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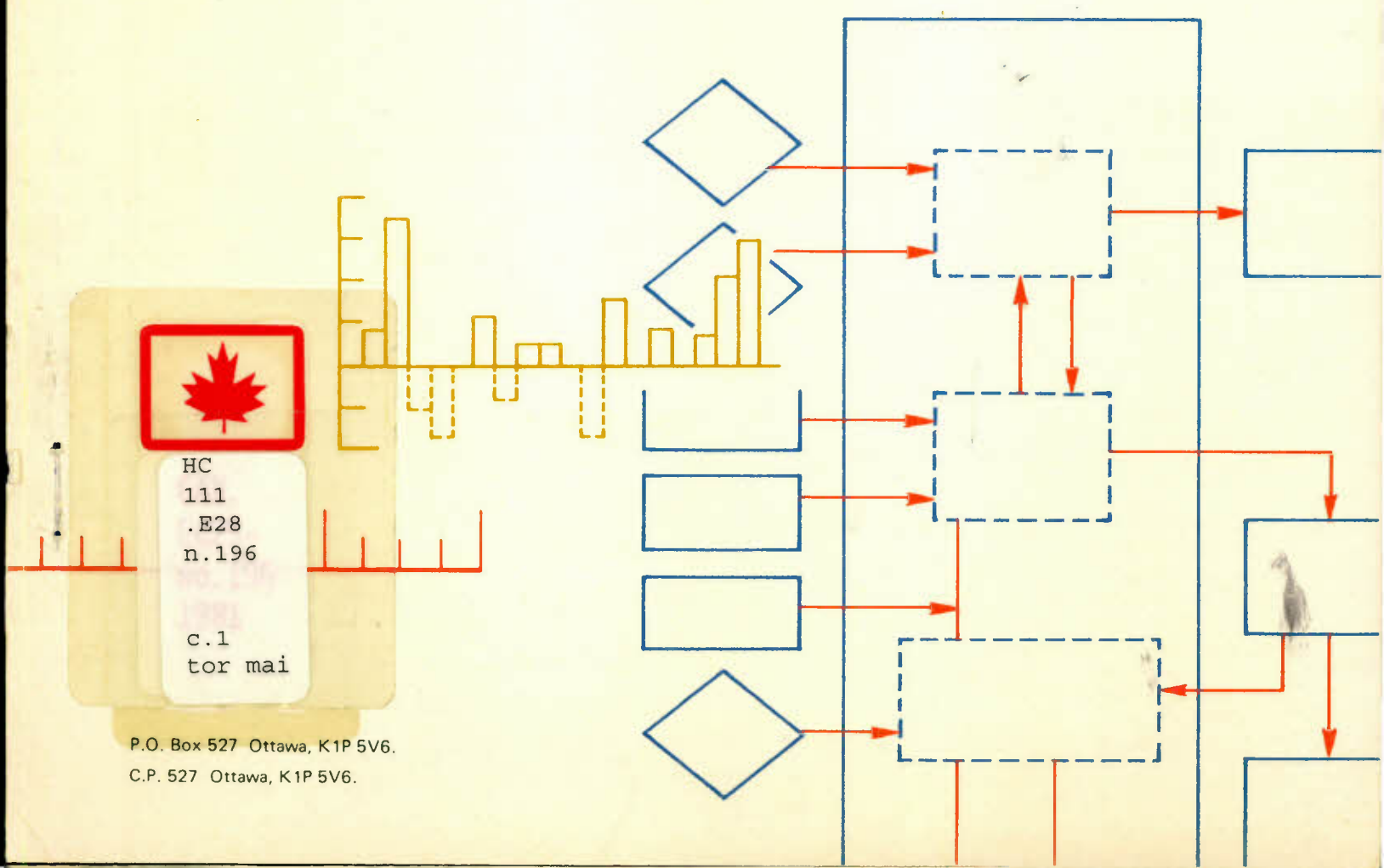

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DISCUSSION PAPER NO. 196

Economic Theories for Small Marine Economies: An Interpretation for Newfoundland

by

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Acknowledgement

The author wishes to thank all those persons associated with the Economic Council's "Newfoundland Reference" including advisors, fellow researchers, independent commentators and persons interviewed during the course of the study. The theoretical ideas that evolved as we worked came from many sources and were gradually refuted or reinforced by the empirical evidence and opinion we were receiving from many quarters. While it is impossible to name all the participants it is interesting to note the main debates and debators.

Neil Swan, building upon the productivity research of Ludwig Auer and technological diffusion studies by Fernand Martin, with which he was intimately acquainted, was the originator of much of the theoretical work behind the reference as expressed in his Economic Council discussion paper number 105. It portrays productivity improvement and technological advance as a key to raising both employment and per capita income in a model that had something of a macroeconomic flavour.

The skepticism of Frank Flatters reinforced by the empirically based doubts of persons like Brian Bursey of Newfoundland gave rise to an alternative model with an international trade orientation (à la Ron Jones) which portrays Newfoundland as a multi-sectoral export base economy in which employment growth can be fueled by natural resource discoveries and income transfers, but in which labour-saving productivity improvement might well destroy employment, not create it.

Neither Swan nor Flatters had previous experience with fisheries economics so their models paid no attention to it. The collective weight of our fisheries economists, Gordon Munro, Charles Plourde, Stephen Ferris, and Bill Schrank, reinforced by the fisheries interests of our advisors, however, forced us to recognize that labour market adjustment can seriously malfunction when a relatively large common property resource sector is present, especially when the problems are compounded by subsidies, poorly devised income maintenance programs and migration. Persons outside the research team, notably Peter Pearse and Parzival Copes also had strong influences on our understanding of this sector.

We gained a number of insights into productivity improvement from our eight business-trained industry analysts but the most important productivity insight came from an unexpected quarter: Patrick Reid, studying the urban structure of Newfoundland, claimed that the advent of roads linking isolated outports to peninsular service centres was revolutionizing the island's economic pattern while leaving its settlement pattern intact. People were being united into larger markets to which they commuted for both services and employment while continuing to live in outports. Statistical analysis of data collected by our

industry analysts showed utilization rates and to a lesser extent, returns to scale, (such as can be achieved in larger markets) were the most important factors in productivity improvement. Dick Zuker and Réal Cournoyer showed as well that multi-establishment business enterprises tended to perform better than independent establishments. Research by Noel Roy reminded us that productivity improvement of a material-saving nature may not only generate more employment but extend the effective size of the natural resource export base as well.

Debate on the role of migration in economic adjustment was partly resolved by empirical analysis carried out by Robin Boadway, Alan Green and Denis Gauthier. Further on labour market adjustment, there was lively skepticism between Harry Postner and Craig Riddell. Postner went on to demonstrate empirically that frictional unemployument could account for virtually none of the unemployment disparity between Newfoundland and the rest of Canada and he concluded that weak aggregte demand was the culprit. Riddell persisted with the notion that Newfoundland had a high natural rate of unemployment, a substantial part of which was accounted for by the relatively greater generosity of the unemployment insurance program in Newfoundland. Earlier work by Wayne Thirsk and current empirical research by Neil Swan and Paul Kovacs provided evidence that wage parity forces were very important in explaining Newfoundland's economic adjustment. Additional ideas on labour market functioning and equilibrium rates of unemployment were provided to the author by Keith Newton, Abrar Hasan and Jonathan Wilby. Our work on seasonal unemployment was done by Jerald Wilson.

There was much more theory than this discussed and used in developing the consensus document Newfoundland: From Dependency to Self-Reliance, and many more people were involved. Nevertheless, the author believes that these ideas were the main core of theory implicitly used in the Council document and that it is possible to mould most of these ideas into a synthesis that offers a better understanding of this small marine economy than we had before we began. While the author wishes to acknowledge and draw attention to the ideas of others who worked on this project, he alone assumes responsibility for the way those ideas are expressed in this paper.

Résumé

Le présent document puise aux études théoriques et empiriques complétées par le Conseil économique dans le cadre de son mandat sur la Terre-Neuve afin de présenter une synthèse des principaux éléments de théorie économique qui sont implicites dans son rapport final, intitulé Au-delà de la dépendance : Pour une productivité accrue à Terre-Neuve. L'auteur applique les notions conventionnelles de l'offre et de la demande à la pêcherie de propriété commune puis, une à la fois, aux autres denrées exportées, aux biens de consommation locale et aux biens faisant concurrence aux importations. Avec l'addition de chaque partie du modèle, des preuves empiriques tirées des travaux du Conseil et d'autres sources sont utilisées afin de vérifier le réalisme des hypothèses et l'exactitude des prévisions du modèle. Lorsque les prédictions s'avèrent fausses, un nouvel aspect est introduit dans la théorie, qui produit de meilleurs résultats. M. Copithorne traite ensuite des divers secteurs qui engendrent la demande globale de main-d'oeuvre, et tire des conclusions sur les répercussions possibles de l'amélioration de la productivité et des transferts de revenu, pour ensuite s'intéresser à certains aspects de l'offre de main-d'oeuvre, y compris la taille de la population d'âge actif, la migration et le taux d'activité. Enfin, l'auteur nous présente une série de mécanismes d'ajustement du marché du travail, en commençant par un simple modèle walrasien de détermination des salaires, pour passer au concept de l'efficacité du marché du travail (le mécanisme servant à faire concorder les travailleurs et les emplois), et modifiant ensuite une courbe de Phillips intégrant les anticipations (que rejette les données) de façon à y incorporer l'hypothèse relative à la parité des salaires, dont les prévisions sont conformes aux faits. Des conclusions relatives aux répercussions possibles sur les politiques sont tirées à chaque étape de la formation du modèle. Certains aspects de cette théorie pourraient probablement servir à expliquer les ajustements de revenus, de l'emploi et du marché du travail dans d'autres petites économies maritimes ou régionales.

Abstract

This paper draws upon the theoretical and empirical studies conducted by the Economic Council under its "Newfoundland Reference" to present a synthesis of the central core of economic theory that is implicit in the Economic Council's final report Newfoundland: From Dependency to Self-Reliance. Using the traditional graph of supply and demand the author begins with the common property fishery and, step by step, builds in the remaining staples of the export base, then the home goods and import-competing sectors. As each part of the model is added, empirical evidence from the Council's work and other literature is used to implicitly check the realism of the assumptions and the accuracy of the model's predictions. Where predictions prove false, a new aspect is built into the theory which yields better predictions. After the various sectors that generate the aggregate demand for labour have been developed and the implications of productivity improvement and income transfers have been drawn, aspects of labour supply including the size of working age population, migration and the labour force participation rate are developed. Finally, the author leads through a series of labour market adjustment mechanisms starting with simple Walrasian wage determination, then building in the concept of labour market efficiency (the people and jobs matching mechanism) and modifying expectations-augmented Phillips Curve wage adjustment (which is rejected by the data) to incorporate the wage-parity hypothesis whose predictions are consistent with the facts. Policy implications are drawn as each part of the model is assembled. Aspects of this theory are probably helpful in explaining incomes, employment and labour market adjustment in some other small maritime and regional economies as well.

Introduction

The recent Economic Council Study, Newfoundland: From Dependency to Self Reliance, reveals some aspects of economic theory that can be very important to the functioning of a small marine economy or the economy of a small region within a larger national economy -- aspects that tend to be overlooked by standard texts.[1] A synthesis of what we learned is not only relevant for Newfoundland; it is also relevant for Prince Edward Island, Nova Scotia, New Brunswick, Gaspésie and parts of coastal British Columbia. Our work probably has some relevance for other small marine economies too -- perhaps Iceland, the Faroe Islands and other island economies.

The most significant aspects of economic theory that are important for these economies by contrast to those of large nation economies have to do with the role of a common property resource fishery and labour market adjustment -- especially if these are complicated by income transfers from outside the small economy and if there is substantial migration of labour. Common property resource economics is usually taught to students as a curriosum in specialized courses in natural resource economics. But in Newfoundland the common property resource industry affects five to fifteen per cent of the province's labour force directly (depending on how labour force and fishery employment are

measured). Around the coast this common property resource industry and its attendant processing sector almost constitutes the entirety of the non-service marketable output of outport communities. In this case the peculiarity of a common property resource industry, especially when tied up with a poorly designed income maintenance scheme, can have a marked influence on the entire provincial economy.

We also believe we learned some useful things about the nature of productivity improvement and the spatial pattern of economic activity by contrast to the spatial pattern of human settlement. These are matters which apply to larger mainland economies as well, not only to small economies with a large common property resource sector.

Newfoundland is an astonishingly complex economy to explain. Its economic problems run the gamut from those of an underdeveloped country with a non-monetized subsistence sector (substantially complicated with transfers payments) to those of the modern post-industrial state with a very large service sector and high mass consumption. Thus we have found it helpful to borrow ideas from the theories of economic development; urban and regional science; economic history, staples theory and natural resource economics, export base theory, a neoclassical synthesis of microeconomics, labour economics, macroeconomics,

international economics; economic growth and technological advance.

In this paper the author, while focusing on the supply and demand for labour, presents a sequence of economic theories, learning something from each and showing in each case why additional theories are needed to explain the realities we find. No economist can claim to form a coherent synthesis of this entire mass of theories, but a synthesis of the microeconomic, natural resource and labour market adjustment theories is attempted. An attempt is made through the use of diagrams and elementary exposition to make the theories and evidence intelligible to a broader audience.

1. The Development Approach

To begin with, the Newfoundland economy is still incompletely monetized. It is a little like an underdeveloped country in which a large proportion of the population produces some of its own food, shelter, fuel and investment goods directly as income in kind rather than in a market economy. Outport consumption of rabbit, moose, cariboo, codfish and blueberries and the use of owner-built homes, fishing stages, dories, fishing gear and self-produced firewood is lower than at the time of Confederation, but it is still considerable.[2]

These characteristics mean that theories of economic development which direct attention to capital accumulation, building infrastructure, increasing education and human capital, raising the level of technology, modernizing primary industry and coping with social structures and attitudes that do not fit the mold of a modern market economy have some relevance.

The major contributions of Confederation to Newfoundland were economic developmental in nature. The simultaneous introduction of family allowances, old age pensions, unemployment insurance benefits for seasonal workers and self-employed fishermen along with subsidies on the transportation of imported consumer goods had several effects. It gave strong impetus to the market economy, largely eliminated subsistence agriculture and terminated the semi-feudal relationship between subsistence fishermen and outport merchants. Inshore fishermen could now supplement their traditional life style with several thousand dollars' worth of consumer goods financed by transfers from Ottawa, not by loans in kind from the local merchants.

The construction of the Trans-Canada Highway and the introduction of peninsular roads, regional hospitals, high schools and shopping centres helped unify the economy by allowing people to commute to jobs and to shopping areas -- again giving impetus to the growth of commercial markets for labour and consumer goods. The increased levels of education seem to have encouraged greater mobility of the labour force.

Nevertheless theories of economic development are not very good at explaining the low average income, high unemployment and the apparent failure of urbanization in Newfoundland. They do not tell us why such a large proportion of the population remains underemployed in outports now that education is almost universally available, most outports are connected by roads, and average wages and capital per worker are close to and sometimes above national levels.

2. The Regional and Urban Science Approach

Regional and urban research in Canada[3] has demonstrated that population growth and measured per capita incomes tend to be larger in major cities than in smaller urban centres and rural areas. The sharpest increases in incomes through urbanization are experienced in going from rural and semi urban centres to towns of 5,000 - 10,000 people. Some of these gains are more apparent than real because they reflect the monetization of tasks that are performed informally by rural people for themselves as unrecorded income-in-kind.

While the average rate of unemployment is apparently not affected by urban size, the variation in unemployment rates is lower in larger centres, possibly because the shut down or weakness of individual industries cannot disrupt a large, diversified urban centre as much as it does a small one. The labour force participation rate is also higher in larger urban

centres, partly because there is a greater range of opportunities for full-time and part-time employment.

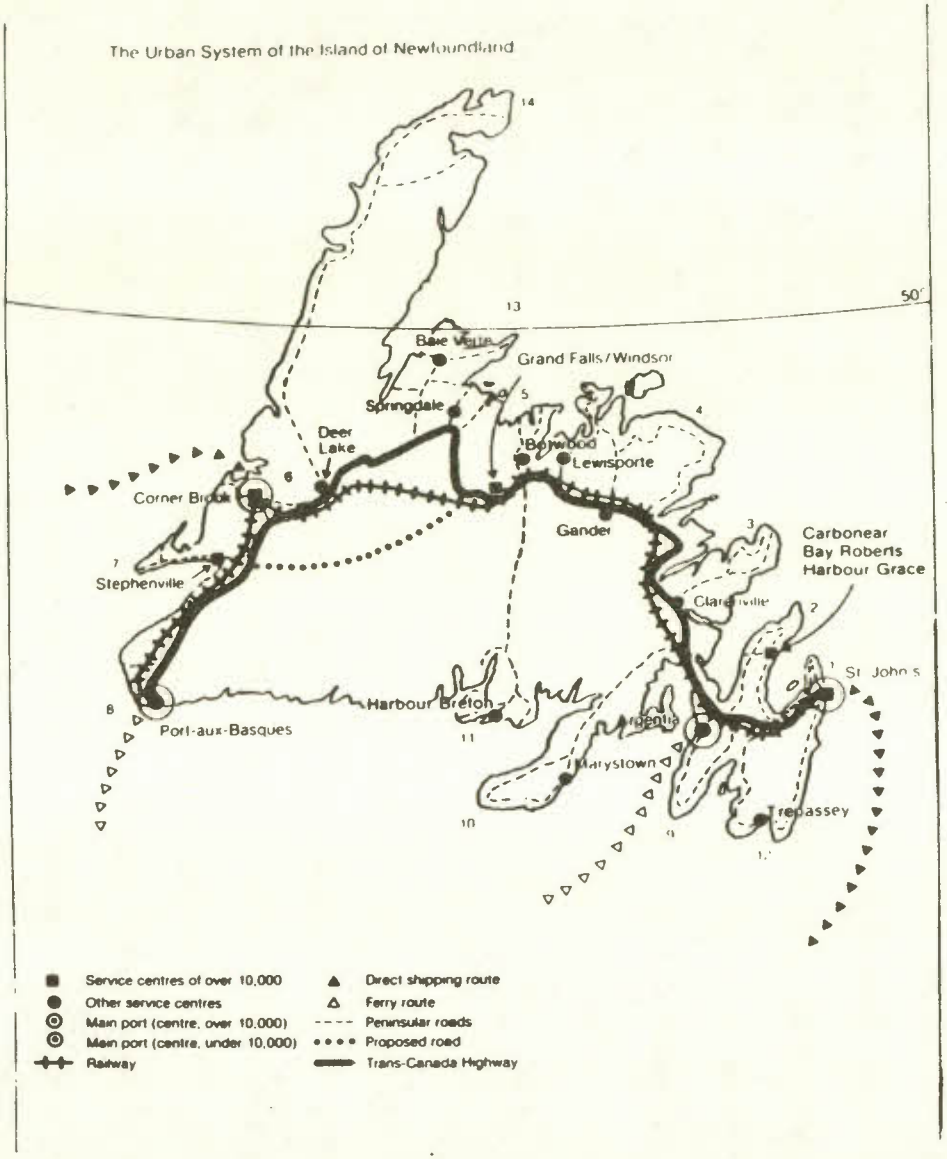
Regional scientists find that the full range of personal, governmental, business and financial services can only flourish in larger centres, and that these services are necessary for strategic decision-making in the economy. Hence large urban centres, especially if they have major industries clustered in their commuting hinterland and if they have fairly frequent and intense interaction with other cities, become centres of innovation; innovation is the source of much of the modern world's economic growth. In Newfoundland we have found that the advent of roads which link rural outports to main service centres on or near the Trans-Canada Highway have served to unite some 25,000 to 50,000 people on major peninsulas into larger markets so that many of the service industries that normally flourish only in urban centres of that size can now exist in the larger peninsulas of Newfoundland.

The fewer the number of "gateways" to the geographic region, the better the chance of urban clustering at the existing gateways or transportation nodes. Urban scientists also point out that the opportunity to develop industrial clusters is much lower in a "natural resource region" like Newfoundland which has to gather its wood and fish from many small rural centres, than it is in a "transformation region" which processes the raw

products into usable materials) or in a "fabrication region" that produces finished goods.

These theories suggest that Newfoundland's income levels and labour force participation rates are low partly because of the poor urban structure imposed on the province by its inherent nature as a natural resource region. But they also prescribe policies for improvement. If new economic activity can be clustered within commuting distance of St. John's and Corner Brook and its interactions with other cities strengthened, then the range of services that can survive in St. John's and Corner Brook will increase. With a wider range of services, greater specialization, and a larger local market, the St. John's area can become a greater centre of innovation and the chances for more spontaneous economic growth are enhanced.

Any increase in economic activity and interaction between St. John's and Carbonear (65 miles away), Argentia (79 miles away) or Bay Bulls (a harbour 30 miles south) are bound to increase the economic strength of this region. (See Map) Hence upgrading road connections among Carbonear, Holyrood, Bay Bulls and St. John's would help unify the labour market of this entire urban hinterland. Establishment of the new fish landing centre at Harbour Grace and the concentration of new oil and gas industry staging areas within commuting distance of St. John's would be important forces for the improvement of urban structure on the Avalon Peninsula. The concentration of cold ocean



Population of Peninsulas[1] and Their Service Centres, Island of Newfoundland, 1976

	Population 1976
A The Urban System	
1 St. John's	123,540
Hinterland	25,296
Subtotal	148,836
2 Carbonear, incl. Bay Roberts and Harbour Grace	12,035
Hinterland	37,470
Subtotal	49,505
3 Clarenville, incl. Shoal Harbour	3,816
Hinterland	26,272
Subtotal	30,088
4 Gander	9,301
Lewisporte	3,782
Hinterland	39,655
Subtotal	52,738
5 Grand Falls/Windsor	15,078
Springdale	3,513
Hinterland	28,549
Subtotal	47,140
6 Corner Brook	25,198
Deer Lake	4,546
Hinterland	19,656
Subtotal	49,400
7 Stephenville	10,284
Hinterland	15,366
Subtotal	25,650
8 Port-aux-Basques	6,187
Hinterland	8,848
Subtotal	15,035
9 Argentia, incl. Dunville and Placentia	3,953
Hinterland	6,224
Subtotal	10,177
Total, category A	428,569
B Outside the Urban System (remote from Trans-Canada Highway)	
10 Marystown	5,915
Hinterland	19,405
Subtotal	25,320
11 Harbour Breton Bay d'Espoir peninsula	10,710
12 Trepassey Southern Shore peninsula	11,597
13 Baie Verte peninsula	9,907
14 Great Northern Peninsula (North of 50th parallel)	17,385
Remaining population (nonpeninsular)	21,185
Total, category B	96,104
Total population, island of Newfoundland (A + B)	524,673

Source: Newfoundland: From Dependency to Self Reliance

research and apprenticeship training in cold ocean oil-well drilling and production technology would aid the development of innovation in this urban centre. Should offshore oil refining be revived at Come by Chance (85 miles west of St. John's) the refinery would bear the same relationship to strengthening the St. John's urban structure that Sarnia bears to Toronto.

On the west coast, a large central urban area could be strengthened by upgrading its port facilities to handle roll-on-roll-off cargoes and establishing modern warehouse facilities (akin to the Donovans warehousing facilities at St. John's, so that it could become the distribution centre for all points west of Gander. Although we did not formally model the transportation system to measure costs and benefits, it seems apparent that if interprovincial transportation subsidies were either removed or equalized for all points of entry into Newfoundland, then Corner Brook and St. John's would be the two lowest cost port and distribution centres. Their locations minimize the cost of road transport to and from the island's main centres of population and industry, if only because they are the two largest centres of population and both can be served by direct shipping. Hence the long 565 mile road or rail trip from Port-aux-Basques to St. John's is unnecessary.[4]

One policy danger pointed out by urban science theories is that political forces could wreak havoc with Newfoundland's urban potential. Given the proposed new road link through Buchans to

St. Georges, there could be political pressure to upgrade it to Trans-Canada standards and to develop more port capacity at Port-aux-Basques and Stephenville to use this new highway. The result could be the dissipation of Corner Brook's economic strength among three harbours instead of one. As a result, little innovative, spontaneous urban growth would be expected on the west coast, and the cost of infrastructure and unused ports and highways would be seriously increased. If, in addition, the oil and gas staging areas were distributed around the island beyond comuting distance to St. John's, the beneficial effects of this industry on the province's urban structure would also be lost.

Finally, urban science suggests that some of the population must remain somewhat dispersed to harvest the natural resources of fish, forest and minerals, and that fish plants be located near the resource. But there is no need to locate shopping centres, highschools and hospitals beside each fish plant. They are better located in central places near the central transportation system within commuting distance of the outport communities. This in fact has been happening in Newfoundland.[5]

While urban science findings suggest there are large income gains to be had in going from rural and semi-rural settings to towns of 5,000 to 10,000 people, we remain skeptical that such a move would produce any automatic gains for Newfoundland; it would

disrupt a stable life style without guaranteeing jobs in the larger centres and it would cut off some of the access to income-in-kind that rural people have. Urban science is also unable to explain why this urbanization has failed in Newfoundland -- why these outports hold their population so much more tenaciously than prairie towns do in Saskatchewan. The answer to that anomaly lies not in urban science but in the economics of common property resources -- the economics of the fishery -- interacting with the transfer system of gear and boat subsidies and unemployment insurance. We turn next to those theories.

3. The Augmented Natural Resource Staples Approach: A Neoclassical Synthesis

Harold Innis and W.A. MacIntosh explain the economic development of Canada through the history of exploitation of natural resource products or "staples" for export.[6] In Newfoundland's case, the exploitation of fish, seals, pulpwood, iron ore and other minerals, hydro electricity (and perhaps offshore oil and gas in the future) certainly does explain the pattern of settlement. The loss of natural resource rents through bad deals frozen into long-term contracts helps explain why a region rich in natural resources is not wealthy.

Because the expansion of a natural resource industry has backward linkages to transportation and supply industries,

forward linkages to processing industries and final demand linkages to supply goods and services to the workers, it can be a powerful engine of growth and, when the natural resource is exhausted or the world market declines, it can be a powerful cause of economic decline.

The policy prescriptions for declining regions under this theory are very pessimistic: either discover more natural resources to exploit; subsidize the processing and transport of existing resources; or encourage outmigration of the population.[7] The staples approach has some usefulness in explaining Newfoundland's economic development and there are problems with the common property fishery. But we are far more optimistic about Newfoundland's future than staples or fisheries theories would lead us to believe. If natural resources were a prerequisite for economic success, economic powerhouses like Japan would never have had a chance.

We instead present a neoclassical synthesis of economic theories that starts with a common property fishery economy and gradually expands to encompass the processing, import competing and home goods industries. In so doing, we spell out the problems of

- over-entry to the fishery
- the existence of economic rents on natural resources;
- the importance of technological advance;
- the detrimental effects of transportation and fishery subsidies; and

- the fact that if wages could adjust downward enough, there is virtually no limit to the amount of labour that could be employed in Newfoundland.

Since we have solid evidence that wages will not adjust that far, we are then led to our next set of labour economic theories to follow up those problems in the labour market.

3.1 A One-Sector Common Property Resource Theory of Economic Development

We begin with two facts: Newfoundland has historically been settled by fishermen; and fishing is still carried on by some 20,000 to 30,000 people out of a labour force of only 200,000. These facts suggest that the economic problems associated with common property resources can be significant for the entire Newfoundland economy and that outmigration from the fishery, if not from the province as a whole, would help raise earned incomes per worker in the fishery and possibly in the province as well.

