from the "traditional" to the "modern". The modern being associated with urbanization, literacy, and economic growth in the "Western", "developed nation" fashion. Some Diffusionists conclude that cheap radios and broadcasting presenting modern "social norms" are all that is needed to promote modernization and attendant economic growth.

It should be pointed out that the Diffusionists are only one school, among many, studying the impact of communications. Other research workers have challenged the Diffusionists' claims. In particular, the global applicability of the data base, on which their hypotheses are grounded, has been seriously questioned at times. However, irrespective of the applicability of the data used, it is sufficient to note that discussions of complex societal infrastructures are based on nationally aggregated statistics and their correlations. Whether the Diffusionists are correct or not, the methods they have employed to derive their conclusions lend little credence to their claims.

With particular regard to this project, it is evident that Diffusionist hypotheses should be weighed with a certain degree of hesitation. Their conclusions are controversial and it would be ill-advised to adopt them wholesale. However, some of the issues raised are certainly worthy of consideration. Still, the relevance of conclusions concerning the national economic growth of underdeveloped nations to a modelling study of a region within Canada, an obviously developed nation, is questionable. The diffusion controversy is probably best left to one side.

One of the real problems with generating causal outputs for the mass media submodel was the dubious relevance of the variables being overtly modelled. There may well be variables to do with the "level of media" which could be directly related to possible impacts, but variables based on counts of receiving sets or newspaper circulation are unlikely candidates. Unfortunately, they were the only recourse. Otherwise the media submodel would have been a confusing mass of intangibles linked by completely conjectural functions. Still another weak point in the model of media is the open system problem. Media in northwest Ontario, and their impact, are not readily isolable from the Canadian media and their impact on our society as a whole. Thus the size of media variables in northwest Ontario alone is not likely to reflect the actual media situation. This is due to the nature of media

as a tightly knit, homogeneous factor in all developed countries (Schramm, 1964).

A.8.2.2 Possible Areas of Impact

Though the social impact of media is not at all clear, a few economic areas do appear to be definitely affected by changes in media services. Transportation, for one, seems to be positively affected by media, though this is clearest when the sum total of telecommunications is considered in the impact analysis. This positive effect may be due to an increase in travel for tourist purposes, an increase in mobility due to heightened awareness of jobs and other economic advantages in other areas, facilitated business communications over a distance, and so forth. For whatever reason, "The general conclusion must be that communication and transportation are mutually reinforcing", (Gerbner et al. 1973, p. 351).

Another, relatively definite, impact area is the positive effect of media, and telecommunications generally, on economic growth. Service industries would be expected to benefit most, as primary industries have a much simpler supply-demand situation and are largely insensitive to the short-term fluctuations of the individual consumer's preferences. Media's role in economic facilitation is probably a natural outcome of the fact that "an increase in communications rate is a prerequisite of socioeconomic growth". (Meier, 1962, p. 2.)

Finally, it may be expected that the media will affect expectations in general. In particular, media's impact on travel and the economy is no doubt augmented by changes in attitudes. However, a good case can be made for the impact of communications, as such, on both transportation and economic growth (Meier, 1962; Gerbner et al., 1973, p. 348), irrespective of their impact on expectations. As previously mentioned, media do seem to affect expectations and aspirations, but in confusing and often contradictory ways. No simple causal relationships may be inferred; our modelling approach (to be discussed in the next section) had of necessity to be contingent on varying assumptions.

A.8.2.3 Modelling of Contingent Media Outputs

(We shall defer discussion of media's impact on the economy and transportation sectors till a later section. This part of our discussion will be concerned with modelling of the mass media's impact on expectations only.)

Even though the effects of media on expectations are not completely understood, impact modelling is still possible if one is able (as in this project) to couple the program with a human decision-maker. Through the person-program interaction it was possible to change the shape of the functions relating media to expectations (such as EME/V402 and EMH/V452) to conform with one's assumptions that media have a positive, negative or negligible effect on a specific variable. The program then created a scenario based on the decision-maker's assumptions.

By means of such a modelling approach it was possible to obtain a valuable and fundamental yield from the model: some knowledge of the possible significance of one's suppositions. It is doubtful that it will ever be unequivocally, clearly and simply decided just how media impact on society. It is also clear that we have everything to gain by some kind of formal exploration of possible impact scenarios. To do otherwise would be an abdication of our responsibility as designers, rather than victims, of our future.

A.8.3 Telecommunications, Transportation, and Urbanization

A.8.3.1 Telecommunications and Transportation

In considering the relationship between telecommunications and transportation the "substitution" point (the movement of information rather than people) is often made. The supposed consequence of such substitution is a net decrease in transportation activities. This is, in fact, not the case at all. There is a net increase in transportation as a necessary concomitant of an increase in telecommunications (Gerbner et al, 1973, p. 348). Thus functions in the regional model which had been based on this assumption, such as F262 which had predicted a decrease in traffic as a result of improved communications service, had to be reappraised.

Telecommunications, in its most basic sense, makes the far-away person here-and-now; alternatively phrased, telecommunications facilitates long distance personal transactions. Understandibly this enables both institutional and individual communications to be carried on easily over great distances. And, humanity being what it is, this will mean travel over longer distances. People do not appear to be satisfied with the impersonal business associate at the other end of the line; a personal meeting is usually arranged to put the business process on a more social, face-to-face basis. Clearly, an increasing function should link telephone service and transportation

(inputting to RTFR/V252 and RTPR/V253).

The case of functions from media is not quite so clear. While advertising broadcast over distance probably encourages the consumption of non-local goods, by both persons and institutions, several points remain unclarified. It is difficult to decide on the relative importance of advertising between the three types of media. It may be that passenger traffic and freight traffic are very differently affected. Too, the whole question of advertising is quite unsettled. And, as always, the particular functions are difficult to specify. However, links between all types of telecommunications and transportation were imperative additions for the regional model.

A.8.3.2 Urbanization, Telecommunications, and Transportation

The city is very much an "organism-like system". By this we mean that it requires inputs in order to maintain itself in a steady-state, much like a typical organism. Meier (1962) has similarly analysed the "city as a complex living system". Without going into depth in the use of what may be after all, a misleading analogy, the city - like the organism - relies on both a nervous system and a life-support system. The city's nervous system is, of course, its telecommunications services; its life-support system is its economic system, resting heavily, as we have seen, on a transportation system to maintain it in an ecologically unnatural state. Pellucidly, the exchange and manipulation of information and resources are key in the growth of both systems. Thus the most complex organisms are the mammals with their highly developed nervous systems and physiological adaptations. And thus the most burgeoning economies are those of nations with highly developed telecommunications systems and transportation capabilities.

Furthermore, positive feedback - that universal of human systems - will cause an increase in communications and transportations as a result of further growth of communications and transportations brought on by the increasing urbanization characteristic of growing economies. Urbanization is the vital completing link between the separate steps of the growth process. The extent of urban population concentration has been found to be a fundamental multiplier in the total cycle of regional development, being intimately tied up with the availability of services, economic acceleration, and high density communications (Meier, 1962). Empirically, the provision of media services and the distribution of telephone services have been found

to be congruent with urbanization patterns (Meier, 1962, p. 103).

In conclusion, it then seemed to be highly desirable to change urbanization from an exogenous model input to an endogenous model variable sending outputs to telecommunications generally.

APPENDIX A.9: STRESS

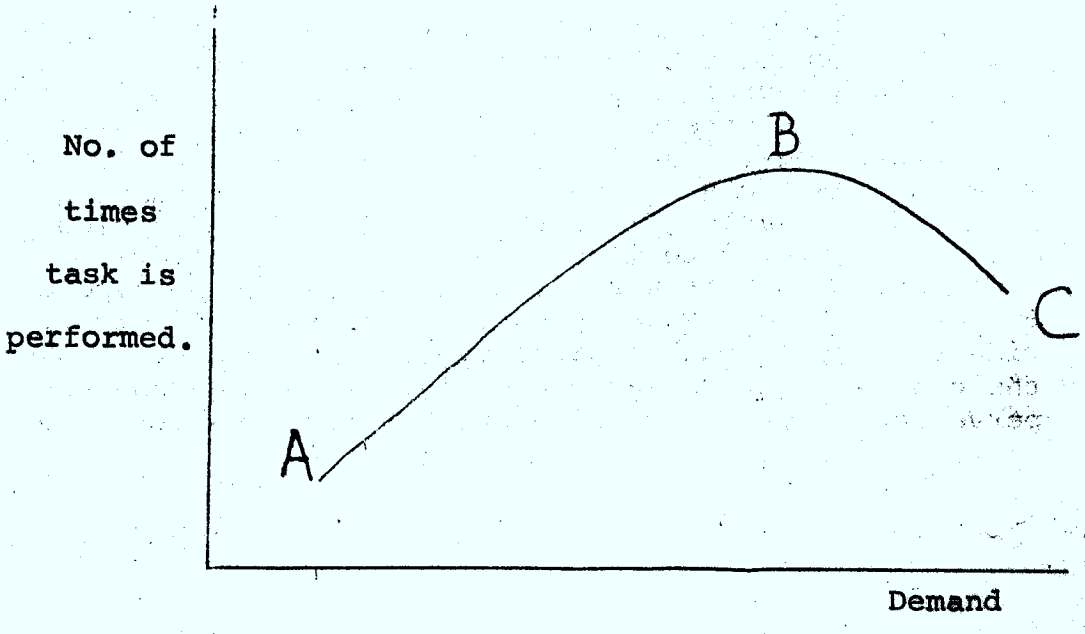
A.9.1 Introduction

Stress is a general term applied to organism reactions in a variety of biological and psychological settings. We may define it as the general response to environmental deviation from a certain healthful optimum (of course, there are other definitions). This general conception of stress has been found useful in analysing a variety of otherwise anomalous phenomena.

