JENKINS, GLENN P. April, 1976

The Social Cost of Filling Temporary and Permanent Jobs; A Regional Analysis

Appendix 3
Annex "A"
Part 6

24047

THE SOCIAL COST OF FILLING TEMPORARY AND PERMANENT JOBS; A REGIONAL ANALYSIS

by

Glenn P. Jenkins
Harvard University

and

Chun-Yan Kuo
Department of Regional
Economic Expansion
Government of Canada

April 1976

The authors have had the benefit of working closely with Professors' Arnold Harberger, Harvey Schwartz and John Evans. The work reported in this paper builds on the theoretical and empirical research previously completed by these individuals. Donald Tate, Director, Program Evaluation Division, Department of Regional Economic Expansion, not only initiated the research effort on this topic but provided many helpful suggestions and comments throughout the development of this work. The opinions expressed in this paper and any errors that remain are the responsibility of the authors alone.

THE SOCIAL COST OF FILLING TEMPORARY AND PERMANENT JOBS: A REGIONAL ANALYSIS

Introduction

In most countries which are made up of regions with significantly different economic conditions there is usually a migration of labour from the poorer areas to the more prosperous. At the same time governments are usually actively engaged in promoting job creation in the slow growth areas to mitigate against either the depopulation or the relatively high unemployment of these regions. The issue that naturally arises when regional preferences and incentives are discussed is how much of the country's resources should be used to fight against these regional disparities.

If encouraging economic development in the depressed areas is the principal objective of the regional assistance program, then in order for the program to be justified on resource allocation principals the total economic welfare, aggregated over all residents of the country affected by this action, must be improved by at least as much as the resource

costs of the regional development assistance. This leads us to the development of a methodology for evaluating the economic impact of such investment programs which have the objective of alleviating regional economic disparities. To carry out such an evaluation an estimation must be made of the economic cost of the resources, both capital and labour, used to build and operate these projects. The subject of this paper is the measurement of the social opportunity cost of labour in a typical regional economy.

This paper uses data from the Cape Breton Island region of Canada to empirically evaluate the social opportunity cost of labour for a slow growth area. While every region will have its own distinct characteristics the framework developed here for the analysis of such labour markets will have general application.

In the first section of this paper a theoretical framework is developed for the measurement of the social opportunity cost of labour in a regional setting which permits labour migration. This analysis brings together many of the characteristics of a regional labour market with a national unemployment insurance program which is designed to provide maximum assistance to the individuals located in the higher unemployment regions. In section 2, the determinants of the duration of unemployment are evaluated for the Cape Breton

region of Canada. Section 3 draws on the results of the previous two parts of the paper to derive estimates of the social opportunity cost of labour employed in this region.

I.1 Permanent Employment, Temporary Employment and Migration

In most labour market there is a large group of workers who are almost never unemployed while at the same time other members of this labour force experience frequent periods of unemployment. The former group we will refer to as the permanently employed and the latter as the temporary employed.

Some of the individuals who are included among the temporary employed may be working in plants where most of the workers are permanently employed, but because of fluctuations in production those workers with low seniority suffer periodic spells of unemployment. Alternatively, these workers may be working in industries which are seasonal or project related such as construction and thus experience regular periods of unemployment. This group of workers will have a much greater incidence of unemployment than is indicated by the rate of unemployment of the total labour force in the region.

In previous examinations of the determinants of regional migration the unemployment rate and/or the income of the sending and receiving regions have been used as proxy variables to measure the economic forces that would cause people to want to leave the region.[1] However, we find that the general market unemployment rate will seriously underestimate the unemployment experience of the average migrant who decides to leave the region to work elsewhere, and the average income in the sending region will tend to overstate the earnings of a typical migrant. When measuring the social cost of retaining potential migrants in the slow growth region it is the unemployment and earnings experience of the migrants that are the relevant variables.

Many slow growth regions are characterized by a large volume of outmigrants accompanied by a significant amount of return migration. In some of these regions large migration flows in both directions have existed for a number of years yet the unemployment rates of the slow growth regions have not been reduced relative to the areas experiencing net in-migration. The net out-migration has not been large enough to both offset the natural additions to the labour force and to reduce the time that the members of the labour force spend out of work. In such situations an explanation for the persistence of the high unemployment rates is that the differential in the employment conditions between the slow growth regions and the rest of the country is largely a reflection of relative wage rates of those employed in the regions and people's preference for location of

---

1 For example: Thomas J. Courchene, "Interprovincial Migration and Economic Adjustment", Canadian Journal of Economics, November 1970.
John Vanderkamp, "Migration Flows, Their Determinants and Effects of Return Migration", Journal of Political Economy, Sept/Oct. 1971.

residence. For the people who are near to the point of deciding either to move out of the slow growth region or to migrate back, there is an approximate equality between the utility this individual would receive by living in the slow growth region or the high income areas. In the slow growth region he might experience both higher rates of unemployment and lower wages while working, but the lower costs of living and locational preferences compensate for the unfavourable employment opportunities.[1] This relationship can be expressed as follows:

$$(1) \quad U_s(P_s w_s(1-t_s) + (1-P_s)(f_s UIC_s(1-t_s) + L_s)$$

$$= U_o(P_o w_o(1-t_o) + (1-P_o)(f_o UIC_o(1-t_o) + L_o)$$

where:

$U_s(\ )$ is the utility function for the individual if he is living in the slow growth region,

$U_o(\ )$ is the utility function for the individual if he is living outside the slow growth region,

P_s is the proportion of time spent in employment in the slow growth region,

P_o is the proportion of time spent in employment if the individual migrates outside of the slow growth region,

f_i is the proportion of the unemployed time that an individual expects to be able to collect unemployment insurance payments in region i,

UIC_i is the unemployment insurance benefit received each period during periods of unemployment in region i,

---

1 This theory of the role of unemployment in controlling migration flows has been applied by J.R. Harris and M.P. Todaro, "Migration, Unemployment and Development : A Two Sector Analysis", American Economic Review, March 1970, pp. 126-42. It was also used by A.C. Harberger, "On Measuring the Social Opportunity Cost of Labour", in Project Evaluation, University of Chicago Press, ch.7

w_s is the wage received each period from working in the slow growth region,

w_o is the wage received each period from working outside the slow growth regions,

t_s is the average personal income tax rate if the individual remains in the slow growth region,

t_o is the average personal income tax rate if the individual migrates outside the slow growth region,[1] and

L_i is the value the individual places on the leisure he receives while unemployed in region i.

The forces which determine the level of unemployment and migration for the slow growth region are critical to the evaluation of the social opportunity cost of a migrant or the social cost of filling a job in the region. For the entire labour force in the slow growth region the unemployment rate may be, for example, 15 percent while the unemployment rate in the high income regions receiving the migrants may be only 5 percent. However, for the evaluation of the social opportunity cost of a migrant it is the time the typical migrant would have spent unemployed in the slow growth region as compared to the time the average migrant will be unemployed in the high income areas that are the relevant unemployment rates (for example 50 percent versus 20 percent).

The terms inside the utility function on the left side of equation (1) express the individual's private supply price to remain in the slow growth region. This consists of the net of

---

[1] For the analysis of migration it is the average personal income tax rate that is relevant because the decision to migrate is a function of the annual net of tax wages in the two regions not the net of tax wage rate on the marginal hours or weeks worked in the region.

tax wage income the individual expects to receive during the period he is employed plus the net of tax unemployment benefits he receives while unemployed plus the value of the leisure the individual enjoys while not working that is over and above the unemployment insurance payments he receives. The private supply price of labour in the region can be expressed as follows:

(2) Private Supply Price of Labour in Region s $= P_s w_s(1-t_s) + (1-P_s)(f_s UIC_s(1-t_s) + L_s)$

In competitive equilibrium the net of tax unemployment insurance payments plus the additional value of leisure an individual receives while being unemployed will be equal to the net of tax wage expressed as follows:

(3) $w_s(1-t_s) = f_s UIC_s(1-t_s) + L_s$

Substituting (3) into (2) yields:

(4) Private Supply Price of Labour in region s $= w_s(1-t_s)$

However, in the case where the migration decision is based on relative annual incomes in the regions the value of leisure will be less than for the closed economy competitive case. In deciding to migrate between regions it is not the marginal value of leisure as compared to the wage that is relevant. This decision is based upon the value of the package of wages and leisure as an annual total. Therefore equation (3) assumes the maximum value for leisure. This assumption is relaxed in the empirical analysis which follows.

In addition to the private supply price of labour the retaining of a migrant in the slow growth area will lead to a loss in tax revenue that would have been generated if the person

had moved to the high income area. Any unemployment insurance payments that would have been paid to this individual in the high income area are gained if the individual does not migrate. These externalities can be expressed as follows:

(5) Loss in Externalities Arising from Retaining a Migrant in Slow Growth Region $= P_o W_o t_o - (1-P_o) f_o \, UIC_o (1-t_o)$

These two items are usually thought of as income transfers. However, in this case they represent either a net addition or subtraction of income accruing to the country's treasury. These funds are a loss to the rest of society separate from the amount of net of tax wages and U.I.C. payments required to make him at least as well off in the slow growth area as he would be in the high income region. If equation (5) is positive then by migrating the worker can be compensated to move to the high income region and the rest of society also made better off by this amount. The incremental loss to the Treasury's revenue must be included as a social cost of inducing the individual in the slow growth area from migrating to a higher income region.

By combining equations (4) and (5) we can evaluate the social opportunity cost of retaining a migrant in the slow growth region as follows:

(6) SOC Migrant in Region S $= W_s (1-t_s) + P_o W_o t_o - (1-P_o) f_o \, UIC_o (1-t_o)$

While equation (6) evaluates the cost of retaining a migrant in the slow growth region it is also of interest to determine the social opportunity cost of migrant from region S who will be

employed in region O. Beginning with the right hand side of equation (1) and using the same steps as the derivation of equation (6) the social opportunity cost of a migrant from region S but located in region O is as follows:

$$(7) \quad \text{SOC of a Migrant from Region S in Region O} = W_o(1-t_o) + P_s W_s t_s - (1-P_s) f_s \, UIC_s (1-t_s)$$

Typically the net of tax wages rate in the high income region $W_o(1-t_o)$ is higher than net of tax wage rate in the slow growth region $W_s(1-t_s)$. However, the fact that P_o is also much larger than P_s reducing UIC payments and increasing tax receipts will cause the social cost of employing a migrant in the high income region to move toward the social cost of employing the migrant in his home region.