Although we could present a more complete theory of the fishery[8] let us assume first, that there is only one industry -- fishing -- second, that there is a finite amount of fish that can be harvested each year; and third, that all the fish caught are sold for export at a fixed price of $1 per pound. The theory can be represented graphically (Figure 1). At whatever level of technology, is available, there is a certain minimum number of fishermen, L_o who can conceivably catch the entire annual

A One Sector Theory of Income Determination

Figure 1

Income Determination in a Common Property Fishery

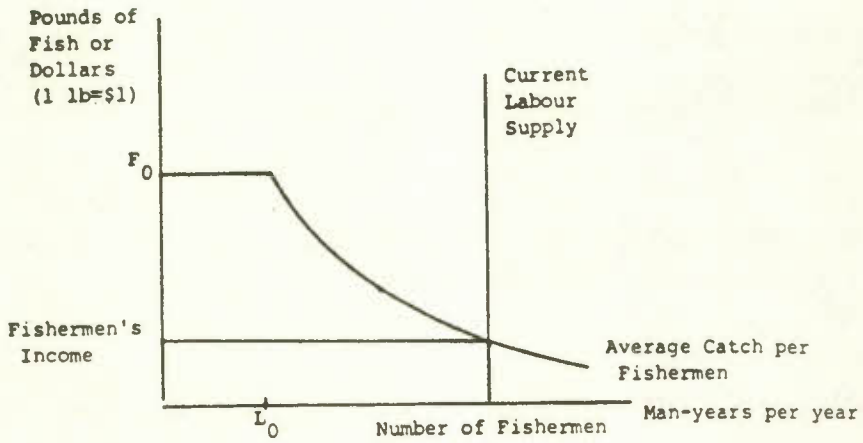


Figure 2

Income Determination in Fishery Augmented by Income Subsidies such as Unemployment Insurance

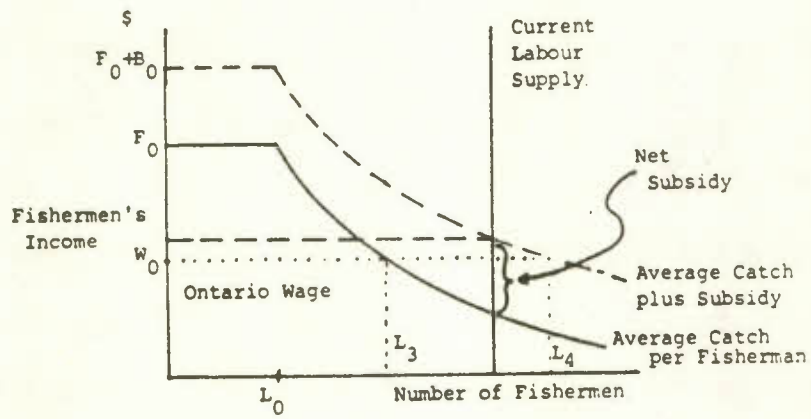
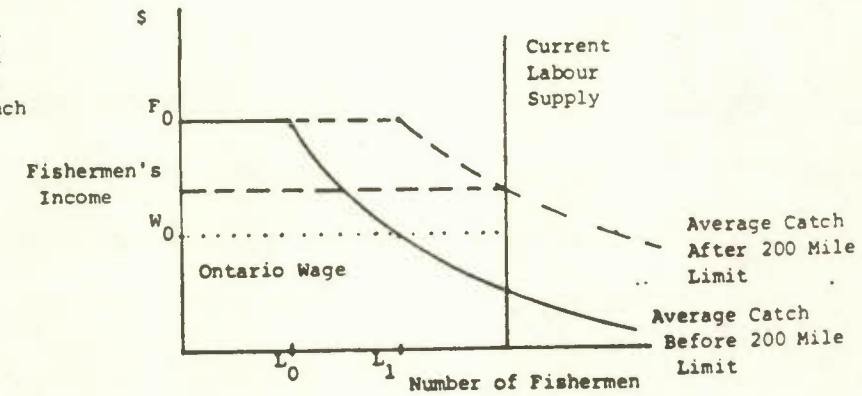


Figure 3

Income Determination in Fishery Augmented by Additional Annual Harvestable Stock such as Provided by 200 Mile Limit



harvestable stock of fish. If the population contains fewer fishermen than that minimum L_o, each additional man takes the maximum amount of fish F_o that can be caught with existing technology.[9] By selling his fish for export, he adds income (F_o pounds at $1 per pound) to the society. In the case of Newfoundland codfish, that could be expected to be a rather large income.

Once the population of fishermen expands beyond L_o, the minimum needed to catch the annual harvest, each additional fisherman adds nothing to society's total income because the entire stock of harvestable fish can be caught without his help. But if there is nothing to prevent him from buying his own boat and gear and going fishing, he will catch on average just as much fish as everybody else, which means all the others catch a little less than before. We can therefore predict that as the human population increases and the number of fishermen climbs beyond the minimum L_o, the average catch and average income will go on falling. The marginal value of production by additional workers will be zero or even negative.

If some of the additional workers cannot afford the outlay for a boat and gear, they will be unemployed because there is nothing else to do in a one-sector economy. If the provincial government introduces boat and gear subsidies paid for with money it borrows on world markets or gets as a grant from another government, then it can help the unemployed workers get into fishing. They would

no longer be unemployed -- but they still would not produce anything more than society was producing without them. Boat and gear subsidies cannot increase the annual harvest of fish available to the province as a whole.

While subsidies to assist entry to fishing can be used to help "hide" or "disguise" unemployment as underemployment in the fishery, they cannot prevent the inexorable fall in average incomes as the human population increases.[10] Ultimately the entire province and all its fishermen will be reduced to abject poverty as the population grows too large for the natural resource base supporting it. In fact, the borrowed money spent on excess boats and gear is wasted because it does not raise the global catch. Aggregate consumer income would actually be higher in real terms if all this money were directly used for consumer goods.

This inexorable march to poverty can be held at bay if politicians can find a "legitimate" source of income subsidies to supplement fishing income. If fishing in this hypothetical provincial economy is strictly a seasonal operation and if the nation at large is willing to pay seasonal unemployment insurance benefits to fishermen during the off-season, then the net unemployment insurance benefits per fisherman (annual payments less premiums paid) B_o can be added to the fishermen's incomes (Figure 2). But this solution is only a temporary reprieve; as the human population continues to increase, the same

annual harvest of fish still gets divided among a larger and larger number of fishermen. And, as the population grows, the aggregate annual volume of transfers in net unemployment insurance benefits grows. Transfers become a proportionately larger and larger share of provincial income.

A better solution to the income problem would be to find more fish. Historically fishermen did just that. First, they fished farther up the north coast, off Labrador and offshore; then they began to exploit additional species of marine life (flatfish, squid, mackerel, shrimps); and now, Canada has largely expelled foreigners from fishing within 200 miles of the coast. As a result, the total annual stock of fish to be harvested has risen and the minimum number of fishermen needed to harvest it with existing technology has also increased from L_o to L_1, (Figure 3). The larger natural resource stock can support a larger population of fishermen. Because the human birthrate is not held in check, however, the number of fishermen cannot be held at this new and higher minimum L_1 so that same old decline in average incomes will take place and poverty is still the long-run result.

That raises the prospect of outmigration of surplus fishermen as a long-run solution to the province's problems of unemployment and low incomes. If fishermen had the option of migrating to some other place like Ontario where they could earn an Ontario wage of $\$W_0$ per year, and if many of them did not care

whether they earned that wage in Ontario or earned the same income as Newfoundland fishermen, then we would expect earned incomes from fishing in Newfoundland would never fall below the Ontario wage. If it did, surplus fishermen would leave the province.

At least they would leave if it were not for unemployment insurance and other transfers (Figure 2). Since there is a system of transfers to Newfoundland fishermen that is designed to raise their incomes, those transfers encourage fishermen to stay in the outports of Newfoundland until their combined income from fish and transfers falls to the Ontario level W_0. Hence these income subsidies to fishermen will fail to raise fishermen's incomes in the long run; they will only serve to encourage a larger population of fishermen to stay in Newfoundland (L_4 as opposed to L_3 in Figure 2), where each will get a smaller share of the same fishing industry pie.[11]

If extra fishermen beyond the minimum L_0 needed to harvest the annual catch do not succeed in catching any extra fish because there are no more available to be caught, what is the sense of having the extra workers in fishing? If these workers who add nothing to production in the fishery could actually produce goods and services worth the Ontario wage elsewhere why don't we limit entry to the fishery to the necessary minimum (L_0 workers) -- all of whom are productive -- and let the

rest go elsewhere? As the same total earnings from fishing were divided among fewer people, average incomes in Newfoundland would rise from W_0 to F_0, the difference being the economic rent per fisherman in the fishery.

Although we do not recommend auctioning fishing rights to inshore fishermen, we can predict that if the total allowable catch of fish were auctioned off to a limited number of L_0 owner-operators of fishing boats, the typical price a fisherman would pay would be the extra income he can get from fishing instead of working at his alternative job elsewhere, say in Ontario. That is to say, he would pay (F_0-W_0) for his annual fishing rights. One problem with auctioning quota to fishermen who have access to subsidized unemployment insurance, is that the net benefits would get capitalized into the price of the fishing rights. If access to his share of fishing rights also gives him access to a net subsidy of $\$B_0$ per year in UI benefits, the fishermen would tend to bid up the annual value of fishing rights by this amount.

If the government wants to maximize per worker incomes in the fishery, it could give the fishing rights to the necessary minimum number of fisheren L_0 on a seniority basis (or it could use some other allocation rule) in which case the economic rent would be captured by these fishermen themselves and their average incomes would exceed what they would be paid in Ontario -- possibly by a wide margin.

Of course no one is going to argue that this one sector common property resource theory represents the Newfoundland of the real world. Nevertheless, this little theory does an excellent job of pointing out certain potential truths:

- To prevent incomes from falling in the long run, we are forced to look for job opportunities outside the fishery. The 200-mile limit and the discovery of unexploited fish stocks both apparently help to create jobs and income but they cannot maintain constant real incomes for a growing human population; and Newfoundland's population is growing.

- Subsidies to ease entry to the fishery and to subsidize fishermen's incomes apparently help disguise unemployment at the expense of making the industry and the region dependent on transfers, but they cannot prevent incomes from falling in the long run, unless they are steadily increased in size so that the degree of dependency chronically worsens.

- Transfers apparently create incentives that could reduce outmigration while increasing the amount of disguised unemployment.

- The value of production of marginal labour in the fishery might be zero.

. Reduction in the number of fishermen would apparently raise the earned incomes of the fishermen who stay behind. Incomes of fishermen could apparently be raised even above per worker incomes in other regions such as Ontario if entry to the fishery were limited because the fishery could then generate economic rents if those marginal workers who add nothing to the total fish catch were to leave the industry. Whether these economic rents should remain with private fishermen or be collected by government for redistribution more broadly is largely a political question, not a question of economic efficiency.

3.2 A Two Sector Natural Resource Theory of Economic Development

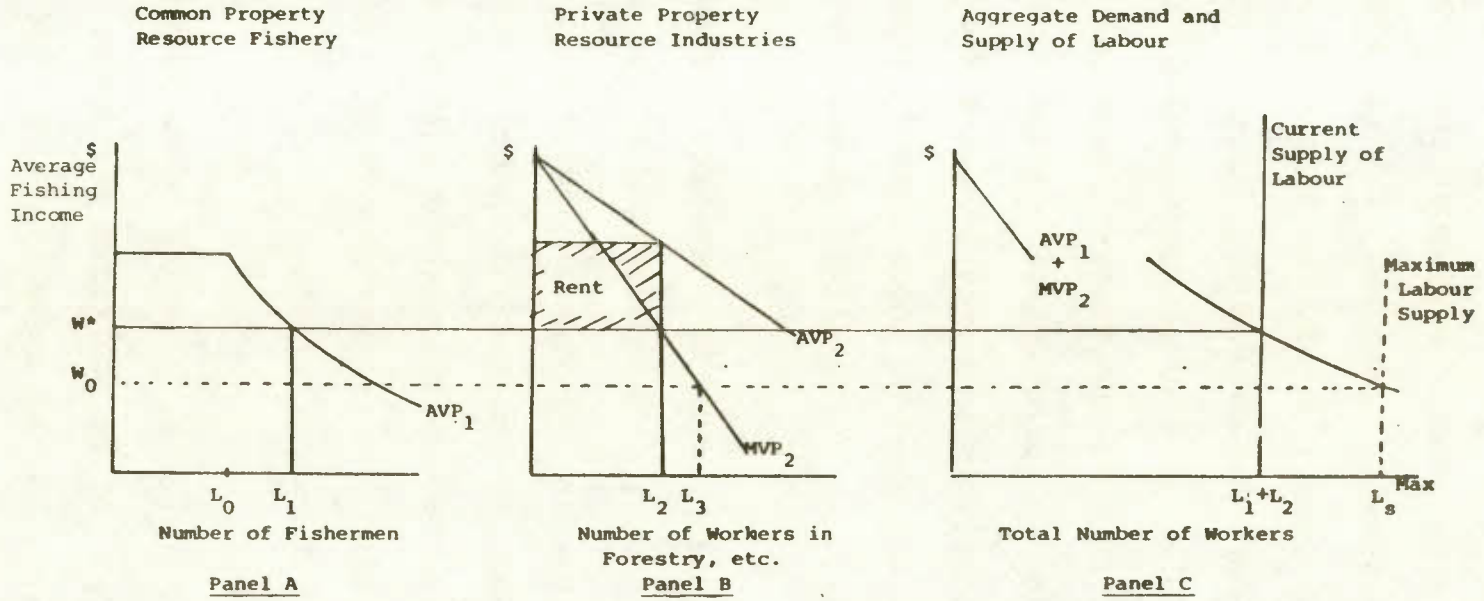
The prospect of forcing Newfoundland sons and daughters to leave the fishery and especially to leave Newfoundland is not pleasant. Even if they were enticed to leave by the prospect of earning good wages in places like Ontario, the out-migration solution posed by the one-sector natural resource theory of development is not a happy one in the eyes of most Newfoundlanders. Surely there must be something productive that these people can do in Newfoundland besides fish. There are other natural resources to be exploited -- forests, metals, hydro electric power and agriculture. Will they solve the problem in the long run?

Assume the fishery industry exists just as we have described it (in Figure 1). The new theory merely adds the other natural resource industries into the picture (Figure 4). Unlike the fishery which has historically been a common property resource where all persons have free access to the common fishery and catch what they can, the other natural resources have normally been transformed into private property resources, where the government has given private people or companies exclusive rights to tracts of forest, farmland, metal deposits and sites with hydro electric potential.

Normally private entrepreneurs will not allow any person to work in their natural resource enterprises unless that extra or marginal person actually increases the value of total output by at least as much as his own wage. This is in sharp contrast to the fishery where marginal workers only serve to lower the average catch of all the others, unless entrance to the fishery is limited. As a result, the demand for labour in these private property resource industries is determined by the size of the marginal value of output of that labour. As the amount of labour employed increases the marginal value of its output drops because of the Law of Diminishing Returns. Because the marginal product of labour will ultimately be falling as more labour is added, the average value of production of labour will be somewhat higher (Figure 4, Panel B).

Figure 4

A Two Sector Natural Resource Theory of Income Determination



Note: AVP_1 = average value product in fishing (average value of catch per fisherman).

MVP_2 = marginal value product of labour in forestry, etc. (the increase in total value of production by the last worker hired).

AVP_2 = average value of production of labour per worker in forestry, etc.

The aggregate demand for labour (AVP_1+MVP_2 in panel C) is the broken curve representing the total number of workers demanded by both industries simultaneously at any given wage or income level.

The total demand for labour in this economy is the horizontal addition of the average value product of labour in the fishery plus the marginal value product of labour in the private property resource sectors (Figure 4, panel C). The equilibrium wage -- where the demand for labour equals the supply of workers -- occurs at wage W* where L_1 workers stay in the fishery and L_2 workers enter the other natural resource industries. While all economic rents in the fishery are dissipated by overentry, the difference between the average product of labour and the wage in the private property resource sectors is the average economic rent earned by those natural resources (including quasi-rents on the capital invested in them).

These rents are collected by the resource owners. Part of these rents may be paid to the government if the agreements to assign these resources to the private sector made provision for it. Historically most of the natural resource rents in Newfoundland were intended to be captured by the private investors as a reward for having taken the risks of setting up the mines and woods industries in the first place.

Even in this kind of world, it still makes sense to limit entry to the fishery to L_0. While the extra fishermen ($L_1 - L_0$) do not increase the aggregate output of fish, they could increase the aggregate output of the other natural resource industries because there they will be paid a wage equal to the marginal product of their labour. If fisheries employment

were effectively restricted to L_0, the apparent aggregate demand curve for labour would decline, the wage would fall, employment and net output would rise in the private property resource sector by roughly the amount of the new wage times the number of workers who transferred from the fishery to the private property resource sector.

Economic rents would then appear in the fishery and they would increase in the other natural resource sectors. Average incomes for the province (including both rents and wages) would rise. Thus, if some of the natural resource industries like forestry, agriculture and mining are operated as private property resource industries, the fishery should still be operated according to the same rules in order to maximize incomes. Just as forest cutting rights and pasture grazing rights have been allocated to individuals in past, so too, fishing rights could be allocated to individuals and be restricted to the total allowable catch of fish. Just as we limit annual wood cutting and annual grazing to levels commensurate with the long run viability of these natural resources industries, so could we limit the annual catch of fish.

In the long run, however, the multi-sector natural resource economy has the same problems as our single-sector fishery economy. The population and labour force keep growing while the supply of natural resources stays fixed: so the wage has to keep falling to encourage the private property natural resource sector

to absorb more and more workers, each one of whom adds less and less to total output.

If the workers have the option of migrating to earn a wage W_0 in some other province, then outmigration puts a lower limit on competitive wages in Newfoundland and a ceiling on the labour supply ($L_S Max$) that will stay in Newfoundland. Extra workers will leave to get the higher wages elsewhere, rather than stay home and earn less -- providing they are mobile and providing job opportunities actually exist in Ontario at wage W_0.

But Ontario itself may be experiencing some unemployment at its own wage rate so Newfoundlanders will have trouble getting jobs there. That would bottle up labour in Newfoundland. Rather than accept wage cuts, workers in the Newfoundland forests and mines may unionize and refuse to accept wages below W_0. In that case, private property resource employers will refuse to hire more than L_3 workers. As the local labour supply continues to grow some of it will be forced to go unemployed, or to go fishing if there are no restrictions on entry to the fishery. If the fishery is the only place redundant workers can go, then average incomes in the fishery continue to decline. The marginal value product of labour in the fishery is zero, so earned incomes remain static as population increases. By using the common property fishery sector as a human shock absorber, unemployment both in Ontario and in Newfoundland can be disguised. If we

introduce unemployment insurance and gear subsidies into the theory again, they will have the same effect on this fishery sector as before.

At least this multi-sector theory offers more hope than the single sector one. Employment and incomes can be raised and transfers reduced not only by finding new stocks of fish; they can also be improved by developing forests, farms, mines and hydro dams or discovering oil, all of which provide incomes (in the form of wages, return to capital and natural resource rents) from natural resource exports.[12] Governments can foster job creation by creating transportation systems and other social overhead capital to assist the development of these new resources.

There are risks with this kind of theory. Governments may spend more on new infrastructure and give away more natural resource rent in concessions to natural resource developers than is economically justified in order to develop remote marginal natural resources whose time has not yet come. When labour is unemployed, authorities may be prompted to enter some unfortunate long term natural resource agreements in an effort to put the unemployed to work. As our next theoretical model shows, there may still be some other options -- outside the natural resource sector. It may be better to exploit them than try to force the development of sub-marginal natural resources.[13]

3.3 Natural Resources, Import Competition and Resource Processing

Natural resources are believed to be so important to Newfoundland because it is felt that they enable the province to have something to sell in return for the goods it imports -- everything from canned milk, lumber, vegetables and marine engines to bananas and chewing gum. What would happen to incomes and employment if Newfoundland tried to produce import-competing goods either for local consumption or even for export? (In fact, before Confederation in 1949 Newfoundland did produce its own dairy products, lumber, vegetables and marine engines.)

This new model simply adds a new private property tradable goods sector to represent most of those other groups of industries that advocates of the Staples Theory of economic development typically describe as "linkages" to the natural resource sectors. The first group of additional industries consists of the forward linkage industries that process local natural resource products such as fish plants, pulp mills and sawmills. The second group, called the final demand linkage industries, produce import-competing goods such as dairy products, vegetables, meat, and non-tradable items such as personal services and government services which cannot be imported but must be produced locally in the region. We shall leave the non-tradable sectors until the next part of this paper. The third group, the backward linkage industries, produces inputs needed by the natural resource industries, such as lumber,

cement, fishing gear, paint, marine engines, boats, ships, metal products, machinery repair.

If we abstract from problems of imperfect competition (local monopolies for example) these sectors will not hire a person unless he increases the value of output by as much as his wage. So again, the demand for labour is given by the marginal value product curve which is falling for two reasons: first, as more workers are hired to work with an existing capital stock of buildings and machinery and equipment, their output runs into diminishing returns; second, to sell more output in the local market, the price of the product has to be lowered.

Staples theorists argue that these linkage industries will exist automatically. After all, they point out, you cannot sustain a population of workers in a natural resource hinterland without providing them with food, shelter, fuel, entertainment, retail and personal services, and some government services such as police and fire protection and education for their children. As a result, there will be a natural resource employment multiplier at work. For every 10 natural resource jobs created, there will be something like two to nine secondary jobs created in these linkage industries. (These "multipliers" are based on the actual experience of natural resource-based communities like Wabush, Labrador; Fermont, Quebec; Thompson, Manitoba or Kitimat, British Columbia). The public relations departments of companies argue that natural resource industries have much larger multipliers than this).

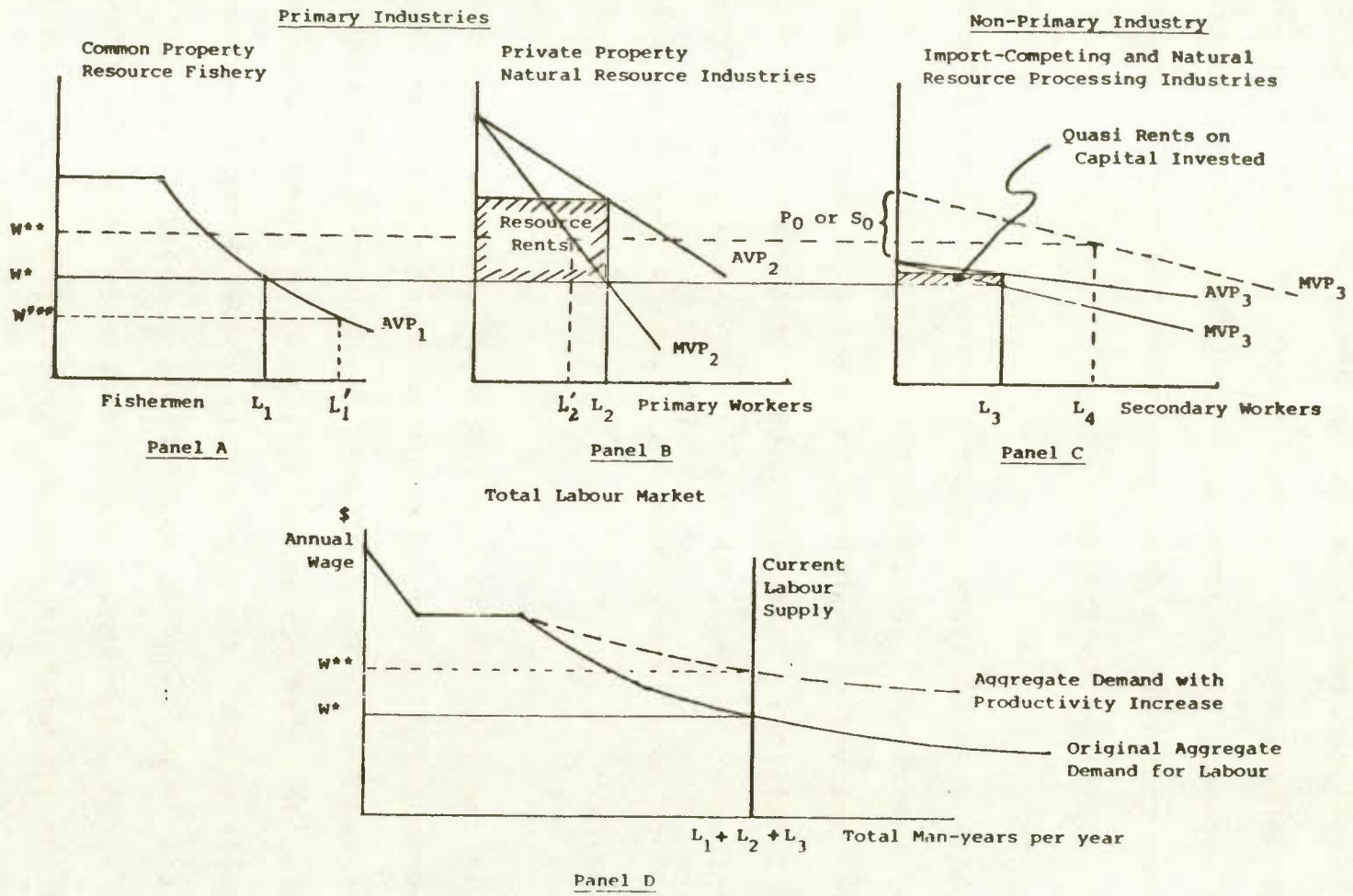
That theory is contradicted by the real world in some cases. Oil companies have pioneered new systems of transporting their labour forces to work sites on the high seas, in polar regions and deserts; some modern natural resources operations (such as the Rabbit Lake uranium mine in Saskatchewan) have been developed without any local service industry whatever. On the other hand, some well-located frontier communities like Sudbury develop an indigenous labour force and begin to realize productivity increases from agglomeration economies and returns to scale so that they begin to produce more and more local goods and services, some for export to other communities.

It is helpful to look at the non-primary sector as a continuum of activities which survive in the natural resource hinterland only when their local cost of production falls below the value of these same goods and services when imported, or when their local cost of production is below the cost of having the local population commute outside the region to consume these services elsewhere. The natural resource employment multiplier can therefore take on a variety of values.

Another way to look at it is to say that these goods and services will only be produced by local labour when the value of the goods and services produced by this labour is high enough relative to local wages (Figure 5). At wage W* the wage is right for some of the non-primary industry sector to be profitable and to exist. So long as the outputs from the natural resource

Figure 5

Income Determination with Primary and Non-Primary Industry



industries are valued at world prices, the difference between the average and marginal value products in this non-primary sector is not natural resource rent. Rather it is the quasi-rents earned by the capital invested in this industry. (Quasi-rents are the money that must be earned to cover the cost of replacing the capital stock in the long run.)

As the solid lines and wage level in figure 5 have been drawn, our theoretical economy looks very satisfactory. All the workers are employed at wage W*. As the labour supply grows wages will keep falling. That will make more and more production and employment possible in the import-competing, local processing sector. All sectors can still absorb more workers if wages decline.

In fact, at relatively low wage levels the demand for Newfoundland labour is probably quite elastic in the long run because Newfoundland workers can make end products for export using imported raw materials, just as other labour abundant countries do. The non-primary tradable goods sector may actually put a lower bound on how far wages could ultimately be depressed in a small economy. This sector uses materials (that can be either produced locally or imported) in order to create products that can be consumed locally or exported. Since this region is too small to bid up world prices for materials or to depress world prices for finished products, it should be possible to import virturally unlimited amounts of materials and to export

unlimited amounts of finished products at fixed prices. As long as some world products can be found whose outbound transportation costs are less than the inbound transportation costs of the materials by a margin wide enough to more than cover the costs of capital services needed in production, there is a margin left to pay a wage to labour. This is how countries like Hong Kong and Singapore employ large numbers of people by using imported raw materials instead of materials produced from local natural resources.