Since stress is a general condition or situation, it can often account for "spillover" in organism response. Thus the causal factors underlying the interface between biology and psychology can be interpreted as follows: a biological stress may be expressed as a psychological dysfunction and, conversely, a psychological stress may be manifested as a biological dysfunction (cf. psychosomatic illness). In short, stress is of general impact and may be induced by inputs from several levels of organism/environment interaction.

Stress is somewhat equivocal in that it may be adaptive or maladaptive. In its adaptive mode it is the key to the marshalling of bodily and mental defenses to deal with some problem. Maladaptively, stress (continued beyond the point of tolerance) can result in the breakdown of an organism's survival mechanisms. This breakdown is termed the General Adaptation Syndrome or GAS; its immediate cause is hormonal overload.

Let us consider a simple model of stress. Take a typical experimental situation where we have a test animal, such as a small mammal, which has a certain task in its behavioural repetoire. If we increase the "compulsion" or "demand" to perform this task such that it must perform it with increasing frequency we get the following results:



The response frequency increases with increasing "demand" until the test animal can no longer cope with the increased "demand", and the number of successful performances of the task decreases (though the number of attempts may not). From A to B the response curve represents the adaptive stress response, B is the breakdown point and the portion of the curve from B to C is the maladaptive response. Stress may be viewed as the factor which determines whether or not there will be a successful response to a problem situation.

Stress is an important facet in any complete model of organism or population systems and human communities are certainly not excluded from this group.

A.9.2 Stress in Animal Communities

The stress response is, of course, a phenomenon of the individual organism. However, since many animals form groups and groups may be expected to be subject to synergies, the stress phenomena in populations are often quite different from those of the organism in isolation. Field work has indicated that stress may be an important factor in cyclical population regulation (especially among mammals like the rabbit and field vole). Further, experiments in the laboratory have unearthed quite surprising facets of the stress mechanism in rodent communities.

John Calhoun, see Duhl (1963), conducted a series of unlimited food, constant space, experiments on laboratory rat populations. It was expected that severe crowding would limit numbers. The results, however, indicated that the population stabilized at a density well below the tolerance point for a single laboratory rat in isolation. The reason for this was a surprisingly high infant mortality rate. This high infant mortality was due to the dynamics of the entire population under stress.

Without going into too many of the details, it was found that certain behavioural/social patterns (primarily those which increased social contact and motivations) were augmenting the stress mechanism to produce extensive psychopathology. Cannibalism, sexual deviancy, loss of maternal instincts (among females), and so forth, all occurred. Clearly all of these maladaptive behaviours are quite important determinants of infant mortality. In addition, many rats were stunted, unhealthy or hyperactive. By contrast, some were hypoactive, asexual and obese. A wide variety of pathological types were present. However, the general pattern was one of increasing aggression, perversion, novelty seeking and behaviour pattern break-

down. Calhoun's work has a nightmarish relevance to some of the findings of J.W. Berry (a member of this multi-disciplinary team) with regard to stress levels among Indian communities in some cases approaching those found in psychiatric wards (see Section 6 of this report).

A.9.3 Stress in Human Communities

Stress is not an unusual condition; every person is stressed in a variety of different situations. Stress may have as its source extremes of environment: intolerable heat, extreme cold, continuous loud noises, and so forth. Or stress may be due to psychological pressures: overwork, emotional anxiety, achievement pressure, testing, and extreme cognitive dissonance. Such psychological inputs have clearly correlated physiological and medical consequences. Specific secretions of the adrenal glands increase profoundly, especially the secretion of corticoids. Heart, respiratory, and other diseases occur in cases of continued stress.

Stress, as we have seen, may be due to both material and informational factors; the major results of either may be psychological or physiological, or both. This is a case where a mind/body dichotomy confuses the issue. There is no hard and fast distinction to be made between psychological and biological stress mechanisms. There is only stress: a general response mechanism, (see Figure A.9.1).

Each person's stress response is ostensibly a result of the immediate environment. However, this is not always the whole situation, as Calhoun's results show. In fact, stress may be largely preconditioned by a person's role within a community and the state of that community system. Thus stress would seem to be an unequivocally important variable in a community's dynamics.

Strictly biological causes of stress are, perhaps, less important in the majority of North American communities, with the possible exception of communities undergoing economic hardship. Disease-induced stress, which may act in a positive feedback pattern, will be intimately bound up with community variables like nutrition and sanitation. In some cases, physical labour may cause stress; this would be tied in with employment opportunities, education, and style of economy.

More important in North American communities is the problem of mentally induced stress. Such straightforward causes of stress as civil anarchy, rioting, persecution,

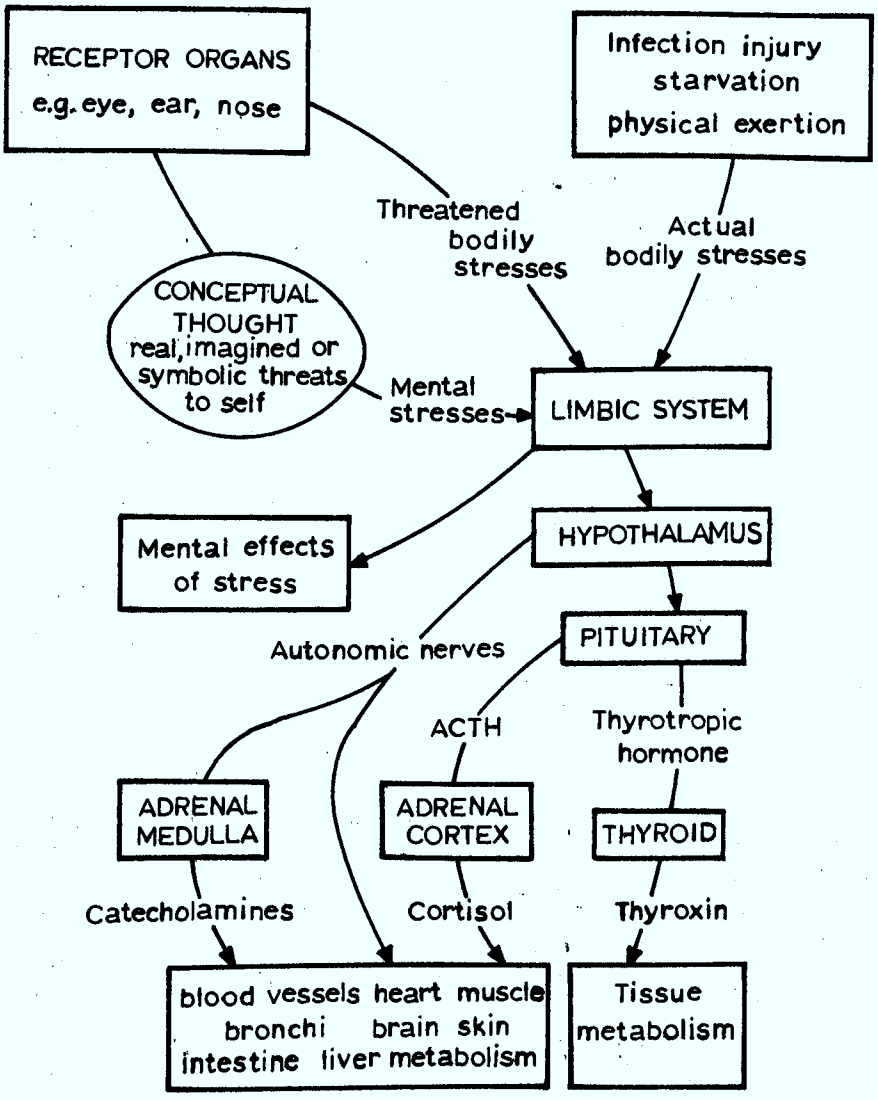


Fig. A.9.1 DIAGRAMMATIC REPRESENTATION OF STRESS MECHANISM IN MAN (Boyden 1970)

etc., will be important in unusual times, or for particular groups. Of more widespread impact are the stressful factors of achievement pressure, social role-playing, status pressures, etc. These prey on all those lacking in defenses and barriers in social situations. Finally, there are the somewhat subtler sources of stress like "anomie", "existential dislocation", "culture shock", "acculturative stress" and so forth.

This last area is, admittedly, fairly difficult to analyse precisely. Moreover, the situation is further complicated by interaction with other sources of stress, both psychological and biological, which blur the situation. Complications notwithstanding, this is the aspect of stress most crucial to the study of native communities.

A.9.4 Telecommunications, Stress and the Indian

The introduction of telecommunications in the North will eventually mean increased communications, in general. As Meier (1968) has outlined, increasing communications input to any given communicator may result in a personality breakdown attributable to stress. This stress response, though of a purely symbolic origin, may cause suicide, nervous breakdown, and other dramatic consequences of surprising magnitude.

Clearly the Indian, in some cases, has been profoundly stressed by normal cultural/informational contact alone. From the Aroland study (see Appendix A.5) it would seem that media have little effect, being largely ignored in terms of specific communications content. However, from what Meier (1968) argues it becomes apparent that a crucial factor is communicator responsibility. Most media, such as television, are one-way affairs; the viewer has neither obligation nor opportunity to respond.

If the type of telecommunications technology introduced involves more two-way communication, as a ground-satellite-ground relay might, we may anticipate two main possibilities. First, the obligation to respond to the incoming flow of information may tax the Indian community's ability to respond effectively. This might result in a breakdown of adaptive, autonomy sustaining, responses and acute disruption. Second, it is possible that if there is equally shared control over this two-way communications system, the Indian may gain in security and confidence in the cultural contact situation. Perhaps both possibilities may arise through some complicated (synergistic or antagonistic) interaction among all the variables.

In any event, we may be sure that whether stress increases or decreases due to the introduction of particular telecommunications technologies, it will be an important variable to watch.

APPENDIX A.10: ABBREVIATIONS USED IN THE COMMUNITY MODEL OF SIOUX LOOKOUT

The Community Model of Sioux Lookout is described in full in Section 4.8, with a complete flow diagram shown in Figure 4.9. The following list of abbreviations explains the meanings of all the symbols used in this Regional Model.