From equation (6) we can measure the social cost of retaining an additional migrant in the slow growth region. However, the social cost of a migrant need not always be equal to the long run cost of filling an additional job in the slow growth region.

If it is the rate of unemployment in the temporary sector that is a determinant of migration flows rather than the general unemployment rate of the region then we would expect that an additional man year of employment in the temporary sector will lead to a greater inflow of migrants than a man-year of permanent employment. The nature of temporary sector employment, e.g. construction or seasonal activities, is such

that the typical individual employed in this sector expects on average to remain at that particular position less than a year. During the rest of the year some time will be spent out of work and collecting unemployment insurance while looking or not looking for another job. It is useful to identify certain occupations or activities that are complementary to the use of U.I.C. compensation and those that are substitutes to receiving unemployment insurance. If more temporary activities are created then more claims can be made on the unemployment insurance program.

For this model of the regional labour market we begin with a given proportion of the time the labour force in the temporary sector of the region is willing to tolerate being unemployed before moving away from the slow growth area. From the previous analysis this proportion has been denoted as $(1-P_s)$. To begin the analysis we also assume that the number of man-years of work of temporary and permanent activities is given to the region each year. The quantity of temporary and permanent man-years of work are expressed as J_T and J_p, respectively. The labour force associated with the permanent sector activities (LF_p) is equal to the man-years of permanent work as no unemployment exists in this sector.

$$(8) \quad LF_p = J_p$$

For the temporary sector each man year of work can support $\frac{1}{1-(1-P_s)} = \frac{1}{P_s}$ members of the labour force because of the time spent collecting UIC payments between periods of employment

in this sector. If there are J_T man years of work then the labour force associated with these activities can be expressed as follows:

$$(9) \quad LF_T = \frac{J_T}{P_s}$$

In any period the unemployment rate in the temporary sector which determines migration flows can be written as follows:

$$(10) \quad (1-P_s) = \frac{LF_T - J_T}{LF_T}$$

The total labour force (LF) is therefore expressed as the sum of equations (8) and (9)

$$(11) \quad LF = J_p + \frac{J_T}{P_S}$$

If additional <u>permanent</u> jobs are created then they will be filled by hiring from the unemployed or from individuals employed at that time in the temporary sector. Initially this will cause an increase in LF_p and a decrease in LF_T. As the amount of work to be done in the temporary sector is assumed not to have decreased then from equation (10) we know the $(1-P_s)$ has fallen. This fall in $(1-P_s)$ will induce a decrease in the flow of net out-migration. In order for the unemployment rate to return to its previous equilibrium level the change in the number of migrants remaining in the region will have to be the same as to the change in the number of permanent sector jobs

created. This means that the social opportunity cost of filling a permanent sector job for one year is equal to the social opportunity cost of one migrant for one year.

Suppose that instead of creating a permanent sector job an additional (dJ) years of employment are generated in the temporary sector. Here, each man-year of employment generated in the temporary sector is realized by either the creation of more than one job with less than one year's duration or one job which is characterized by a turnover rate of greater than one. From equation (10) we find that the creation of (dJ_T) temporary sector jobs will cause ($1-P_s$) to fall leading to a decrease in the amount of net out-migration taking place. Ultimately ($1-P_s$) will return to its initial level. The labour force in the temporary sector will have increased through the change in migration flows by an amount $\frac{1}{P_s} dJ_T$. Thus, the social opportunity cost of one man-year of work in the temporary sector is the social cost of retaining $\frac{1}{P_s}$ additional migrants in the region. Increasing temporary sector activity will lead to an increase in the consumption of leisure which has a net of U.I.C. payment value of L_s per period. The additional leisure that arises when a temporary sector job is created will be equal to the proportion of time each migrant spends unemployed times the number of migrants that remain per man-year of temporary jobs created.

$$(12)\quad \begin{array}{l}\text{Value of Additional Leisure Created by } dJ_T \\ \text{Man years of Temporary Jobs in Region S}\end{array} = \frac{1}{P_s}(1-P_s)L_s dJ_T$$

$$= \frac{1-P_s}{P_s} L_s dJ_T$$

This value of additional leisure is subtracted from the social opportunity cost of filling a man-year of temporary job as follows:

$$(13)\quad \begin{array}{l}\text{Social Opportunity Cost of Filling } dJ_T \\ \text{man years of Temporary jobs in Region S}\end{array} = \frac{1}{P_s} dJ_T \left(\begin{array}{c}\text{SOC migrant} \\ \text{(equation 6)}\end{array} \right) - \frac{1-P_s}{P_s} L_s dJ_T$$

The following numerical example will perhaps help to clarify this method for the evaluation of the cost of filling permanent and temporary jobs.

Suppose an additional 1000 jobs are created in the permanent employment sector which are filled by 1000 people from the temporary employment sector. The unemployment rate which was previously 40 percent in the temporary sector will now be

lower than 40 percent and people who would have migrated out of the region will now not move. In addition, in-migration will increase until the 1000 workers who moved from the temporary labour market are replaced.

Table 1

	Initial Situation	Immediately After 1000 Permanent Jobs Created	Final Solution
Number in labour force	16250	16250	17250
Employment in Permanent Sector	10000	11000	11000
Individuals in Temporary Sector	6250	5250	6250
Jobs in Temporary Sector	3750	3750	3750
Unemployed at Any Time	2500	1500	2500
Unemployment Rate (Temporary)	40%	29%	40%
Unemployment Rate Total Market	15.4%	9.2%	14.5%

When migration is determined by the unemployment rate in the temporary sector it will stop when the labour force in this sector has returned to its previous level of 6250. Therefore, the social opportunity cost of labour in the permanent sector is the cost of retaining the same number of people in the region that would have migrated from the area.

Now suppose 1000 additional man-years of temporary employment is provided in the area. This employment is characterized by frequent lay-offs or seasonality such that each person who works in these jobs also spends 40 percent of his time collecting UIC benefits. The final two columns of the above example are derived again below in Table 2.

Table 2

	Immediately After 1000 Temporary Jobs Are Created	Final Solution
Number in Labour Force	16250	17917
Employment in Permanent Sector	10000	10000
Individuals in Temporary Sector	6250	7917
Jobs in Temporary Sector	4750	4750
Unemployed at Any Time	1500	3167
Unemployment Rate (Temporary)	24%	40%
Unemployment Rate Total Market	9.2%	17.7%

In this case the temporary jobs allow the would-be migrants to remain in the region and work 60% of the time and collect UIC 40% of the time, a state in which they are indifferent between remaining in the region and migrating. However, the general unemployment rate will now have increased to 17.7% from 15.4%. The social opportunity cost of 1000 man-years of temporary jobs is the social cost of retaining 1667 would-be migrants in the region. From this example it is clear that the creation of temporary jobs results in a significantly larger social cost than for the case of an expansion of permanent jobs.

1.2 Migration and the Unemployment Multiplier

The next step is to integrate this process of migration which occurs between the slow growth region and the other areas of the country with the more traditional analysis of the regional income multiplier. The idea behind the regional multiplier is that there are certain regional expenditures which are autonomously determined and others which are a function of the level of income in the region. The autonomous expenditures

are those which are created by either the export of goods and services and income transfers to the regions. If some of the autonomous or "base" expenditures were to decline then after a period of time some of the other induced or secondary activities are expected to decline due to the lack of demand. In this case we wish to determine both the initial impact on the region when employment in the base sector is either increased or decreased and the long-run impact and social opportunity cost of labour after the migration flows have had an opportunity to adjust.

Let us denote the proportion of total man-years of employment in the base sector that is permanent in nature as B_p and the proportion that is temporary as B_T. For the secondary sector the proportion of the total man-years of employment that are permanent and temporary are denoted as S_p and S_T respectively.

If Q and Q' are the total man-years of employment in the base and secondary sectors we can express the total number of man-years of permanent and temporary employment in the economy as follows:

$$(14) \quad J_p = B_pQ + S_pQ'$$

$$(15) \quad J_T = B_TQ + S_TQ'$$

The labour force in the permanent and temporary sectors will now be equal to the following:

$$(16) \quad LF_p = B_pQ + S_pQ'$$

$$(17) \quad LF_T = \frac{B_TQ + S_TQ'}{P_s}$$

The regional income multiplier which we will denote as K is defined as the change in total income accruing to the region that arises from a dollar change in base sector income earned by the owners of factors of production residing in the region. Such a multiplier is extremely difficult to measure accurately with or without a full scale econometric model. One measure of this long-term multiplier is the ratio of the total regional income to base sector income accruing to the residents of a region. This can be expressed as follows:

$$(18) \quad K = \frac{\alpha I + \alpha' I' + (wQ + w'Q')(1-t_s) + f_s\left(\frac{1-P_s}{P_s}\right)(1-t_s)(UIC\ B_TQ + UIC'\ S_TQ') + G}{\alpha I + wQ(1-t_s) + f_s\left(\frac{1-P_s}{P_s}\right)(1-t_s)(UIC\ B_TQ + UIC'\ S_TQ') + G}$$

where

I and I' are the net of tax incomes generated by capital in the base and secondary sectors respectively,

α and α' are the proportions of the income from capital that accrue to residents of the region from the base and secondary sectors,

UIC and UIC' are the unemployment insurance compensation paid to workers laid off from base and secondary sectors, respectively, and

G is other government transfer payments to residents of the region.