Again, though, the real world intervenes. There are forces that may prevent wages from falling enough for the import-competing and resource processing industries even to exist let alone expand. Wages may be held up at W** by labour union action and/or the forces of wage parity. Many of these secondary sectors are unionized in the rest of Canada and businesses cannot realistically expect to pay workers in Newfoundland only one-quarter or one-half what is paid for the same labour in Ontario.[14] In the interests of protecting their jobs in the centre of the country, workers in these unions would have an added incentive to unionize workers in Newfoundland and push for wages in Newfoundland that are on a par with Ontario.

What are those economic disadvantages? First, transportation costs on imported materials for use in local processing and import competition are high because Newfoundland manufacturers are located hundreds or even thousands of miles from their

nearest suppliers. Second, Newfoundland's domestic market is less than one-quarter the size of the city of Montreal; as a result, its manufacturers cannot achieve returns to scale or get volume purchase discounts as large as local manufacturers get in Montreal or Toronto. (Worse yet, the Newfoundland domestic market is scattered whereas Montreal and Toronto markets are highly concentrated.) Third, Newfoundland labour may be less experienced, less trained, less skilled and less educated for work in this sector. Fourth, the technology used in Newfoundland may be out-of-date. Fifth. local management may be less educated, experienced and effective than in Ontario. All of these disadvantages can be overcome to some extent by policies aimed at influencing them. See later in this text.

Natural disadvantages may not be the only things that keep the marginal value product of labour low in the import-competing and local processing sector. First, the United States imposes part tariffs on cooked fish but not on frozen cod blocks. Thus, the latent demand for fish products cooked in Newfoundland is artificially low. Second, transportation subsidies help reduce the cost of getting material inputs but they also reduce some of the natural protection import-competing goods would have in Newfoundland. So the net effect of transportation subsidies on the railroad and in trucking is mixed.

The impact of a wage level that goes no lower than W** can also be seen in Figure 5. Employment in each private property

sector settles at the point where the dotted horizontal line from W** cuts the solid MVP lines in Panels B and C. Employment in the private property resources industries drops from L_2 to L_2' and employment in the non-primary sector disappears altogether. The effect of this high wage is to rob the economy of both $L_2 - L_2'$ jobs in the private property resource industries and L_3 jobs in the non-primary tradable goods industries. Where will all these surplus workers go? In most economies we would simply expect them to be unemployed. But with a large open access fishery, (and especially with subsidies to help people buy boats and nets, and with a special fishermen's unemployment insurance program with benefits in excess of premiums paid to help supplement fishermen's incomes) some of these unemployed people will generally enter the fishery so that the number of fishermen rises from L_1 to L_1'.[15] The region's income will actually decline if the wage level rises from W* to W**. As workers are laid off in the private property resource industries and the non-primary industries where they had a positive marginal value product, they enter the fishery where they add nothing at all to the total amount of fish caught. They just end up sharing the catch among a larger number of people so that fisherman's incomes fall (to W*** in Figure 5) and a large income gap opens up between the wages in industry and the incomes in the fishery. The fishery ends up being a shock absorber that disguises unemployment in the regional economy at large as underemployment among the fishermen.

The result is pertinent for Newfoundland. Before Confederation, Newfoundland did have a manufacturing sector. Confederation helped foster wage parity with the mainland, it introduced transportation subsidies which made mainland goods relatively cheaper, and Newfoundland's custom duties on Canadian goods were removed. About three thousand manufacturing jobs in Newfoundland simply disappeared in the early 1950s. This put greater pressure on people to enter the fishery.

But if wages cannot be lowered enough to make it economic to hire Newfoundland labour in the import-competing and resource processing sector, there may still be a way out. Local jobs can be created by raising productivity up (if Newfoundland's productivity is unnecessarily low by reason of poor technology, low labour skills, or poor utilization of capital for example) or even by introducing a wage subsidy that makes local labour worth hiring. This would shift the marginal value product of labour (see dotted line in Figure 5) upward by the amount P_0 (a productivity increase) or S_0 (a permanent wage subsidy). The result would be an expansion of the aggregate demand for labour in Figure 5, Panels C and D. A productivity improvement is better than a wage subsidy, but a wage subsidy which creates jobs in the secondary sector is more productive than making the same outlay for unemployment insurance payments and gear subsidies which only induce more labour into the fishery where its marginal value product is zero.

The effect of a productivity improvement in the import-competing or natural resource processing sector in a fully employed economy would raise wages throughout the region (from W* to W** in Figure 5). It would also lead to an expansion in employment in the non-primary sector. The new jobs would be filled by drawing workers from the fishery and the primary sector. If wages are already up there (at W**) then the productivity increase will not change wages. It will merely create jobs (represented by L4 in Figure 5). A wage subsidy under these latter circumstances (financed by externally provided funds) would do the same thing.[16] We return to the productivity issue below.

3.4 Introducing the Service Sector and Home Goods

The theories introduced so far assume that all goods are "tradable"; that they can be exported or imported. Some services - like insurance - are "tradable" because a person can buy insurance from a company in another region or country. But most services - like retailing, education, health care, municipal and personal services can only be produced or consumed in the local region, so they always create a great deal of local employment. Buildings, roads and harbours are immobile goods that, once built, cannot be traded. They have to be built in the region where they are located. Hence these home goods or non-tradable goods also generate a lot of employment when they are built.

Adding this new sector to our theory only adds one more panel to Figure 5 and it only expands the aggregate demand curve for labour farther to the right in the labour market, so we do not bother to draw a separate figure for it. Suffice to say that it is a very large employer.

What is especially important about this "non-tradables" sector is that its level of demand for labour depends crucially upon the total level of purchasing power in the local economy. We hasten to point out that aggregate demand in Newfoundland is largely dependent upon personal and intergovernmental transfers. It is not limited to the final demand linkages of the natural resource industries which figure so prominently in the traditional staples theory.

Furthermore, the productivity of the non-tradable sector -- especially in construction -- affects the economic viability of the tradables goods sectors because buildings, roads and harbours and business services are major inputs to the fishing, natural resource and secondary manufacturing sectors. If factories are twice as expensive to build in Newfoundland because of low productivity in the local construction industry, some of the natural resource and secondary manufacturing industries that use those factories may fail to meet the competition in Ontario; as a result, local jobs that could have existed in those sectors are lost.

The demand for non-tradable goods and services therefore depend partly on the sector's productivity, but it depends even more on the size of the local population and on its purchasing power. Twice as many people need twice as many groceries, haircuts, and s hospitalization time. Anything that increases population or disposable incomes helps increase the aggregate demand for this home goods sector. We now see why transfers are so important to Newfoundland. When people spend their unemployment insurance cheques, or their gear and boat subsidies, or their family allowance and pension cheques, they create local employment in grocery stores, department stores, service stations and movie theatres. The more income transfers, the more local jobs created in the non-tradable goods sector. But again, the warning flag: the more transfers, the more vulnerable is the region's employment level to changes in government policy on transfers.

Worse yet, the jobs that exist in the provincial and local governments are in this non-tradable sector too. They are largely financed not by transfers to persons, but by transfers from the federal government. A rather frightening proportion of the jobs in Newfoundland may be directly dependent on a permanent flow of transfers. Newfoundland's greatest worry may not be that her fishery is overcrowded or that her fishermen are conspicuously collecting a few million dollars in unemployment insurance. They can probably survive without it. The big worry is that the bloated service sector comprised of government jobs and the entire retail distribution system is fundamentally dependent on

transfers. Many of the jobs of those workers in this tertiary sector who appear to be fully employed simply could not survive if transfers were taken away.

4. Productivity Improvement, the Export Base and Employment

4.1 The Natural Resource Sector

Optimists argue that increasing productivity probably leads to greater employment.[17] Pessimists remind us that productivity improvements may be costly and that they may have a labour-saving bias that will ultimately enable the regional economy to produce more output from the same endowment of natural resources while getting by with even fewer workers.[18]

Technical advance involves getting more output from a given set of inputs -- such as producing more pounds of fish fillets from a given amount of raw fish using the same amounts of labour and equipment. Or it could involve producing the same output for less input (the same amount of fish fillets using less labour, capital and/or less raw material). Technical progress could also involve getting a larger value of output from given inputs, say by raising the quality of the final product so it commands a better price. Automation does not necessarily imply technical progress in spite of the fact that it results in higher output per worker. Automating a fish plant to replace a large number of human fish cutters with a few fish filletting

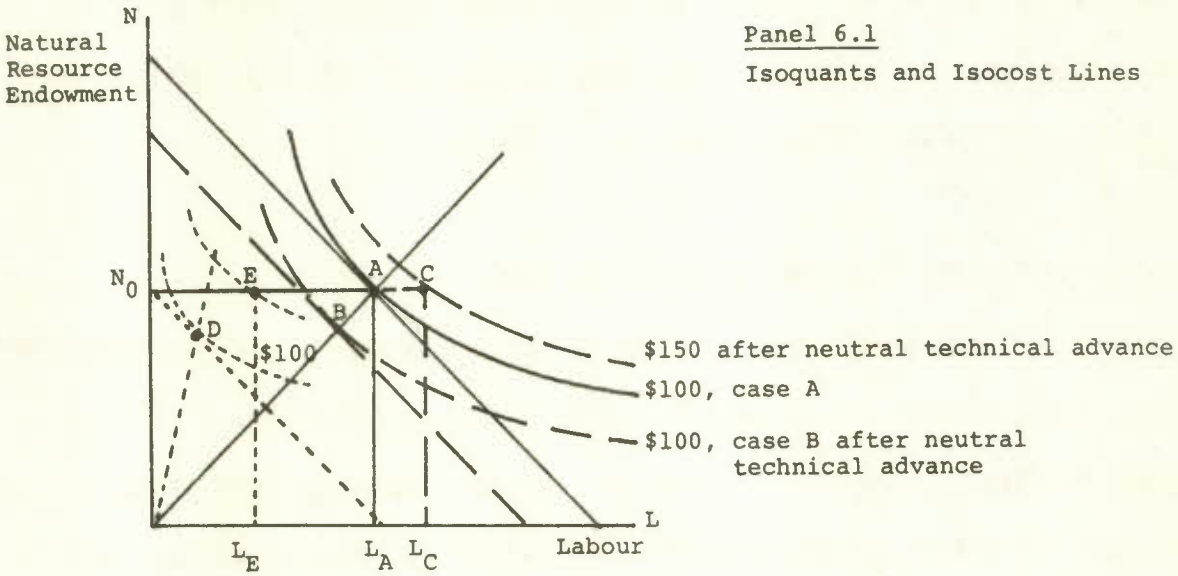
machines may actually lower output per dollar of capital and it normally does lower the amount of product recovered per pound of raw material. (The machines generally remove less flesh from the frame of a fish than human workers do.) Whether or not technical advance has occurred therefore depends upon whether more value can be produced for less cost, or greater value for the same cost (See Figure 6).

Suppose the region has a natural resource endowment N_0 (Panel 6.1) which generates a certain marginal value product of labour MVP_A (Panel 6.2) which, at the going wage W_0, justifies the hiring of L_A workers in the natural resource industry in order to produce $100 million worth of product.[19] Hicks-neutral technical advance involves producing more output from the same inputs, or the same output from less input in such a way that all inputs can be saved in the same proportion (see the movement from A to B in Panel 6.1).[20] This kind of technical advance is like an increase in the price of the final product (as might be engineered by an improvement in the quality of the product); it raises the marginal value product of all inputs (see broken line MVP_B in Panel 6.2) by the same proportion so the least cost combination of inputs remains the same if their relative prices are held constant (see broken lines at point B in Panel 6.1).

But with fixed wages, the technical advance causes the natural resource to become more valuable so it becomes profitable to use

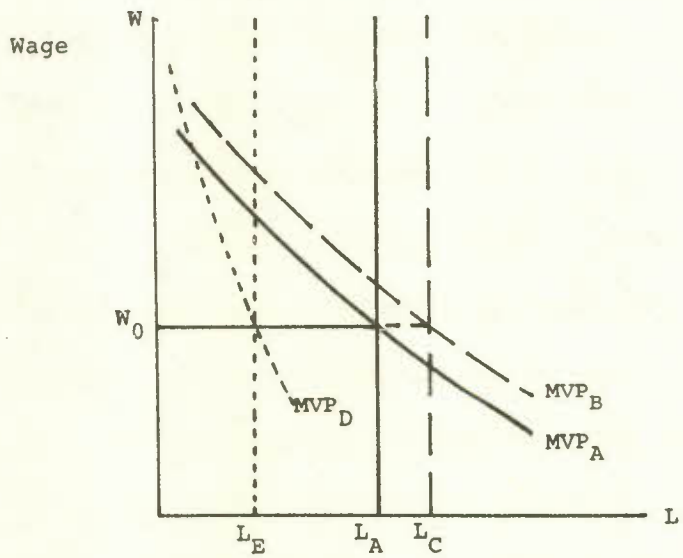
Figure 6

Productivity Improvements: Neutral and Labour-Saving Technological Advance in the Natural Resource Sector



Panel 6.1

Isoquants and Isocost Lines



Panel 6.2

The Demand for Labour

Key: ———— Original Situation
— — — Hicks-neutral Technical Advance
-------- Labour-saving Technical Advance

more labour so as to make better use of it. The demand for labour goes from L_A to L_C. Hence a Hicks-neutral technical advance or an increase in the price of the final product actually creates jobs in the natural resource industry at the same time as it increases the economic rents earned by the natural resources.[21] These additional jobs involve, for example, taking more time and care in handling, storing and processing fish to recover larger and better quality fillets. (That is why the Economic Council's recommendation No. 19 called for improving the quality of fish.) These kinds of jobs can also be created in the forest industries by means of integrated tree harvesting and processing to recover a larger portion of raw logs as lumber and to recover a larger portion of wood residues as pulp and paper (recommendation No. 20).

There is a risk however, that technological advance will be of a labour-saving variety (such as the movement from B to D in Panel 6.1) so that given the same relative factor prices, the same value of output can be produced with a much greater saving of labour than of natural resources. Then at the going wage and the new (much higher) value for natural resources, the entire endowment of natural resources can be fully utilized with much less labour, L_E, than was employed previously, L_C.

Technical change of this labour-saving kind undoubtedly occurred when the chain saw replaced the axe in forest harvesting, for example. Should policy makers have passed a law

against chain saws in the interests of keeping up employment in the forest? No. If they had, all the jobs in the region's forest industry would probably have been lost because technical advance in competing regions would have gone ahead anyway, lowering the price of wood products relative to national wage levels until Newfoundland's forest industry would have been unprofitable.

In the course of our studies of individual industries and the general economy in Newfoundland, we found evidence that average productivity of labour and capital was frequently lower there than in Ontario (or Nova Scotia in the case of fish plants), and we found evidence of large lags in the adoption of new techniques of production.[22] The fact that we also found instances of high productivity and early adoption of new technology in Newfoundland suggests that low productivity and technological lags are not inevitable for that economy. The empirical study by Swan and Kovacs presented evidence (to be discussed later in the labour market adjustment section of this paper) suggesting that productivity improvement actually has raised employment in Newfoundland, but their measure of productivity depended upon the use of a Cobb-Douglas production function which automatically assumes Hicks-neutral technical advance and cannot measure labour-saving technical advance even if it is present.

In this connection, however, some very interesting inferences about technological change in fish plants -- Newfoundland's

largest manufacturing sector in terms of employment -- are suggested by Professor Noel Roy and his colleagues[23] who fitted a generalized Leontief Cost Function which does allow non-neutral technological change to be measured. While the results are based on annual aggregate Newfoundland data for 1961-77 (and not on a large number of individual establishment-level observations as one would prefer), they do suggest that non-neutral technological advance of a labour-using, capital-using and materials-saving nature has occurred over this time period. Rather than laying workers off, the results suggest that technical advance involved a move toward larger plants to take advantage of returns to scale (which evidently exist in fish processing) and to use more labour and more capital equipment to produce more usable product from the input of raw fish.

The results also suggest that, whereas the demand for labour is inelastic in the short run, there is also substantial opportunity to substitute other inputs in place of labour. Without implying that the measures are precise or highly reliable, the author's results suggest that a 1 per cent increase in the wage rate would result in a 0.8 per cent decline in labour input which causes a 0.3 per cent increase in the demand for raw fish to be processed with the help of 0.6 per cent more machinery and equipment driven by 0.9 per cent more fuel and electricity.

On the other hand there is a suggestion that a one per cent rise in the price of raw fish would reduce the demand for it by 0.3 per cent while raising the demand for labour by 0.7 per cent, lowering the demand for machinery and equipment by 0.2 per cent and reducing the amount of fuel and electricity needed. The labour-intensive process of getting better recovery rates of product from the more valuable raw fish input creates employment and reduces the need for machinery, equipment, fuel and electricity.

If the general nature of these results are borne out by further research, we may conclude that technical advance in fish plants has generally helped generate employment in a vital sector in the Newfoundland economy while helping the province conserve one of its most important natural resources. It implies that the Economic Council's recommendation of full competitive market pricing of the raw resource (through a system of transferable landing rights) may encourage employment creation, and that subsidies to reduce the cost of installing machinery and equipment in fish plants may cause a substitution of capital to replace labour. If subsidies are to be used to assist fish processing, it is labour subsidies, not capital subsidies that will create employment. The Council generally recommended the removal of subsidies to individual industries. However, for older immobile workers it did recommend a wage subsidy that would be phased out as this generation of workers gradually left the labour force.

In conclusion, both neutral and labour-saving technological advances occur from time to time in the natural resource-related industries. The labour-using and neutral advances create employment and are welcome. The labour-saving ones must be accepted if even larger employment losses are to be avoided in the long run. We are not arguing that technological advance should be subsidized, but any region that makes no effort to seek cost-reducing technological advances to keep up its competitive position with the rest of the world is endangering its natural resource jobs and collecting less natural resource rent than it might otherwise earn.

4.2 The Non-tradable Home Goods and Service Sector

Professor Flatters has devised a rather ingeneous and sophisticated model that does a good job of explaining the gut feelings of a lot of policy makers who continue to feel that in spite of the fact that the vast majority of jobs in Newfoundland are not in the export industries, that somehow everything in the end is driven by the natural resources and that productivity advance is a potential threat to employment. Professor Flatters argues, with good justification, that wages in Newfoundland are largely set by institutional forces emulating wage levels outside the region and that Newfoundland's economy is really made up of only two sectors, natural resource-based export industries and non- tradable goods and services. His model fits the popular (and realistic) conception of Newfoundland as a region of fish

plants, newsprint mills and iron mines with a bunch of retail stores used to distribute imported consumer goods to a small and scattered population. The export industries create incomes in wages, some profits for local capitalists and some tax revenue. These in turn enable local citizens, businesses and the provincial government to buy a certain volume of import goods. Net transfers from the federal government to local persons and to the provincial government enable the region to pay for still more imports. The region's gross income of export and transfer income creates a demand for non-tradable goods and services such as construction (of retail stores and government buildings), retail services and government services along with the demand for imports.

Some people seem to go one step further to imply that the export jobs are "good" jobs (because they generate the income that pays for tangible imports) and that service jobs (like grocery retailing) are "not so good" (because they only exist vicariously to distribute the imports to the population).[24]

In this kind of world, all regional employment is firmly bolted to the limits of the natural resource base -- augmented by supplementary handouts, of unemployment insurance, family allowances and equalization payments from Ottawa. The model solves sequentially: because wages and the rate of return on capital are determined elsewhere in Canada, independently of supply and demand in Newfoundland, the most economic combination

of capital, labour and natural resources in the natural resource sector is determined without any reference to local supply and demand of anything except the natural resources themselves (see appendix). Having determined the most economic combination of labour and natural resources, the employment, output and export earnings of the natural resource industries are determined by the supply of natural resources. If we think of consumers dividing their incomes up into certain proportions to be spent on importable goods and non-tradable goods and services, then the total demand for non-tradables is limited by the balance of payments constraint. The spending on retail services and other non-tradable goods is constrained to bear a fixed relationship to the size of imports, and imports are constrained by the size of export earnings plus transfers. To the man in the street it is intuitively obvious that you cannot create more retail service jobs in Newfoundland if you cannot get more imports to sell by virtue of the fact that people's incomes are limited by export earnings and UIC payments. Nor can you create more service industry employment like jobs for garage mechanics unless you import more cars for them to repair and maintain.

Now, what about technical advance in grocery stores (or some other non-tradable sector)? The replacement of local outport grocery stores with regional minimarts within commuting distance of rural people saves both capital and labour and uses some extra gasoline for commuting. If total costs are lower and service is better at the larger store, it will survive in the long run and

the little stores ultimately will not. Because this sector does not use natural resources, -- only labour and capital whose prices are pegged by external forces, -- there is no tendency to substitute more labour in place of other factors in the same way that there was a move to substitute labour for natural resources in primary industry (Figure 6). In this case, productivity advance is liable to be devastating to employment. If the demand for non-tradable home goods and services is limited by the volume of imports (or some function of local income) then either technical advance in the home goods sector will have to be biased in favour of using more labour at going factor prices, or the demand for home goods and services will have to be readily substitutable for imports and the demand for home goods and services must be very price elastic if technical advance in the home goods sector is to avoid causing unemployment in this sector.

Within his model, Professor Flatters has established that a variety of kinds of technical advance can be relied upon to increase the level of employment -- especially if the technical advances occur mainly in the natural resource export industries, especially if they are not labour-saving technical advances, and especially if home goods and services are easily substituted for imports. There is a genuine possibility however, that labour-saving technical advances like chain saws, fish-filletting machines and self-serve retailing will increase unemployment.

How appropriate is the characterization of Newfoundland as a wage-taking export base economy with no import competing sector? First it automatically implies that unemployment can be solved only by out-migration if the supply is too large relative to the natural resource base. It is not much of a problem as viewed by a theoretical economist, but it could severely limit the perceptions of policy makers. The theoretical economist can visualize import-competing industry as being included with exports in a tradable goods industry whose output is partly consumed locally and he can imagine a high elasticity of substitution between imports and home goods to portray the fact that local import-competing industries can arise. But the policy maker who conceptualizes the Newfoundland economy as a group of retailers living off the proceeds of exports and unemployment insurance may be tempted to put extraordinary stress on natural resource industries and federal transfers to create jobs because he sees no other policy tools to turn to. There is a danger that bad bargains will be struck with natural resource developers in an effort to get jobs created and a danger in preventing the introduction of new technology. The unhappy history of Newfoundland's economic development by means of large natural resource development schemes in the postwar period suggests that policy makers did indeed push for natural resource developments under unfavourable and sometimes uneconomic terms.

4.3 Migration of Surplus Labour from the Export Base

We shall return to the empirical and theoretical issues of migration later in this paper when we take up labour market adjustment mechanisms in detail. For the moment we will merely complete our discussion of the Flatters two-sector export base model by examining its implications for migration policy in contrast to the simpler export base models that treated the entire provincial economy as one or more natural resource industries and nothing else.

It goes without saying that the author has no intention of suggesting out-migration as an economic policy. Ever since the days of the Resettlement Program (in which a government program to help people voluntarily move from smaller islands in the 1950s became a more coercive program in the 1960s designed to close down smaller outports and move people to larger centres where public services could be provided more cheaply) and an economist's suggestion[25] of a population policy (to reduce the province's population relative its natural resource base, so as to raise incomes) Newfoundlanders have had a paranoic fear of both economists and migration policy. Amongst economists and policy makers, the perceived usefulness of migration as a tool to raise incomes and reduce unemployment depends very much on which theory they hold dear. The empirical evidence about the effectiveness of migration in reducing unemployment is not at all clear.[26]

In a simple natural resource theory of economic development, (Figures 1, 2, 3 and 4) migration is clearly seen as a way to get rid of surplus labour. With fewer workers exploiting a fixed stock of natural resources like fish, average incomes will rise (Figures 1, 2, 3). With wages determined by forces outside the region, there is a distinct limit to the number of workers that can be employed in mines or forests. All other workers are in surplus and must migrate out to other regions to find gainful employment. That this out-migration might reduce local employment in non-primary industry was largely overlooked because it was implicitly assumed that the few service jobs were tied directly to serving the families of the workers in primary industry -- much as cooks constitute the service industry in a lumber camp.

In the more sophisticated neoclassical export theory of Professor Flatters, out-migration is implicitly still the ultimate solution to the unemployment problem because the natural resources endowment (and fixed wage rates) determines a finite volume of exports (and employment) which, (given world prices and transfers) implies a fixed volume of imports which (given a finite elasticity of substitution between imports and home goods) determines a fixed demand for non-tradable home goods and services, which (given fixed wages and rates of return on capital) imply a fixed number of jobs in the non-tradables sector. There is still a finite number of cooks in the lumber camp.

The more sophisticated model, however, recognizes the role of income transfers from outside the region -- either as transfers from the federal government or as external borrowing by the provincial government, local businessmen or local consumers. To the extent that people in the region have more to spend, they will not only buy imports; they will buy additional non-tradable home goods and services as well. When we recognize that transfers are a function of the number of unemployed, the level of income per capita and the size of the region's population, we discover that out-migration loses some (or all) of its power to reduce measured unemployment. When an unemployed worker who was receiving unemployment payments and family allowances leaves Newfoundland for a job elsewhere, he may take his family and its purchasing power with him. Hence there are fewer people needed to sell groceries and provide services in Newfoundland. Out-migrants take some service sector employment with them when they go.[27] (Still, when such a worker moves from being unemployed in Newfoundland to being employed elsewhere, the total burden on the unemployment insurance system is reduced and the aggregate volume of production of goods and services for the nation is increased by the value produced by the worker in his new job.)

While some transfers are exogenous, most are not. Unemployment insurance benefits are essentially a function of the number of persons unemployed or the number of jobs and the population of persons amongst whom those jobs are shared, both of which are

positively related to total population of the region. Equalization payments are indirectly related to the difference between regional and national per capita income and, once the per capita "entitlement" for equalization payments has been established, the payments themselves are directly proportional to the region's population. Family allowances, established program financing for shared cost government programs and other government transfers are essentially a function of the region's population.

A formal model of transfers as functions of unemployment, income per capita and population reveals that exogenous out-migration could actually make measured unemployment worse under some circumstances (see appendix). Out-migration will be less effective at reducing measured unemployment if

- output per worker in the home goods and service sector is low,
- the share of income spent in the home goods and service sector is large,
- the proportion of population employed is low,
- the elasticity of labour supply with respect to the availability of jobs is low,

. direct transfers (like family allowances and direct government spending) predominate over equalization-type transfers.

These are worrisome conditions: our industry studies based on personal interviews by our own researchers show output per worker in the service industries is low in Newfoundland; the share of income spent in the domestic service sector in Newfoundland is large because it has a large service sector of government and retailers relative to the tradable goods sector; Newfoundland is famous for having a low share of its population employed and it is famous for having large transfers under family allowance and -- most important -- large net transfers under shared cost program financing and provincial government borrowing. These are precisely the conditions for destroying the efficacy of out-migration as a tool for reducing the level of measured unemployment.

The only aspects of Newfoundland's economy which tend to augment the power of out-migration to reduce measured unemployment are the equalization payments program and the responsiveness of its labour force participation rate to job creation. With out-migration, employment falls in the home goods sector which discourages workers from looking for jobs. Hence out-migration as an unemployment policy for Newfoundland has its biggest effect in disguising the unemployment as discouraged workers, not in solving the unemployment problem in a fundamental way.