Exogenous Variables

EV1-EPOL1 - Education policy no. 1 (services)
EV2-HPOL1 - Health policy multiplier no. 1 (services)
EV3-HPM - Housing policy multiplier
EV4-HPOL2 - Health policy multiplier no. 2 (utilization)
EV6-RESINM - Resource investment multiplier (jobs)
EV7-RAILPM - Rail policy multiplier (jobs)
EV8-FINVM - Forestry investment multiplier
EV9-FTECHM - Forestry technology multiplier
EV10-TINVM - Tourism investment multiplier (jobs)
EV11-PMSWRM - Professional/managerial/skilled wage rate multiplier
EV12-SSWRM - Semi-skilled wage rate multiplier
EV13-AVCH - Available TV channels
EV14-AVRS - Available radio stations
EV16-COMTV - Community TV
EV17-CABTV - Cable TV
EV18-EDTV - Educational TV
EV19-REGFRR - Regional fraction of radio programming
EV21-COMR - Community radio
EV22-FM - FM radio
EV23-GOVPM - Government policy multiplier (jobs)
EV24-HPTV - Hours of programming TV
EV25-REGFRT - Regional fraction of TV programming

Levels

L1-P1 - Population group 1 (0-17 yrs.)
L2-P2 - " " 2 (18-24 yrs.)
L3-P3 - " " 3 (25-44 yrs.)
L4-P4 - " " 4 (45-64 yrs.)
L5-P5 - " " 5 (over 64 yrs.)

L6-PMS1 - "Professional, managerial, skilled" group 1 (0-17 yrs.)
L7-PMS2 - " " " " 2 (18-24 yrs.)
L8-PMS3 - " " " " 3 (25-44 yrs.)
L9-PMS4 - " " " " 4 (45-64 yrs.)
L10-PMS5 - " " " " 5 (over 64 yrs.)

L11-SS1 - "Semi-skilled" group 1 (0-17 yrs.)
L12-SS2 - " " " 2 (18-24 yrs.)
L13-SS3 - " " " 3 (25-44 yrs.)
L14-SS4 - " " " 4 (45-64 yrs.)
L15-SS5 - " " " 5 (over 64 yrs.)

L16-ESC - Educational services in community
L17-LED - Level of education
L18-HSC - Health services in community
L19-COH - Cohesiveness
L20-KFN - Kin and friendship network
L21-DWE - Dwellings

Variables

V1-TP - Total population
V3-ALH - Average level of health
V4-HSU - Health service utilization
V6-SERA - Service attractiveness
V8-GPMSJ - Government "PMS" jobs
V9-GSSJ - Government semi-skilled jobs
V10-IGSPMJ - Industrial goods and services "PMS" jobs
V11-IGSSSJ - Industrial goods and services semi-skilled jobs
V12-RGSPMJ - Retail goods and services "PMS" jobs
V13-RGSSSJ - Retail goods and services semi-skilled jobs
V14-RPMSJ - Railway "PMS" jobs
V15-RSSJ - Railway semi-skilled jobs
V16-FPMSJ - Forestry "PMS" jobs
V17-FSSJ - Forestry semi-skilled jobs
V18-PMSJ - "PMS" jobs
V19-SSJ - Semi-skilled jobs
V20-PMSLF - Professional/managerial/skilled labour force
V21-SSLF - Semi-skilled labour force
V22-PMSER - "PMS" employment ratio
V23-SSER - Semi-skilled employment ratio
V24-SSE - Semi-skilled employment
V25-PMSE - "PMS" employment
V26-RCH - Radio contact hours
V27-ORI - Orientation
V28-TVCH - TV contact hours
V29-PMSWR - "PMS" wage rate
V30-SSWR - Semi-skilled wage rate
V31-INC - Income
V32-INCC - Income per capita
V33-ATT - Attachment to community
V34-PART - Participation
V35-RES - Length of residency
V36-EASS - Economic attractiveness (semi-skilled)
V37-TPMSJ - Tourism "PMS" jobs
V38-TSSJ - Tourism semi-skilled jobs
V39-SOCA - Social attractiveness
V40-ASMN - Average social mobility normalized
V41-AMIGN - Average migration normalized
V42-TD - Tourist-days
V50-ESR - Education service ratio
V51-ER - Education ratio
V52-HSR - Health service ratio
V53-STR - Stress
V54-DWEC - Dwellings per capita
V55-RS - Retail sales
V56-EAR - Economic attractiveness ratio
V57-EAPMS - Economic attractiveness (PMS)
V58-OT - Outside travel
V59-PMSF - Professional/managerial/skilled fraction
V60-RLCR - Residential local calling rate
V61-RLDCR - Residential long distance calling rate
V62-RT - Residential telephones
V63-RTC - Residential telephones per capita
V64-RTPD - Residential telephones per dwelling

Rates

R1-BR - Birth rate
R2-DRI - Death rate for population group P1
R3-MIG1 - Migration rate for population group P1
R4-DR2 - Death rate for P2
R5 - Aging rate for P1
R6-MIG2 - Migration rate for P2
R7 - Aging rate for P2
R8-DR3 - Death rate for P3
R9-MIG3 - Migration rate for P3
R10 - Aging rate for P3
R11-DR4 - Death rate for P4
R12-MIG4 - Migration rate for P4
R13 - Aging rate for P4
R14-DR5 - Death rate for P5
R15-MIG5 - Migration rate for P5
R16-MIG1P - Migration rate for population group PMS1
R17-UMOB1 - Upward mobility rate 1 (SS1 to PMS1)
R18-MIG1SS - Migration rate for population group SS1
R19-DR1P - Death rate for PMS1
R20-DMOB1 - Downward mobility rate 1 (PMS1 to SS1)
R21-DR1SS - Death rate for SS1
R22-MIG2P - Migration rate for PMS2
R23-UMOB2 - Upward mobility rate 2 (SS2 to PMS2)
R24-MIG2SS - Migration rate for SS2
R25-DR2P - Death rate for PMS2
R26-DMOB2 - Downward mobility rate 2 (PMS2 to SS2)
R27-DR2SS - Death rate for SS2
R28-MIG3P - Migration rate for PMS3
R29-UMOB3 - Upward mobility rate 3 (SS3 to PMS3)
R30-MIG3SS - Migration rate for SS3
R31-DR3P - Death rate for PMS3
R32-DMOB3 - Downward mobility rate 3 PMS3 to SS3
R33-DR3SS - Death rate for SS3
R34-MIG4P - Migration rate for PMS4
R35-UMOB4 - Upward mobility rate 4 (SS4 to PMS4)
R36-MIG4SS - Migration rate for SS4
R37-DR4P - Death rate for PMS4
R38-DMOB4 - Downward mobility rate 4 (PMS4 to SS4)
R39-DR4SS - Death rate for SS4
R40-MIG5P - Migration rate for PMS5
R41-UMOB5 - Upward mobility rate 5 (SS5 to PMS5)
R42-MIG5SS - Migration rate for SS5
R43-DR5P - Death rate for PMS5
R45 - Aging rate for PMS1
R46 - Aging rate for PMS2
R47 - Aging rate for PMS3
R48 - Aging rate for PMS4
R49 - Aging rate for SS1
R50 - Aging rate for SS2
R51 - Aging rate for SS3
R52 - Aging rate for SS4
R53-DR5SS - Death rate for SS5

Rates Cont'd.

R54	- Birth rate for PMS1
R55	- Birth rate for SS1
R56-COHR	- Rate of change of cohesiveness
R57-DWER	- Rate of change of number of dwellings
R58-ESCR	- Rate of change of educational services
R59-HSCR	- Rate of change of health services
R60-KFNR	- Rate of change of kin/friendship network
R61-LEDR	- Rate of change in level of education

Rate Averages

ASM	- Average social mobility
AMIG	- Average migration

APPENDIX A.11: COMMUNITY MODEL (SIOUX LOOKOUT)

SOFTWARE

Listings are given here for the following:

(1) The simulation model equations for that section of the Sioux Lookout community model for which results are discussed in this report in Section 4.3;

(2) Multiplier function data in numerical form.

The associated subroutines and functions are similar to those used for the regional model simulation. Subroutine INTERP is the same as Subroutine FUNC used previously. Output software is left to the users' choice and can be graphical and/or numerical in nature.