The numerator of equation (18) contains the after tax income accruing to residents of the region from the capital in the base and secondary sectors, the after tax labour income from the base and secondary sectors and all government transfer payments. The denominator contains the after tax income accruing to capital and labour in the base sector plus all government transfer payments which is an income flow determined exogeneously with respect to the region. The value of k will be estimated from the long-run equilibrium relationship between base and total income of the region and will be used as an approximate measure of the total long-run impact of an increase or decrease in base sector activity.

In this study we are primarily interested in the relationship between base sector income and the employment

income in the secondary sectors. Factoring base sector income out of the numerator and denominator equation (18) can be re-written as:

$$(18)' \quad K = \frac{\alpha I' + w'(1-t_s)Q'}{\alpha I + wQ(1-t_s) + f_s\left(\frac{1-P_s}{P_s}\right)(1-t_s)(UIC\ B_T Q + UIC' S_T Q') + G} + 1$$

The numerator of the first term of equation (18)' now contains the income accruing the region's residents from secondary sector capital plus the labour income generated by this sector. Considering the labour income multiplier only and denoting it as (M) we can depict the multiplier in equation (19):

$$(19) \quad M = \frac{w'(1-t_s)Q'}{\alpha I + wQ(1-t_s) + f_s\left(\frac{1-P_s}{P_s}\right)(1-t_s)(UIC\ B_T Q + UIC' S_T Q') + G} + 1$$

The problem now is to model the impact on a slow growth region of a permanent decline in base sector activity and to measure the social costs and benefits of such an action.

1. Decline in Base Sector Activity

In period zero prior to the decline in base activity there are Q_o man-years of base sector employment and Q' man years of secondary sector employment. Immediately after the decrease in base sector activity employment in this sector is described as follows:

$$(20) \quad Q_t = Q_o + (B_p^* + B_T^*)\, dQ$$

where: B_p^* and B_T^* refer to the proportion of permanent and temporary sector work done in the specific base sector activity that is being altered.

After a period of time there will be an additional impact on activity in the secondary sector as the workers who have been laid off will now only be receiving unemployment insurance payments which are typically less than the wages they have been earning. Also the income to capital in the base sector may fall decreasing the demand for secondary sector activities. Therefore, in period 1 the employment in the secondary sector is expressed as:

$$(21) \quad Q_1' = Q_o' + \frac{(M-1)}{w_s'(1-t_s)}\alpha dI + \frac{(M-1)}{w_s'(1-t_s)}(w_s^*(1-t_s) - f_s UIC_s^*(1-t_s))(B_p^*+B_T^*)dQ$$

where: w_s^* and UIC_s^* are the wage rate and unemployment benefits in the specific base sector activity that is being altered.

A period of time in this model is defined as the length of time that it requires for the multiplier effect of a change in base sector income on the secondary sector to be completed.

When migration takes place there is another impact on the secondary sector. As the unemployed migrate out of the region they take their transfer payments with them and further decrease the demand for secondary sector activities. The total impact on secondary sector employment to a period t can be expressed as follows:

$$(22)\quad Q'_t = Q'_o + \frac{(M-1)}{w'_s(1-t_s)}\alpha dI + \frac{(M-1)}{w'_s(1-t_s)}\left(w^*_s(1-t_s) - f_s UIC^*_s(1-t_s)\right)(B^*_p + B^*_T)\,dQ$$
$$- \frac{(M-1)}{w'_s(1-t_s)}\, f_s \left(\frac{B_T Q_o UIC_s + S_T Q'_o UIC'_s}{P_s\, LF_{T_o}}\right)(1-t_s) \sum_{j=1}^{t} M_j$$

To estimate the change in employment in the secondary sector of the regional economy the variables determining the migration flows must be specified. In the migration model outlined about it is the current rate of unemployment relative to a normal or equilibrium unemployment rate in the temporary sector that determines the flow of migrants from a particular region, given that employment conditions in the other regions are held constant. This can be written in functional form as follows:

$$(23)\quad M_j = F\left((1-P_{s(j-1)}) - (1 - P^*_s)\right) \qquad (j = 1, \ldots t)$$

where $(1-P_s^*)$ is the equilibrium unemployment rate in the slow growth region. The problem now is to calculate how the actual unemployment rate adjusts through time because of the decrease in base and secondary activity and the subsequent migration flows.

From equation (10) we know that the proportion of time spent unemployed is a function of the number of people in the temporary sector labour force (LF_{Tt}) at a point in time, and the number of man years of work available for temporary sector jobs (J_{Tt}). If we assume no natural growth in the population then the number of people in the temporary sector labour force at time period t can be written as:

$$(24)\quad LF_{Tt} = LF_{To} - B_p^* dQ - \frac{(M-1)}{w_s'(1-t_s)} S_p \alpha dI$$
$$- \frac{(M-1)}{w_s'(1-t_s)} (w_s^*(1-t_s) - f_s UIC_s^*(1-t_s)) S_p dQ$$
$$+ \frac{(M-1)}{w_s'(1-t_s)} f_s \frac{B_T Q_o UIC_s + S_T Q_o' UIC_s}{P_s LF_{To}} (1-t_s) S_p \sum_{j=1}^{t} M_j - \sum_{j=1}^{t} M_j$$

All out migration that is caused by unemployment conditions is assumed to occur from the temporary sector's labour force. If a person migrates directly from the permanent sector his job is assumed to be filled by a member of the temporary sector and thus inducing an additional in-migrant into the temporary sector. The second term of equation (24) measures the number of individuals who are displaced from permanent employment in the

base sector to the temporary sector by the elimination of man years of work. The third and fourth terms measure the number of individuals displaced from the permanent portion of the secondary sector into the temporary sector because of the decline in base sector capital income and the switch from wages to unemployment insurance compensation by workers eliminated from the base sector. The fifth term measures the permanent workers in the secondary sector who join the temporary sector when there is a decline in aggregate demand in the region brought about by the subsequent migration of labour. Finally the term

$$\sum_{j=1}^{t} M_j$$

measures the reduction in the temporary sector labour force when migrants leave the region.

To measure the number of people employed at any time in the temporary sector or the number of man years of work in the temporary sector, we again assume no natural growth in the economy. In estimating shadow prices we wish to measure the incremental impact of either destroying or creating jobs and therefore we can ignore the natural growth in the labour force and employment. The number of man years of employment provided by the temporary sector in period t is expressed as follows:

$$(25)\quad J_{Tt} = J_{To} + B_T^* dQ + \frac{(M-1)}{w_s'(1-t_s)} S_T \alpha\, dI$$

$$+ \frac{(M-1)}{w_s'(1-t_s)} \left(w_s^*(1-t_s) - f_s\, UIC_s^*\,(1-t_s)\right) S_T\, dQ$$

$$- \frac{(M-1)}{w_s'(1-t_s)} f_s \frac{B_T Q_o UIC_s + S_T Q_o' UIC_s'}{P_s\, LF_{To}} (1-t_s) S_T \sum_{j=1}^{t} M_j$$

The second term in equation (25) indicates the decline in temporary jobs in the base that are eliminated with the decline in base activities. The last three terms measure the decline in temporary employment in the secondary sector that results from, respectively, the decline in base sector capital income and the decline in wage income from the base sector and loss of transfer payments when migration occurs.

Substituting equation (24) and (25) into (10) we can calculate the unemployment rate in the temporary sector in each period as follows:

$$(26)\quad (1-P_{st}) = \frac{LF_{Tt} - J_{Tt}}{LF_{Tt}}$$

By defining the migration response so that in period t migration is a simple linear function of the unemployment rate and the number of people in the temporary labour force during time period t-1 the migration function can then be written as in equation (27).

$$(27) \quad M_t = LF_{T(t-1)}\, b((1-P_{s(t-1)}) - (1-P_s^*))$$

After specifying the values of b and P_s^* and the initial values of the variables the set of equations (22), (24), (25), (26) and (27) can be solved for each time period to determine the level of employment, the labour force and unemployment in the temporary sector; the level of employment in the secondary sector; and the flow of migrants for each period. The information derived from the solution of this system of equations can now be used to evaluate the social cost of retaining workers in a base sector activity which is being considered for closure.

To evaluate the economic externality associated with a decrease in base sector jobs we must also estimate the change of employment in the permanent and temporary parts of the secondary sector. The value of labour's output that is foregone is then compared with the social opportunity cost of labour used to generate this output.

Equation (6) measures the social cost of a migrant or a permanent job in region s and equation (13) measures the social cost of filling a man-year of temporary activity when the labour market is in a state of equilibrium. However, these

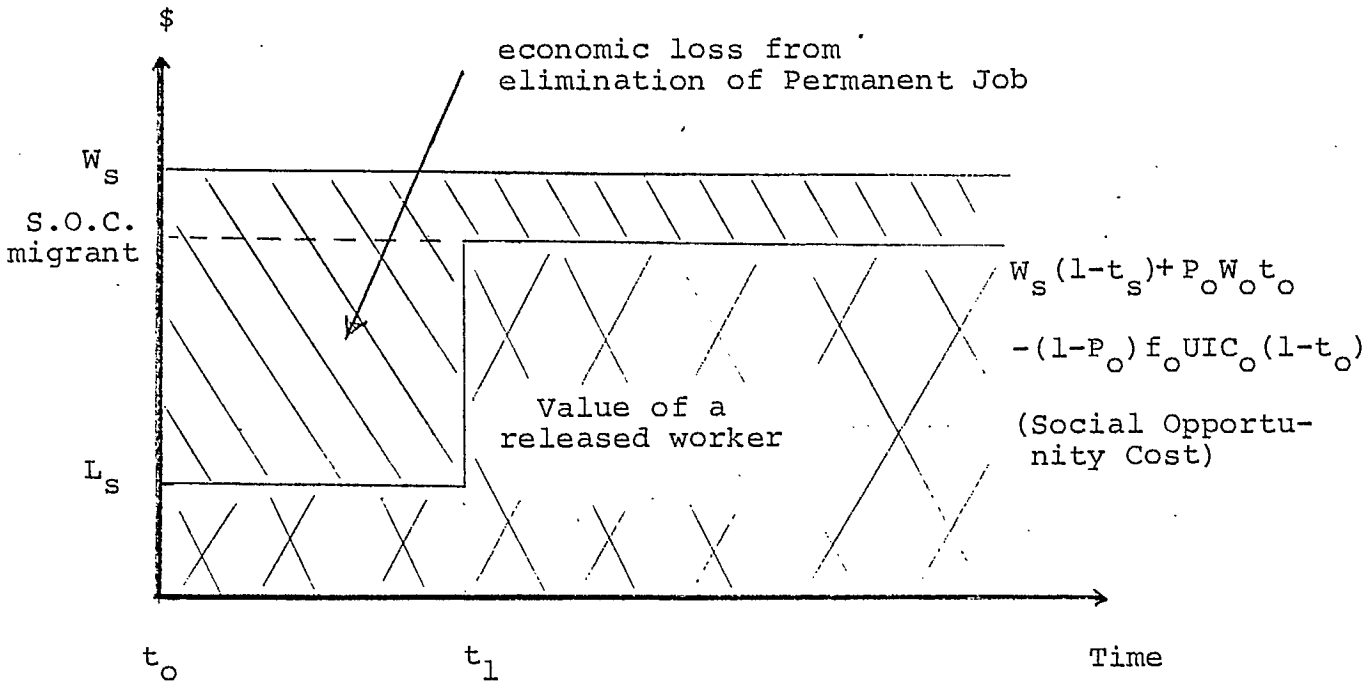
measures of the opportunity cost of labour will overstate the value of the released workers because there will be periods of adjustment when the rate of unemployment in that region's temporary sector rises above the long-run equilibrium rate.