To break the iron link between the natural resource base and the level of employment in a market economy without using external income transfers or wage cuts to do it, one needs a tradable goods sector that can use imported raw materials if necessary and which can sell its goods and services to local people in place of imports or export them to the rest of the world. Whether or not such a non-primary tradable goods sector exists in Newfoundland is debatable. Virtually all its exports are natural resource products although some Newfoundland-based companies do sell shipping services, airline services, insurance and fishing trawlers (with subsidies) to customers outside the province. At the same time some engineering, marine repair and limited manufacturing is done in St. John's in competition with firms in Halifax and Montreal so it is difficult to argue that import-competition is non-existent or that local import competition could not expand (and even export ultimately). The greatest current hope for employment creation in this import-competing sector is by way of spin offs from the Hibernia oil discovery. The histories of the rather isolated and originally unimportant cities of Houston, Calgary and Aberdeen show that a great deal of local industry can be spawned in an urban location near an oil field if it has good transportation, communications, and technical facilities. Over the life of the local oil fields these urban centres develop import-competing industries that adapt and innovate to serve the local oil industry. As local oil production declines, these innovative industries begin to export their products and expertise. Some

Economic Council members believe that St. John's -- with its labour force, marine skills, university, airport and local harbours will have an opportunity to become a leading world centre in cold ocean petroleum industry skills and technology -- the idea behind the Council's recommendation No. 8. To encourage the creation of these jobs, the productivity improvement and technological advance in the import-competing, non-primary tradable goods sector is important.

Given this multi-sectoral view of the Newfoundland economy and the way in which productivity improvement might offer some long run hope for increasing employment without resorting to substantial out-migration, there is -- political issues aside -- some doubt about the usefulness of out-migration as an economic policy, especially when out-migration itself would tend to reduce employment in the home goods sector. A look at the actual data on migration raises more doubts.[28] A large proportion of the native-born out-migrants come back again. Boadway and Green conclude from 1971 and 1976 census data that there are several distinct kinds of migration going on simultaneously and that this human capital exchange does not appear to be unfavourable to the Newfoundland economy.

Many native-born Newfoundlanders with high school education (and frequently with some vocational training as well) leave Newfoundland in their late teens and early twenties, primarily for Ontario, but also for the Maritimes, and increasingly for

Alberta. They take few children with them -- only about 15 per hundred out-migrants. Some of these Newfoundland-born migrants stay in the rest of Canada where in 1971, they had a very high labour force participation rate (85 per cent for males compared to 77 per cent for males in the rest of Canada), where they initially earned incomes that were larger than their counterparts in Newfoundland and where their incomes tend to rise still more relative to other Canadians as time passes. The remainder of these Newfoundland-born out-migrants return to Newfoundland, making up about half the gross in-migration to that province. They do not bring many children with them, they tend to take some reduction in incomes to come home, their male labour force participation rate falls to about 79 per cent and they experience a higher unemployment rate than local Newfoundlanders who never left the province (largely because the latter have a participation rate of only 64 per cent.)

Those in-migrants to Newfoundland who were born elsewhere tend to be older, in their late 20s and early 30s, to have more education, and to experience larger incomes and lower rates of unemployment than if they had stayed in the rest of Canada. They tend to move in family groups, bringing about 30 children per hundred migrants with them. They continue to earn high incomes if they stay beyond five years, but evidence suggests that many of them stay in Newfoundland for a relatively short time before returning to the rest of Canada without any increase in income.

This migration pattern suggests that there is a relative surplus of young high school educated, native-born Newfoundlanders, some of whom find better job opportunities in the rest of Canada, and that there is a relative shortage of highly educated and highly skilled people in Newfoundland -- a shortage that is made up by drawing such workers from the rest of Canada. While first-time migrants experience an increase in relative income which continues to grow if they stay beyond five years, back-migrants in both directions appear to be returning home for non-economic reasons. Hence gross in-migration to this low income, high unemployment province is explained partly by back-migration, and partly to overcome a skill imbalance that exists in the Newfoundland labour force. Back-migrants to Newfoundland apparently earn less and face more unemployment than if they had stayed in the rest of Canada, but they do have fewer children, more education, more income and a higher probability of being employed than the resident population of Newfoundlanders who stay home. They have more work experience than the very young Newfoundlanders who leave. They therefore act to raise the skill and income levels of the Newfoundland labour force.

In the face of this complex and apparently beneficial migration experience, and being mindful of back-migration and the anguish associated with government-encouraged migration, the Economic Council recommended that the migration mechanism be left alone -- that migration should neither be encouraged nor discouraged, and that such policies as may be influencing migration should be reviewed with a view to removing implicit migration incentives.

5. Some Thoughts on the Theory of the Firm

Texts on economic development often stress the importance of capital per worker in raising the productivity of the economy -- both physical capital in the form of machinery and equipment which might have productive new technology embodied in it, social overhead capital like roads, schools, hospitals and port facilities, and human capital in the form of general education, and experience among the labour force of production workers, managers and public servants. In underdeveloped countries and underdeveloped regions, one hypothesis is that market imperfections discourage or prevent investment in these places. The resultant capital shortage reduces the opportunity to adopt the technology embodied in new capital equipment, and it lowers labour productivity, thereby reducing both incomes and employment. Texts on international trade, microeconomic theory and economic growth also stress the role of capital relative to labour.

Following these texts one would expect to find ways to raise average product per worker in Newfoundland by increasing the physical or human capital per worker or upgrading the technology. But when we looked at the data we found the value of physical capital per worker in Newfoundland is already very high by comparison to the national average.[29] When we personally interviewed several hundred businesses in Newfoundland and Ontario, we confirmed that Newfoundland has a lot of capital

per worker -- both in the form of large inventories and fixed assets in such industries as construction, bakeries, hotels, wholesale establishments, grocery stores, insurance agents and fish plants.[30] While we frequently found evidence of a lag in the adoption of new technology in Newfoundland by comparison with Ontario, and we frequently found evidence of less education and experience in the Newfoundland labour force, the education, experience and business management factors did not have statistically significant effects on our measures of productivity, although there was sometimes a high correlation between firms with well-educated management and the presence of modern technology and high productivity, notably in the industrial construction industry.

The most powerful influences on productivity we found are the rate of utilization of factors of production and the nature of business organization -- whether the establishment was itself an independent business, a cooperative, or part of a multi-divisional or multi-national corporation. We also found the scale of plant and the nature of technology were important in some industries and that labour substitutes for materials, especially in fish plants.

Our findings do not refute past theory; they merely cause us to focus our attention on unexpected parts of it. But this change of focus leads to very different policy prescriptions. Rather than concentrate on market imperfections that inhibit investment

in physical capital we find ourselves searching for ways to organize the province's economy so as to enable individual establishments to make use of lower cost scales of plant and to achieve high rates of utilization of those facilities once they are established. Good location of business and government services so as to shorten supply lines and to reach as large a local market as possible becomes the key to higher productivity and lower cost. Larger markets for the individual establishments and higher rates of utilization allow a greater degree of specialization and make it more economic to introduce newer technology.

The superior performance we generally observed among multi-establishment organizations (chain stores for example) by comparison with independent establishments stem, we believe, from several factors. Multi-establishment organizations have more knowledge of performance possibilities because they have intimate knowledge of the several establishments (sometimes hundreds) under their control. They can spot poor performance by comparison -- an option not so readily available to the management of an independent establishment. Partly for this reason the Economic Council recommended the creation of an advisory council on industry performance that could be a vehicle through which confidential interfirm comparisons could be made so that independent businessmen could learn more about performance in their industry.

There are also economies of scale in business organization that are separate from the economies of scale at establishment level. For example, our data suggest that there exists an optimum size for a grocery retail store (in the neighborhood of 20,000 square feet of selling space) at which the economies of scale are exhausted for the individual establishment. The grocery chain which owns that store can, however, continue to reap economies of scale at the enterprise level by obtaining discounts on merchandise purchased for a large number of stores and it can spread overhead costs for head office functions, advertising and warehousing over many establishments. Such an organization can also spread the risks of innovation by experimenting with new technology in one establishment at a time without endangering the cash flow of the entire enterprise. On the policy level, it should be recognized that multi-establishment organizations can be effective at raising the performance of the regional economy and they provide increased career scope for the local people they employ. That is not to say these organizations pose no concern of monopoly power or that the profits they generate might not be transferred out of the region as easily as they transfer investment funds in.

The theory of the firm that summarizes our interpretation of the establishment data that we collected in Newfoundland, Ontario and Nova Scotia can be summarized in a general production function: the establishment's output X, can be represented as a function of capital K, labour L, materials M, technology T,

labour quality Lq, the scale of establishment operation S, the rate of utilization of the establishment's facilities U, and the nature of business organization Or, so that

$$X = F(K,L,M,T,Lq,S,U,Or).$$

When the factor prices of capital, labour and materials are taken into account, this production relationship implies a certain long run average cost of production for the establishment (see LAC in Figures 7.1 and 7.2). Once the establishment has been built so that its capital stock, technology and scale of plant become fixed at K_0, T_0 and S_0, its short run average cost of operation becomes more circumscribed because only labour, labour quality and materials are still variable (see SAC in Figures 7.1 and 7.2).

In some industries such as grocery retail stores and fish plants we found evidence of increasing returns to scale implying that average cost per unit of output falls and value added per worker rises as the size of the establishment increases, up to a point (Figure 7.1). In other industries such as industrial construction there was not evidence of increasing returns to scale so we presume the industry is characterized by constant returns to scale (Figure 7.2).

Figure 7.1

Average Costs of Operating an Establishment When Increasing Returns to Scale are Present

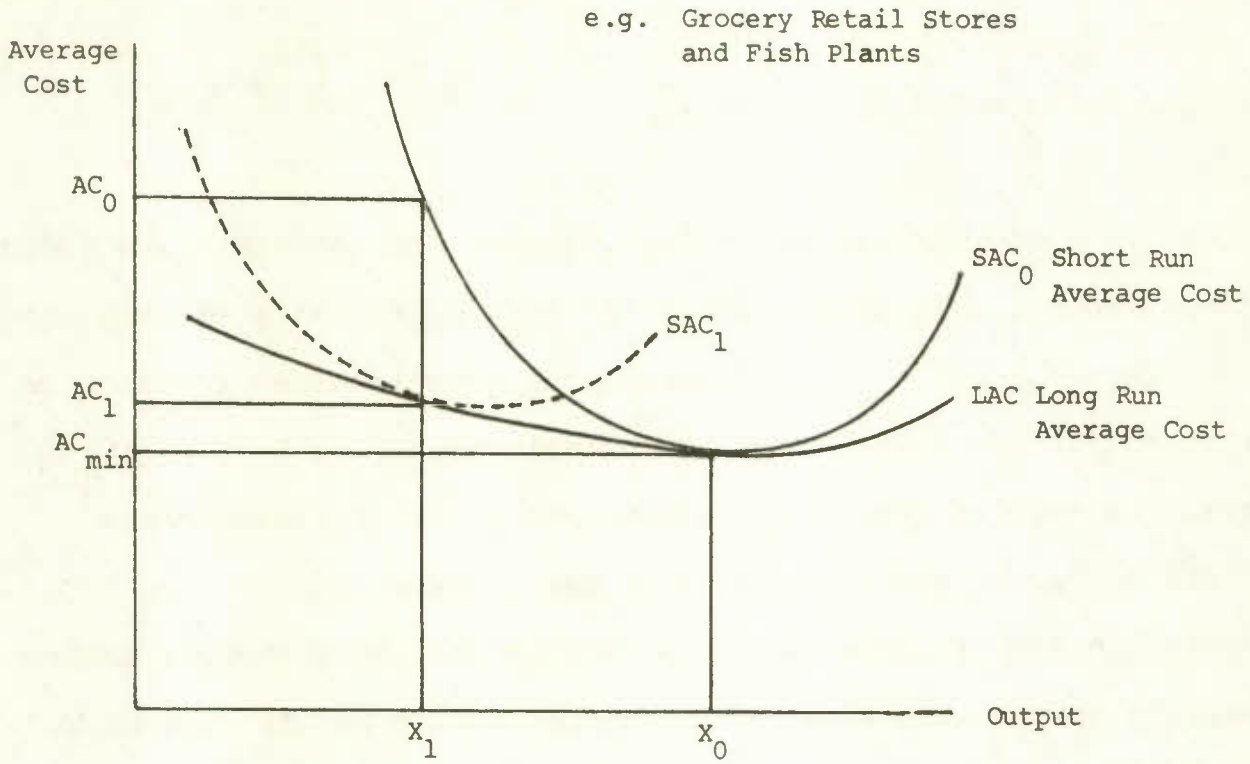
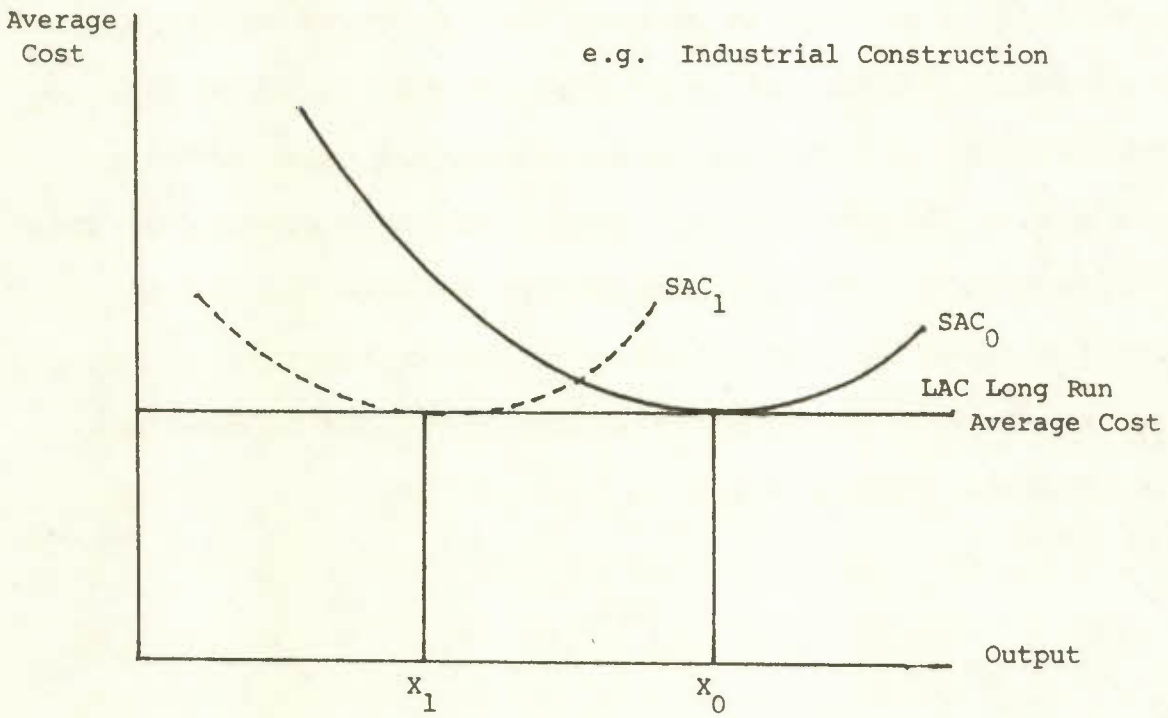


Figure 7.2

Average Costs of Operating an Establishment Constant Returns to Scale Industry



Whereas there is something to be gained in some industries by choosing a scale of plant that has the potential to produce at lower long run average cost, our data suggest that Newfoundland establishments suffer to an even greater extent from producing much less than their design capacity in the course of a year -- in short, by having a low utilization rate. In Figure 7.1 the scale of plant that could produce at highest productivity and lowest average cost in the long run would have to be designed to produce X_0 units of product and have a short run average cost curve SAC_0. If these establishments were then operated at a level of output like X_1 which is much less than its design capacity, its average cost of operation would be AC_0 which is much higher than long run minimum average cost AC_{min}, and will be even higher than could be achieved by a smaller plant which is designed to produce output X_1, in the first place (see SAC_1).

In Newfoundland, we found some evidence of both problems: smaller scale establishments than could produce at long run minimum average cost and small rates of utilization of existing plant. Poor utilization rates were usually the most serious problem. Generally it is necessary to search for locations and transportation systems that will increase the size of market served by the establishment to achieve higher utilization rates, but good location is not the only solution. Seasonality is often the culprit. We found that fish plants for example were, on average, larger in Newfoundland than in Nova Scotia, they

employed more capital per worker and paid lower prices for raw fish, yet ended up lower value added per man hour, largely because they operated at less than full capacity or were closed for a larger number of weeks per year. By one calculation the larger scales of plant gave Newfoundland a productivity advantage of 16 cent per man hour which was more than offset by a 90 cent per man hour disadvantage through a lower average utilization rate.[31]

Our studies of business establishments, of the fishery and of the labour market suggest that institutional factors, notably fishermen's unemployment insurance and regionally extended unemployment insurance benefits may be involved in explaining the very short operating season of fish plants and construction firms, for example.[32] Policies to lengthen the working season may be facilitated by changes in these social programs.

In summary, our policy prescriptions for productivity improvement after having done the study are rather different from what we had expected. While increasing the amount of capital per worker does raise value added per worker as one would expect, there is no evidence of a capital shortage that needs to be overcome. Rather, the gross output (sales) and net output (value added) per unit of labour, per unit of capital and per unit of materials all tend to be low in Newfoundland (but not for all establishments and not for all industries). The most powerful ways to raise productivity have to do with scale of plant and utilization rates which can be most easily be influenced by <u>where</u>

one locates the establishment and how one organizes its seasonal work pattern. These factors are to some extent more easily influenced by governments than by individual businessmen. It is governments that build the roads, harbours, and other social overhead capital and which grant permission for the location of shopping centres and industrial parks. It is governments that establish institutional arrangements like fishermen's unemployment insurance and regionally extended unemployment insurance benefits that may influence seasonality. As the major client of the construction firms in Newfoundland, governments have an opportunity to influence the seasonality of this industry directly. Whereas, we had expected to find that productivity improvement in business establishments would be essentially a matter of improving business management (adopting better technology, getting better control over inventory and accounts receivable, reducing labour turnover, etc -- which would indeed help) we were surprised to find such a big role for government in the productivity puzzle.

Originally we thought Newfoundland with its half million people scattered among 700 outports was too small and scattered a market to take advantage of returns to scale or high rates of utilization. But on looking closely at how its economy had evolved since the advent of the network of roads installed on the island since 1965, we discovered that a small number of urban centres had evolved into service centres without forcing the demise of the small outports where many people continue to live. People,

previously isolated in dozens of little fishing villages on a major peninsula, accessible only by coastal vessel, are now linked by road to the same urban centre. They now commute to these urban centres (which may serve as any as 25,000 or 50,000 people) both for employment and for goods and services. Although the urban centre may be as small as 3,000 people,it may contain businesses that need markets of 25,000 people to survive. Hence the new pattern of economic activity brings goods, services and employment opportunities within commuting distance of people who hitherto lived largely in a subsistence non-market economy. Our policy prescriptions for productivity improvement and the creation of new paid employment therefore centre on the development of urban centres within commuting distance of rural people.

It is vital to point out that the pattern of economic activity can change without fundamentally altering the pattern of settlement. After the unhappy attempt in the 1960s to resettle people from smaller communities into larger ones, Newfoundlanders now have a profound phobia about "resettlement". In the past decade however, it is apparent that economic activity in the larger urban centres has continued to grow, employment has increased, especially in the service sector, and outports have continued to exist.

6. The Labour Economics Approach

The neoclassical synthesis presented so far has identified the problem of unemployment for people who could not find a way to enter the fishery. But the only cause of unemployment we have suggested so far was that of having wages that were too high. In reality there would be some unemployment even if all workers could increase output by as much as the going wage. Some unemployment is normal as workers move between jobs, as they move in and out of the labour force, and as some businesses close down and others start up. In addition to this frictional unemployment (which is usually defined as being less than three months duration) and structural unemployment (when a region finds itself with a labour force whose skills are no longer suitable for the industry job openings available so that retraining is necessary) there can be a great deal of seasonal unemployment when fish plants, construction projects, trucking and other industries lay workers off at the end of the season. (Our evidence however shows that most of the seasonal workers stop looking for jobs sooner or later, in effect leaving the labour force as Statistics Canada defines it, until the next season.) We also find that wages are rather inflexible, that is to say they do not fluctuate much in the short run because collective agreements are in force and because employers find it advantageous to avoid short term fluctuations, especially to avoid the damage to morale caused by wage cuts. Because of inflexible wages, there can also be cyclical unemployment generated by downturns in the business

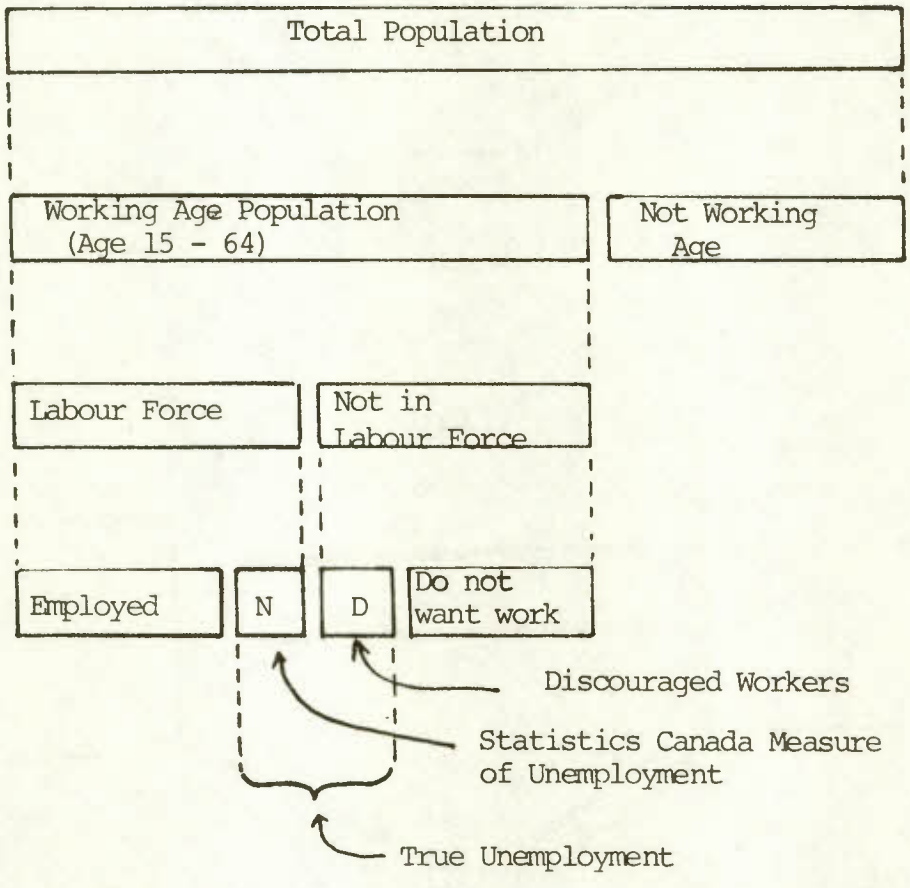
cycle when the demand for products declines and employers lay off workers for indefinite periods.

Among the people in the working-age population, the actual flows of workers among the three states of "not in the labour force", "employed" and "unemployed" are proportionately larger in Newfoundland than in Canada as a whole (see Figure 8 and Figure 9). Of the working-age people in Canada, 55.3 per cent held jobs in March 1978 and only 6.0 per cent of them were unemployed (out of work and actively looking for a job). In Newfoundland, however, only 38.4 per cent of working age people held jobs at that time of year, and 9.3 per cent of them were unemployed (although 15.8 per cent said they wanted work). In an average month 2.9 per cent of working-age Newfoundlanders lose or quit their jobs: 1 per cent of these continue to look for work and 1.9 per cent of them go out of the labour force either because they do not want the job or because they despair of finding one. Meantime 2 per cent of the working-age population begins looking for work (going from the "not in the labour force" block to the "unemployed" block) and 1.5 per cent give up looking for jobs(going in the opposite direction). On average, 9.3 per cent of the population continues to be unemployed in Newfoundland from one month to the next.

Because there is so little employment relative to the size of the working age population in Newfoundland, because so many of the province's working-age population say they want work

Figure 8

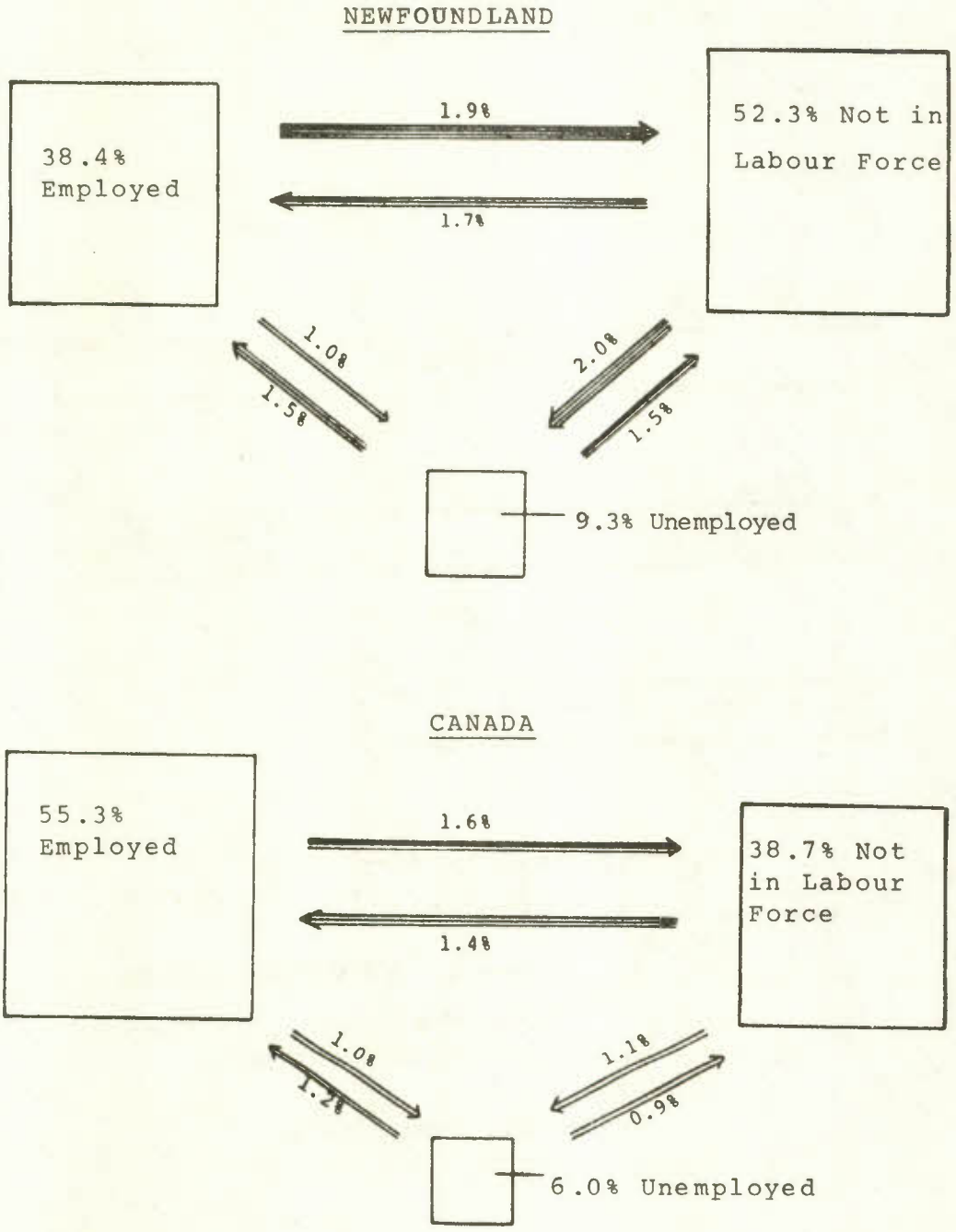
Statistical Divisions of the Population[1]



1 The diagram abstracts from the fact that there are also some people 65 years and older who also participate in the labour force.

Figure 9

Accounting for the Working Age Population, March 1978 Showing Typical Monthly Flows Averaged Over the Year



1 All figures represents stocks (boxes) or flows (arrows) as percentages of working age population. Boxes are drawn to scale: ¼ by ¼ inch equals 1% of stock of working age population. Arrows are drawn to scale: 1 line ≃ 0.5% of working age population. Stock figures are for March 1978. Flow figures are the average of 12 monthly flows in 1978. No allowance is made for the complexities of aging, death or migration.