SIMULATION MODEL EQUATIONS FOR PART OF COMMUNITY MODEL OF SIOUX LOOKOUT.

```
V1=(L1+L2+L3+L4+L5)/V1I
V41=1. +((R3+R6+R9+R12+R15)/V1)*10
V40=(R23+R26+R29+R32+R35+R38)/(L2+L3+L4)
V56=EV24/EV23

CALL INTERP(4,M1X,M1Y,M1,KM1,EV27)
CALL INTERP(4,M2X,M2Y,M2,KM2,EV29)
CALL INTERP(4,M3X,M3Y,M3,KM3,EV29)
CALL INTERP(4,M4X,M4Y,M4,KM4,EV29)
CALL INTERP(4,M5X,M5Y,M5,KM5,EV29)
CALL INTERP(4,M6X,M6Y,M6,KM6,EV29)
CALL INTERP(4,M7X,M7Y,M7,KM7,EV29)
CALL INTERP(4,M8X,M8Y,M8,KM8,EV25)
CALL INTERP(4,M9X,M9Y,M9,KM9,EV25)
CALL INTERP(4,M10X,M10Y,M10,KM10,EV25)
CALL INTERP(4,M11X,M11Y,M11,KM11,EV25)
CALL INTERP(4,M12X,M12Y,M12,KM12,EV25)
CALL INTERP(4,M13X,M13Y,M13,KM13,EV25)
CALL INTERP(4,M14X,M14Y,M14,KM14,EV25)
CALL INTERP(4,M15X,M15Y,M15,KM15,EV25)
CALL INTERP(4,M16X,M16Y,M16,KM16,EV24)
CALL INTERP(4,M17X,M17Y,M17,KM17,EV24)
CALL INTERP(4,M18X,M18Y,M18,KM18,R23)
CALL INTERP(4,M19X,M19Y,M19,KM19,R29)
CALL INTERP(4,M21X,M21Y,M21,KM21,R26)
CALL INTERP(4,M22X,M22Y,M22,KM22,R32)
CALL INTERP(4,M90X,M90Y,M90,KM90,EV24)
CALL INTERP(4,M91X,M91Y,M91,KM91,EV23)
CALL INTERP(4,M52X,M52Y,M52,KM52,EV23)
CALL INTERP(4,M89X,M89Y,M89,KM89,EV23)
CALL INTERP(4,M20X,M20Y,M20,KM20,V56)
CALL INTERP(4,M23X,M23Y,M23,KM23,V56)
CALL INTERP(4,M24X,M24Y,M24,KM24,V56)
CALL INTERP(4,M25X,M25Y,M25,KM25,V56)
CALL INTERP(4,M26X,M25Y,M26,KM26,V56)
CALL INTERP(4,M27X,M27Y,M27,KM27,V56)
CALL INTERP(4,M120X,M120Y,M120,KM120,EV28)
CALL INTERP(4,M92X,M92Y,M92,KM92,EV28)
CALL INTERP(4,M33X,M33Y,M33,KM33,EV26)
CALL INTERP(4,M30X,M30Y,M30,KM30,EV26)
CALL INTERP(4,M34X,M34Y,M34,KM34,EV26)
CALL INTERP(4,M53X,M53Y,M53,KM53,EV26)
CALL INTERP(4,M35X,M35Y,M35,KM35,EV26)
CALL INTERP(4,M43X,M43Y,M43,KM43,EV26)
CALL INTERP(4,M36X,M36Y,M36,KM36,EV26)
CALL INTERP(4,M44X,M44Y,M44,KM44,EV26)
```

```
R1=BRN*M1*M2*(L2+L3)
R2=DR1N*M3*L1
R4=DR2N*M4*L2
R5=(1./17.)*L1
R7=(1./6.)*L2
R8=DR3N*L3*M5
R10=(1./19.)*L3
R11=DR4N*M6*L4
R13=(1./19.)*L4
R14=DR5N*M7*L5
R19=R2*L6/L1
R21=R2*L11/L1
R22=L7*(R22N+M8+M33+M16)
R23=R23N*L12*M24
R24=L12*(R24N+M91+M30+M9)
R25=R4*L7/L2
R26=R26N*L7*M25
R27=R4*L12*L2
R28=L8*(R28N+M10+M34+M17)
R29=R29N*L13*M26
R30=L13*(R30N+M52+M53+M11)
R31=R8*L8/L3
R32=R32N*M26*L8
R33=R8*L13/L3
R34=L9*(R34N+M12+M35+M90)
R35=R35N*L14*M27
R36=L14*(R36N+M89+M13)
R37=R11*L9/L4
R38=R38N*L9*M23
R39=R11*L14/L4
R40=L10*(R4N+M14+M36)
R41=0.
R42=L15*(R42N+M44+M15)
R43=R14*L10/L5
R44=0.
R45=R5*L6/L1
R46=R7*L7/L2
R47=R10*L8/L3
R48=R13*L9/L4
R49=R5*L11/L1
R50=R7*L12/L2
R51=R10*L13/L3
R52=R13*L14/L4
R53=R14*L15/L5
R54=R1*L6/L1
R55=R1*L11/L1
R56=R56N*M108*M109*EV2
R57=R57N*M98
R58=R58N*M100
```

```
R16=R22*M115+R28*M114
R17=(R23*M18+R29*M19)*M120
R18=R24*M117+R30*M116
R20=(R26*M21+R32*M22)*M92

R3=R16+R18
R6=R22+R24
R9=R28+R30
R12=R34+R36
R15=R40+R42
```

```
L1=L1+(R1+R3-R2-R5)*STEP
L2=L2+(R5+R6-R4-R7)*STEP
L3=L3+(R7+R9-R8-R10)*STEP
L4=L4+(R10+R12-R11-R13)*STEP
L5=L5+(R13+R15-R14)*STEP
L6=L6+(R54+R16+R17-R19-R20-R45)*STEP
L7=L7+(R45+R22+R23-R25-R26-R46)*STEP
L8=L8+(R46+R28+R29-R31-R32-R47)*STEP
L9=L9+(R47+R34+R35-R37-R38-R48)*STEP
L10=L10+(R48+R40+R41-R43-R44)*STEP
L11=L11+(R55+R18+R20-R17-R21-R49)*STEP
L12=L12+(R49+R24+R26-R23-R27-R50)*STEP
L13=L13+(R50+R30+R32-R29-R33-R51)*STEP
L14=L14+(R51+R36+R38-R35-R39-R52)*STEP
L15=L15+(R52+R42+R44-R41-R53)*STEP
L16=L16+R54*STEP
L17=L17+R55*STEP
L18=L18+R56*STEP
L19=L19+R59*STEP
L20=L20+R58*STEP
```

NUMERICAL FUNCTION DATA FOR THE COMMUNITY MODEL OF SIOUX LOOKOUT.

```
DATA M1X/0.5,0.6,1.0,2.0/
DATA M1Y/2.0,1.3,1.0,0.8/
DATA M2X/0.0,0.6,2.0,4.0/
DATA M2Y/1.2,1.2,0.5,0.3/
DATA M2Y/1.,1.,1.,1./
DATA M3X/0.,0.,0.,5./
DATA M3Y/1.,1.,1.,1./
DATA M4X/0.,0.,0.,5./
DATA M4Y/1.,1.,1.,1./
DATA M5X/0.,0.,0.,5./
DATA M5Y/1.,1.,1.,1./
DATA M6X/0.0,0.2,0.8,3.0/
DATA M6Y/0.5,0.5,0.8,3.0/
DATA M7X/0.0,0.2,0.8,3.0/
DATA M7Y/0.5,0.5,0.8,3.0/
DATA M8X/0.0,1.0,2.0,3.0/
DATA M8Y/-.2,0.0,.05,.06/
DATA M9X/0.0,1.0,2.0,3.0/
DATA M9Y/-.2,0.0,.05,.06/
DATA M10X/0.0,1.0,2.0,3.0/
DATA M10Y/-.2,0.0,.05,.06/
DATA M11X/0.0,1.0,2.0,3.0/
DATA M11Y/-.2,0.0,.05,.06/
DATA M12X/0.0,1.0,2.0,3.0/
DATA M12Y/-.2,0.0,.05,.06/
DATA M13X/0.0,1.0,2.0,3.0/
DATA M13Y/-.2,0.0,.05,.06/
DATA M14X/0.0,1.0,2.0,3.0/
DATA M14Y/-.05,0.0,.03,.04/
DATA M15X/0.0,1.0,2.0,3.0/
DATA M15Y/-.05,0.0,.03,.04/
DATA M16X/.8,1.0,1.1,1.2/
DATA M16Y/-.2,0.,0.1,0.2/
DATA M17X/0.0,1.0,2.0,3.0/
DATA M17Y/-.2,0.,0.1,0.2/
DATA M18X/0.,0.,0.,5./
DATA M18Y/0.5,0.5,0.5,0.5/
DATA M19X/0.,0.,0.,5./
DATA M19Y/.5,.5,.5,.5/
DATA M20X/0.,0.8,1.0,1.2/
DATA M20Y/1.,1.,1.,1./
DATA M21X/0.,0.,0.,5./
DATA M21Y/.5,.5,.5,.5/
DATA M22X/.5,.5,.5,.5/
DATA M22X/0.,0.,0.,5./
DATA M22Y/1.,1.,1.,1./
DATA M23X/0.0,0.8,1.0,1.2/
DATA M23Y/1.,1.,1.,1./
```

```
DATA M24X/0. , 0. 8, 1. 0, 1. 2/
DATA M24Y/0. 5, 0. 5, 1. 0, 1. 5/
DATA M25X/0. 0, 0. 8, 1. 0, 1. 2/
DATA M25Y/1. , 1. , 1. , 1. /
DATA M26X/0. , 0. 8, 1. 0, 1. 2/
DATA M26Y/0. 7, 0. 7, 1. 0, 1. 3/
DATA M27X/0. 0, 0. 8, 1. 0, 1. 2/
DATA M27Y/1. , 1. , 1. , 1. /
DATA M30X/0. 0, 0. 0, 1. 0, 2. 0/
DATA M30Y/-. 05, -. 05, 0. 0, . 01/
DATA M33X/0. 0, 0. 0, 1. 0, 2. 0/
DATA M33Y/-. 05, -. 05, 0. 0, . 01/
DATA M34X/0. 0, 0. 0, 1. 0, 2. 0/
DATA M34Y/-. 05, -. 05, 0. 0, 0. 01/
DATA M35X/0. 0, 0. 0, 1. 0, 2. 0/
DATA M35Y/-. 05, -. 05, 0. 0, . 01/
DATA M36X/0. 0, 0. 0, 0. 0, 1. 0/
DATA M36X/-. 05, -. 05, -. 05, 0. 0/
DATA M43X/0. 0, 0. 0, 1. 0, 2. 0/
DATA M43Y/-. 05, -. 05, 0. 0, 0. 01/
DATA M44X/0. 0, 0. 0, 0. 0, 1. 0/
DATA M44Y/-. 05, -. 05, -. 05, 0. 0/
DATA M52X/. 8, 1. 0, 1. 1, 1. 2/
DATA M52Y/-. 2, 0. , 0. 1, 0. 2/
DATA M53X/0. 0, 0. 0, 1. 0, 2. 0/
DATA M53Y/-. 05, -. 05, 0. 0, . 01/
DATA M89X/0. 8, 1. 0, 1. 1, 1. 2/
DATA M89Y/-. 2, 0. , . 1, . 2/
DATA M90X/0. 8, 1. 0, 1. 1, 1. 2/
DATA M90Y/-. 2, 0. , . 1, . 2/
DATA M91X/0. 8, 1. 0, 1. 1, 1. 2/
DATA M91Y/-. 2, 0. , . 1, . 2/
DATA M92X/-5. , 0. , 0. , 5. /
DATA M92Y/1. , 1. , 1. , 1. /
DATA M114X/0. , 0. , 0. , 5. /
DATA M114Y/1. , 1. , 1. , 1. /
DATA M115X/0. , 0. , 0. , 5. /
DATA M115Y/. 5, . 5, . 5, . 5/
DATA M116X/1. , 1. , 1. , 1. /
DATA M116Y/0. , 0. , 0. , 5. /
DATA M117X/0. , 0. , 0. , 5. /
DATA M117Y/. 5, . 5, . 5, . 5/
DATA M120X/-. 05, . 05, . 1, . 2/
DATA M120Y/0. , 1. 0, 2. 0, 3. 0/
```

APPENDIX A.12: SIOUX LOOKOUT INTERVIEW SCHEDULE

The interviewing schedule reproduced in the following pages is that used during the field work conducted in the community of Sioux Lookout in northwest Ontario, as described in Appendix A.6. The data obtained formed a basis for the construction of the community model described in Section 4.3 of this report.