When a permanent job in either the base or secondary sector is eliminated then one individual who was working is now unemployed. While he values this leisure time by an amount equal to the net of tax unemployment insurance or welfare payments plus the value of leisure time net of these income transfers, the social benefit of this additional leisure is only the latter item. If we assume that there is no adjustment in the market wage rate paid for these types of workers then no additional employment will be created. Until there is a migration response the only benefit received by the economy through releasing workers from the permanent sector is the value of the additional leisure of L_s per person. After migration takes place then the social benefit becomes the social opportunity cost of a migrant times the number of out migrants that are induced by the elimination of one man-year of permanent work. In the above model there was a one to one correspondence between the change in permanent jobs and the change in the number of migrants. The net social cost of eliminating a permanent job is calculated by comparing the gross of tax wage

rate with the social opportunity cost through time of the labour released at each point in time and calculating the present value of their difference. The process of adjustment of the social cost of labour is shown in Figure 1.

Figure 1

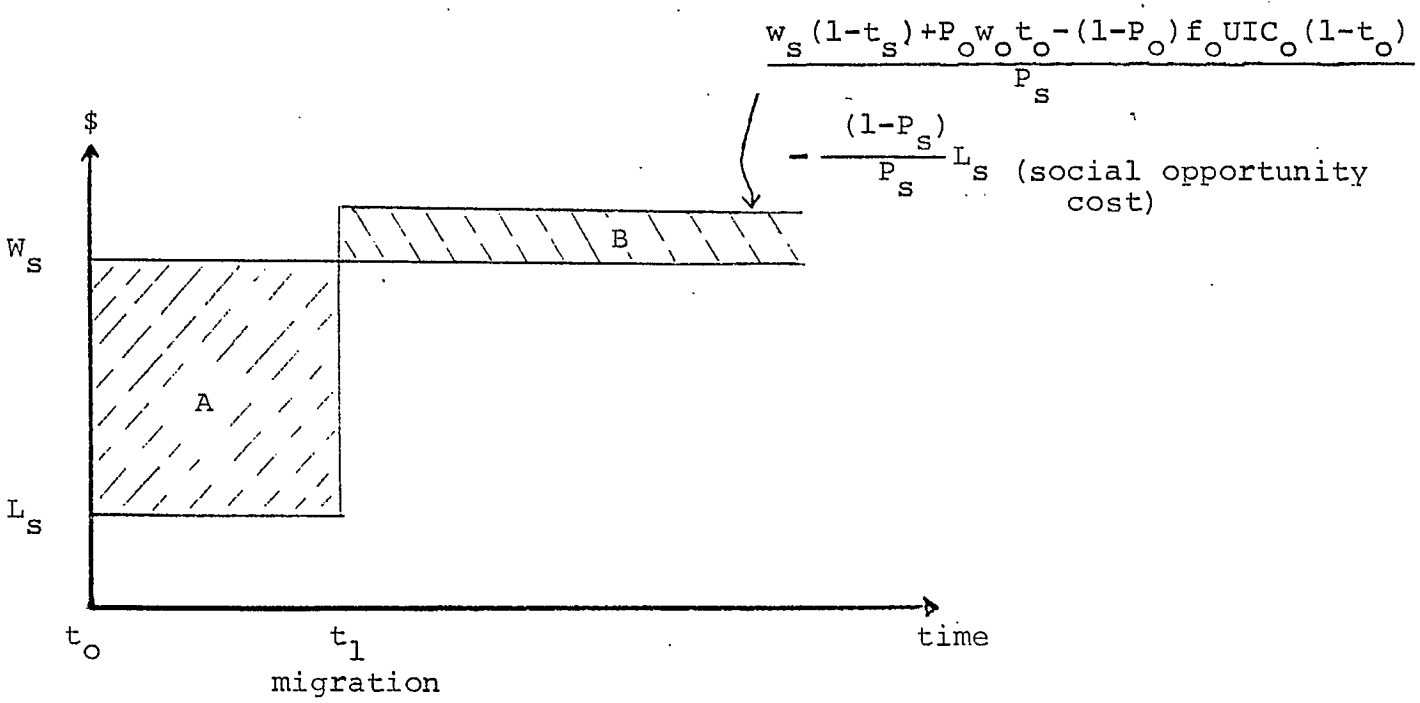
Adjustment of Social Opportunity Cost of Permanent Sector Jobs



We now turn to evaluation of the social opportunity cost of the labour released from a man-year of temporary employment. For each year of temporary sector employment there will be $\frac{1}{P_s}$ individuals in the labour force. Therefore, under normal circumstances for each man-year of temporary sector employment there will be leisure generated worth $\frac{(1-P_s)}{P_s}L_s$. When a temporary sector job is discontinued initially the only benefit generated will be the additional man-year of leisure L_s. However, after migration takes place the social opportunity cost of the labour required to fill a temporary sector job becomes equal to the social opportunity cost of a temporary job as expressed in equation (13). The path of adjustment of the social opportunity cost of labour released from temporary sector employment can be shown as in Figure 2.

FIGURE 2

Adjustment of Social Opportunity Cost of Temporary Sector Jobs



The net social benefit or cost of releasing temporary sector labour is evaluated by calculating the present value of area A in Figure 2 less the present value of area B.

In order to measure to total externality that is a consequence of a decrease in base activity by dQ man-years of employment we must solve the system of equation (20), (22), (24), (25), (26) and (27) for each time period and evaluate the entire externality between the wage rates and the social opportunity cost of labour in all the sectors affected directly and indirectly by the change in base sector employment.

2. Increase in Base Sector Activity

When an economy experiences a decline in base sector activity causing a subsequent decrease in secondary sector activity it is reasonable to expect that most of the labour released from these activities will experience a period of unemployment before obtaining another local job or migrating. However, when there is an increase in base sector activity the

additional labour employed in this activity and in the further expansion in the secondary sector need not all come initially from the ranks of the unemployed. Some workers who are hired for the newly expanded activities will come directly from other places of employment. The remainder will be hired from the unemployed and will thus become employed earlier than they would have in the absence of this project.

When some of the workers are bid away from other places of employment we would not expect these jobs to be filled immediately because of the time required to recruit suitable replacements. Thus when there is an expansion of employment in the base and secondary sectors we would also expect to find that the number of vacancies in the existing activities will increase for a period of time above their long-run equilibrium level. These job vacancies will decline through time or a proportion of vacant jobs are filled from the unemployed. The decrease in the amount of unemployment in the temporary sector will induce a decrease in out-migration and or an increase of in-migration. If there are many potential migrants compared to the number of new jobs created, then we would expect that migration would cause the unemployment rate to return to its previous long-run equilibrium level. However, if

the supply of migrants is less than infinitely elastic the long run unemployment rate in the region may be reduced. At some point the marginal migrant will require a greater proportion of employment to unemployment before remaining in the region. This result occurs because of the assumption that wage rates are determined outside of the region. Therefore it is the unemployment rate in the region's temporary sector not the wage rate that adjusts to attract more migrants when the demand for labour has increased in the region.

We denote the proportion of new hires for a project that were previously in a state of unemployment as u. The remainder are assumed to have been bid away from other sectors of employment. In this regional model where the wage rate is fixed above the equilibrium wage rate any new hires will ultimately come from either the unemployed in the temporary sector or from migrants. For this analysis we will assume that this process of adjustment takes one period of time, or the same length of time as required for the multiplier effect to take place. Therefore, at the beginning of the period when dQ additional base sector jobs have created the effect on total man-years of employment in the region will only be udQ. By the beginning of the next period we assume that the (1-u)dQ jobs

that were made vacant by employees moving to the base sector have now been completely filled. The multiplier effect which was applied to udQ jobs in the initial period is applied to an additional (1-u)dQ jobs in the subsequent period.

In addition, the normal long-run unemployment rate $(1-P_s^*)$ may be lower than the previous equilibrium unemployment rate if the project employs a large number of people and if further migration can only be induced by the prospect of a higher proportion of time spent in employment.

However, the creation of base sector jobs in the initial period may only be a certain proportion of the total base sector jobs ultimately created out of dQ. Let this proportion be denoted as γ_t. Hence, the employment in this sector is expressed below:

$$(28) \qquad Q_t = Q_o + (B_p^* + B_T^*)\ \gamma_t\ dQ$$

If a project is relatively large in a small economy, a proportion of jobs created may have to be filled by directly hiring workers from other regions. Examples of these type of jobs are foreman, management, and jobs with special skills. We denote the proportion of these types of jobs as δ. These direct hires are likely to be fully employed in the sending areas and are therefore assumed to receive the same wages in their new and last jobs.