Source: Adopted from Harry Postner, A New Approach to Frictional Unemployment: An Application to Newfoundland and Canada, Economic Council of Canada (Supply and Services Canada, Ottawa, 1980.)

(although many have given up looking), there is doubt about how large unemployment truly is. The presence of discouraged workers is also suggested by the facts that so many stay unemployed from one month to the next, so many start looking for work each month and so many others quit looking.

It is enlightening to look at the anatomy of the unemployment rate in a different way: the unemployment rate (referring only to those workers who are actively searching for a job at any moment in time) is really a weighted average of the percentage of people w_i in each demographic group times the average duration d_i of unemployment in each group times the average frequency f_i with which these people experience unemployment. That is

$$\text{The Unemployment Rate} = u = \sum_{i=1}^{n} w_i \, d_i f_i$$

One set of estimates[33] for 1977 shows that the average duration of unemployment is 19.4 weeks in Newfoundland versus 18.9 weeks in Canada and that the average number of weeks of labour force activity (working or looking for a job) experienced by those with some labour force participation at any time during the year was 42.4 weeks in Newfoundland and 45.8 weeks in Canada. The average frequency or incidence of unemployment is much higher in Newfoundland -- 34.9 per cent of Newfoundland's labour force experience some unemployment in a year by comparison with only 19.1 per cent in Canada as a whole. Using these data in the

unemployment rate formula (and recognizing that the weight w_i is unity because we are treating the entire labour force as a group for the moment) we can synthesize 1977 unemployment rates for Newfoundland and Canada as

$$U_{NFLD} = 1(\frac{19.4}{42.4})\ 34.9 = 15.9 \text{ per cent}$$

$$U_{CANADA} = 1(\frac{18.9}{45.8})\ 19.1 = 7.9 \text{ per cent}$$

Looking at unemployment rates in this way highlights the fact that although the average duration of spells of unemployment in Newfoundland is longer, it is primarily the higher incidence of unemployment -- the fact that over one third of working Newfoundlanders experience some unemployment each year - that causes its unemployment rate to be so high.

One could also investigate the anatomy of unemployment by breaking the labour force up into sub groups by age and sex. Younger people tend to experience more frequent (but shorter) spells of unemployment as they hop in and out of jobs at the bottom of the job career ladders. Older workers fall off or jump from the middle and upper rungs of career ladders less often, but have more trouble getting back into a job once they do. Women more frequently get discouraged and stop looking for work between bouts of unemployment than men do. Newfoundland has a larger percentage of young people who are more subject to short term frictional unemployment, and fewer older people who are more

subject to long term structural unemployment, but this demographic factor is balanced by a smaller percentage of women who tend to have longer spells of unemployment than men do.

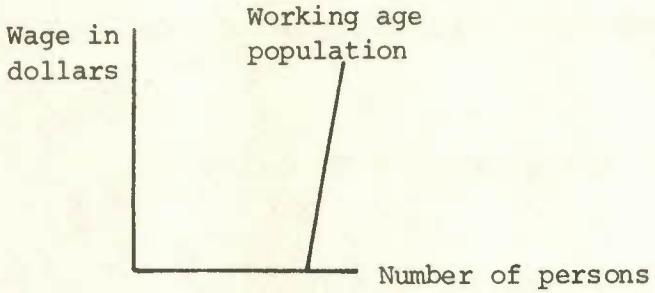
6.1 A Synthesis of Labour Market and Migration Theories

In this section we develop a more complex view of the labour market which takes into account the fact that the demand for labour, the supply of labour, the wage rate and the unemployment rate are determined by many factors not yet mentioned in detail. We begin with a model where the wage level is determined exogenously. (See Figure 10).

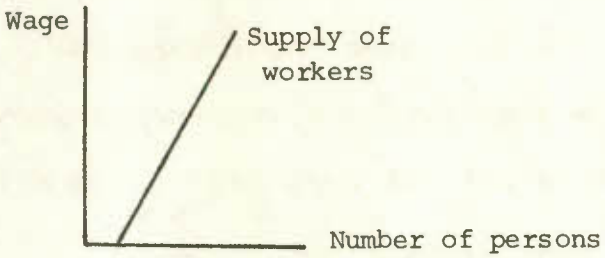
The supply of labour depends upon the number of persons of working age in the province and the percentage of those persons that want to work (the participation rate). The working age population, WAP, is a function of the number of persons retiring, the number of young people reaching working age, and net migration between Newfoundland and elsewhere. The participation rate changes over time as social customs and demographic forces change (allowing more women to seek work, for example), and it is influenced by the rewards for work (such as the wage level and the generosity of unemployment insurance), and the probability of finding a job (which is influenced by the rate of growth of local employment and the rate of increase in new entrants to the labour force, for example).

Figure 10

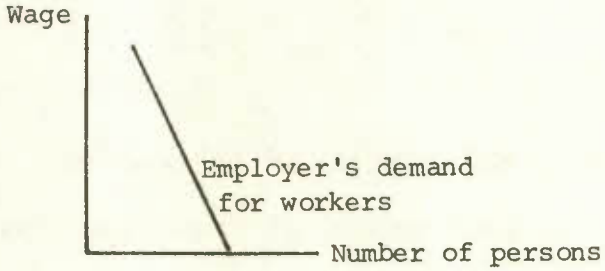
Key to the Diagrams of the Labour Market



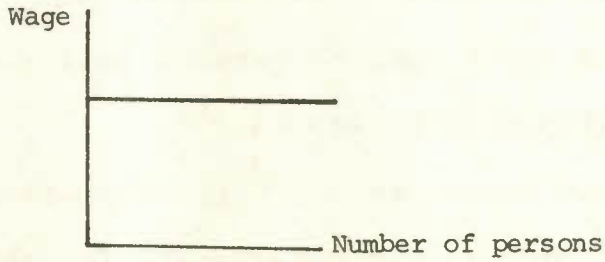
Holding other things constant (including the Ontario wage) the number of people in Newfoundland who could conceivably work gets larger as the wage gets larger because fewer people migrate out and more migrate in as the wage rises.



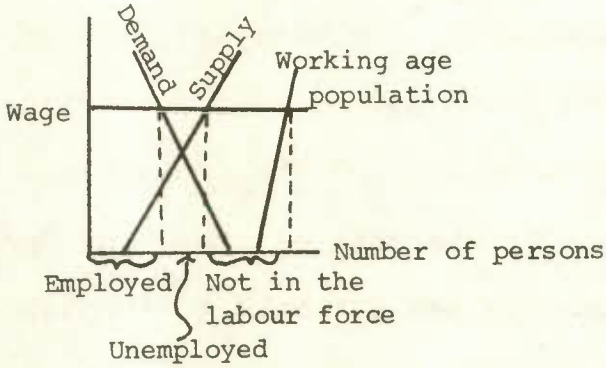
The supply of persons wanting jobs gets larger as the wage gets larger because more people want to participate in the labour force as the wage rises



The employer's demand for workers gets smaller as the wage gets larger.



In this oversimplified model, the wage is determined by a variety of forces independent of Newfoundland supply and demand.



When we put all the pieces together we can explain the division of the working age population up into the three categories "employed", "unemployed" and "not in the labour force".

Net migration from Newfoundland, which averaged more than 3,000 persons per year compared to gross out-migration of more than 12,000 per year in the past decade, has been slowing down, mainly because of a recent increase in migration to Newfoundland. About half the in-migrants are Newfoundland-born returning home. Ontario, which typically receives about half of Newfoundland's out-migrants became a net exporter of people to that province during the first half of the 1970s when the Ontario economy, with its troubled automobile industry and increased energy prices, began to experience higher than normal unemployment relative to the rest of Canada.

We have discovered that net out-migration from Newfoundland falls under several conditions: when the wage level rises in Newfoundland relative to Ontario; when the Ontario unemployment rate goes up; when the generosity of unemployment insurance in Newfoundland increases relative to local wages; or when there is an increase in the number of young people entering the labour force in Newfoundland.[34] In addition, there is some evidence that an increase in federal transfers including equalization payments relative to labour income reduces out-migration.[35] A ten per cent increase in wages in Newfoundland relative to Ontario will apparently reduce net outmigration by 1,300 to 2,000 persons per year; an increase in the number of 16 year olds by 100 over the previous year apparently increases net out-migration by some 80 persons; an increase in the unemployment rate in Ontario by one percentage point will apparently reduce net

out-migration by 1,000 persons, partly by reducing opportunities for young Newfoundlanders in Ontario and partly by laying others off so they come home. Newfoundland, along with some other provinces, thus seems to play the role of a balance wheel for the Ontario economy, which may help explain why the unemployment rate fluctuates twice as much in Newfoundland over the course of the business cycle as it does in Ontario. Finally, if unemployment insurance benefits payable in Newfoundland were to increase 10 per cent relative to wages paid net outmigration from Newfoundland would apparently decline by some 1,700 persons per year.

Since 1953 the participation rate has risen about 0.2 percentage points for every one per cent increase in employment, and it has been positively influenced by the increase in real wage rates. In addition to this labour market response, the participation rate has increased quite independently of the cyclical fluctuations by about 0.3 percentage points annually. Since 1966 the rate of growth in the adjusted participation rate for women has been twice as high as that for men, partly because the decline in the youth dependency rate has meant that women are less tied to family responsibilities and freer to take paid employment.[36]

Because net migration of some 3,000 persons per year from a working age population of some 380,000 persons (1978) is responsive to the local wage level, the working age population is

a steeply rising function of the wage level in Newfoundland (Figure 10). Because the participation rate is also a rising function of wages, we know the labour supply (some 200,000 workers) is a somewhat more wage responsive function (Figure 10) whose precise location is influenced by demographic forces and the probability of finding employment.

We have evidence that the demand for labour depends partly on the wage level. A 10 per cent increase in the real wage apparently reduces the number of workers demanded by one or two per cent in the short run and by 3 to 6½ per cent in the long run, other things equal.[37] Thus the demand for labour declines as the wage rises (Figure 10).

The local demand for labour also depends upon the cyclical state of aggregate demand in the world economy which imports Newfoundland's fish, forest products and iron ore, and on the state of aggregate demand in the local Newfoundland economy which is profoundly influenced by major investment projects like Churchill Falls and especially on transfers, both to government (to finance provincial and local government spending) and to persons (through unemployment insurance benefits and family allowances for example). Transfers make up about 47 per cent of provincial government revenue and about 29 per cent of personal income. Finally, one of the central theories underlying the entire Newfoundland Reference is that the aggregate demand for labour is influenced by the productivity of the production processes in Newfoundland relative to those elsewhere.

Now that we have the supply and demand for labour, what determines wages? Neoclassical economic theory suggests that the higher the level of unemployment, the lower the wage will fall, (or the lower the rate of wage increase in an inflating economy). We think that influence is rather weak in Newfoundland. First, the unemployed workers we surveyed were significantly less willing to take a wage cut to get a job (that is, to accept a lower paying job than their last one) than the workers we surveyed in Ontario, even after we took the obvious other economic variable into account.[38] (We suspect that sociologists could find that "wages" play a somewhat different role in Newfoundland society.) Second, none of our researchers using independent approaches could find any significant effect of the level of unemployment in Newfoundland on the local wage or the rate of change of local wages. (We also suspect that flows of workers between the categories of measured unemployment and hidden unemployment were so large as to render changes in measured unemployment inaccurate over time.) Researchers did, however, find evidence that the wage rate in Newfoundland is strongly influenced by wage increases and wage levels in the rest of Canada (Ontario in particular) and that the rate of increase slows down the closer the Newfoundland wage gets to that in the rest of Canada.[39] We shall deal with these matters in detail in the next sections. For now, the very simple model portrayed in Figure 10 is complete if we make the not-so-unrealistic assumption that the Newfoundland wage rate is simply pegged at some degree of parity with a leading region like Ontario.

Because of the substantial number of discouraged workers, we know that the true supply of workers is somewhat larger than that measured by Statistics Canada. We also suspect that the true supply of workers is affected by availability of unemployment insurance benefits (which should encourage many men, women and youths to look for at least 10 weeks of employment); by the presence of good roads allowing people to commute to work; by the level of education and job skills in the working age population; and by the degree to which the local economy is monetized (so that wage paying jobs actually exist).

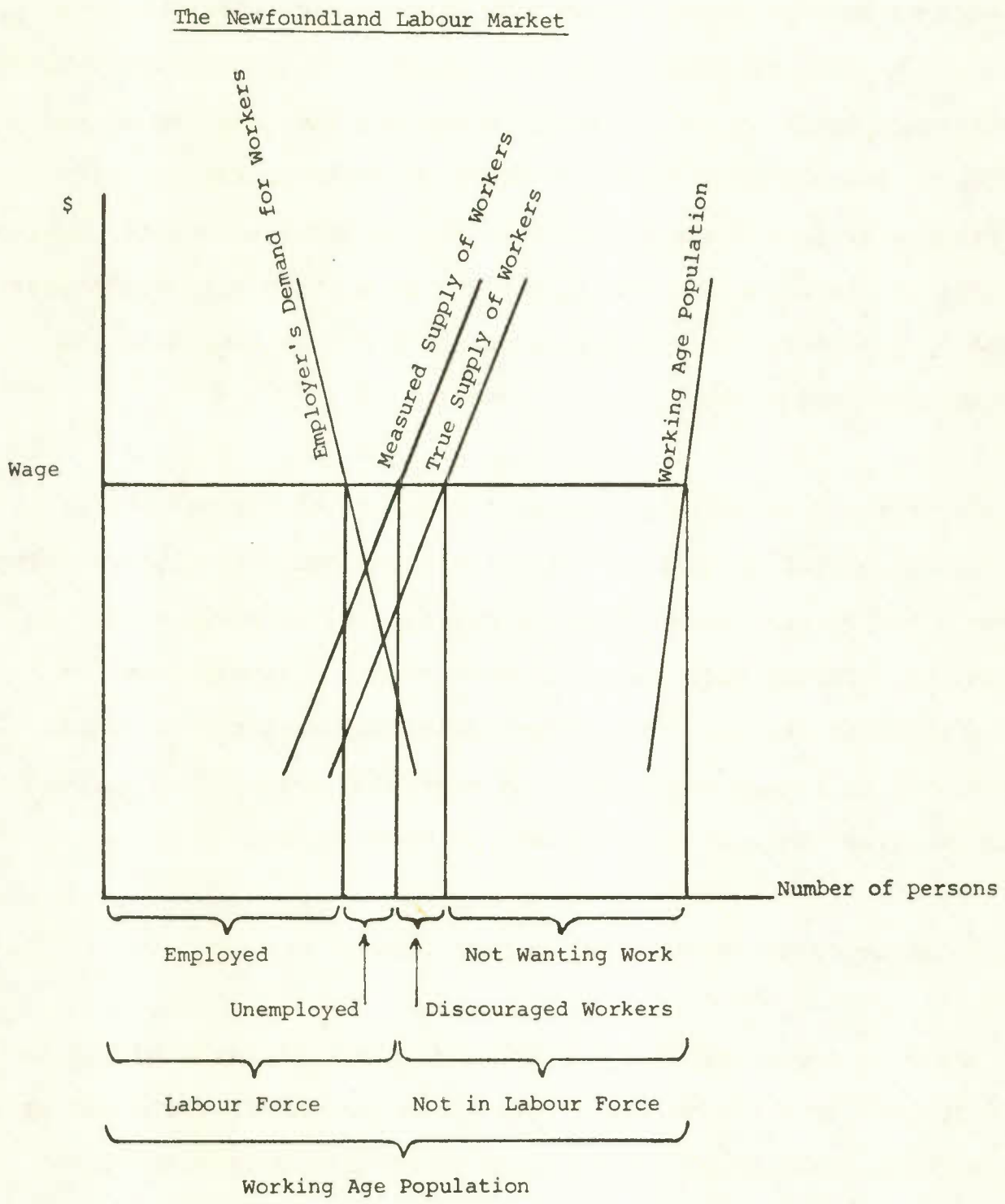
If we could accurately measure the number of persons who truly want employment as distinct from those who are actively searching for a job by Statistics Canada's definition, we would expect to measure a larger true supply of workers and a larger level of unemployment (Figure 11). Under those circumstances we might discover that wage adjustment and migration actually do respond to the true state of unemployment in Newfoundland.

6.2 Labour Market Adjustment in More Detail

While it seems that the general wage level in Newfoundland is influenced by the wage rates determined elsewhere, there are some important economic policy insights to be gained by looking at wage adjustment in the labour market as a series of increasingly detailed mechanisms until we find one realistic enough to explain

Figure 11

Synthesis of Labour Market Theories



Note: The diagram is drawn on the assumptions that other things are held constant -- that the wage levels and aggregate demand in the rest of Canada do not change as policy changes are made in the labour market in Newfoundland.

Newfoundland experience. When we do, we discover that malfunctioning labour markets in Canada as a whole help to compound the problem in Newfoundland.

The simplest labour market clearing mechanism is that of Walrasian price adjustment in a perfectly competitive market (See Panel A in Figure 12). Assume that employers always fill their job openings if the wage is above W_e so that no job vacancies exist in this range. Assume that all workers who want jobs find them if the wage is below W_e so there is no unemployment in this range. Hence the locus of wage-employment solutions is given by the solid line EE.

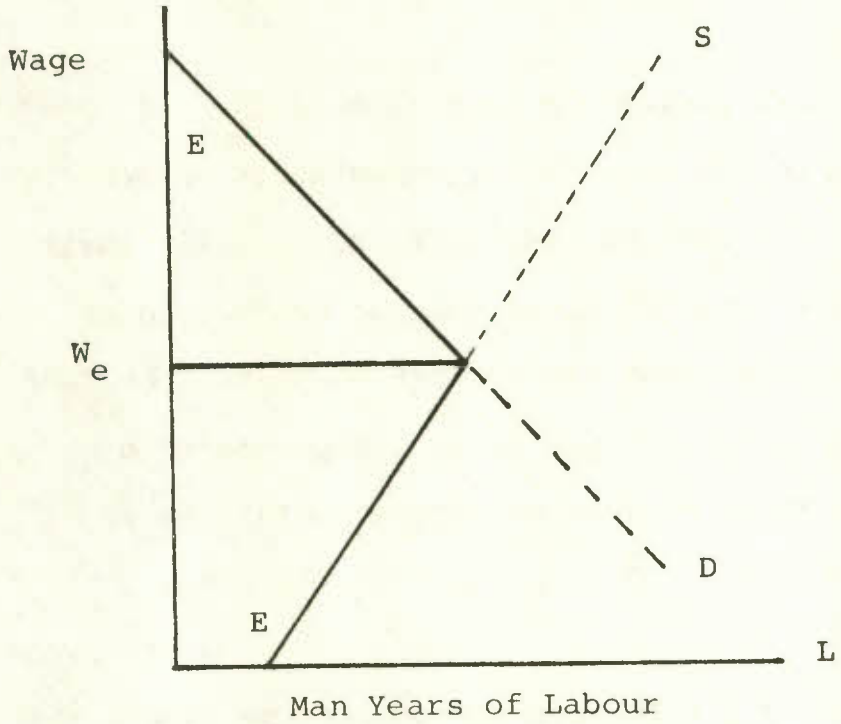
Suppose wages are set by a Walrasian auctioneer who lowers the wage whenever there is unemployment and raises it whenever there are unfilled job vacancies. Suppose also that the size of the wage change he names is roughly proportional to the amount of unemployment or unfilled job vacancies. In other words, with Walrasian adjustment, wages will rise if there is excess demand for labour, the rate of rise being greater the larger the extent of excess demand. Excess demand is the same thing as negative excess supply. The <u>rate</u> of excess supply is

$$\frac{L^S - L^D}{L^S} = u$$

where L^S is labour supply, L^D is labour demand and u is the unemployment rate. Hence the unemployment rate is itself the

Figure 12

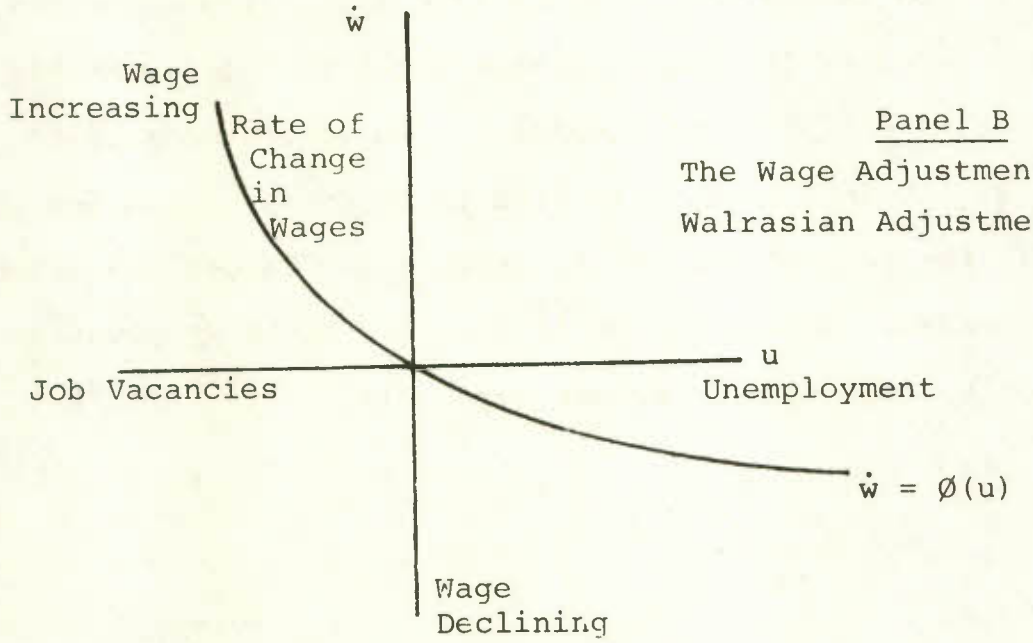
Labour Market Mechanisms: Walrasian Perfect Competition



Panel A

The Labour Market:

Supply and Demand



Panel B

The Wage Adjustment Mechanism

Walrasian Adjustment

definition of the rate of excess supply. (Negative unemployment is interpreted as positive job vacancies when the wage is below equilibrium.) Therefore Walrasian adjustment amounts to saying that the wage rate rises when there are job vacancies (i.e. when unemployment is negative) and it falls when unemployment is positive. Equilibrium exists (wages stop changing) when unemployment is zero. The rate of increase in wages per unit time is faster the tighter the market becomes, i.e. the smaller the level of excess supply as measured by the unemployment rate or rate of job vacancies. This dynamic Walrasian adjustment is portrayed graphically in Panel B of Figure 12.

This model can be summarized as the equations

(1) Supply $L^S = f(w)$

(2) Demand $L^D = g(w)$

(3) Definition of Negative Rate of Excess Demand $u = \frac{L^S - L^D}{L^S}$

(4) Walrasian Wage Adjustent $\hat{w} = \phi(u)$

Econometrically we can estimate the dynamic wage adjustment mechanism using ordinary least squares on some functional form that runs through the origin and has the shape in Panel B of Figure 12, in which case we are really estimating the behaviour of the Walrasian auctioneer on the assumption that the supply response of the workers and the demand response of the employers is only influenced by wage levels.

We do not find this model satisfactory for two reasons. First the model does not admit to the simultaneous existence of unemployment and unfilled job vacancies which we do find even in Newfoundland. Second, as pointed out above, we have not been able to find a statistically significant relationship between the rate of wage adjustment and the rate of unemployment in Newfoundland.

The next modification of the model admits the simultaneous existence of job vacancies and unemployent (Figure 13). As the wage falls from W_1 through W_2 to W_3 in Panel A of Figure 11, job vacancies increase and unemployment decreases, as is traced out by the EE locus in panel A and the uv locus in Panel B.[40] The uv locus is not necessarily a rectangular hyperbola, but it looks like one, primarily because it must pass through the point (u_0, v_0) where the unemployment rate exactly equals the vacancy rate. (We could hypothesize a functional form like $v = k\bar{u}^{\beta}$ where $k, \beta > 0$.) Some researchers use uv or $\sqrt{uv}$ as a measure of the efficiency of the mechanism matching people and jobs.[41]

What constitutes the equilibrium wage rate is no longer clear from the diagrams because there is now no reason to expect the place where supply equals demand to be one of equilibrium since there exist both unsatisfied demanders and suppliers of labour, not only at wage rate W_2, but at all wage levels. The Walrasian auctioneer will have to decide somewhat arbitrarily how

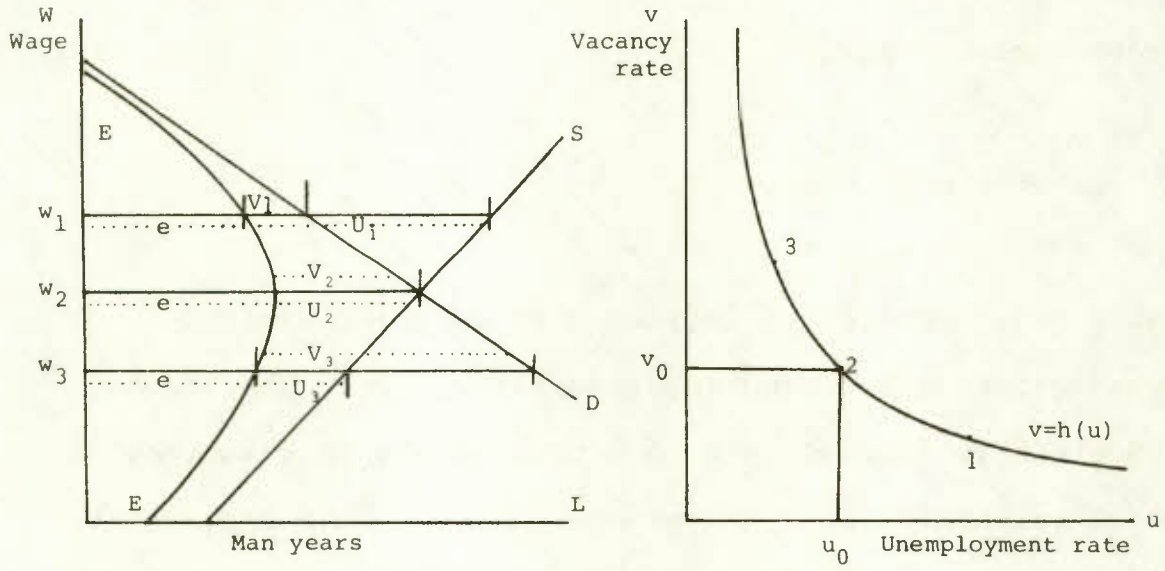
FIGURE 13

LABOUR MARKET MECHANISMS:

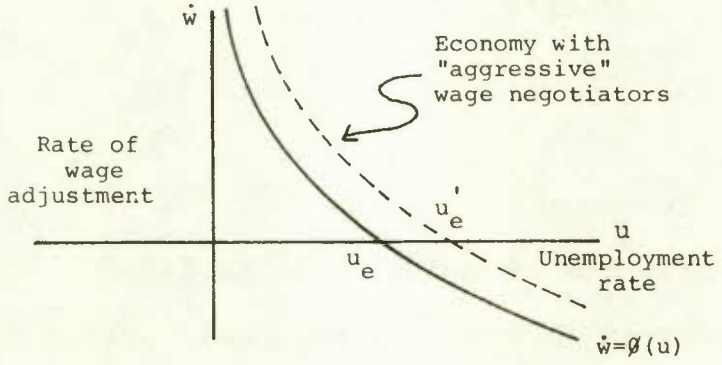
RECONCILING FRICTIONAL UNEMPLOYMENT AND JOB VACANCIES

Panel A
The Labour Market:
Supply and Demand

Panel B
The Matching Mechanism:
Matching People and Jobs



Panel C
The Wage Adjustment Mechanism:
Modified Walrasian Adjustment



Code:

e = Number of persons employed
U = Number of persons unemployed
u = Unemployment rate
V = Number of jobs vacant
v = Vacancy rate

large job vacancies have to be relative to unemployment before calling out wage increases. In the absense of a single auctioneer calling out tentative prices for labour, this relationship can be interpreted as the way wages tend to adjust in the economy on average. It should be recalled that some unemployment may be voluntary in that frictional unemployment can be generated as people voluntarily move between jobs. It is reasonable to modify the Walrasian adjustment mechanism to incorporate vacancy rates:

$$(5) \quad \dot{w} = \psi(u,v);\ \psi_1 < 0,\ \psi_2 > 0$$

The first partial derivative implies that as unemployment worsens, the rate of increase in wages slows down. The second partial derivative implies that when the vacancy rate increases, the rate of growth in wages increases. However, the employment locus EE in Figure 11 implies a unique relationship $v = h(u)$ among u and v which is portrayed in Panel B. When we recognize this fact we see that the second modified Walrasian adjustment function portrayed above (b) is really

$$(6) \quad \dot{w} = \psi(u,h(u)) = \emptyset(u)$$

Hence, we really have only one form of modified Walrasian adustment $\emptyset(u)$ which is portrayed in Panel C, popularly called the Phillips Curve. For example, we could hypothesize relationships such as (5') $\dot{w} = au + bv$ where $a, b > 0$ and $v = k\bar{u}^{\beta}$ where $k, \beta > 0$ so that (6') $\dot{w} = au + bk/u^{\beta}$.