INTERVIEWING SCHEDULE

TELECOMMUNICATIONS RESEARCH STUDY OF NORTHWESTERN ONTARIO COMMUNITIES

Hello! I am from Queen's University in Kingston and am participating in a detailed research study of communities in Northwestern Ontario. We are interested in telecommunications and how they affect the lives of people here. To learn this we shall be asking for information and opinions on health care, education, employment, use of televisions, telephones, radios, and so on. I wonder if I might interview you, please?

You have been selected at random for this interview, and I would like to assure you that all the information you give me is strictly confidential. It will be seen by NO ONE except members of the research team, and there is no way that your replies can be identified. The information you give me will be put together with similar information obtained from very many other community residents, and there will be no possible way in which one person's answers can be identified separately from any others.

I sincerely hope that you will feel comfortable about answering these questions, and that you will do your best to tell me exactly the way things are with you, and how you feel about some of the matters in which we are interested. The results of this study will be forwarded to your town officials at their request, so it is hoped that our interviewing will be of benefit to citizens of your town, as well as our team.

We thank you very much for your cooperation.

Project Coordinator: Dr. John Beal, Dept. of Electrical Engineering, Queen's University

Supervisor of Field Research: Professor Kathleen Herman, Dept. of Sociology, Queen's University

INTERVIEWER: _____ QUIST INTERVIEW SCHEDULE, Summer 1974 Page 1

Address_____Date_____Time_____ Code Number
Card Number

SECTION I: HOUSEHOLD INFORMATION

1.1 Specify if house_____or apt._____ Do you own?_____or rent_____

1.2 Do you own: Car_____, Store account_____, Bank account_____, life insurance

1.3 How many people live here:

1.4 Who are they: How old? Marital Status? Relationship to Head? When married?

No.	Name	Relation-ship	Age	Sex	Marital Status	When Married
1						
2						
3						
4						
5						
6						

1.5 Do you have (any other) children? Yes ____No_____How many?_____

1.6 IF YES:

a. Where does your child live? Age? Sex? Marital Status?

(IF NOT LIVING IN SIOUX LOOKOUT)

b. What was his (her) reason for leaving Sioux Lookout?
c. Have you visited him (her) in his (her) home this past year?
IF YES: How often?
IF NO: When was the last time?
d. Do you ever call him (her) on the telephone? How often?
e. How often do you write to him (her)?
f. Has he (she) visited you here in the past year?
IF YES: How often?
IF NO: When was the last time he (she) visited you here?
g. Does he (she) ever call you on the telephone? How often?
h. How often does he (she) write to you?

Code:
at least 1 x day.....6
at least 1 x week.....5
at least 1 x month.....4
at least 1 x 6 mos.....3
less frequently.....2
never.....1
not applicable 9

REPEAT THIS SAME SET OF QUESTIONS FOR NEXT OLDEST CHILD .....ETC. ETC.

(ON CHART, OLDEST CHILD IS NO. 1; SECOND OLDEST NO. 2; ETC.)

No.	Where Living	Age	Sex	Marital Status	Reason for Leaving	Frequency of Contact					
						Parent to Child			Child to Parent		
						Vis.	Ph.	Let.	Vis.	Ph.	Let
1											
2											
3											
4											
5											
6											

SECTION II. MOBILITY

	Adult Male	Adult Female	Other Adult(s)
2.1 Where were your born? (specify province/country)			
2.2 Where were you brought up?			
2.3 Was that a large city? ..5 small city? ..4 town?.....3 village?.....2 farm?.....1			
2.4 Where was your father born? (specify country)			
2.5 Was that city? town? etc. (use codes as above)			
2.6 Where was your mother born? (country)			
2.7 City? town? farm? etc.			
2.8 What was your father's job: a. when he first started work?			
b. what is his job now?			
OR c. what was his last job? (PRECISE OCCUPATIONAL TITLES)			
2.9 What was your mother's job? a. when first started work?			
b. now?			
OR c. last job?			

2.10 a What other places have you lived? (LIST IN CHRONOLOGICAL ORDER WITH DATES, AND SPECIFY WHETHER TOWN, CITY, FARM, ETC.....use codes)

b. What was your reason for moving from there?

c. Do you like Sioux Lookout better? Why?

	Place	code	From	To	Why Left?	Like Better?	Why?
Male: 1							
2							
3							
4							
5							
Female: 1							
2							
3							
4							
5							
Other Adult: 1							

IF NOT BORN IN SIOUX LOOKOUT:

2.11 a. Why did you come to Sioux Lookout? (Ask for other reasons) _____

_____

b. If you had it to do over again, knowing what you do now, would you still move here? Yes___ No___ Why? _____

_____

ALL RESPONDENTS:

2.12 a. Do you like living here in Sioux Lookout? Yes____ No____

b, Why (not)? _____

_____

2.13 Do you plan to move away from here in the near future? Yes ____ No _____

IF YES:

a. Where do you plan to move to? _____

b. Why are you moving there? _____

c. How do the other members of the family feel about this move?

_____

IF NO:

d. What keeps you from moving from here? _____

e. Would you consider leaving if you had a good job opportunity?

Yes_____

No _____

Why (not)? _____

_____

f. Would any other members of the family like you to move? Yes____

No ____

(Specify who? and why?) _____

_____

2.14 Are there any reasons why you would feel badly about leaving this area? (If yes, specify) (PROBE FOR ATTACHMENT TO FRIENDS, RELATIVES, ETC.)

Male: _____

Female: _____

Children: _____

For those whose children have left Sioux Lookout:

2.15 Would you like to have your children return to Sioux Lookout to live?

_____

2.16 How likely do you think it is that they <u>will</u> come back here to live?

_____

SECTION III EMPLOYMENT

ASK THESE QUESTIONS OF EACH ADULT IN THE HOUSEHOLD:

	Male	Female	Other (Specify)
3.1 Are you working now?			
IF YES:			
3.2 a) What is your job? (Precise title)			
b) Who do you work for?			
c) How far from here is that?			
d) How long have you worked on this job?			
IF NO:			
3.3 a) Are you looking for work?			
b) What kind of work?			
c) Are you on unemployment ins. or something else now?			
ASK OF ALL RESPONDENTS:			
3.4 What was your first job? (excluding summer employment)			
3.5 What other jobs have you had? (Specify titles, how long, where.)	1.	1.	1.
	2.	2.	2.
	3.	3.	3.
3.6 What job would you like to have a) 10 years from now?			
b) When you retire?			
3.7 What job do you think you will have: a) 10 years from now?			
b) When you retire?			

3.8 Could you tell me, please, in which of the following categories your income falls? (TICK ONE)

SHOW CARD:

1. under $5,000
2. $5,000 to $7,500
3. $7,500 to $10,000
4. $10,000 to $15,000
5. Over $15,000

Husband: _____

Wife: _____

Other: _____

Combined Family: _____

(Employment aspirations for children)

3.9 What kind of work would you like to see your (sons/daughters) do in adulthood?

SONS DAUGHTERS

3.10 Does your (son /daughter) have any idea of what work they would like to do when he/she is an adult?

SONS DAUGHTERS

3.11 How do you feel about this choice?

SONS DAUGHTERS

3.12 (a) Do you think your (son/daughter) will be able to find the kind of work he wants here in Sioux Lookout, or will he have to look elsewhere?

SONS DAUGHTERS

(b) How would you feel about your (son/daughter) moving away from Sioux Lookout?

SONS DAUGHTERS

SECTION IV. EDUCATION

	Male	Female	Other adult (specify)
4.1 What was the last grade completed in school?			
4.2 Where was that? Elementary?			
Secondary?			
4.3 Additional training (if any) 1. apprentice or practical			
2. vocational			
3. university			
4. other			
(Specify type of training / yrs./ diploma)			
4.4 Where was that?			
4.5 How many years schooling did a. your father have?			
b. your mother have?			
4.6 How much education do you want your sons to have? (specify grade & post-secdy. if applicable)			
4.7 How much education do you want your daughters to have?			
4.8 Do you think it is likely that your sons will get as much education as you would like them to? (if not, why not?)			
4.9 ASK SAME QUESTION FOR DAUGHTERS			

4.10 What do you think of the schools here in Sioux Lookout? _____

_____

4.11 What changes, if any, would you like to see made in the schools here? _____

a. _____

b. (IF APPLICABLE:) What do you think you could do about getting these changes made? _____

4.12a. What other educational services would you like to see here? (specify)

_____

b. What do you think you could do about this? _____

_____

4.13 Other comments about educational services:

_____

_____

_____

SECTION V. ETHNIC AFFILIATION

		Male	Female
5.1 What is your ethnic background? (SHOW CARD)			
5.2 What languages do you speak? (Specify where spoken: Home only? Work only? Recreation only? etc.)	1.		
	2.		
	3.		
	4.		
5.3 What language did you learn first?			