In the local economy there are $(1-u)\gamma_t\ (dQ)(1-\delta)$ jobs hired from other sectors of employment.

The hiring of these workers who were previously employed will create job vacancies. These job vacancies will be filled again by unemployed workers as well as by workers employed in other sectors. If such a bumping down process is assumed to occur in one period, the total effect on secondary sector employment by the end of period t can be described as follows:

(29)

$$Q_t' = Q_o' + \frac{(M-1)}{W_s'(1-t_s)} \alpha \gamma_t dI$$

$$+ \frac{(M-1)}{W_s'(1-t_s)} \left[W_s^*(1-t_s) - f_s \left(\frac{B_t Q_o UIC_s + S_t Q_o' UIC_s'}{P_s \, LF_{To}} \right) (1-t_s) \right] (B_p^* + B_T^*) \gamma_t (dQ)(1-\delta)$$

$$- \frac{(M-1)}{W_s'(1-t_s)} \left[-W_s^{**}(1-t_s) \gamma_t (dQ) \delta + f_s \left(\frac{B_T Q_o UIC_s + S_T Q_o' UIC_s'}{P_s \, LF_{To}} \right) (1-t_s) \sum_{j=1}^{t} M_j \right]$$

Where: W_s^{**} is the wage rate paid to those workers who are brought directly from other regions.

If we assume that there is no natural growth in the labour force and directly imported migrants are permanently employed, then the size of the labour force in the temporary sector at period t can be written as :

(30)

$$LF_{Tt} = LF_{To} - B_p^* \gamma_t (dQ)(1-\delta) - \frac{(M-1)}{W_s'(1-t_s)} S_p \alpha \gamma_t dI$$

$$- \frac{(M-1)}{W_s'(1-t_s)} \left[W_s^*(1-t_s) - f_s \left(\frac{B_T Q_o UIC_s + S_T Q_o' UIC_s'}{P_s LF_{To}} \right) (1-t_s) \right] S_p \gamma_t (dQ)(1-\delta)$$

$$+ \frac{(M-1)}{W_s'(1-t_s)} \left[-W_s^{**}(1-t_s) \gamma_t (dQ) \delta + f_s \left(\frac{B_T Q_o UIC_s + S_T Q_o' UIC_s'}{P_s LF_{To}} \right) (1-t_s) \sum_{j=1}^{t} M_j \right] S_p$$

$$- \sum_{j=1}^{t} M_j$$

Similarly, the number of man-years of employment by the temporary sector in period t now becomes:

(31)

$$J_{Tt} = J_{To} + B_T^* \gamma_t (dQ)(1-\delta) + \frac{(M-1)}{W_s'(1-t_s)} S_T \alpha \gamma_t dI$$

$$+ \frac{(M-1)}{W'(1-t_s)} \left[W_s^*(1-t_s) - f_s \left(\frac{B_T Q_o UIC_s + S_T Q_o' UIC_s'}{P_s LF_{To}} \right) (1-t_s) \right] S_T \gamma_t (dQ) (1-\delta)$$

$$- \frac{(M-1)}{W'(1-t_s)} \left[-W_s^{**}(1-t_s) \gamma_t (dQ) \delta + f_s \left(\frac{B_T Q_o UIC_s + S_t Q_o' UIC_s'}{P_s LF_{To}} \right) (1-t_s) \sum_{j=1}^{t} M_j \right] S_T$$

The unemployment rate in the temporary sector in each period is still calculated in the same way as (26). The specification of migration flow in this case remains as (27) and is a linear function of the number of people in the temporary labour force and the difference between the actual unemployment rate and the long-run equilibrium unemployment rate.

To evaluate the social cost of hiring additional employees the system of equations (26), (27), (29), (30) and (31) are solved for each time period to determine the level of unemployment, the level of employment in the secondary sector and the flow of migrants. The calculation of the social opportunity cost of labour, however, is much more complicated for the expansion case. This is because new jobs and subsequent vacancies are filled from both the unemployed and the employed in other sectors, and also because such a bumping down process is assumed to occur within the same time period. Nevertheless, the social opportunity cost of hiring additional workers at a period t can be expressed as follows:

(32)

$$
\begin{aligned}
SOCL_t = & \left[\sum_{j=1}^{t} dU_j - \tfrac{1}{2}(1-u)\,dU_t\right] L_s \\
& + \left[\sum_{j=1}^{t} dM_j - \tfrac{1}{2}(1-u)\,b\left(dJ_{pt-1} + dJ_{Tt-1}\right)\right] SOC_M \\
& + \left[\left(\sum_{j=1}^{t} dQ'_j\right) W'_s - \tfrac{1}{2}(1-u)\,(dQ_t)\,\left(\frac{W_s Q_o + W'_s Q'_o}{Q_o + Q'_o}\right)\right] \\
& - \tfrac{1}{2}(1-u)\,\gamma_t\,(1-\delta)\,(dQ_t)\left(\frac{W_s Q_o + W'_s Q'_o}{Q_o + Q'_o}\right) \\
& - \sum_{j=1}^{t} \gamma_t\,(dQ_t)\,\delta W_s^{**}
\end{aligned}
$$

The first term in equation (32) indicates the value of leisure time generated over t periods after hiring additional workers in the base sector. Because we assume that the adjustment process for the filling of vacancies from the unemployed occurs is a linear fashion the portion of leisure time measured by $\frac{1}{2}$ (1-u) $(dU_t)L_s$ should be deducted. All the subsequently created job vacancies are filled by the end of the same period in which they are created and this means that $\frac{1}{2}(1-u)dU_t$ jobs are on average not filled during that period. The second item measures the social opportunity cost of migrants. The rate of migration has been adjusted for the fact that unfilled job vacancies will slow down the migration response in the t-th period. The third and fourth items measure the increase of employment in the secondary sectors and the foregone output in both the base and secondary sectors due to the bidding away of workers from these sectors. The last item is the foregone product of the migrants directly hired from other regions.

II Nature and Duration of Unemployment in Cape Breton Island

II.1 Nature of Labour Market

To study the incidence and duration of unemployment in the Cape Breton region of Canada a ten percent sample of all the individuals who claimed unemployment insurance at least once in the region was obtained for the period July 1972 to December 1974 from the Canadian Unemployment Insurance Commission (U.I.C.). Information is available for each unemployment insurance claim made throughout this period whether or not the claim was made in Cape Breton. From each U.I.C. record the sex, age, occupation, and industry of last employment of the claimant is also available. In addition, the values for the period of time when the insurance benefits were being claimed, the potential number of weeks that could be claimed, and the reason for termination of the claim can be determined.

During the 30 month period from July 1972 to December 1974 approximately 33.9 thousand different individuals made claims for unemployment insurance with an average duration of

claim of 23.6 weeks.[1] During this same period of time the labour force in the Cape Breton region was approximately 55.4 thousand people. Therefore, about 61 percent of the total labour force experienced some period of unemployment during the 2.5 years. For the female labour force of 16.6 thousand approximately 12 thousand or 72 percent of the women in the labour force experienced unemployment during this 30 month period. Out of a male labour force of 38.8 thousand those who experienced some unemployment amounted to 58 percent of the labour force.

This very general data indicates that even in a very high unemployment area the experience of being out of work affects less than two-thirds of the labour force. The next step is to estimate the proportion of the total potential working time that those who become unemployed spend claiming U.I.C. This is made up of two components: the frequency of claim and the duration of unemployment insurance claim. These are shown in Table 3.

---

1 It is important to note that the duration of claim will be an underestimate of the actual duration of unemployment because some individuals exhaust their unemployment insurance claim period before finding employment. The duration of unemployment is estimated below.

Table 3

EMPLOYMENT AND UNEMPLOYMENT
EXPERIENCE OF CAPE BRETON WORKERS

Age Group		<25	26-35	36-45	46+	Total
Males						
1.	No. of UIC claims [a]	13810	7290	5240	8770	35110
2.	No. of individuals	9390	4180	2990	5500	22060
3.	Average no. of claims	1.5	1.7	1.8	1.6	1.6
4.	Duration of Unemployment Insurance claim (wks)	21.3	23.1	22.9	24.0	22.6
5.	Proporation of time claiming Unemployment Insurance	24.6	30.2	31.7	29.5	27.8
6.	Unemployment Rate as Measured by Unemployment Insurance b.	38%	23%	20%	21%	26%
Females						
7.	No. of UIC claims [a]	6490	3820	2530	3170	16010
8.	No. of individuals	5120	2830	1820	2160	11930
9.	Average no. of claims	1.3	1.4	1.4	1.5	1.3
10.	Duration of Unemployment insurance claim (wks)	24.0	27.6	27.0	26.0	25.7
11.	Proporation of time claiming Unemployment Insurance	23.4	28.7	28.9	29.4	25.7
12.	Unemployment Rate (measured by Unemployment Insurance)	36%	43%	31%	22%	32%

a. Unemployment Insurance data obtained by special tabulations for a 10 percent sample of claims from Unemployment Insurance Commission, Government of Canada, for period July 1972 to December 1974.

b. This unemployment rate is calculated by multiplying the average duration of unemployment (weeks) as calculated in Table 8 by the total number of U.I. claims and then dividing this product by the number of weeks over which the U.I. claims occured.

From Table 3 we find that the male members of the labour force in Cape Breton Island who experienced unemployment sometime between July 1972 and December 1974 averaged 1.6 periods of unemployment during this period with an average length of claim of 22.6 weeks each time. In other words, these members of the labour force spent approximately 27.8 percent of their time claiming UIC and a greater proportion of their time unemployed.[1]

While a larger proportion of female workers experience unemployment than do male workers, they average fewer claims per person unemployed (1.3) than males. On average the females who experienced unemployment spent over 25.7 percent of their time claiming UIC payments. Young female workers less than 25 experience high rates of unemployment but the unemployment rate of those in the 26-35 is much greater than for any other group

---

[1] The male workers of the labour force younger than 25 years of age have experienced unemployment rates as measured by UIC claims and total labour force of approximately 38 percent while for workers over 35 years of age the unemployment is between 20 and 21 percent.

of female workers.[1] The provision in the Unemployment Insurance Act allowing women who are having children to collect unemployment insurance has had the effect of increasing the unemployment insurance claims for females in the 26-35 age group.