Whereas the original Phillips Curve was presented as a descriptive, empirically observed relationship in a macroeconomy, we are presenting it here as a theoretical relationship representing the collective average behaviour of persons negotiating wage contracts or setting wages in the economy. It is presumed that wage negotiators in aggregate exhibit behaviour very similar to a single Walrasian auctioneer whose wage changes reflect the degree of oversupply or undersupply of labour in the market.

In this new model, since unemployment is present at all wage levels, there must exist some equilibrium level of unemployment u_e at which the rate of wage increase is zero. When the level of unemployment rises above u_e wage negotiators on balance are willing to accept wage reductions to keep jobs. When unemployment is below the equilibrium rate of unemployment, there is dynamic upward pressure on wages so wage negotiators are, on balance, coming up with wage settlements that involve wage increases. Whether this equilibrium level of unemployment occurs at wage level W_1, W_2 or W_3 is impossible to say a priori. In an economy with aggressive wage negotiators -- either aggressive labour unions which demand higher wages in spite of unemployment among non-unionized workers, or with aggressive employers who compete fiercely for the best workers by offering them high wages (and leaving the less skilled workers unemployed) -- the dynamic wage adjustment locus will be shifted upward to the right in Panel C. An economy dominated by

aggressive wage negotiators will experience both higher unemployment and higher wage levels at equilibrium. British Columbia labour relations experience comes to mind here.[42]

6.3 Introducing Price Expectations and Dynamic Technological Advance

One problem with our second model is that it implicitly assumed there was no inflation and no dynamic technological advance in the rest of the economy. In the post war world, the general price level in the country (or region) is rising at the annual rate $\dot{p}$ and people have the expectation that it will rise at rate $\dot{p}_e$. Since expectations are not always realized ex post, $\dot{p}$ is not necessarily equal to $\dot{p}_e$ at all times. In addition, gross domestic product per worker is generally rising at a rate $\dot{\pi}$ as a result of more or less continuous technological advance.

If we presume that neither businessmen nor workers are subject to money illusion, this new model will have a supply and demand for labour that are defined in terms of real wages, not nominal wages. If the efficiency with which the labour market matches people and jobs is not systematically influenced by inflation the employment locus EE will remain constant and so will uv locus. Hence the new model is adequately portrayed by Panels A and B of Figure 13 if we interpret "wage" to mean "real wage" and if the demand and supply of labour are influenced by inflation. The only difference is in the wage rate adjustment function.

We can hypothesize that both employers and workers will agree that wages should be rising at the same rate as expected inflation $\dot{p}_e$ plus productivity improvement $\dot{\pi}$ resulting from dynamic technological advance, when the labour market is in equilibrium. If unemployment falls to a low level for any reason, however, both employers and workers will agree that wages have to rise faster than the rate of expected inflation to restore equilibrium (the reverse if unemployment gets too large). Hence the new dynamic wage adjustment mechanism augmented for expected price inflation is

$$(7) \quad \dot{w} = \emptyset(u) + \dot{p}_e + \dot{\pi}$$

(See Figure 14). Now, equilibrium in the labour market occurs when actual rate of inflation equals expected rate of inflation i.e.

$$(8) \quad \dot{p} = \dot{p}_e$$

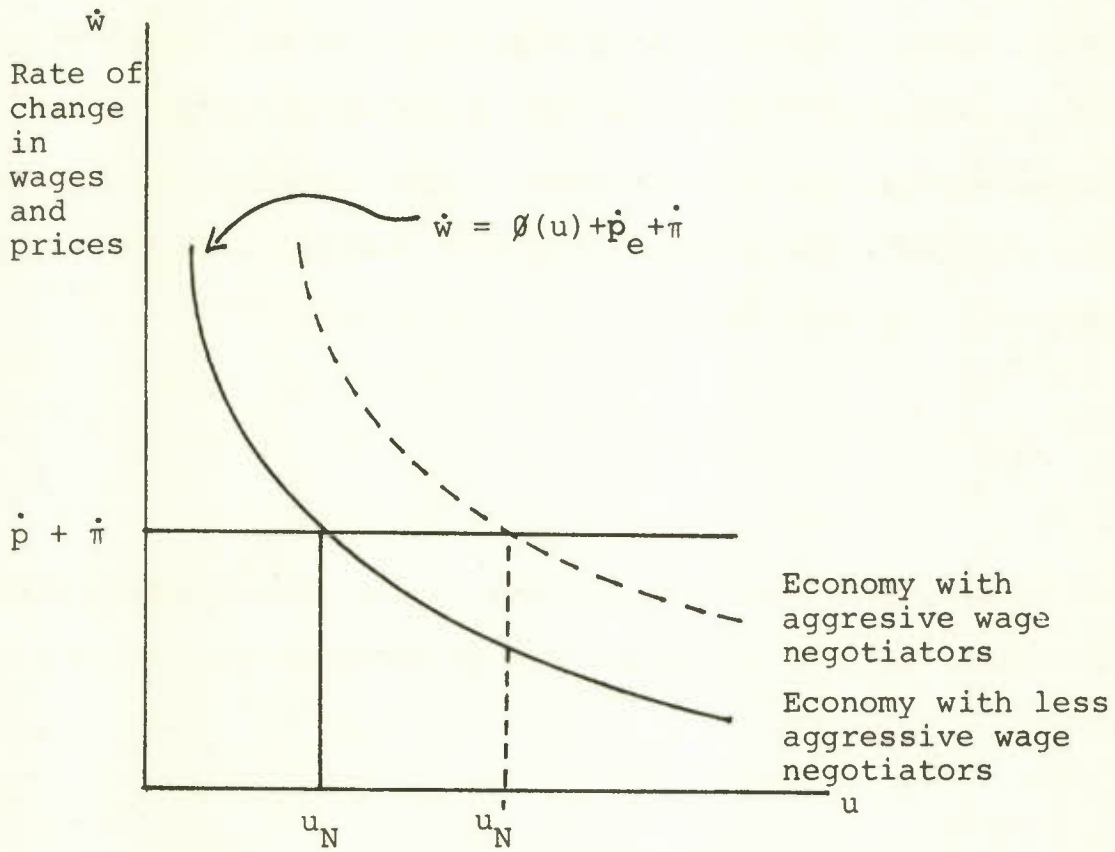
and when the actual rate of wage inflation equals the expected rate of inflation plus the annual rate of productivity improvement, i.e.

$$(9) \quad \dot{w} = \dot{p}_e + \dot{\pi} = \dot{p} + \dot{\pi}$$

Comparing equilibrium condition (9) with the wage adjustment mechanism (7) it is apparent that there exists an equilibrium or

Figure 14

Inflation Expectations - Augmented Phillips Curve
with Dynamic Technological Advance



At the equilibrium or "natural" rate of unemployment, u_N, expectations are realized so that $\dot{p}_e = \dot{p}$ and $\dot{w} = \dot{p} + \dot{\pi}$ so that $\emptyset(u_N) = 0$.

"natural" rate of unemployment U_N where expectations are realized so that $\dot{p}_e = \dot{p}$ and $\dot{w} = \dot{p} + \dot{\pi}$ which implies

(10) $\emptyset(U_N) = 0$

Again, an economy with more "aggressive" wage negotiators among unions and businessmen will have a higher rate of unemployment at equilibrium.

To empirically test this model, we can run regressions on some functional form of the expectations-augmented Phillips equation

(7) $\dot{w} = \emptyset(u) + \dot{p}_e + \dot{\pi}$

or we can manipulate it into the form

(11) $u = \emptyset(\dot{w}, \dot{p}_e, \dot{\pi})$

and fit that. It should be stressed that this single equation estimation presupposes that the demand and supply of labour are functions of variables like working age population, the level or rate of change of employment and wage <u>levels</u> W, but <u>not the rate of change of wages</u> $\dot{w}$. If supply and demand are functions of $\dot{w}$, we have a simultaneous equation problem and it should be estimated as such. Single equation estimation of (7) or (11) presumes that the wage setting behaviour of the Walrasian auctioneer or of the wage negotiators is in some sense detached from the supplying and demanding of labour.

Craig Riddell tried running both sets of regressions (7) and (11). He got poor fits on the $\dot{w}$-form equations and he obtained almost unbelievably high natural rates of unemployment from the u-form equations.[43]

6.4 Hybrid Wage Adjustment Mechanisms: Wage Parity

Because our researchers could not find significant statistical relationships among wage rate changes $\dot{w}$ and the unemployment rate u in Newfoundland, and because we discovered there is a large amount of migration of workers into and out of the province, we began to test the hypothesis that wages in Newfoundland are partly influenced by tendencies for large employers to pay the same wage in Newfoundland as they pay elsewhere, and that labour unions in Newfoundland implicitly or explicitly demand some degree of wage parity with places like Ontario. Hence the wage adjustment relation or hybrid Phillips Curve can be represented as

$$(12) \quad \dot{w} = \phi(u, w, \bar{w}) + \dot{p}_e + \dot{\pi}$$

or

$$(13) \quad \dot{w} = \phi(\dot{L}_S, w, \bar{w}) + \dot{p}_e + \dot{\pi}$$

where $\bar{w}$ is the target wage level in, say, Ontario that employers and workers are aiming at, w is the wage in Newfoundland, and $\dot{L}_S$ is the rate of growth of labour supply in Newfoundland. While we have not been able to demonstrate the existence of a

significant relationship between measured unemployment u and the rate of wage increase $\dot{w}$, we remain open to persuasion that the relative state of joblessness does indeed have an influence on wage settlements in Newfoundland, if only we could measure both wage settlements and unemployment accurately. Boadway and Green find some evidence to suggest that recent increases in Newfoundland labour supply $\dot{L}_S$ do have a depressing effect on wage levels in Newfoundland, and we notice that the wages paid by the small business firms we interviewed in Newfoundland were frequently much lower than the wages paid by their counterparts which we interviewed in Ontario. This wage disparity among small businesses probably reflects the greater unemployment rate in Newfoundland. The official wage data presented by Statistics Canada is for larger establishments for whom wage parity may be more important and whose employees are more permanent and more insulated from unemployment experience. Thus while official statistics do not manifest a Phillips Curve for Newfoundland the author would hesitate to rule it out.

If workers and employers in Newfoundland are aiming for strict wage parity with Ontario, we can expect them to accept a rate of wage inflation equal to the rate of general inflation when absolute parity has been achieved, i.e., when $w/\bar{w} = 1$. The farther the Newfoundland wage falls below parity the more rapidly they will try to catch up, so the larger a rate of wage increase they will demand. The more the Newfoundland wage exceeds that of Ontario, the more the local rate of wage increase will be allowed to fall below the rate of expected inflation.

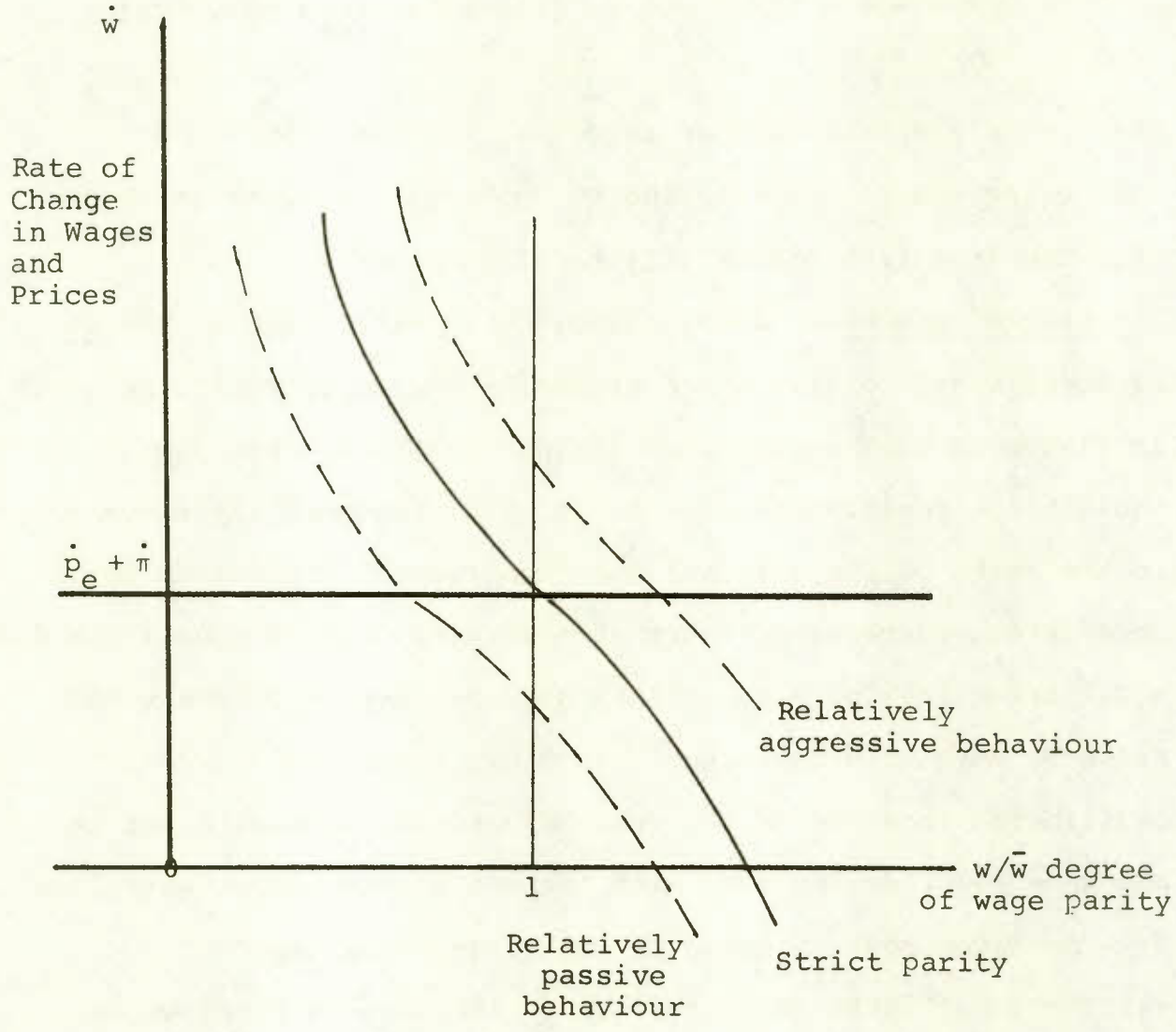
There is no assurance that Newfoundland workers and businesses are aiming for strict parity with Ontario. If they are relatively passive (as may be true for Newfoundland), they may settle for less (see Figure 15); if they are aggressive (as might be true of British Columbia) they may demand more.

What will influence the aggressiveness of the wage setters? Introducing minumum wages or an unemployment insurance system that pays benefits based on past earnings will encourage workers to demand higher wages so they can collect higher benefits if they become unemployed. Extending the length of time over which those benefits can be paid will make people demand higher wages because they have less fear of losing their incomes if they price themselves out of work. Minumum wages and unemployment insurance factors, however, do not merely affect the wage adjustment mechanisms; they affect the demand and supply curves of labour as well. Hence they should be modelled into Panel A of Figure 13 as well as into Panel C of that Figure. They may also affect the efficiency of the labour market people and jobs matching mechanism represented by the uv locus in Panel B.

This hybrid model suggests that an exogenous increase in the wage rate in Ontario will cause Newfoundlanders to become more aggressive in the wage rates they will demand which increases the natural rate of unemployment in Newfoundland -- if in fact there is any relationship at all between the state of joblessness in Newfoundland and wage determination in that province. If we

Figure 15

Wage Parity Adjustment



hypothesize a simple functional form for the wage adjustment mechanism such as

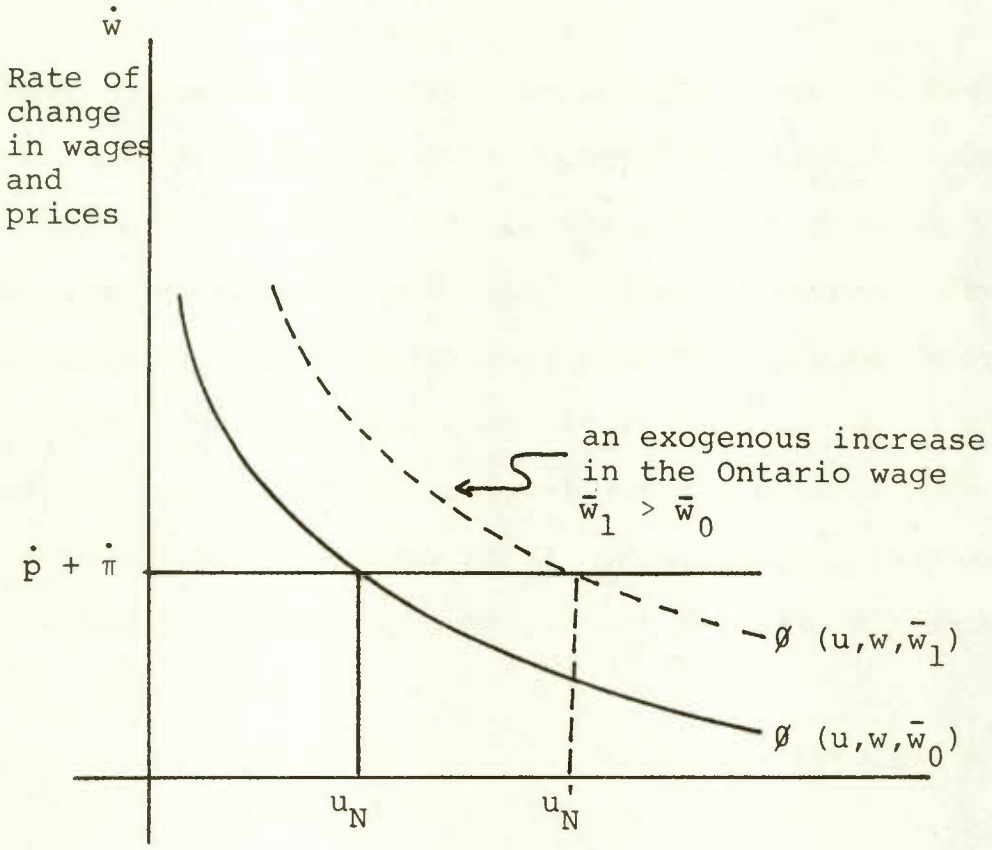
$$\dot{w} = -au + bk/u^{\beta} - cw/\bar{w} \quad \text{(all parameters positive)}$$

then it is apparent that an exogenous increase in $\bar{w}$ will cause the entire function to shift to the right in figure 16. The immediate affect will be to increase $\dot{w}$, the rate of growth of local wages, which will cause w, the level of local wages to rise which gradually begins to shift the locus in figure 16 back toward its original position. The new equilibrium position for the locus will, however, lie above and to the right of the original position because the higher local wage level w generates higher unemployment u which causes the new equilibrium rate of wage inflation to be reached before w has risen as much as $\bar{w}$ has risen. In other words the equilibrium location of the wage adjustment locus will not be homogeneous of degree zero with respect to the target wage level $\bar{w}$ -- an autonomous increase in the target wage level will only partially be matched by an increase in local wages.

In fact, regional differentials in the rate of growth of productivity and technological advance can cause a secular growth of the natural rate of unemployment in a province like Newfoundland. If the rate of technical advance were to speed up in Ontario but not in Newfoundland, then wages could rise faster in Ontario without causing an increase in inflationary pressure.

Figure 16

Effect of Ontario Wages on the Natural Rate of Unemployment in Newfoundland[1]



1 A similar effect occurs when the rate of growth in labour productivity in Ontario (which allows a faster growth in Ontario wages without adding inflationary pressure) is not matched by the rate of growth in Newfoundland productivity.

This more rapid growth in Ontario wages would only be partially matched in Newfoundland so that there would be a growing wage gap and a growing natural rate of unemployment in Newfoundland. Conversely, technological catch-up by Newfoundland would reduce its natural rate of unemployment and reduce its wage gap.

Empirically we can estimate the hybrid wage adustment mechanism using various functional forms. If we believe that the wage adjustment mechanism is truly a function only of local joblessness (however measured), expected inflation, the rate of technological advance and wage parity, if we believe wage setting in Ontario is independent of Newfoundland's economy, and if we believe these factors are not involved in the supply and demand of Newfoundland's labour, then it is reasonable to use ordinary least squares to estimate the hybrid wage adjustment mechanism

$$(13) \quad \dot{w} = \phi(u, w/\bar{w}) + \dot{p}_e + \dot{\pi}$$

On the other hand, if we believe unemployment insurance is at work influencing the supply and demand for labour as well as influencing the wage adjustment mechanism, then we truly have a simultaneous equation problem and we should estimate the demand, supply and wage adjustment mechanisms using simultaneous equation techniques (although ordinary least squares may give a useful approximation).[44]

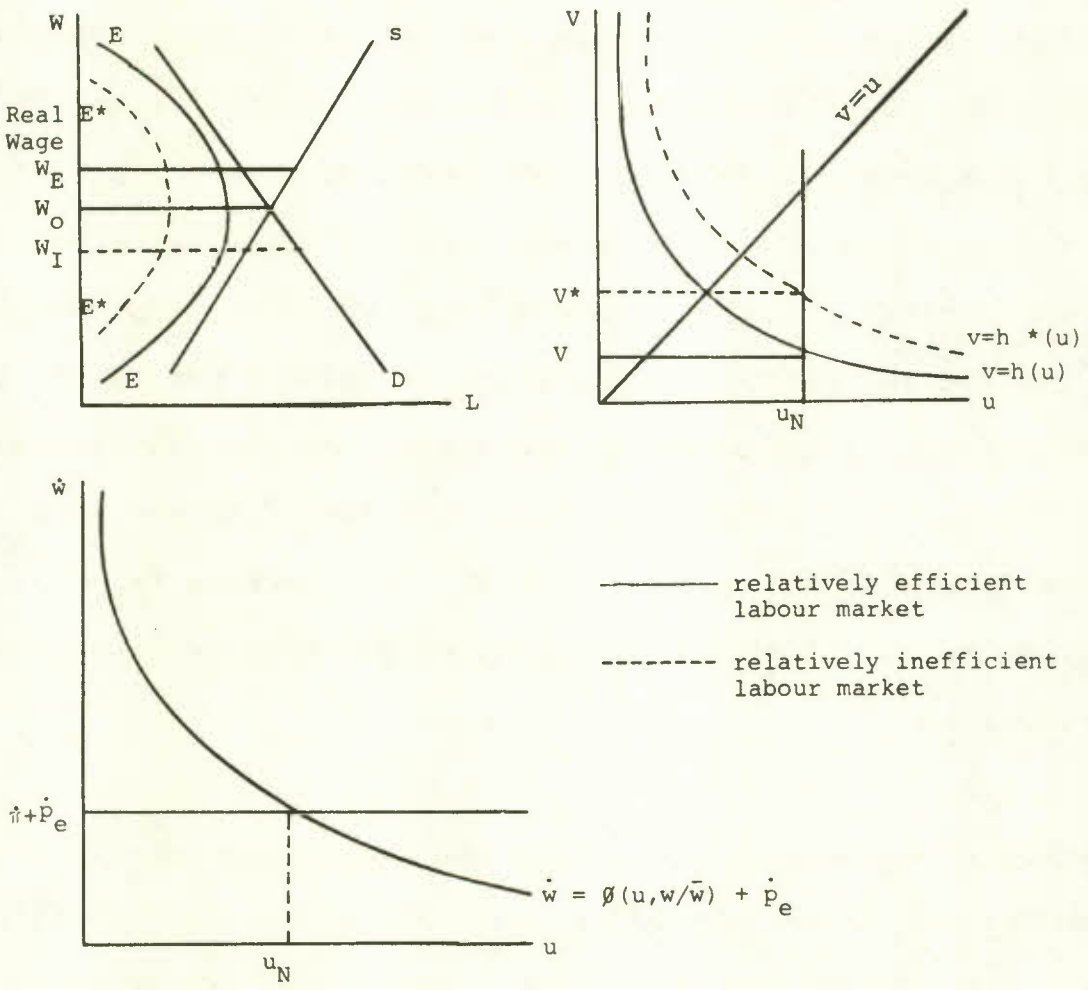
6.5 Inefficiency in the Labour Market

It is possible for two regional economies to have exactly the same supply and demand for labour and to have exactly the same natural rate of unemployment even if one of them has a much less efficient labour market than the other, provided the less efficient labour market also has a sufficiently less aggressive wage adjustment mechanism (see Figure 17). In that case the equilibrium wage rate must be much lower and the vacancy rate much higher in the region with the less efficient mechanism for matching workers and jobs. We are thus led to the impression that the natural rate of unemployment is jointly determined by the efficiency of the matching mechanism (the u-v relationship, $v = h(u)$) and by the degree of "aggressiveness" in the wage adjustment mechanism $\dot{w} = \Psi(u, v, w/\bar{w})$. An increase in inefficiency can be offset by a decline in "aggressiveness" and vice versa.

If we assume for the moment that the people and jobs matching mechanism, the u-v relationship -- is a rectangular hyperbola, $uv = k$, then we can perform a simple empirical test using the the coefficient k or $\sqrt{k}$ as a measure of the degree of inefficiency in the worker-job matching mechanism. Using that simple formulation and combining it with data from Harry Postner[45] we perceive that the Newfoundland labour market is perhaps the most inefficient in Canada, followed by Alberta, then Quebec.

FIGURE 17

Inefficiency in the Labour Market



Canada	uv = 3.45
Ontario	uv = 2.95
Alberta	uv = 3.83
Nfld	uv = 4.08
Quebec	uv = 3.60

6.6 Some Empirical Literature on Regional Labour Market Adjustment in Newfoundland

The simple heuristic notions of the wage adjustment mechanism that we have developed in the text above, can be represented as

$$\dot{w} = \phi(u, w/\bar{w}, \text{UIC}, \ldots) + \dot{p}_e + \dot{\pi}$$

which states that the rate of change in wages, $\dot{w}$, equals the rate of expected wage change (which is $\dot{w}_e$, the sum of expected price inflation $\dot{p}_e$ plus expected productivity growth $\dot{\pi}$) and that these wage adjustments will be tempered by the current state of tightness in the local labour market (measured by unemployment u, or an index of help wanted, for example). The degree of wage parity (measured by $w/\bar{w}$), the relative generosity of the unemployment insurance program UIC, the level of minimum wages, demographic characteristics and any other variables that might influence the degree of aggressiveness in wage negotiating can also be included.