5.4 What languages do your children speak? _____

5.5 a. Do you belong to any (SPECIFY ETHNIC) club? _____

b. Name of club _____

c. Extent of involvement: _____

5.6 Do your children take part in any special (specify ethnic) activities? Specify

_____

_____

5.7 To what extent do you try to maintain the (specify which) culture in your Home? (Probe for celebration of ethnic holidays and festivals, ethnic food, clothes, customs, etc.)

_____

_____

_____

5.8 (a) Do you read any (specify ethnic) newspapers or magazines. Yes ____ No____

(b) Have you a subscription to any of these? Yes_____ No_____

(c) Which ones are these? _____ _____ _____

5.9 Would you say you think of yourself as an _____ (ethnic)? _____

an _____-Canadian? _____

or a Canadian? _____

SECTION VI: COMMUNITY PARTICIPATION

ASK OF ALL HOUSEHOLD MEMBERS: FILL IN CHART ON NEXT PAGE

6.1 a. What clubs, unions and/or professional organizations do you belong to now?

b. How frequently do you attend the meetings?

Code:	
	Almost every time.....4
	About half the time 3
	occasionally 2
	never 1
	does not apply 9

c. Do you hold office in that organization now? (If yes, specify)

d. Have you ever held an office in that organization? (If yes, specify)

e. In your opinion, what is the most important thing that club does for the community here?

f. What do you get out of it?

ASK THESE QUESTIONS OF UNION MEMBERS ONLY. IF NOT UNION MEMBER, SKIP TO Q. 6.4

6.2 a. In your opinion, how much control would you say the members of your union have over policy decisions?

A great deal	4
Some	3
Not much	2
None at all	1
Not applicable	9

b. Can you elaborate? _____

6.3 a. Is there anything you would like your union to do that it is not doing now?

(elaborate) _____

_____

b. Have you ever proposed this at a union meeting? Yes_____No_____

IF YES: What happened? _____

IF NO: Why not? _____

6.4 ALL RESPONDENTS:

a. What, in your opinion, is the most important thing this community needs?

_____

b. Do you think this is a job for one of your clubs? (Probe) _____

_____

c. IF YES: Have you ever proposed this at one of the meetings?_____

What happened? _____

IF NO: Why not? _____

6.5 What clubs, if any, would you like to see in this community that are not here now? (Probe for type of club, reasons for wanting, etc.) _____

_____

_____

6.1 CHART: ORGANIZATIONS

	Name of Organization	Frequency of attendance	Office Present	Held Past	Most important activity: Community	Self
Male:						
Female:						
Other adults:						
Children:						

Code:
Almost every time.....4
About half the time....3
Occasionally.....2
Never.....1
Does not apply 9

VII KINSHIP

Now I have a number of questions about your relatives, how often you visit them, that sort of thing.

(PROBE FOR MALE FEMALE DIFFERENCES IN FREQUENCY OF KINSHIP INTERACTION)

CODE:
at least 1 x day.....6
at least 1 x week.....5
at least 1 x month.....4
at least 1 x 6 mths.....3
less frequently 2
never 1
not applicable.....9

	Male's Parents		Female's Parents	
	Father	Mother	Father	Mother
7.1 Are your parents still living?				
7.2 a) Where do they live?				
b) How far is that in miles?				
7.3 When was the last time they visited you?				
7.4 Last time you visited them?				
7.5 How often have you seen them a) in the past year?	a.			
b) in the past 5 years?	b.			
7.6 Do you write to them? How often?				
7.7 Do you telephone them? How often?				
7.8 Do they telephone you? How often?				
7.9 Do they write to you? How often?				
7.10 a. Would you like to live closer to your parents?				
b. How much closer?				
c. Do you think your parents would prefer to live closer to you?				
7.11 a. Have you ever helped them financially?				
b. When was that?				
7.12 a. Have they ever helped you financially?				
b. When?				
7.13 Do they offer advice on major decisions you must make?				
7.14 a. Have they given you big gifts, say at Christmas or on birthdays, or for a thank you or some such?				
b. Have you given them a major gift?				

CODE:
frequently.....4
sometimes 3
rarely 2
never 1
not applicable...9

	Male's Parents		Female's Parents	
	Father	Mother	Father	Mother
7.15 Do they assist you by babysitting, that sort of thing? How often?				
7.16 a. Have you helped them when they were sick?				
b. When? What kind of help?				
7.17 Have they helped you in such times? EXPLAIN:				
7.18 When have your parents and in-laws been of most help to you: a. When first married?				
b. During a crisis?				
c. Following the birth of a child?				
d. Other?				
7.19 If something happened, would you want to have your mother/father come here to live with you?				

7.21 On this card I have four things in family living which frequently cause conflict between married couples and their parents. I wonder if you could tell me please what your experience has been.

ADDRESSING WIFE: Would you tell me please how often you have had a dispute with your own mother about any of these topics? ....with your own father? mother-in-law? father-in-law?

ADDRESSING HUSBAND: Ask same set of questions.

		Wife's		Husband's	
		Mother	Father	Mother	Father
WIFE:	Husband's Job				
	Child Rearing				
	Money				
	Visiting				
HUSBAND:	Husband's Job				
	Child Rearing				
	Money				
	Visiting				

COMMENTS:

7.22 KINSHIP: VISITING PATTERNS AND OTHER OBLIGATIONS

Now, I wonder if you could tell me about other relatives you know; how often you visit them or keep in touch with them, that sort of thing.

	Relationship	Place of Residence	Have Never Met	Last Time Seen	Where Was That?	Frequency of Contact: Visits		Phone Calls		Letters	Xmas Cards	Other Obligations (do you do anything else for each other)
MALE						Your Home	Their Home	You Call	They Call			
	1.											
	2.											
	3.											
	4.											
	5.											
	6.											
	7.											
	8.											
	9.											
FEMALE	1.											
	2.											
	3.											
	4.											
	5.											
	6.											
	7.											
	8.											
	9.											

Frequently 4 Rarely 2
Sometimes 3 Never 1
Not applicable 9

VIII HEALTH

We are interested in the amount of sickness and accidents in families in this area. I would like to get a little information about the experience of your family in this regard.

8.1 Could you tell me whether anyone in this household has been sick this year.

a. Who?

b. Type of ailment?

c. How long?

d. Where treated?

8.2 Has anyone had any major sickness or health problem during the past three years? YES_____NO_____

a. Who?

b. Type of ailment?

c. How long?

d. Where treated?

8.3 In general what do you think of the medical services you have here in Sioux Lookout?

8.4 How would you say the medical services here compare with those in other communities?

_____

_____

8.5 Have you ever had any trouble getting to see a doctor here? Yes___No___

IF YES: Could you tell me a little more about that please?

8.6 Have you had any children who died before they were twelve years old? Yes_____, No_____IF YES: Probe for cause of death, sex, age, year.

8.7 Since you have lived here, has anyone in this family had to go someplace else (away from Sioux Lookout) to see a doctor? Yes_____, No_____

IF YES:

a) Who was that?

b) Where was that?

c) When was that?

d) Was he/she referred by a local doctor? Yes_____No_____

e) Could you tell me a little bit more about the treatment?

(e.g. Was the patient hospitalized? For how long? Follow-up visits?

Did someone else in the family go to live near the patient, etc.)

8.8 What do you consider to be the IDEAL number of children for a family to have? (Probe)

Male: Female:

8.9 In general would you say you agree that people should plan their families?

8.10 Have you ever been a patient in one of the hospitals here? (Specify which hospital. When? For how long? For what reason?)

8.11 What do you think of the hospitals here?

8.12 I understand that there is some talk about combining the General Hospital and the Zone Hospital under one roof. What do you think about this? (PROBE FOR DETAILS)

8.13. If there is to be a new hospital, in what part of town would you like to see it built?

8.14 Do you think there should be separate wings for Whites and Indians, or how should this be arranged?

8.15 Should this new hospital be a municipal hospital or what?

8.16 Do you have any other ideas on the best administrative arrangements for the new hospital?

IX GOVERNMENT

9.1 a. Who is the mayor of Sioux Lookout? _____

b. How long has he been the mayor? _____

9.2 a. Did you vote in the last municipal election? Yes_____,No_____

b. the last provincial election? Yes____ No_____

c. the last federal election? Yes____No_____

d. IF NO TO ANY OF THE ABOVE: Why not?_____

_____

9.3 Who is your provincial member (M.P.P.)? _____

9.4 Who was your federal member in the last Parliament? _____

9.5 How closely would you say you follow:

	Very 4	Fairly 3	Not too closely 2	Not at all 1
Federal politics				
Provincial politics				
Municipal politics				

9.6 What issues are you particularly interested in (LIST IN ORDER OF IMPORTANCE)

in Federal politics? _____

in Provincial politics? _____

in Municipal politics? _____

9.7 Are you a member of a political party? Yes_____, No_____

IF YES: a. How active would you say you are?
Very active_____, Fairly _____, Not too active _____, inactive__

b. Have you ever held office? Yes____, No____
IF YES: Specify_____

9.8 Here is a list of the various ways people find out about what is going on in the world around them. Which would you say are the most important to you?
(Rank 3 items in order of importance).

Talking with people _____, Books_____, Movies_____, Newspapers_____, School _____, Radio_____, Personal experience_____, Church_____, Newspapers____, Magazines_____, T.V. ____, Other ____

X: POWER AND DECISION-MAKING

10.1 Have you ever had occasion to get in touch with any elected representative about any problem?

	Mayor	M.P.P.	M.P.
(i) when			
(ii) nature of problem			
(iii) mode of contact			
(iv) how did you feel about response?			

10.2 What do you think has been the most important thing done for this community in the recent past? _____

_____

_____

10.3 a. What would you say is needed most of all in Sioux Lookout right now?