For a regional labour market such as the one for Cape Breton Island the migration of labour between this area and other parts of the country is an integral part of the adjustment process of the market. When opportunities for employment in the region decline it is expected the individuals who have the least economic or social ties to the region will migrate elsewhere in search of employment.

There is generally a two-way flow of workers between a depressed region and the rest of the country. Workers will return if employment opportunities become available in the region or if they have been unsuccessful in obtaining permanent year-round employment away from the region, or they may return to spend their periods of unemployment in the region where it is less costly for them to live. The outflow and inflow of the migrant labour force for Cape Breton Island has been estimated and is reported in Table 4. The number of migrants who

---

1

This is also an underestimate of the average proportion of time these young workers spent in unemployment for workers less than 25 who became unemployed may not have been in the labour force for the full 2½ years.

Table 4

MIGRATION FLOWS FOR WORKING AGE AND LABOUR FORCE (16-64) IN CAPE BRETON ISLAND BY AGE GROUP FROM 1966/67 to 1970/71

Age Group	16-24	25-44	45-64	Total
Working Age				
Population: Outflow	8249	6335	1495	16079
Percentage of Total	51.3%	39.4%	9.3%	100%
Inflow	6145	6497	1587	14229
Percentage of Total	43.2%	45.7%	11.2%	100%
Net Flow	-2100	179	64	-1857
Labour Force				
Outflow	3720	4001	800	8521
Percentage of Total	43.7%	46.9%	9.4%	100%
Inflow	2817	4220	868	7905
Percentage of Total				
Net Flow	-906	229	52	-625
Out-migrants per year as percentage of labour Force by age	5.1%	3.7%	1%	3.2%
In-Migrants per year as percentage of Labour Force by age	3.9%	3.9%	1%	2.9%

Sources:

1. Migration flows for working age were calculated from Statistics Canada, Intercounty Migration Data Base (December 1973).

2. Labour force data was obtained from the multiplication of the population in working age by age and sex and the corresponding participation rate. The later data were calculated for Cape Breton Island in 1971. See Statistics Canada, Labour Force and Individual Income, Catalogue 94-704 Vol: III - part 1.

are members of the labour force and are less than 24 years of age will be biased downward as the regional participation rate was applied to migrants of this age group to estimate the proportion of these migrants who are in the labour force. We expect that the participation rate of migrants in this age group will be much greater than for this age group in the region as a whole.

From Table 4 it is estimated that over 43 percent of all the outflow of the labour force from Cape Breton Island are less than 24 years of age. And this estimate is biased downward. These migrants represent an annual flow of over 5 percent and probably closer to 10 percent of the total labour force in Cape Breton of this age group. Over 90 percent of the outflow of the migrant labour force has been of less than 45 years old. The inflow of migrants is also very strong and only slightly smaller in magnitude than the outflow.

Another source of information on migration in Canada is the records of the relocation grants given to some of the out-migrants of the region by the Department of Manpower and Immigration. The recipients of these grants spent on average 16 weeks unemployed in Cape Breton Island during the year prior to their date of

application for this assistance. Of the people receiving these grants 50 percent were between 18 and 24 years of age, 42 percent between 25 and 44, and 8 percent over 44 years of age.

From the examination of this information on unemployment and migration it is clear that a significant degree of mobility exists in the Cape Breton labour force, especially among those individuals who are less than 35 years of age. It is also this age group of workers who have experienced a higher than average amount of unemployment in the Cape Breton region.

II.2 Expected Duration of Unemployment versus Expected Duration of Unemployment Insurance Claim

The information provided in Table 3 rows 5 and 11 dealt with the average duration of unemployment insurance claim. However, this will tend to underestimate the average duration of uenmployment as several of the recipients of unemployment insurance will exhaust their insurance claims before they obtain their next job.

Using data from the unemployment insurance records, the probability of obtaining employment can be estimated for successive time periods since leaving prior employment. From these probabilities the duration of unemployment can be estimated for those individuals who exhausted their rights to claim unemployment insurance before finding another job.

The probabilities obtained from the equation for estimating the probability of obtaining employment in a time interval are presented in Table 5.

A probit model is used to estimate the interval probabilities with the dependent variable for each interval period of four weeks set to one for every worker who found employment during the interval, and set to zero if he fails to find a job or he has exhausted his unemployment benefits during the period.[1] If one has found employment or has exhausted his benefits, this claim is eliminated from the sample in the equation of the subsequent run. The overall regressions up to 48 weeks since lay-off date appear statistically significant at 0.10 level.

The following factors were introduced as explanatory variables to determine the probability of an unemployed worker

---

1 The probit model we used was developed by John G. Cragg, Department of Economics, University of British Columbia. For a description of the probit model see, for example, A.S. Goldberger, Econometric Theory, (New York: John Wiley, 1964); J. Tobin, "Estimation of Relationships for Limited Dependent Variables", Econometrica, (1958), pp. 24 - 36.

finding an alternative job during the successive four week periods after lay-off: age, skill experience required to do last job, dependents (yes = 1 or no = 0), unemployment rate in market where individual was claiming UIC benefits, number of periods of unemployment insurance claimed during a 30-month period, urban or rural area, and the potential number of weeks left that the individual could claim unemployment insurance.

As shown in Table 5, male workers tend to find employment more rapidly than females. This may be caused by the fact that when women leave employment they tend to plan to leave the labor force for extended periods of time either because of marriage or to raise a family. Because of the unemployment insurance benefits they have an incentive to indicate that they are willing to accept another job even though it is not their desire to do so.

The age of worker has a significant negative influence on the probability of obtaining alternative employment, but the skill level required to do the individuals previous job is not statistically significant in all the regression equations.[1] This would suggest that in the labour force of Cape Breton Island the duration of unemployment is quite similar across skill levels, however, the frequency of unemployment may still

---

[1] This variable is measured by the basic requirement for each occupation according to Special Vocational Preparation of Canadian Classification and Dictionary of Occupation.

differ between skill levels. The proposition that people with dependents would have a higher probability of obtaining employment is also not shown to be statistically significant.

As would be expected, the unemployment rate in the general labour market has a strong negative influence on the probability of any individual obtaining employment during any time period.

It is also found that individuals which have more periods of unemployment during a given period of time tend to be unemployed for shorter periods of time. This could be caused either by the fact that those who are employed for only a short period of time are only eligible for a small number of weeks of insurance benefits or that certain occupations lead to frequent periods of unemployment. The variable reflecting whether an individual resides in an urban or rural area does not appear as a significant variable in determining the duration of unemployment.

A surprising result is that the potential number of weeks still remaining to collect unemployment insurance has a very significant positive relationship with the probability of finding employment. However, this result is consistent with a labour market where the duration of unemployment is determined

by demand forces rather than labour supply conditions. The number of potential weeks available for an individual to claim unemployment insurance is determined by the number of weeks he worked in his previous job. Therefore, we would expect that those with the greatest amount of seniority would be recalled first after any layoff and at the same time be eligible to collect unemployment insurance payments for the longest period. This same relationship would hold for seasonal workers. Those workers who were employed longest during the previous season would have the greatest amount of potential U.I. claims, while at the same they are unemployed for the shortest amount of time prior to the beginning of the next season when work is again available to them.

Table 5

FACTORS AFFECTING THE PROBABILITY OF FINDING ALTERNATIVE JOBS SINCE LAY-OFF BY TIME INTERVAL

Time Interval Since Lay-off Date (Weeks)	0-4	4-8	8-12	12-16	16-20	20-24	24-28	28-32
Variables (standard errors in brackets)								
Constant	-1.3561	-2.7847	-2.0668	-1.6285	-1.4491	-1.4155	-1.5236	-1.2506
	(.3831)	(.3610)	(.3488)	(.2999)	(.2778)	(.2840)	(.3097)	(.3405)
1. Sex Male = 1 Female = 0	.12502	.29130	.26082	.33588	.23805	.37074	.16108	.25659
	(.1202)	(.1098)	(.1143)	(.1061)	(.0982)	(.1078)	(.1042)	(.1163)
2. Age	-.00643	-.00602	-.00817	-.01331	-.00162	-.00190	-.00853	-.00667
(Years)	(.0041)	(.0034)	(.0036)	(.0035)	(.0030)	(.0033)	(.0034)	(-.0036)
3. Skill	.05086	-.04602	.00251	.00880	.04994	-.00157	.05688	-.01075
(Years)	(.0335)	(.0422)	(.0381)	(.0348)	(.0290)	(.0372)	(.0317)	(.0415)
4. Dependents	.12348	.13619	-.19017	-.09170	.00053	-.07488	.00061	-.03234
	(.1231)	(.1038)	(.11206)	(.1030)	(.0956)	(.1008)	(.1045)	(.1135)
5. Unemployment Rate	-.06753	-.07967	-.07825	-.05924	-.07251	-.0650	-.02404	-.06111
	(.0263)	(.2411)	(.0230)	(.0199)	(.0195)	(.0205)	(.0218)	(.0245)
6. No. of Claims	-.10950	-.06234	.10768	.13868	.07428	.18118	.22507	.27944
	(.0584)	(.0488)	(.0518)	(.0452)	(.0436)	(.0461)	(.0477)	(.0517)
7. Urban residence Sydney = 1	.01226	.03724	-.07802	.04601	.26466	-.02750	.04876	-.00701
	(.1179)	(.1132)	(.1039)	(.0973)	(.0980)	(.0946)	(.0985)	(.1049)
8. Insurance Wks. Available	.00391	.03982	.03123	.01906	.01228	.00719	.00365	.00619
	(.0040)	(.0037)	(.0038)	(.0034)	(.0034)	(.0040)	(.0041)	(.0045)
No. of Observations	4059	3831	3383	2997	2632	2245	1948	1571
No. of Positive Observations	59	138	122	157	192	167	170	148
Likelihood Ratio Test	16.2	175.0	92.8	64.1	36.2	44.8	33.2	55.0