This relationship in effect breaks up into a long run wage trend, $\dot{p}_e + \dot{\pi}$, and short run deviations or cyclical wage movements $\phi(u,\ldots)$ which are determined by the state of the

business cycle. In the natural rate of unemployment literature this formulation is preferred by some authorities as an explanation of how wage contracts move over time. Because it takes time for old wage contracts to terminate and new ones to be negotiated, they argue short term adjustment of the economy will have to be absorbed more by unemployment adjustments than in wage adjustments.

An alternative way to estimate labour market adjustment is to reorganize this relationship to the form

$$u = \theta(\dot{p}_e, \dot{w}, \ldots) = \theta_1(\dot{p}-\dot{p}_e) + \theta_2(\ldots..)$$

Advocates of this form suggest that in the short run prices adjust much faster than unemployment does and that unemployment can thereby be represented by a short run cyclical component θ_1 which shows how workers and employers adjust their offers of labour and jobs in response to unexpected inflation $(\dot{p}-\dot{p}_e)$ or short term fluctuations in economic activity and a long run component θ_2 which is determined by such aspects as minimum wages, unemployment insurance, demographic factors and so on.

The variations on these two themes are immense. We shall limit our attention here to the empirical results of only 4 pieces of literature -- Wayne Thirsk, Craig Riddell, Auld et. al. and Swan/Kovacs.[46] The first three use single equation estimation while the last one estimates two reduced form equations which

represent the boiled down version of a 15 equation regional economic model. One of these equations is a function for $\dot{w}$ and the other is a function for u which rather gives the impression of following both of these approaches simultaneously.

Wayne Thirsk did some of the most important work on regional labour market adjustment back in 1971 including description of the problems, development of the theory and empirical tests of the results. Using the annual rate of change in average hourly earnings he demonstrated that, by contrast to Ontario and Quebec, the link between the rate of unemployment and the rate of wage adjustment was virtually non-existent and certainly insignificant (t statistics in brackets, $D_{1968-70}$ is a dummy variable for those years):

$$\text{e.g. } \dot{w}_{NFLD} = \underset{(1.25)}{5.3} + \underset{(1.80)}{6.24 * D_{1968-70}} - \underset{(-0.54)}{0.12u} - \underset{(-0.02)}{0.02\dot{p}} \quad R^2 = 0.14, \; DW = 2.19$$

The rate of wage change in Ontario, however, was a powerful influence on the rate of wage change in Newfoundland:

$$\dot{w}_{NFLD} = \underset{(-1.43)}{-6.21} - \underset{(-0.47)}{1.54 D_{1968-70}} + \underset{(0.82)}{0.16u} + \underset{(3.16)}{1.85\dot{w}_{ONT}} \quad R^2 = 0.52, \; DW = 2.86$$

In fact, of the variables Thirsk tried, the rate of wage change in Ontario was the only thing that had any significant effect on wage rate determination in Newfoundland.

Ontario itself did seem to have a Phillips-curve type wage adjustment mechanism:

$$\dot{w}_{ONT} = \underset{(5.53)}{7.76^{*}} + \underset{(4.94)}{4.44^{*}}D_{1968-70} - \underset{(-2.61)}{0.93^{*}}u \qquad R^2 = 0.66,\ DW = 1.78$$

$$\dot{w}_{ONT} = \underset{(3.12)}{5.60^{*}} + \underset{(3.68)}{3.57^{*}}D_{1968-70} - \underset{(-1.68)}{0.63}u + \underset{(1.76)}{0.56^{*}}\dot{p} \qquad R^2 = 0.70,\ DW = 2.26$$

Whereas the rate of unemployment had a statistically significant depressing effect on the rate of wage change in only a few provinces and in only a few regressions, the sign on the variable was almost always negative. Although the effect of unemployment on wage adjustment was weak it was consistently present.

Thirsk also investigated the efficiency of the people and jobs matching mechanism (the u-v curve) in a variety of ways including estimating relationships of the form

Atlantic: $\ln v = 2.33 - 0.87 \ln u$

Ontario: $\ln v = 2.83 - 2.12 \ln u$

None of his data supported the rectangular hyperbola hypothesis but curves of that general shape were produced with fairly good statistical results and were fairly constant over time. The matching mechanism for the Atlantic region was generally farther from the origin and flatter than any other region, implying that the people and jobs matching mechanism worked more poorly in the Atlantic region than elsewhere.

Craig Riddell explains the rationales for both the augmented Phillips curve type relation for determining $\dot{w}$ and the unemployment relation for determing u. He fits both forms but sticks to single equation estimation and he does not test the wage parity theory that wages in Newfoundland might be influenced by wage adjustments outside the province. As factors influencing the labour market adjustment mechanism, he concentrates on MINWAGE (minimum-wages relative to average wages) and unemployment insurance (such as UICMAX, the ratio of maximum possible weekly unemployment insurance relative to average wages, adjusted for taxation and percentage of work forces covered by unemployment insurance), as well as a variety of demographic variables.

Riddell found all his Phillips curve type regressions to be unsatisfactory as the following example for Canada illustrates.

$$\dot{w} = \underset{(-1.0)}{-\ 10.62} + \underset{(0.7)}{16.26}\ 1/u + \underset{(0.9)}{1.13}\Delta u + \underset{(1.6)}{0.99}\dot{p}_e + \underset{(1.9)}{22.67}\text{MINWAGE}$$

$$+ \underset{(0.4)}{7.58}\text{UICMAX} \qquad R^2 = 0.65,\ DW = 2.11$$

His results substantiate Thirsk's claim that there is no significant relationship between the rate of wage adjustment in Newfoundland and local unemployment but they also raise doubt about whether such a relationship works for either Canada or Ontario. His results definitely favour the alternative formulation of the labour market adjustment mechanism as illustrated by the following two examples

$$u_{NFLD} = \underset{(6.2)}{13.18} - \underset{(-5.4)}{2.82}UNEXP - \underset{(-4.5)}{2.02}UNEXP_{-1} - \underset{(-3.1)}{1.45}UNEXP_{-2}$$

$$-\underset{(-5.4)}{32.16}MINWAGE + \underset{(5.7)}{29.81}UICMAX \qquad R^2 = 0.83, \; DW = 1.21$$

$$U_{ONT} = \underset{(4.4)}{3.14} - \underset{(-3.4)}{0.73}UNEXP - \underset{(-4.3)}{0.79}UNEXP_{-1} - \underset{(-2.4)}{0.46}UNEXP_{-2}$$

$$-\underset{(-2.5)}{2.86}MINWAGE + \underset{(5.4)}{10.20}UICMAX \qquad R^2 = 0.82, \; DW = 1.34$$

All of us, Professor Riddell included, are hesitant to draw strong conclusions based on these results, not only by reason of data problems, and the omission of the wage parity variables, but because it is asking a lot of a single equation to represent concepts like unemployment insurance which probably have important effects simultaneously in many parts of the economy. These results, if one were to take them at face value, would imply natural rates of unemployment in the order of 6.5 per cent for Ontario and 14.5 per cent for Newfoundland. They would also imply that the 1971 liberalization of unemployment insurance raised the equilibrium rate of unemployment by some 2 to 2 1/2 percentage points in Ontario and some 7.2 to 8.4 percentage points in Newfoundland.[47]

A pair of micro data estimates of a wage adjustment mechanism of the Augmented Phillips Curve type estimated by Auld, Christofides, Swidinsky and Wilton is presented here, not because it represents Newfoundland (it is based on thousands of

individual wage settlements all across Canada) but as a reminder that there is evidence that labour markets in Canada do indeed respond to the degree of labour market tightness (measured in this case by a help wanted index). The fact that our other regressions demonstrate no significant relation between average hourly earnings and unemployment rates is not a conclusive rejection of the hypothesis that wage rate adjustment is influenced by the degree of tightness in the labour market. Perhaps we would find such a relationship for Newfoundland if we had the right data. Two interesting equations estimated by Auld et al. are

Private Sector

$$\dot{w} = \underset{}{3.43} + \underset{(9.25)}{0.38}\dot{PE} + \underset{(7.72)}{0.57}\dot{PCU} + \underset{(18.31)}{1.97}RHW - \underset{(5.16)}{4.76}D + \underset{(-4.03)}{0.55}D^{*}\dot{PE} + \underset{(4.01)}{}$$

$$- \underset{(-5.85)}{0.30}D^{*}\dot{PCU} - \underset{(-0.12)}{0.07}D^{*}RHW \qquad R^2 = 0.40$$

Public Sector

$$\dot{w} = \underset{}{1.16} + \underset{(1.78)}{0.25}\dot{PE} + \underset{(3.10)}{0.64}PCU + \underset{(14.87)}{3.64}RHW + \underset{(6.15)}{1.55}D + \underset{(1.18)}{0.42}D^{*}\dot{PE} + \underset{(3.22)}{}$$

$$- \underset{(-3.58)}{0.26}D^{*}\dot{PCU} - \underset{(-4.21)}{3.44}D^{*}RHW \qquad R^2 = 0.41$$

where $\dot{w}$ is the annual percentage change in the base rate of negotiated wage settlements in 1966-1975 prior to the introduction of the Anti-Inflation Board, $\dot{PCU}$ is a measure representing unexpected inflation that has transpired since the signing of the previous eage contract (and thereby is a measure of the need for price catch-up in the new contract), $\dot{PE}$ is currently expected price inflation and RHW is a regionalized help

wanted index which measures the degree of tightness in the regional labour market where the new wage rate is being negotiated. D is a dummy variable equal to unity during the period of the operation of the Anti-Inflation Board. This variable when multiplied by the other variables, shows a significant change in wage rate adjustment during the tenure of the AIB.

The general equilibrium model devised by Swan and Kovacs includes labour demand and supply. Rates of wage change from the supply side are determined by price inflation $\dot{p}$, the degree of labour market tightness (as measured by the unemployment rate u), wage parity forces (modelled by $w/\bar{w}$ relating Newfoundland wages and salaries per employed person w to those in the rest of Canada $\bar{w}$), and other factors such as the degrees of generosity and coverage of the unemployment insurance program (UIC and THETA). Working through a perfectly competitive market mechanism, the demand for labour is influenced by movements in relative wage inside and outside Newfoundland ($w/\bar{w}$), and by RELA, the ratio of total factor productivity in Newfoundland relative to the rest of Canada (as measured by residuals from a fitted Cobb Douglas production function). The level of labour demand is also influenced by the buoyancy of the economy outside Newfoundland (measured by UROCLAG) and, in the presence of money illusion, by three other variables -- the level of net government spending and transfers (FISC), outmigration (OUTMIG), and the rate of change of relative real wages (WRELDOT).

Using this notation the Swan/Kovacs results estimated by means of instrumental variables are summarized in the two equations

$$\dot{w} = \underset{(1.74)}{0.495} + \underset{(0.20)}{0.081u} - \underset{(-2.22)}{0.735w/\bar{w}} + \underset{(1.71)}{1.644UIC} + \underset{(1.12)}{0.079THETA} + \underset{(2.88)}{1.058\dot{p}_{-1}}$$

$$R^2 = 0.62$$
$$DW = 1.91$$
$$F(5,17)^{**} = 8.09$$

$$u = \underset{(-.53)}{-0.044} + \underset{(1.89)}{0.36 \log w/\bar{w}} - \underset{(-1.70)}{0.17 \log RELA_{-2}} - \underset{(-2.84)}{0.047 \log FISC}$$

$$+ \underset{(3.81)}{1.42 UROCLAG} + \underset{(2.02)}{0.0037WRELDOT} + \underset{(0.71)}{0.78 OUTMIG}$$

$$R^2 = 0.87$$
$$DW = 1.45$$
$$F(6,16)^{**} = 25.03$$

They find (as did Thirsk and Riddell) that Newfoundland's unemployment rate has no significant effect on wage determination. Going beyond Thirsk these results suggest not only that Newfoundland wage levels are influenced by wages elsewhere in Canada, but that the rate of Newfoundland wage inflation slows down as its wage level approaches parity with the rest of Canada. They also hint that increasing the generosity of the unemployment insurance program may exert upward pressure on wage levels in Newfoundland, but this effect is not quite statistically significant at the 10 per cent level.

The results also suggest that faster growth in Newfoundland wages and higher wage levels in Newfoundland relative to the rest of Canada cause local unemployment and they suggest that increased net government spending and productivity improvement help reduce unemployment.

The authors interpret the importance of their findings by stating that a 10 per cent increase in Newfoundland's productivity relative to the rest of Canada would decrease unemployment by 3/4 of a percentage point, and that making unemployment insurance as generous as the average of 1954 and 1976 would reduce the margin of unemployment between Newfoundland and the rest of Canada by only 0.2 percentage points while probably reducing unemployment rates in both regions by an unmeasured amount. Net government spending however has weak employment effects. Finally, growth in the rest of the world economy that reduces unemployment rates in the rest of Canada by one percentage point would lower measured unemployment in Newfoundland by 2 3/4 percentage points.

7. Conclusions

This paper presents something of a synthesis of the economic theory we used when we developed the text for the Economic Council's study, Newfoundland: From Dependency to Self-Reliance. It is a synthesis that begins with fishery economics and incorporates natural resource staples into an export base before

going on to include home goods and services and the import-competing sector. It encompasses the role of government transfers and various kinds of technological advance. It incorporates migration, not just as a means of exporting unemployed people to the rest of Canada, but as an integrated part of the labour market adjustment mechanism which influences the productivity of the economy and the aggregate demand for labour as well as influencing its supply.

The theory of the firm and spatial economics are used to explain one important discovery -- that the most effective ways to raise the productivity of Newfoundland's economy are to allow the natural evolution of its economic organization so as to unify the isolated outport economies into larger markets so as to achieve higher rates of utilization of the province's business establishments. Finally, modern theories of labour market adjustment are incorporated to help us understand how the economy adjusts over time.

The synthesis presented in this paper does not include all the economic theory implicit in the Council document although it does represent the theoretical core. It is not the brain child of any one person and it is certainly different in fundamental ways from ideas that we individually held at the time the study began. As the facts came in, preconceived assumptions were demonstrated to be false, old hypotheses were rejected and new ones developed in their place. There is a good chance that some aspects of the

resultant synthesis will be relevant to other regional economies too. The lessons of the Economic Council's "Newfoundland Reference" need not be limited to Newfoundland.

The Newfoundland economy is still incompletely monetized by comparison with urban central Canada so the direct application of the tools of economic measurement and the explanations offered by the theoretical tools devised for an impersonal highly monetized economy probably work less well there. As a result our measures of unemployment less accurately portray involuntary joblessness in Newfoundland and monetary measures of output probably understate the province's economic activity to a greater extent than for urban central Canada. Labour market clearing in rural outports and economic activity itself is much more personal and informal than in a large urban environment.

There is an important difference between the hated ideas of "resettlement" and the idea of unifying and enlarging markets so as to achieve higher rates of utilization of factors of production, greater scale of operation, greater specialization and to make the unified market large enough to sustain in the minimum scale of plant for a larger number of industries. Within Newfoundland it is not necessary to resettle people to achieve the economic advantages of larger markets as long as the centres of economic activity are located within commuting distance of most outlying settlements. While this unification and enlargemnt of markets is not possible for all parts of the province, it is

relevant for most of the communities of insular Newfoundland. It does not force resettlement upon the people; rather it brings a range of employment opportunities and services to major peninsulas where people previously did without these services.

The economics of fish -- the common property resource problem -- can generate serious malfunctioning for the entire marine regional economy. When the problems of unlimited access and uncontrolled harvesting rights are compounded with fishery subsidies and poorly devised income supplementation plans (such as the fishermen's provision and the regionally extended benefits provision of the national unemployment insurance program) the troubles inflicted upon the operation of the regional economy are more severe than either fisheries economists or regional economists have previously envisaged. The fact that interregional migration is also sensitive to the incentives embedded in this situation helps magnify the problems. The fishery and the regional economy of Newfoundland have become -- unwittingly and unwillingly -- an economic balance wheel for Central Canada and a repository for some of its cyclically unemployed.

Productivity improvement, cost reduction, increased economic efficiency, enhancement of competitiveness -- by whatever name -- an increase in the value of output obtained from a given outlay for labour, capital and materials is indeed worthy of consideration as a means of raising earned incomes in any

underdeveloped regional economy. And, on balance, a strategy of productivity improvement -- especially if fostered largely by unifying and enlarging localized markets -- will likely enhance employment and increase the range of goods and services available to people in the region. While some technical advances such as the replacement of axes by chain saws undoubtedly lay off workers in the short run, some of these same labour-saving technical advances may be necessary to preserve some of the region's industries -- and the jobs in them -- in the long run.

Nor is all technical advance of a labour-saving nature. Some of it, in fish plants in particular, may be materials-saving and labour-using in which case it helps expand the effective size of the region's export base and create employment at the same time.

Finally, the enhancement of productivity and economic performance may help create or expand the import-competing, non-primary tradable goods sector that ultimately frees the regional economy from the shackles of its natural resource export base.

But productivity improvement costs money does it not? Who is to pay for the new factories and the new machines that embody the new, more productive technology? And building new roads so rural people can commute to larger market centres for jobs and services involves extra cost and extra gasoline in an age of high energy prices does it not? Surprising as it may seem, productivity

improvement does not necessarily call for more capital; it may call for less than Newfoundland is currently using; the roads already exist and people are doing a great deal of commuting anyway.

According to our results, the most effective ways to raise establishment performance are not through capital subsidies to overcome some kind of market imperfection inhibiting capital flows, but through the gradual location of business establishments and government services in central places so as to serve the largest possible number of people. That policy leads to fewer but larger establishments and smaller inventories which could lead to a lower total capital outlay for businesses, schools, hospitals, civic centres, and the like. (But as argued below, the policy does not necessarily lead to fewer establishments in total). An alternative policy of subsidizing capital equipment for workers in outlying areas may result in the uneconomic installation of capital-using, labour-saving technology that raises costs, lowers the marginal productivity of capital and fails to create employment. Automated fish plants working short seasons in dozens of far-flung outports are not only expensive; they are big users of capital; they are big users of raw material because they recover less usable flesh per pound of raw fish; they are not the source of many man hours of employment.

Locating a smaller number of larger establishments for a given industry in central places does not necessarily mean fewer establishments in total; it may result in more. By drawing the peninsular markets together into central places, a larger number of industries can be made viable within the peninsulas; there is a much larger number of industries whose minimal scale of plant can be justified in a market of 50,000 people than can be justified in 100 isolated communities of 500 people.

Allowing regional centres of commuter sheds to develop is not an expensive process. It largely means going along with what happens naturally. Governments do not need to subsidize the process -- although they certainly may be seen to. In the provision of government services such as large community centres and recreational facilities, locating police detachments, harbour facilities, regional highschools and hospitals, the government has the option of scattering these all over the peninsula and making lots of them. The result would be a very expensive dissipation of the market so that few but the most rudimentary of merchant services could survive in any one community. The other option of locating these government services in a small number of central places will probably reduce the overall cost of providing these services to peninsular people and bring the peninsular market together where a larger number of industries can justify a minimum scale of operation and where some industries can experience competition. While it gives the outward appearance that government is subsidizing the central place it really amounts to a reduction in the total cost of public goods to the peninsula.

The cost of commuting to one or two urban centres is probably less than the cost of commuting to a dozen different centres for different social services. The peninsular roads are already built on the Island of Newfoundland. By locating services in a small number of central places, the overall accessibility of these services to peninsular people is probably increased. We do not advocate the commuter solution for coastal Labrador or the most isolated parts of Newfoundland.

Whereas we did not find evidence of a statistically significant causal relationship between economic performance and human capital -- education, training and experience, we did find strong correlations in some instances. Our evidence suggest that education increases mobility and adaptability in the labour force so that new skills are then more readily learned. Education and training of the local labour force do enhance the chances that this labour will migrate to other parts of Canada, but we also know that many out-migrants return later and that much of the in-migration seems to be used to fill gaps -- jobs requiring education and job skills not readily available in Newfoundland. The author concludes that education and unfettered migration are important to allow individuals to maximize their own potential, and to raise the performance of the regional economy. Whether there is a case for Central Canada assuming a greater or lesser burden in financing Newfoundland's education and training system is unclear: Newfoundland loses some of the young people she educates and trains, but she also receives many she did not train or educate.

The labour market in Newfoundland does not function very well partly because of the common property resource, subsidy and income maintenance aspects tied to the fishery and partly because the malfunctioning of central Canada's labour market compounds the problem in Newfoundland. In buoyant times the rest of Canada draws workers from Newfoundland; in recession it tends to send them back and would-be out-migrants get "bottled up" in Newfoundland. While evidence does suggest larger short term frictional unemployment in Newfoundland, Postner's evidence shows it does not constitute a larger fraction of total unemployment. While evidence from both Postner and Thirsk hints that the people and jobs matching mechanism works less well in Newfoundland than Ontario, there is no suggestion that much can be done to lower the unemployment rate through policies aimed at making workers more knowledgeable about the tiny number of job vacancies.

While we did not discuss it in this paper, seasonality does explain some of the unemployment in Newfoundland and something can be done about.[48]

The empirical evidence we have seen suggests that the wage determination mechanism in Newfoundland is much more a function of wage parity with Ontario or the rest of Canada than it is with respect to the level of unemployment in Newfoundland. This has two important implications:

First, unfortunately, any events which raise the rate of wage increase in a target region like Ontario will soon touch off wage increases in Newfoundland even though nothing may have happened to the level of aggregate demand in Newfoundland. The increased wage in Newfoundland will cause Newfoundland workers to be laid off needlessly as a result of wage events that happened somewhere else. Presumably Newfoundland's employment levels would be marginally improved (or at least be prevented from getting worse) by policies such as wage and price controls which hold down the rate of wage and price increase in provinces like Ontario.

Second, and much more happily, virtually anything that increases the demand for labour in Newfoundland -- improved export markets, natural resource discovery, resource-saving or labour-using technological advance, an injection of transfers, or government spending financed by external borrowing, will all translate directly into improved employment in Newfoundland without causing wage inflation to dampen the employment creation.

How should we sum up the general nature of our findings about the ways in which the Newfoundland economy functions, and about the prospects for government action to raise earned incomes and reduce employment? First, market forces -- especially those linking Newfoundland's exports, imports and labour markets to the rest of the world are very active, and cannot be ignored. But price determination, both for products and for labour, is largely external to the region. Regional policy action to control the

level and location of government spending and to influence economic activity through subsidies or other market interference impact mostly, therefore, on the choice of factors of production used and the level of economic activity, not on prices or wages.

The policy decisions which will lead to the greatest number of self-sustaining jobs and highest earned incomes in the long run are those that aim at making the regional economy most efficient. Policies aimed at making government services accessible to the largest number of people at lowest cost are also the ones which tend to unite markets and create additional employment opportunities in the home goods and services sector and in import competition.

Policies aimed at bucking market forces in an effort to force job creation or to force jobs into particular places may end up doing more harm than good. Dispersing the location of government services among many small centres in an effort to share government largesse acts to fragment markets, keeping them small, and keeping out of the region those industries which need larger markets in order to survive.

Policies aimed at subsidizing a particular industry like the fishery, tend to disguise unemployment as underemployment, and to inject both capital and labour into an industry where their ecnomic contribution is about zero. Policies aimed at subsidizing capital may raise the productivity of labour but may

also raise total costs and could even reduce employment through inadvertently subsidizing labour-saving, materials-using technical changes that would not be adopted in an unsubsidized economy. Policies to subsidize particular modes of transport may inhibit the growth of the most effective means of transportation and curtail the efficiency and job creation potential of the entire economy.

All this analysis leaves aside the prospect of the province capituring huge economic rent bonanzas in offshore oil and hydroelectricity -- massive rents which could inject billions of dollars into the hands of the Newfoundland government enabling it to undertake large scale job creation projects or to finance a higher level of consumption. How to capture such a bonanza is a matter of political strategy about how to share unearned economic rents or how to divert them from one set of hands to another. It is not a question about raising earned incomes and reducing unemployment for a given economy which is the subject matter of this paper. To whatever extent the governments of Newfoundland, Canada and the other provinces decide to cede, grant, or allow Newfoundland to receive economic rents, the lessons of this paper will still apply; there are more jobs and more earned income to be had in an economy that is economically efficient than one that is not.

Notes

1 The Economic Council of Canada, Newfoundland: From Dependency to Self-Reliance, Supply and Services Canada, Ottawa, 1980. The study was requested by the Prime Minister of Canada in response to an approach made by the Government of Newfoundland and Labrador for a study of the economic development problems and opportunities in that province. The current discussion paper presents much of the economic theory that is implicit in the Council report. For additional studies in economic theory associated with this work, see, N.W. Swan and P.J.E. Kovacs, Empirical Testing on Newfoundland Data of a Theory of Regional Disparities, Economic Council of Canada, Supply and Services Canada, Ottawa 1981 and Frank Flatters, "Productivity, Transfers and Employment: Government Policies and the Newfoundland Economy", Economic Council Discussion Paper No. 191, 1981.

2 Economic incentives help explain the low degree of monetization and dispersed nature of economic activity in Newfoundland. Andy Rowe in "The Financing of Residential Construction in Newfoundland", Canadian Public Policy, VII:1, Winter 1981, argues that many Newfoundlanders built their own houses without mortgages because they could not prove ownership of the land upon which they proposed to build, and thereby could not qualify for NHA mortgages. Historically the land was not surveyed and land titles were not registered in rural areas. On the other hand, failure to register property ownership discouraged the implementation of property taxes outside major cities, as did the provincial government's willingness to assume the burden of municipal expenditures for small communities. A new program to survey and register land and a new municipality act in 1980 which encourages the amalgamation of small communities and the imposition of local property taxes should overcome these problems.

3 Economic Council of Canada, Living Together: A Study of Regional Disparities, (Ottawa, 1977), Chapter 7. See also Michel Boisvert, The Correspondence Between the Urban System and the Economic Base of Canada's Regions, Economic Council of Canada Staff Study, (Ottawa, 1978).

4 This argument is developed at length in the "Sullivan Report". See Report of the Commission of Inquiry into Newfoundland Transportation, Volume I, Supply and Services Canada, Ottawa, 1978.

5 See Newfoundland: From Dependency to Self-Reliance, op. cit. Chapter 2.

6 H.A. Innis, The Fur Trade in Canada: An Introduction to Canadian Economic History, (Toronto: University of Toronto Press, 1930, 2nd edition, 1956); idem, The Cod Fisheries: The History of an International Economy, (Toronto: University of Toronto Press, 1940, 2nd edition, 1954). W.A. MacIntosh,

"Economic Factors in Canadian History," Canadian Historical Review, (1923), pp. 12-25, and idem, "Some Aspects of a Pioneer Economy," Canadian Journal of Economics and Political Science, 2 (1936): pp. 457-63.

7 A.D. Scott, "Policy for Declining Regions: A Theoretical Approach," Regional Economic Experience, ed. N.H. Lithwick (Toronto: McGraw Hill Ryerson, 1978).

8 See Gordon Munro, A Promise of Abundance: Extended Fisheries Jurisdiction and the Newfoundland Economy, Economic Council of Canada, Supply and Services Canada, 1980, Chapter 2 and appendix.

9 According to the provincial government study Setting a Course, after the Atlantic Fish stocks have recovered in 1985, 5,676 near shore fishermen and 3,573 long liner fishermen could be sustained by the inshore fishery and earn reasonable incomes of $7,500 in 1977 dollars. An additional 1,100 to 1,200 persons work in the offshore sector.