_____

_____

_____

10.3 b. Do you know whether anything is being done about this now? (PROBE)

_____

_____

c. Is there any action an ordinary citizen like yourself could take to get this done? _____

_____

10.4 What do you think has been the worst decision or action taken on the part of the community in the recent past? (PROBE) _____

_____

_____

10.5 Recently the government of Ontario announced that it was going to establish air services on a regular basis here (Nor-Ontario). What do you think about this? _____

_____

_____

10.6 Which is the most important means of transportation you use in getting around? Train _____, Bus _____, Car _____, Other _____

10.7 What is your opinion on the transportation services in Sioux Lookout?

_____

_____

_____

10.8 Is there anything else about things here in Sioux Lookout which we haven't covered that you would like to comment on? _____

_____

_____

SECTION 11: COMMUNICATIONS

TELEVISION: (9.1 - 9.9)	Respondent: No. 1	No. 2	No. 3
9.1 Do you have a television set at home?	Yes__ No__	Yes__ No__	Yes__ No__
Is that black & white or colour?	B&W__ Co__	B&W__ Co__	B&W__ Co__
9.2 a. IF NO: Do you watch TV somewhere outside your home?	Yes__ No__	Yes__ No__	Yes__ No__
b. Where?			
9.3 a. Did you watch any TV programs yesterday?	Y___ N___	Y___ N___	Y___ N___
b. Which ones?			
9.4 a. Do you remember any good things from these programs? (Specify)			
b. Any bad things?			
9.5 a. About how much time do you spend watching T.V.? a) in a day?			
b) in a week?			
9.6 What television programs do you like best? (SHOW CARD) next best? etc. 1st choice			
(news 1, sports 2, music 3, drama 4, comedy 5, movies 6, soaps 7, games 8) 2nd choice			
3rd choice			
9.7 Is there anything that you would like to see on T.V. that you can't see now? (SPECIFY)			
9.8 Most of your T.V. programs come from the CBC in Winnipeg now. I understand that a new production centre is being set up in Thunder Bay. This will enable you to have a choice of three centres for T.V. broadcasting. Which of them do you prefer? (Rank order) Winnipeg_____, Toronto_____ Thunder Bay,____			
9.9 Are there any other changes you would like to see in T.V. here?			

SECTION 11: COMMUNICATIONS

	Respondent: No. 1	No. 2	No. 3
RADIO: (9.10 - 9.19)			
9.10 Do you have a radio?	Yes__ No__	Yes__ No__	Yes__ No__
9.11 a. Did you listen to any radio program yesterday?	Y____ N____	Y____ N____	Y____ N____
b. Which ones?			
9.12 a. Do you remember anything good about these particular programs? (SPECIFY)			
b. Was there anything bad, etc.?			
9.13 Are there any things not on the radio now that you would like to hear? (SPECIFY)			
9.14 What radio programs do you like best? next best, etc.? (SHOW CARD) 1.			
2.			
3.			
9.15 a. Would you like to see local broadcasting here in Sioux Lookout?	Yes__ No__	Yes__ No__	Yes__ No__
b. IF YES: What kind of local programs?			
c. What should be cut from the CBC schedule to make room for local programming?			
9.16 Are there any other changes you would like to see in radio here?			
9.17 Do you have: a. a record player?	Yes__ No__	Yes__ No__	Yes__ No__
b. a tape recorder?	Yes__ No__	Yes__ No__	Yes__ No__
9.18 What kind of music (records, tapes) do you buy?			

SECTION 11: COMMUNICATIONS

TELEPHONE: (9:20 - 9.26)	Respondent: No. 1	No. 2	No. 3
9.20 a. Do you have a telephone here in the house?	Yes__ No__	Yes__ No__	Yes__ No__
b. IF NO: Do you use a telephone somewhere else?	Yes__ No__	Yes__ No__	Yes__ No__
c. Where?			
9.21 a. When was the last time you made a local call?			
b. Who did you call?			
c. For what purpose did you make the call?			
9.22 a. About how often do you make local phone calls? (USE CODE AT BOTTOM)			
b. Here are some of the reasons that people use the telephone. (SHOW CARD) Which would you say is most important to you? 1. Next important, etc.? 2. 3. 4.			
9.23 a. When was the last time you made a long distance call?			
b. Who was that to?			
c. Purpose? (as above)			
9.24 a. When was the last time you received a long distance call?			
b. Who was that from?			
c. What, in general, was the purpose? (business, social, Doctor, etc.)			
9.25 a. About how often do you make long distance calls? (USE CODE)			
b. Which of these reasons is most important to you as far as long distance calls are concerned? next important, etc.?			

CODE:	
	at least 1 X day 6
	at least 1 X week 5
	at least 1 X month 4
	at least 1 X 6 months ...3
	less frequently 2
	never 1
	not applicable 9

SECTION 11: COMMUNICATIONS

TELEPHONE: (continued) (9.26)

9.26 What improvements (if any) would you like to have made in the telephone service here? (SPECIFY)

PERIODICALS AND BOOKS (9.30 - 9.41)		Respondent No. 1	Respondent No. 2	Respondent No. 3
9.30 a. Do you have any magazine subscriptions?		Yes___ No__	Yes___ No__	Yes___ No__
b. Which ones are they?	1.			
	2.			
	3.			
	4.			
9.31 Are there any other magazines you like to read?	1.			
	2.			
	3.			
	4.			
9.32 What was the last magazine you read?				
9.33 Would you say you read magazines	4. often			
	3. sometimes			
	2. seldom			
	1. never			
9.34 What is it you especially like to read in these magazines?				
9.35 Do you read the Daily Bulletin?	4. often			
	3. sometimes			
	2. seldom			
	1. never			
9.36 Are there any other magazines you read? (Specify which ones)		Yes__ No__	Yes__ No__	Yes__ No__
9.37 When was the last time you read one?				
9.38 About how often would you say you read a newspaper?				

CODE:
at least 1 X day 6
at least 1 X week 5
at least 1 X month 4
at least 1 X 6 months 3
less frequently 2
never 1
not applicable 9

PERIODICALS AND BOOKS (9.39 - 9.46) (continued)	Respondent No. 1	No. 2	No. 3
9.39 What parts of the newspaper interest you most?			
9.40 a. What was the last book you read?			
b. When was that?			
9.41 About how many books would you say you read in a year?			
9.42 a. How many books do you own?			
b. What type of books are these?			
9.43 Is there a library in Sioux Lookout that you can use?	Yes___ No__	Yes__ No__	Yes__ No___
IF YES: a. Do you use it?	Yes__ No__	Yes__ No__	Yes__ No__
b. IF YES: i) About how often do you borrow books from the library? ii) What kind of books do you borrow?			
c. IF NO: iii) Why don't you make use of the library?			
9.44 a. Are there types of newspapers, magazines and books now available in Sioux Lookout that you would like to have available here?	Yes__ No__	Yes__ No__	Yes__ No__
b. Which ones?			
LETTERS (9.45 - 9.46)			
9.45 a. When was the last time you sent a letter?			
b. Who was it you wrote to?			
c. What was the purpose of the letter?			
9.46 a. When was the last time you received a letter?			
b. Who was the letter from?			
c. What was the purpose of the letter?			

SECTION XII TRAVEL

12.1 When you travel to another town where do you usually go?

12.2 When you travel to another town, is it usually to visit friends or relatives, as part of work or what?

friends
relatives
work
other

12.3 During this past year would you say you have travelled more or less than you did last year?

more
less
same

12.4 a) When you want to talk to friends or relatives in another town would you rather travel to see them, talk by telephone or send a letter?

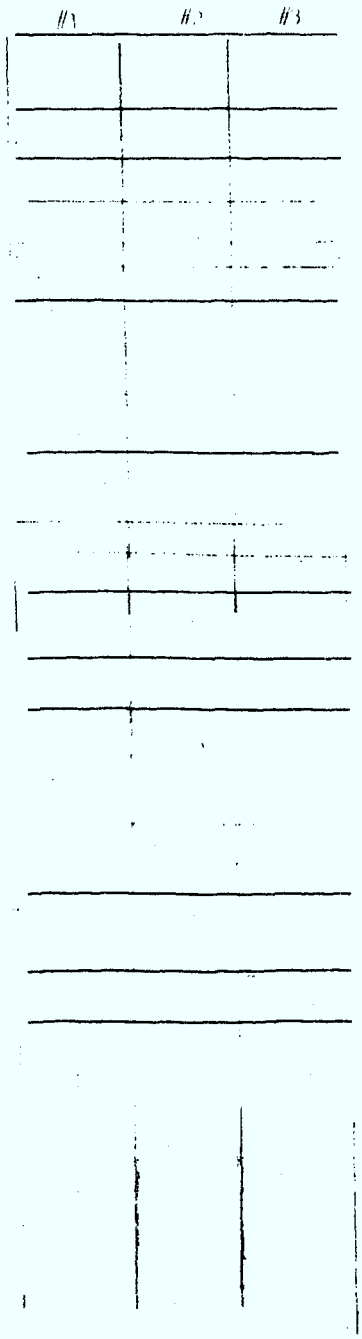
b) Can you give me a reason for your choice?

see
telephone
letter

12.5 a) When you want to do business in another town would you rather travel there, use a telephone, send a letter or send a telegram ?

b) Can you give me a reason for your choice?

see
telephone
letter
telegram



APPENDIX A.13: PERSONNEL INVOLVED IN THE PROJECT

The following persons at Queen's University have been actively involved in the project for various purposes and at various times.

a) Co-Investigators

Dr. J.C. Beal, Professor, Department of Electrical Engineering, Coordinator.

Dr. J.W. Berry, Associate Professor, Department of Psychology.

Dr. C.E.S. Franks, Associate Professor, Department of Political Studies.

Dr. R. Harmsen, Associate Professor, Department of Biology.

Prof. K.A. Herman, Assistant Professor, Department of Sociology.

Prof. J.G.M. McKirdy, Assistant Professor, School of Business.

Dr. L.E. Peppard, Assistant Professor, Department of Electrical Engineering.

At earlier stages the following persons also contributed to the project as co-investigators for various periods:

Dr. F. Cooke, Associate Professor, Department of Biology.

Dr. G.E. Dawson, Associate Professor, Department of Electrical Engineering.