TABLE 5 (CONTINUED)

	Time Interval Since Lay-off Date (Weeks)	32-36	36-40	40-44	44-48	48-52	52-56	56-60
	Variables (Standard errors in brackets)							
	Constant	-1.9175	-2.0207	-1.8918	-.88360	-1.1570	-1.8885	-1.575
		(.3925)	(.4025)	(.5023)	(.5871)	(.6874)	(.8883)	(1.133)
1.	Sex Male = 1 Female = 0	.17425	.30822	.43088	.62042	.02893	.28770	.49123
		(.1312)	(.1547)	(.1901)	(.2292)	(.2716)	(.3500)	(.4653)
2.	Age	-.00548	-.0050	-.01723	-.00516	.00027	-.01103	-.00263
	(Years)	(.0041)	(.0045)	(.0059)	(.0062)	(.0072)	(.0091)	(.0121)
3.	Skill	.06807	-.05720	.09959	-.02921	.00138	-.20078	-.15938
	(Years)	(.0358)	(.0636)	(.0484)	(.0993)	(.0957)	(.1776)	(.2774)
4.	Dependents	.02602	.07554	.14108	-.23220	.07605	.21191	-.04513
	Yes = 1 No = 0	(.1330)	(.1473)	(.1847)	(.2141)	(.2626)	(.3279)	(.4269)
5.	Unemployment	.00009	.02377	.04669	-.06290	-.04560	.07053	-.03180
	Rate	(.0278)	(.0284)	(.0351)	(.0455)	(.0499)	(.0607)	(.0806)
6.	No. of	.24024	.19724	.08114	.24618	.15558	-.03857	.18493
	Claims	(.0602)	(.0731)	(.0980)	(.1092)	(.1414)	(.1703)	(.2393)
7.	Urban	.11624	-.38404	.12757	-.22472	-.15955	-.23893	.21997
		(.1237)	(.1384)	(.1821)	(.1959)	(.2257)	(.2994)	(.4328)
8.	Insurance Wks.	-.00006	.00838	-.00617	-.03779	.02202	.04860	.08121
	Available	(.0057)	(.0072)	(.1034)	(.0173)	(.0197)	(.0315)	(.0509)
	No. of Observations	1269	882	663	469	350	242	97
	No. of Positive Observations	110	91	57	43	31	19	14
	Likelihood Ratio Test	22.1	23.6	23.7	37	4.1	8.7	7.5

After dividing the sample of the unemployed into four age groups the mean values (by group) were calculated for each of the explatory variables used to estimate the equation in Table 5. Substituting these mean values of explanatory variables into the equations reported in Table 5 yields parameter values from $-\infty$ to ∞, which are the distances along a normal distribution. From a cumulative standard normal distribution table we can determine the probability of obtaining employment by sex and age group as a function of time since layoff. For example, Table 6 shows that for a male worker younger than 25 years old the probability of finding employment after being laid off 36 weeks is about 50%. Similarly, for female workers under 25 in Table 7, we find that they have only 32% of probability obtaining employment after being laid off 36 weeks.

To calculate the expected duration of unemployment the incremental probabilities from one period to the next of obtaining employment are multiplied by the duration of time since layoff to the middle of corresponding period and then summed for all periods as follows:

$$(33) \quad \text{Expected Duration of Unemployment} = \sum_t W_i (1-P^A_{t-1}) P_t$$

where: W_i is the number weeks since layoff to the middle of the period for which the incremental probability is being estimated.

P^A_{t-1} is the cumulative probability of finding employment from the date of layoff to period t-1.

P_t is the probability of an individual who did not have employment as of period t-1 obtaining employment during period t.

The principal difficulty in calculating the expected duration of unemployment is that after 13 months we find approximately 25 percent of males and over 50 percent of females have not obtained another job. It is likely that a proportion of these individuals have either left the labour force or are engaged in some other activity. Of course, some will now be obtaining welfare. Yet this proportion would have to be much smaller than the proportion who are estimated from the UIC records not to have obtained work in order to be consistent with the overall labour force participation rates of the region, given the frequency that workers move between states of employment and unemployment.

If we assume that all individuals either obtain employment or leave the labour force within 56 weeks since lay-off, the expected duration of unemployment calculated by equation (33) is equal to an average of 36.7 weeks. This average is composed of 35.4 weeks for the 25 years and under, 35.0 weeks for the 26-35 age group, 36.8 weeks for the 36-45 age group, and 40.0 weeks for the 46 years of age and over (see Table 6). Similarly, Table 7 shows a greater expected duration of unemployment for female workers in Cape Breton Island of (43.5 weeks).

Table 6

Male Probability of Obtaining Employment
As a Function of Time Since Layoff in Cape Breton Island
(average values of explanatory variables for males unemployed in Cape Breton 1972-74)

Period Since Lay-off (weeks)	Age			
	<25	26-35	36-45	46+
4	.0154	.0150	.0125	.0102
8	.0378	.0440	.0355	.0270
12	.0709	.0783	.0619	.0481
16	.1379	.1423	.1084	.0780
20	.2050	.2169	.1791	.1471
24	.2766	.2927	.2572	.2173
28	.3570	.3741	.3291	.2696
32	.4348	.4537	.4012	.3227
36	.4966	.5144	.4613	.3769
40	.5660	.5846	.5332	.4450
44	.6338	.6410	.5784	.4742
48	.6855	.6815	.6454	.5144
52	.7170	.7184	.6866	.5558
56	.7479	.7513	.7194	.5834
Duration of Unemployment (weeks)	35.4	35.0	36.8	40.0

Table 7

Female Probability of Obtaining Employment
As a Function of Time Since Layoff in Cape Breton Island
(average values of explanatory variables for females unemployed in Cape Breton 1972-74)

Period Since Lay-off (weeks)	Age			
	<25	26-35	36-45	46+
4	.0139	.0122	.0099	.0071
8	.0291	.0259	.0217	.0161
12	.0511	.0461	.0379	.0284
16	.0875	.0654	.0535	.0426
20	.1355	.0112	.0975	.0862
24	.1687	.1450	.1299	.1190
28	.2264	.2000	.786	.1583
32	.2714	.2430	.2200	.1950
36	.3173	.2917	.2636	.2357
40	.3620	.3329	.3016	.2698
44	.4046	.3702	.3279	.2849
48	.4251	.3895	.3520	.3059
52	.4682	.4311	.3962	.3559
56	.5044	.4502	.4188	.3728
Duration of Unemployment (weeks)	42.2	43.3	44.4	45.6

The unemployment rate of the general labour market is found to have substantial influence on obtaining employment in all interval periods. When the unemployment rate is increased, the probability of obtaining employment falls and the expected duration of unemployment rises. Table 8 shows the effect of unemployment rate on the duration of unemployment in Cape Breton Island, provided that all workers can find jobs in 56 weeks since layoff. It is interesting to see that younger workers for both sexes have a shorter duration of unemployment than older workers. Also, male workers are expected to have about 7 weeks shorter length of unemployment as compared with females. Overall, the expected duration of unemployment in the island is 39.4 weeks.

Table 8

The Effect of Unemployment Rate on the Duration of Unemployment in Cape Breton Island (unit: weeks)

Unemp. Rate	Sex	Durations of Unemployment Age < 25	26-35	36-45	46+	Average
6.22%	Male	29.3	27.9	30.2	33.6	30.2
	Female	36.1	37.2	38.8	40.5	37.6
8.22%	Male	31.7	31.2	33.1	36.5	33.0
	Female	38.8	39.9	41.3	42.8	40.2
10.22%	Male	34.2	33.8	35.7	39.0	35.5
	Female	41.2	42.1	43.4	44.8	42.5
11.22% (Average)	Male	35.4	35.0	36.8	40.0	36.7
	Female	42.2	43.3	44.4	45.6	43.5
12.22%	Male	36.5	36.1	37.9	41.0	37.8
	Female	43.1	43.9	45.1	46.3	44.2
14.22%	Male	38.5	38.1	39.7	42.7	39.6
	Female	44.6	45.3	46.4	47.5	45.6
16.22%	Male	40.0	39.8	41.1	44.1	41.1
	Female	45.7	46.3	47.4	48.4	46.6

Note: 11.22% was the average unemployment rate all unemployed workers faced in the labour market of Cape Breton Island during the period from July 1972 to December 1974.

The above duration of unemployment was estimated under the assumption that workers were all expected to find employment within 56 weeks after layoff. If the 56 weeks is replaced by either 60 weeks or 64 weeks, and following the same method of estimation, unemployed individuals in Cape Breton would expect, on average, to have either 41.0 weeks or 42.1 weeks of unemployment when laid off in the island. However, many females are expected to drop out of the labour market after layoff. This would reduce somewhat the overall length of unemployment. Therefore, 40 weeks was used as the expected duration of unemployment in the next section of the paper when the social opportunity cost of labour is estimated for Cape Breton Island.

The characteristics of unemployment by industry are shown in Table 9. Construction workers with 1.9 claims in two and half years experienced the most frequent periods of unemployment in Cape Breton Island. The next highest sectors for frequence of claims were forestry, and the food and beverage industry with 1.8 periods of unemployment during the 30 month period.

The duration of unemployment insurance benefits per claim did not fluctuate significantly from sector to sector.