10 In 1979 there were 32,370 fishing licences in Newfoundland (most of which are held by part-time fishermen) and 10,342 unemployment insurance claims to fishermen allowed. Since the value of fish landings was $151,421,000 the average value of fish landings per fisherman had to be less than $151,421/10.342 = $14,641 to average unemployment insurance benefits of $2,379 paid to fishermen. During 1979, there were 1,028 subsidized loans averaging $20,610 per loan made to by the Fisheries Loan Board, one of the sources of subsidies (Source: Table 6-2 of Newfoundland: From Dependency of Self Reliance).

11 Figures 1, 2 and 3 actually portray fishermen's gross income including payments to cover their capital equipment and operating costs. The number N_0 represents the gross fishing income below which fishermen would prefer to work in Ontario. To use an hypothetical example, suppose that in the absense of subsidies an "equilibrium" number of 10,000 fishermen earned gross incomes averaging $12,000 per year which they consider to be "equivalent" to earning the wage that would be offerred to them in Ontario. Then, according to this model, the introduction of a net subsidy of, say, $2,500 per year in net unemployment insurance benefits and other subsidies would entice about 26 per cent (or 2,600) more people into the fishery and average gross income from fishing would decline to $9500 at the new equilibrium.

12 Employment, wages and natural resource rents may also be increased by improving natural resource utilization and enhancing natural resource recovery -- a type of natural resource augmenting technical advance -- a topic which is discussed later in this text.

13 There is also a useful theory which shows that where there are several alternative economic uses for the same natural resource, some uses being more labour intensive than others, that

large amounts of labour can be absorbed by natural resource industries -- without lowering wages -- by gradually expanding the labour intensive processes and reducing the natural resource intensive processes. See Lawrence Copithorne, Natural Resources and Regional Disparities, Economic Council of Canada, 1980, Chapter 2.

14 Wage differentials -- even as large as 50 per cent -- are, however, not uncommon between regions in Canada.

15 Note, if all the unemployed workers from the other industries enter the fishery, we will have
$(L_1 - L_1) = (L_2 - L_2') + L_3$.

16 A permanent wage subsidy is not a ridiculous idea. (Although we do not advocate it as a general solution to Newfoundland's problems it might create more jobs than a permanent transportation subsidy of $50 million plus per year. The transportation subsidy on the Gulf rail link was enshrined into the Terms of Union at Confederation, so it is very permanent. These points are dealt with in detail in Frank Flatters, op. cit. (footnote 1)

17 Neil Swan and Paul Kovacs op.cit. C.E. Ferguson also points out that the American economy as a whole seems to have been characterized by labour-using technological progress in post-war years. See his Microeconomic Theory, 3rd edition, Irwin 1972.

18 Frank Flatters op. cit.

19 I am here assuming constant returns to scale and using the concept of a "community" production function to get isoquants (equal output curves) for the entire community of Newfoundland to avoid introducing the concept of aggregating the demand curves of individual establishments to get the provincial demand curve for labour in panel 6.2.

Assume the wage rate w_0 is given independently of the natural resource industry. In the Newfoundland context it would not be unreasonable to think of the provincial wage rate as being pegged by institutional forces with respect to wage rates set outside the region. If Newfoundland had a competitive economy and a non-tradable primary goods sector, the wage level would be determined in the non-primary sector (see Copithorne op. cit.). Either way the wage rate is taken by primary industry as given independently of the supply of labour.

20 See C.E. Ferguson op. cit. or F.H. Hahn and R.C.D. Matthews, "The Theory of Economic Growth: A Survey", in Surveys of Economic Theory: Volume II, Growth and Development, prepared for the American Economic Association and the Royal Economic Society, St. Martins Press (New York) 1965.

21 The new equilibrium price for natural resources is higher so the new equilibrium isocost line running through point C (not shown in Panel 6.1) is flatter and tangent to the isoquant marked $150.

22 Newfoundland: From Dependency to Self-Reliance, Chapter 5, op cit.

23 Noel Roy, William E. Schrank, Eugene Isoa, "Cost and Production in the Newfoundland Fish Products Industry", Economic Council Discussion Paper No. 190, 1981.

24 See debate by Senators D.D. Everett and W. Doody in Proceedings of the Standing Senate Committee on National Finance, Thursday, December 11th, 1980.

25 Parzival Copes.

26 Swan and Kovacs op. cit. See also R.W. Boadway and A.G. Green; "The Economics of Migration: the Case of Newfoundland", Economic Council Discussion paper, forthcoming.

27 The traditional staples theory recognized these complexities. It, however, put almost no stress on creating jobs by raising productivity in local non-primary industry, on import-competition or the use of productivity increase and innovation to create new non-primary exports in the face of declining staple exports. While evacuation of isolated mine sites is practical when the ore runs out, partial evacuation of Newfoundland is not practical when the Buchans or St. Lawrence mines close and fishmarkets go badly. Nor given the inherent productive powers of over half a million people, do we believe it is necessary.

28 Boadway and Green op. cit.

29 See Ludwig Auer, Regional Disparities of Productivity and Growth in Canada, Economic Council of Canada (Ottawa: Supply and Services Canada, 1979).

30 Lawrence Copithorne et. al., "Productivity and Industry Performance: A Study of Business Establishments in Ontario and Newfoundland", Economic Council of Canada, proposed. In the interim, see Walter S. Good, "Productivity in the Retail Grocery Trade: A Newfoundland-Ontario Comparison", with Econometric Analysis by Jonathan Wilby, Economic Council of Canada Discussion Paper No. 183, 1980. See also Chapter 5 of Newfoundland: From Dependency to Self-Reliance op. cit. See also mimeographs by H.B. Geiger et. al. (construction), P. Shea (bakeries), R. Knight and M. Ash (hotels, local trucking, confectionary wholesale), G. Macmillan (department stores), D. Briffett (fish plants), and B. Hollett (insurance agencies).

31 See Newfoundland: From Dependency to Self-Reliance, Appendix B.

32 See Newfoundland: From Dependency to Self-Reliance, Chapters 5, 6 and 9, J.F. Wilson, "Seasonal Unemployment in Newfoundland: Trends and Determinants", Economic Council Discussion Paper No. 186, and Stephen Ferris and Charles Plourde, "Fisheries Management and Employment in the Newfoundland Economy", Economic Council Discussion Paper No. 173. See also Derek Briffet op. cit. and H.B. Geiger et. al. op. cit.

33 This method of looking at the unemployment rate as a weighted average of the frequency and duration of unemployment in different groups of the labour force is discussed in popular texts such as Rudiger Dormbusch and Stanley Fisher Macro-economics, McGraw-Hill Inc., 1978, pages 478-480. The estimates we use here are presented in Harry H. Postner, A New Approach to Frictional Unemployment: An Application to Newfoundland and Canada, Economic Council of Canada, (Supply and Services, Ottawa, 1980). See page 24 in particular.

34 See R.W. Boadway and A.G. Green, "The Economic Implications of Migration: The Case of Newfoundland", Economic Council Discussion Paper No. 189, 1981.

35 Thomas J. Courchene "Interprovincial Migration and Economic Adjustment", Canadian Journal of Economics, November 1970. Boadway and Green did not find such a relationship for Newfoundland, but Stanley Winer and Denis Gauthier at the Economic Council have re-estimated the Courchene model for more recent Canadian data (excluding PEI) for 1951-1978, and a significant negative relationship between out-migration and total federal transfers per dollar of labour income continues to exist. Another interpretation of this result, as we observed earlier, is that outmigration can cause transfers to decline -- the reverse of the mechanism hypothesized by Courchene.

36 For a participation rate function based on time and employment growth, see R. Cournoyer and J. Wilson, "Projections of the Newfoundland Unemployment Rate, Participation Rate, Labour Force and Employment under Four Scenarios", Economic Council of Canada, (mimeograph) 1980. Boadway and Green op. cit. estimate a wage-related participation rate function.

37 Boadway and Green, op. cit. Chapter 4.

38 P.J.E. Kovacs and L.W. Copithorne, "Downwardly Rigid Wage Demands", Economic Council of Canada (mimeograph), presented at the Canadian Economics Association meetings, Montreal, June 1980.

39 N.W. Swan and P.J.E. Kovacs, Empirical Testing on Newfoundland Data of a Theory of Regional Disparities, Economic Council of Canada (Ottawa, Supply and Services Canada, 1981). Boadway and Green, op. cit. also provide evidence with respect to wage levels.

40 The EE curve is presented by Keith Newton in "Some Simple Analytics of the Phillips Curve: A Geometric Derivation", The American Economist, Vol. XXI, No. 2, Fall 1977. The seminal article introducing the u-v locus and the concept of uv as a measure of labour market efficiency is J.C.R. Dow and L.A. Dicks-Mireaux, "The Excess Demand for Labour: A Study of Conditions in Great Britain, 1946-56", Oxford Economic Papers, New Series, Volume 10, No. 1, February 1958, pp. 1-33. An early application of these concepts to Canadian data was made by G. Peter Penz in "Structural Unemployment: Theory and Measurement", Program Development Service, Department of Manpower and Immigration (Ottawa, 1969). An early application of these concepts to regions within Canada was by Wayne Thirsk, Regional Dimensions of Inflation and Unemployment, Prices and Incomes Commission, Information Canada, Ottawa, 1973.

41 This of course presumes a stable relationship between u and v. In practise, a number of researchers have noticed anticlockwise loops in the Phillips Curve. This can be hypothesized to result from short run variations in the u-v relationship. In particular it has been argued (for example, by Hansen, Quarterly Journal of Economics, 1970) that u x v will be greater in periods of rising unemployment and less in periods of falling unemployment leading to clockwise loops in the Phillips Curve. This effect can be captured by putting $\dot{u}$ in the Phillips Curve.

42 Both Keith Newton op. cit. and Wayne Thirsk op. cit. (pages 90-91) define equilibrium as the state where the vacancy rate equals the unemployment rate. Apart from the fact that statisticians have trouble measuring vacancies and unemployment on a mutually consistent basis, the current author sees no reason at all why powerful labour unions for example would stop pushing for real wage increases at precisely the point where vacancy and unemployment rates are equal.

43 Actually, Craig Riddell fitted

$$\dot{w} = \alpha_0 + \beta_1 \frac{1}{n} + \beta_2 \Delta u + \beta_3 \dot{p}_e + \beta_4 \text{ MinWage} + \ldots, \text{ and}$$

$$u = \alpha_0 + \beta_1 \left(\frac{\dot{p} - \dot{p}_e}{\dot{p}_e} \right) + \ldots + \beta_4 \text{MinWage} + \text{UIC}_{max}$$

where $\frac{\dot{p} - \dot{p}_e}{\dot{p}_e}$ is the rate of unexpected inflation. The theoretical foundations of Riddell's models are actually quite different from the simple Walrasian adustment mechanism presented here. Whereas Riddell draws upon concepts of a NIRU (non-inflation rate of unemployment) and NAIRU (non-accelerating inflation rate of unemployment), the Walrasian idea presupposes that Newfoundland has no influence whatsoever on anybody's inflation rate. Conceptually the current Walrasian idea is closer to Richard G. Lipsey, "The Relation Between Unemployment and the Rate of Change of Money Wages in the United Kingdom, 1962-1957: A Further Analysis", Economica, XXVII, No. 105, February 1960.

44 Simultaneous equations are used by Grubel, Maki and Sax (1975) when they studied the effect of unemployment. Siedule, Skoulas and Newton used the entire CANDIDE model when they studied the effect of unemployment insurance (see references).

45 Harry Postner op.cit.

46 See D.A.L. Auld, L. Christofides, R. Swidinsky and D.A. Wilton, "The Impact of the Anti-Inflation Board on Negotiated Wage Settlements," Canadian Economic Journal, XII, No. 2, May 1979. Thirsk, Riddell, Swan and Kovacs op.cit.

47 These results are not out of line with recent labour market research in Canada. See Tom Siedule, Nicholas Skoulas and Keith Newton, The Impact of Economy Wide Changes on the Labour Force: An Econometric Analysis, Economic Council of Canada, Ottawa, 1976. See also Ronald G. Bodkin and Andre Cournoyer, "Legislation and the Labour Market: A Selective Review of Canadian Studies", in Herbert G. Grubel and Michael A. Walker, editors, Unemployment Insurance: Global Evidence of Its Effect on Unemployment (Proceedings of An International Conference Held in Vancouver, B.C.), The Fraser Institute, Vancouver 1978. See also Abrar Hasan and Surendra Gera, Job Search Behaviour, Unemployment and Wage Gain in Canadian Labour Markets, Economic Council of Canada (forthcoming).

48 See Newfoundland: From Dependency to Self-Reliance, Chapter 4, and J.F. Wilson, "Seasonal Unemployment in Newfoundland: Trends and Determinants", ECC Discusssion Paper No. 186, 1981.

APPENDIX A

A Two Sector Model of a Regional Economy: Natural Resource Exports, Non-tradable Home Goods and Services, and Transfers

The two constant-returns-to-scale production functions are

$$(1) \quad X = F(K_1, L_1, N) = L_1 f(k_1, n)$$

$$(2) \quad H = G(K_2, L_2) = L_2 g(k_2)$$

where X and H are the respective volumes of production of natural resource export product and non-tradable home goods and services, K_i, L_i and N are inputs of capital, labour and natural resources, k_i and n are the amounts of capital and natural resources employed per worker in the ith sector. The balance of payments constraint is:

$$(3) \quad M = X + T$$

where M represents the volume of import goods and T is the value of transfers from outside the region. Both imports and exports are measured in such units as will make the price of exports and the price of imports both equal to one dollar so their prices can be surpressed in the algebra. The local demand for export, import and home goods can be derived from the community utility function

$$(4) \quad u = u(X_D, M, H)$$

maximized subject to the budget constraint

$$(5) \quad Y = w_0(L_1+L_2) + \beta r_0(K_1+K_2) + \gamma RN + T$$

where X_D is local consumption of the export good, Y is regional income which is made up of labour income (determined by the institutionally set wage w_0, capital income (determined by the international price of capital r_0, and the fraction β of the region's capital stock which is regionally owned), the fraction γ of natural resource income RN that is captured within the region, and T, the net transfers from outside the region. For simplicity assume

$$(4') \quad u = X_D^0 H^{\alpha} M^{1-\alpha}$$

so that the share of income spent on home goods is

$$(5') \quad PH = \alpha Y$$

where P is the price of home goods, α is the fraction of income spend on home goods and $(1-\alpha)$ is the share spent on import goods. In that case

$$(5'') \quad M = (1-\alpha)Y$$

so that combining equations (5') and (5'') we obtain the simple demand condition

$$(5''') \quad PH = \frac{\alpha M}{1-\alpha}$$

which clearly shows the demand for home goods is directly tied to imports.

The perfectly competitive equilibrium conditions in factor markets are

$$(6) \quad r_0 = \frac{\partial X}{\partial K_1} = f'(k_1)$$

$$(7) \quad r_0 = \frac{P\partial H}{\partial K_2} = Pg'(k_2)$$

$$(8) \quad w_0 = \frac{\partial X}{\partial L_1} = f(k_1,n) - k_1 f_1(k_1,n) - nf_2(k_2,n)$$

$$(9) \quad w_0 = \frac{P\partial H}{\partial L_2} = P\left[g(k_2) - k_2 g'(k_2)\right]$$

$$(10) \quad R = \frac{\partial X}{\partial N} = f_2(k_1,n)$$

where r_0 and w_0 are the predetermined prices of labour and capital and R is the endogenous economic rent which is determined residually after labour and capital payments have been met.

Solution of the model is partly sequential and partly simultaneous:

(a) The exogenously determined price of capital r_0 and wage rate w_0 in equations (6) and (8) simultaneously determine k_1^* and n^*, the most profitable amounts of capital and labour per worker in the natural resource sector.

$$\left.\begin{aligned} (6)\quad & r_0 = f_1(k_1,n) \\ (7)\quad & w_0 = f(k_1,n) - k_1 f_1(k_1,n) - n f_2(k_1,n) \end{aligned}\right\} \Rightarrow k_1^*, n^*$$

(b) The exogenously determined natural resource endowment N_0 plus the equilibrium amount of natural resource per worker n^* determines the equilibrium amount of labour demanded L_1^* in the natural resource sector:

$$(11)\quad \frac{N_0}{L_1} = n^* \Rightarrow \quad L_1^* = \frac{N_0}{n^*}$$

(c) This equilibrium level of employment plus the equilibrium factor proportions k_1^* and n^* used in equation (1) determine the equilibrium volume of export good production

$$(1)\quad X^* = L_1^* f(k_1^*, n^*)$$

(d) Exports plus the exogenously determined level of transfers T_0 in equation 3 determine the equilibrium volume of imports:

$$(3)\quad M^* = X^* + T_0$$

e) The competitive equilibrium conditions in (7) and (9) silultaneously determine the equilibrium amount of capital per worker k_2^* in the home goods sector and the price of home goods P^*:

$$\left.\begin{array}{ll} (7) & r_0 = Pg'(k_2) \\ (9) & w_0 = P\, g'(k_2) - k_2 g'(k_2) \end{array}\right\} \Rightarrow k_2^* \text{ and } P^*$$

(f) The equilibrium price of home goods and services P^* and the volume of imports M* used in the demand for home goods and services (5''') determine the equilibrium volume of home goods production H*:

$$(5''') \quad P^* H = \frac{\alpha M^*}{1-\alpha} \Rightarrow H^*$$

(g) This volume of home production H^* and the equilibrium factor proportion k_2^* used in the production function (2) determines the demand for labour is the non-tradable home goods and service sector:

$$(2) \quad H^* = L_2 g(k_2^*) \Rightarrow L_2^*$$

(h) This completes the aggregate demand for labour by the definition:

$$(12) \quad L_D^* = L_1^* + L_2^*$$

(i) If one cares to go on to specify some kind of labour supply function

$$(13) \quad L_S = \theta(w_0, L_D^*, POP)$$

which is influenced by the wage level w_0, the level of employment L_D^*, the level of population POP (or whatever), one can residually obtain an equilibrium unemployment rate

$$(14) \quad u^* = \frac{L_S - L_D^*}{L_S}$$

(j) Using the factor proportions in the natural resource industry in the competing equilibrium condition in the market for natural resource utilization rights (10) one obtains residually the per unit economic rent on natural resources

$$(10) \quad R = f_2(k_1^*, n^*) \Rightarrow R^*$$

which, with the natural resource endowment N_0 determines the entire natural resource income R^*N_0.

The Attenuation of the Power of Migration: An Extension of the Two-Sector Export Base Model

Because of the sequential (separable) nature of this model, both labour supply and the rate of unemployment are determined as an irrelevant after thought. Neither can affect wage or output determination. In such a model the out-migration of one worker and his or her dependents serves only to reduce the labour supply and unemployment, and to raise the per capita incomes of those who remain behind.

The current extension of the model involves making transfers a function of the number of unemployed uL_S, earned income per capita Y/POP, and the population of the region, POP. That is

$$(15) \quad T = T(uL_S, Y/POP, POP)$$

This extension increases the amount of simultaneity in the model because it forces imports (M in equation 3), the level of production of home goods (H in equation 5''') the amount of labour in home goods (L_2 in equation 2), the total demand for labour (L_D in equation 12), and labour supply (L_S in equation 13) and the unemployment rate (u in equation 14) to be determined simultaneously. All other variables, including the price of home goods P*, the capital/labour ratio in home goods k_2^* and natural resource rental income R^*N_0 are determined by the institutionally fixed factor prices on capital and labour. For simplicity assume all capital is foreign owned so earned income Y is made up only of labour income w_0L_D and resource rents R^*N_0. The remaining part of the system yet to be solved is:

$$(3) \quad M = X^* + T(uL_S, Y/POP, POP)$$

$$(5''') \quad P^*H = \alpha M/(1-\alpha)$$

$$(2) \quad H = L_2 g(k_2^*)$$

$$(12) \quad L_D = L_1^* + L_2$$

(13) $L_S = \theta(w_0, L_D, POP)$

(14) $u = (L_S - L_D)/L_S$

We wish to totally differentiate this system to obtain the signs of the partial derivatives $\partial u/\partial POP$ and $\partial L_2/\partial POP$ to ascertain the effects of migration (changes in POP) on unemployment, employment (and hence on earned incomes). We also wish to determine the sign of $\partial u/\partial T_0$ to ascertain what factors affect the power of exogenous increases in transfers to reduce unemployment by inducing greater employment in the home goods sector. Since our main concern is not to derive general results, but to illustrate the power of transfers to destroy the effectiveness of out-migration as an anti-unemployment tool under reasonable assumptions, we shall simplify the mathematics by assuming particular forms for the transfer function and labour supply function

Let $T = T_0 + t_1 u L_S + t_2 \left[E - \frac{(w_0 L_D + \beta R^* N_O)}{POP} \right] POP + t_3 POP$ (15')

where t_1 is the average transfer per unemployed person (presuming that workers share existing jobs and periods of unemployment so that many qualify for unemployment insurance much of the time).

t_2 is the average transfer per capita (under the equalization payments program) for every dollar by which provincial earned income in wages and resource rents falls below the national per capita average, or datum E for equalization payments. β is the share of natural resource revenues included in equalization.

t_3 is the average transfer per capita received under programs such as family allowances and shared cost programs.

T_0 is an exogenous level of transfers specific to Newfoundland which could also represent borrowing by the provincial government.

$$\text{Let } L_S = Aw_0^{a_1} L_D^{a_2} POP \qquad (13')$$

where A is a shift parameter, a_1 is the elasticity of the supply of labour with respect to wages, a_2 is the elasticity of the supply of labour with respect to the level of employment (proxied by the demand for labour).**

** a_2 has been tentatively measured at about 0.2. See R. Cournoyer and J. Wilson, "Projections of the Newfoundland and Unemployment rate, Participation Rate, Labour Force and Employment under Four Scenarios," Economic Council of Canada mimeograph, 1980.

Now, substitute (15') into (3) and use (13') to obtain the equation system

$$(3)\quad M = X^* + T_0 + t_1 u L_S + t_2 \left[E - \frac{(w_0 L_D + \beta R^* N_0)}{POP} \right] POP + t_3 POP$$

$$(5''')\quad P^* H = \alpha M/(1-\alpha)$$

$$(2)\quad H = L_2 g(k_2^*)$$

$$(12)\quad L_D = L_1^* + L_2$$

$$(13')\quad L_S = A w_0^{a_1} L_D^{a_2} POP$$

$$(14)\quad u = (L_S - L_D)/L_S \qquad \text{or} \qquad L_S = L_D/(1-u)$$

Substitute (3) and (2) into (5''') to eliminate the variables M and H.

Substitute (14) into (13') and (5''') to eliminate L_S. We are then left with the following three equations in three unknowns L_2, u, L_D and two exogenous parameters POP and T_0.

$$(5''')\quad P^* L_2 g(k_2^*) = \frac{\alpha}{(1-\alpha)} \left\{ X^* + T_0 + \frac{t_1 u L_D}{(1-u)} + t_2 \left[E - \frac{(w_0 L_D + \beta R^* N_0)}{POP} \right] POP + t_3 POP \right\}$$

$$(12) \quad L_D = L_1^* + L_2$$

$$(13') \quad 1/(1-u) = Aw_o^{a_1} L_D^{a_2-1} POP$$

Totally differentiating this system we obtain:

$$\begin{bmatrix} P^* g(k_2^*) & -\frac{\alpha}{(1-\alpha)}\left[\frac{(1-u)t_1 L_D + t_1 u L_D}{(1-u)^2}\right] & -\frac{\alpha}{(1-\alpha)}\left[\frac{t_1 u}{(1-u)} - t_2 w_0\right] \\ -1 & 0 & 1 \\ 0 & \frac{1}{(1-u)^2} & (1-a_2) Aw_0^{a_1} L_D^{a_2-2} POP \end{bmatrix} \begin{bmatrix} dL_2 \\ du \\ dL_D \end{bmatrix} = \begin{bmatrix} \frac{\alpha}{(1-\alpha)}(t_3 - t_2 E)dPOP + \frac{\alpha}{(1-\alpha)} dT_0 \\ 0 \\ Aw_0^{a_1} L_D^{a_2-1} dPOP \end{bmatrix}$$

The determinant of the coefficient matrix D is

$$D = -\frac{P^* g(k_2^*)}{(1-u)^2} - \frac{\alpha}{1-\alpha}\left[\frac{(1-u)t_1 L_D + t_1 u L_D}{(1-u)^2}\right](1-a_2) Aw_0^{a_1} L_D^{a_2-2} POP + \frac{\alpha}{(1-u)^2(1-\alpha)}\left[\frac{t_1 u}{(1-u)} - t_2 w_0\right]$$

which is unambiguously negative if $\frac{t_1 u}{(1-u)} 2 - t_2 w_0 < 0$ which it will be if unemployment insurance payment rates per worker are not too large relative to equalization payment rates.

Using Cramer's Rule we can obtain

$$\frac{\partial u}{\partial POP} = \frac{\begin{bmatrix} P_g^*(k_2^*) & \frac{\alpha}{1-\alpha}(t_3-t_2E) & \frac{-\alpha}{1-\alpha}\left[\frac{t_1 u}{(1-u)} - t_2 w_0\right] \\ -1 & 0 & 1 \\ 0 & Aw_0^{a_1} L_D^{a_2-1} & (1-a_2)Aw_0^{a_1} L_D^{a_2-2} POP \end{bmatrix}}{D}$$

Assuming $D < 0$,

$$\frac{\partial u}{\partial POP} < 0 \text{ if } - P_g^*(k_2^*)Aw_0^{a_1}L_D^{a_2-1} + \frac{\alpha}{(1-\alpha)}(t_3-t_2E)(1-a_2)Aw_0^{a_1}L_D^{a_2-2}POP$$

$$+ Aw_0^{a_1}LD^{a_2-1}\frac{\alpha}{1-\alpha}\left[\frac{t_1 u}{(1-u)} - t_2 w_0\right] > 0$$

Dividing through by $Aw_0^{a_1}L_D^{a_2-1}$, we get $\frac{\partial u}{\partial POP} < 0$

$$\text{if } P_g^*(k_2^*) < \frac{\alpha}{1-\alpha}(t_3-t_2E)(1-a_2)\frac{POP}{L_D} + \frac{\alpha}{1-\alpha}\left[\frac{t_1 u}{1-u} - t_2 w_0\right]$$

Observing that $P_g^*(k_2)$ is the value of output per worker in the home goods sector, we note that there is a greater chance that out-migration will perversely raise unemployment

- if $P_g^*(k_2^*)$, the output per worker in home goods is low to begin with,

- if α, the share of income spent on home goods is very large,

- if L_D/POP, the share of population employed is very low,

- if $(1-a_2)$ is very large, which will be true if a_2 the elasticity of labour supply with respect to employment is very low,

- if t_3 is very large relative to t_2E, that is if per capita transfers of the family allowance and shared cost program type is very large and the per capita equalization payments transfer is very small.

The Employment Powers of Transfers and External Borrowing

Assuming the determinant D is negative, the sign of the derivative $\partial u/\partial T_0$ will have the intuitively expected negative sign if the numerator determinant in the expression of Cramer's Rule is positive, i.e., if

$$\begin{vmatrix} P_g^*(k_2^*) & \alpha/(1-\alpha) & \frac{-\alpha}{(1-\alpha}\left[\frac{t_1 u}{(1-u)} - t_2 w_0\right] \\ -1 & 0 & 1 \\ 0 & 0 & (1-a_2)Aw_0^{a_1}L_D^{a_2-2}POP \end{vmatrix} > 0$$

That is, if $\frac{\alpha}{(1-\alpha)}(1-a_2)Aw_0^{a_1}L_D^{a_2-2}POP > 0$

It is apparent from this expression that any additional exogenous transfers (or borrowings), dT_0, that can be used to finance more imports will <u>always</u> cause unemployment to fall. The powers of exogenous transfers or provincial government borrowing to reduce unemployment are greater

- if a larger proportion of income α is spent on home goods,
- if a_2, the elasticity of labour supply with respect to employment creation is low.

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