Dr. P.J. McLane, Associate Professor, Department of Electrical Engineering.

Dr. S.E. Tavares, Associate Professor, Department of Electrical Engineering.

b) Graduate Students

J. Aitken, M.B.A. student, School of Business.

R.A. Cameron, M.B.A. student, School of Business.

R. Chambers, M.A. student, Department of Political Studies.

S. Eddy, M.A. student, Department of Political Studies.

R. Rumberg, M.B.A. student, School of Business.

Y. Vautrin, M.B.A. student, School of Business.

c) Undergraduate Students

J. Kane, B.A. student, Department of Psychology.

L.N. Mombourquette, B.A. student, Department of Sociology.

M. Rose, B. Sc. student, Department of Biology.

d) Research Assistants

R.J. Adomavicius, B.Sc., Mathematics and Engineering.

P.W. Hand, B.Sc., Computing Science.

J.A. Love, B.Sc.(Eng.), Electrical Engineering.

T.A. Mawhinney, B.A., Psychology.

B. Rose, B.Comm., School of Business.

H.K. Tang, B.Sc.(Eng.), Electrical Engineering.

C. Vetere, B.A., Philosophy.

V.G. Young (formerly Weinreb), B.A., Sociology.

e) Secretary

Mrs. F.G. Kennedy.

APPENDIX A.14: PUBLICATIONS AND WORKING PAPERS ARISING FROM THIS PROJECT

a) Papers Published on this Project

1. L.E. Peppard, R.J. Adomavicius, J. Aitken, J.C. Beal, J.W. Berry, G.E. Dawson, C.E.S. Franks, K.A. Herman, J.G.M. McKirdy, P.J. McLane, H.K. Tang and G. Weinreb, "The Application of Dynamic Modelling to a Multidisciplinary Study of Telecommunications Impact on Developing Regions", International Electrical, Electronics Conference and Exposition, Toronto, Ont., Oct. 1-3, 1973.

2. L.E. Peppard, J.W. Berry and K.A. Herman, "Multidisciplinary Approaches to the Assessment of Telecommunications Impact", Seventh Biennial Symposium on Communication, Queen's University, Kingston, Ont., 30-31 May, 1974.

3. L.E. Peppard, J.W. Berry, K.A. Herman and J.C. Beal, "Multidisciplinary Approaches to the Assessment of Telecommunications Impact", Canadian Psychological Association Institute on Psychology and Telecommunications, University of Windsor, Windsor, Ont., 10-11 June, 1974.

4. L.E. Peppard, R.J. Adomavicius, H.K. Tang, J.C. Beal, "A Multidisciplinary Approach to the Modeling of a Socioeconomic System", 1974 Systems, Man and Cybernetics Conference, Dallas, Texas, 2-4 October, 1974.

5. J.C. Beal, "A Multidisciplinary Investigation of the Application of Dynamic Modelling to the Study of Telecommunications Development in Canada", (invited), 141st Annual Meeting of the American Association for the Advancement of Science, New York, 26-31 January, 1975.

6. L.E. Peppard, "Social and Environmental Impacts of Communications in the Canadian North", (invited), Conference on Technology and Growth, Ottawa, 4-5 February, 1975.

7. L.E. Peppard, J.C. Beal, C.E.S. Franks, R. Harmsen and J.G.M. McKirdy, "Multidisciplinary Socioeconomic Models to Assess Telecommunications Impact", (invited), Canadian Information Processing Society - Symposium on Socioeconomic Modelling, Ottawa, 8 May, 1975.

8. J.C. Beal and L.E. Peppard, "Dynamic Models of the Socioeconomic Role of Telecommunications Technology", Conference on Arctic Systems, Memorial University, Newfoundland, Canada, 18-22 August, 1975. (To be reprinted in Volume 2, NATO Conference Series, II ... Systems Science, Plenum Press, 1977.)

9. J.C. Beal and L.E. Peppard, "Multidisciplinary Modelling of Telecommunications in a Developing Region", IEEE National Telecommunications Conference, New Orleans, La., 1-3 December, 1975.

10. J.C. Beal, "A Multidisciplinary Investigation of the Application of Dynamic Modeling to the Study of Telecommunications Development in Canada",IEEE Transactions on Engineering Management, Vol. EM-23, No. 2, pp. 85-92, May, 1976.

b) Other Publications Using Data from this Project

1. J.W. Berry, "Education Communication and Housing in Northern Canada: Applications of Cross-Cultural Psychological Research", American Psychological Association, Annual Meeting, Montreal, August, 1973.

2. J.W. Berry, "Cross Cultural Studies of Telecommunications Impact", Colloquium at Psychology Department, Leiden University, Netherlands, 1975, (similar colloquia at University of Bristol, U.K.; University of Copenhagen, Denmark; and the University of Oulu, Finland).

3. J.W. Berry, "Amerindian Attitudes Toward Assimilation: Multicultural Policy and Reality in Canada", Society for Applied Anthropology Meetings, Amsterdam, Netherlands, 1975.

4. J.W. Berry, "Nomadic Style and Cognitive Style", International Society for the Study of Behavioural Development, Guildford, Surrey, England, 1975.

5. J.W. Berry, "A Dynamic Model of Relationships Among Ecology, Culture and Behaviour", Conference on Issues in Cross-Cultural Research, New York Academy of Sciences, New York, 1975.

6. J.W. Berry, "Psychology of Social Change", Chapter in H.C. Triandis (ed.) Handbook of Cross Cultural Psychology, Boston: Allyn and Bacon, 1976.

7. J.W. Berry, Human Ecology and Cognitive Style, Sage Publications, New York: John Wiley, 1976.

8. J. Kane, "Perceptual Differentiation in Ojibway and White Populations", B.A. Honours Thesis, Queen's University, Kingston, Ontario, Canada, 1973.

9. T.A. Mawhinney, "Developmental Differentiation: Visual and Auditory Modalities", B.A. Honours Thesis, Queen's University, Kingston, Ontario, Canada, 1973.

c) Working Papers Produced During the Course of the Project

The following list of working papers is included here for completeness. Some were distributed to interested persons during earlier stages of the project. They are no longer available as separate items being essentially incorporated in the body of this report where appropriate.

Working Paper No.	Author	Title	No. of Pages
Q.1	R. Chambers	Government Involvement in Northern Developments.	57
Q.2	L.E. Peppard	Forrester Modelling and Flow-Diagrams: An Introduction.	12
Q.3	H.K. Tang	Ontario Hydro in Northwest Ontario.	5
Q.4	H.K. Tang	The Anik Satellite System.	5
Q.5	H.K. Tang	The Unfinished Mystery of Radio Kenomadiwin.	6
Q.6	H.K. Tang	Telephone Service in Northwest Ontario.	9
Q.7	K.A. Herman, G. Weinreb	Demographic Profile of Northwestern Ontario with detailed statistics.	28
Q.8	-	1st Progress Report to Communications Canada (covering the period 1 July-31 December 1972).	53
Q.9	R.J. Adomavicius, L.E. Peppard and G. Weinreb	Report on Visits to Interdisciplinary Modelling Projects at Oregon State University and the University of British Columbia.	22
Q.10	-	Question Form - QUIST Community Study, 1973.	4
Q.11	R.J. Adomavicius, L.E. Peppard	Causal Description of the Regional Model.	17
Q.12	R.A. Cameron	Dynamic Model of a Forest Tract.	65
Q.13	J. Aitken	Telecommunications and Regional Development.	70

c) Cont'd.

Working Paper No.	Author	Title	No. of Pages
Q.14	-	1st Annual Report to Communications Canada (covering the period 1 July 1972 - 31 March 1973).	41
Q.15	-	Digital Computer Programme for Northwest Ontario Regional Model.	24
Q.16	G. Weinreb, K.A. Herman	The Social Model - Report of Field Work (in Aroland and Longlake 58).	25
Q.17	J. Kane	Perceptual Differentiation in Ojibway and White Populations.	26
Q.18	-	2nd Progress Report to Communications Canada (covering the period 1 April - 30 September 1973).	60
Q.19	Y. Vautrin	A Dynamic Model of Tourism and Recreation in Northwestern Ontario.	85
Q.20	M. Rose	Tubercolosis - Research Summary.	13
Q.21	-	2nd Annual Report to Communications Canada (covering the period 1 April, 1973 - 31 March 1974).	77
Q.22	M. Rose	Stress.	12
Q.23	M. Rose	Extensions to the Regional Model of Northwest Ontario: Telecommunications.	7
Q.24	M. Rose	Pollution: Background and Modelling.	22
Q.25	L.N. Mombourquette	Coding Key - Sioux Lookout Sociological Community Study	20

c) Cont'd.

Working Paper No.	Author	Title	No. of Pages
Q.26	-	3rd Progress Report to Communications Canada (covering the period 1 April - 30 September 1974).	60
Q.27	L.E. Peppard J.C. Beal	A Multidisciplinary Approach to the Modelling of a Socioeconomic System.	45
Q.28	-	Interviewing Schedule - Summer 1974. Field work in Sioux Lookout.	22
Q.29	-	3rd Annual Report to Communications Canada (covering the period 1 April 1974 - 31 March 1975).	53

APPENDIX A.15: REFERENCES AND BIBLIOGRAPHY

(a) REFERENCES

The following references are listed according to the Section of this Report in which they are mentioned.

Section 1

BATCHMAN, T.E., and A.J. WEARING, (1976), "Application of Dynamic Modeling to the Social Consequences of Telecommunications", IEEE Transactions on Systems, Man, and Cybernetics, Vol. SMC-6, pp. 612-622.

Section 2

ANSOFF, H.I., and D.P. SLEVIN (1968a), "An Appreciation of Industrial Dynamics", Management Science, Vol. 14, pp. 383-397.

ANSOFF, H.I., and D.P. SLEVIN (1968b), "Comments on Professor Forrester's 'Industrial Dynamics - After the First Decade'", Management Science, Vol. 14, p. 600.

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