Table 9

Characteristics of Unemployment
in Cape Breton 1972-1974

	No. of Claims	No. of Individual	Av. No. of Claims	Av. duration per UIC Claim	Prop. of Time Spent in UIC	Unemp. Rate in Temp. Sector	Overall Unempl. Rate
1. Agriculture	310	210	1.5	24.5	28.3	48.0	13.1
2. Forestry	620	340	1.8	22.5	31.2	52.9	24.3
3. Fishing & Trapping	150	100	1.5	16.1	18.6	31.5	2.7
4. Mines, Quarries and Oil Wells	1,870	1,400	1.3	20.4	20.4	34.6	9.7
5. Manufacturing							
a) Food & Beverage	4,270	2,410	1.8	23.2	32.1	54.4	45.3
b) Others	6,770	4,7770	1.4	22.6	24.3	41.2	27.0
Sub-total	11,040	7,180	1.5	22.8	26.3	44.6	32.0
6. Construction	4,430	2,330	1.9	23.3	34.1	57.8	27.0
7. Transp. Com. Utility							
a) Transp. Stroage	2,660	1,640	1.6	23.2	28.6	48.5	20.3
b) Others	600	380	1.6	22.5	27.7	46.9	9.2
Sub-total	3,260	2,020	1.6	23.1	28.4	48.1	16.7
8. Trade a) Retail	3,420	2,670	1.3	25.8	25.8	43.7	16.4
b) Wholesale	1,510	920	1.6	22.9	28.2	47.8	25.2
Sub-total	4,930	3.590	1.4	24.9	26.8	45.5	18.2
9. Finance, Insurance & Real Estate	700	550	1.3	26.2	26.2	44.4	19.6
10. Com. Bus. Personal Services							
a) Education	1,330	830	1.6	22.1	27.2	46.1	9.6
b) Health	2,180	1,710	1.3	23.7	23.7	40.2	17.2
c) Personal and Accomodation	3,410	2,170	1.6	23.7	29.2	49.5	28.2
d) Others	2,820	1,910	1.5	25.9	29.9	50.7	48.7
Sub-total	9,740	6,620	1.5	24.1	27.8	47.1	22.5
11. Public Administration	4,140	2,760	1.5	23.7	27.3	46.3	31.3
12. Industry Unspecified	8,660	6,330	1.4	24.2	26.1	44.2	n.a.
Total	49,850	33,430	1.5	23.6	27.2	46.1	27.8

Source: A special tabulation of 10% of the U.I.C. claimants who had at least one claim made in Cape Breton Island during the period from July 1972 to December 1974.

* The expected duration of each period of unemployment is estimated to be at least 40 weeks as compared to an average duration of U.I.C. claim of 23.6 weeks.

Most of the industries ranged from 22 weeks to 26 weeks per claim with the exception of fishing and trapping, and mines and quarries. These sectors had the lowest duration per claim with 16 weeks and 20 weeks, respectively. The workers with the longest time claiming unemployment benefits were in construction, food and beverage, and forestry. On average they spent more than 30% of time claiming unemployment benefits while most of other people spent about 27%.

Since the expected duration of unemployment is about 40 weeks as compared to 23.6 weeks claiming unemployment benefits, the overall proportion of time these experienced unemployed workers spent in not working would then be about 46%. However, in some sectors such as construction, forestry, and food and beverages, those individuals who experience some unemployment spent, on average, more than 50% of their time unemployed. In the remaining sectors, most had unemployment rates in their temporary sectors of greater than 40 percent. The exceptional sectors were fishing and trapping (31.5%), and mines, and quarries (34.6%). The extremely high unemployment rate in the temporary labour force sector is one of the main characteristics in the labour market of Cape Breton Island.

III. EMPIRICAL ESTIMATION OF THE MODEL

In this section, we estimate the social opportunity cost of labour and the economic externality generated when there is either a decline or an increase in base sector activity on Cape Breton Island. First, the regional labour income multiplier for the island has to be computed in order to capture the indirect impact on the local economy of the change in base sector activity.

III.1 REGIONAL LABOUR INCOME MULTIPLIER

Equation (19) is used to calculate the regional labour income multiplier. The value of each parameter in the equation is estimated as follows:

1) Man-year jobs in base and non-base sectors: No official figures on labour force and population are available for Cape Breton Island. However, there has been virtually no growth of population on the Island between 1961 and 1971, and a population increase of less than 1 percent was projected for the period from 1971 to 1976 by Selig and Harvey using the cohort-component method.[1] Therefore, by assuming a constant labour force participation rate between 1971 and 1976, it is not unreasonable to use the 1971 labour force in this study.

---

[1]The labour force in Cape Breton Island was 169,865 in 1961, 170,007 in 1971, and 171,648 in 1976. See B.M. Selig and Harvey, "Nova Scotia Population Projections, 1972-81", Institute of Public Affairs, Dalhousie University(November 1974).

In a recent paper, Schwartz[1] has separated employment for each industry in Cape Breton County into base and secondary activities. Using his results, we have estimated that the experienced labour force on Cape Breton Island would be 24,789 in the base sector and 28,556 in the secondary sector (see Table 10). Multiplying the ratio of total labour force to the experienced labour force by the above figures yields a total labour force of 25,707 persons in the base secor, and 29,613 persons in the secondary sector.

When the number of workers in a region who have experienced unemployment over the period from 1971 to 1974 is examined, it is found that the number of such workers increases rapidly at the beginning and then tends to remain at a fairly constant number. From a 10% sample of unemployed workers on Cape Breton Island over the period from July 1972 to December 1974, we found that the total number of workers who experienced unemployment was 33,430 persons. As is shown in Table 10, this temporary labour force can be broken down into 16,706 persons in the base sector and 16,724 in the secondary sector. The proportion of time these people spent employed was found to be only 54% in the previous section; therefore, the total jobs available are equal to 9,021 man-years in the base sector and 9,031 man-years in the secondary sector.

---

[1] H. Schwartz, "The Long Run Employment Multiplier for Cape Breton County", paper prepared for the Department of Regional Economic Expansion, Government of Canada (January 1976). See Appendix 6 to Annex "A" to Part 6.

TABLE 10

DISTRIBUTION OF EXPERIENCED LABOUR FORCE AND TEMPORARY LABOUR FORCE BY BASE AND SECONDARY SECTOR IN CAPE BRETON ISLAND

		% of L.F.	Experienced Labour Force			Temporary Labour Force		
		in Base[a]	Total[b]	Base	Secondary	Total[c]	Base	Secondary
1.	Agriculture, Forestry, Fishing and Trapping	60.29	2285	1378	907	650	392	258
2.	Mines, Quarries & Oil Wells	100.00	4425	4425	0	1400	1400	0
3.	Manufacturing	81.95	8820	7228	1592	7180	5884	1296
4.	Construction	37.96	4295	1631	2664	2330	884	1446
5.	Transportation, Communication & Utilities	37.79	5065	1914	3151	2020	763	1257
6.	Trade	19.99	7590	1517	6073	3590	718	1872
7.	Finance, Insurance & Real Estate	4.92	1050	52	998	550	27	523
8.	Commercial Business & Personal Services	16.37	11720	1919	9801	6620	1084	5536
9.	Public Administration	46.58	3520	1640	1880	2760	1286	1474
10.	Unspecified	67.43	4575	3085	1490	6330	4268	2062
	Total	-	53345	24789	28556	33430	16706	16724

Source:
[a] The percentages of labour force in the base sector were the mean values of Schwartz's figures in Models I and II. See H. Schwartz, "The Long Run Employment Multiplier for Cape Breton County", paper prepared for the Department of Regional Economic Expansion, Government of Canada, (January 1976). Appendix 6 to Annex "A" to Part 6.

[b] The total experienced labour force by industry was obtained from Statistics Canada, 1971 Census of Canada - Industries, Cat. 94-741, Vol. 111 - Part 4.

[c] Unemployment Insurance Commission, a Special Tabulation of total experienced unemployed workers on Cape Breton Island for July 1972 to December 1974.

The amount of permanent employment, obtained by subtracting the temporary labour force from the total labour force is equal to 9,001 man-years in the base sector and 12,889 man-years in the secondary sector. Thus, the total jobs available on Cape Breton Island is 39,942 man-years which consists of 18,022 in the base sector and 21,920 in the secondary sector. The share of permanent employment and secondary employment in the base sector is 0.4994 and 0.5006, respectively. In the secondary sector, it is 0.5880 for permanent employment and 0.4120 for temporary employment.

2) Weekly earnings in the base and secondary sectors: From the same 10% sample of unemployed workers in Cape Breton Island, we found that weekly earnings were $120 in 1974 dollars for those who worked in the base sector and $113 for those in the secondary sector. It should be noted that these estimates are slightly understated because about 9% of the claimants had actually earned at least the maximum insured earnings, but only the maximum insured earnings were recorded.[1]

However, since the annual increase in wages in the Sydney area was about 14.8% over 1972-74,[2] the average weekly earnings on Cape Breton Island were then adjusted to $147 for the base sector and $139 for the secondary sector for January 1976.

---

[1] The maximum weekly insurable earnings were $150 in 1972, $160 in 1972 and $170 in 1974.

[2] Statistics Canada, Employment, Earnings and Hours, Cat. 72-002.

3) Unemployment insurance benefits in the base and secondary sectors: In this study, we assume that unemployed workers would claim 70% of insured earnings as benefits.[1] Thus, the unemployment insurance benefit on Cape Breton Island would be $103 per week for those previously working in the base sector and $97 for those in the secondary sector.

4) The proportion of time temporary workers spent in employment: This can be calculated by dividing the man-year jobs available in the temporary sector by the temporary sector labour force and it is equal to 0.54.

5) The proportion of unemployed time that an unemployed worker can collect unemployment benefits: Table 9 shows that the average duration of unemployment benefits per claim was 23.6 weeks on Cape Breton Island. The expected duration of unemployment was estimated to be about 40 weeks per claim on the Island. The proportion of time that unemployed workers can claim unemployment benefits is, therefore, approximately 60%.

The value of the remaining variables in equation (19) such as capital income and government transfer payments other than unemployment benefits are not available for Cape Breton Island. However, they can be estimated indirectly by using Nova Scotian data as indicators.

---

[1]The benefit rate was 66 2/3% of the average weekly insurable earnings in the qualifying period with a floor of $20 per weeks. For claimants with dependents and whose average qualifying earnings were equal to or less than one-third of the maximum weekly insurable earnings, the benefit rate was 75%. Nevertheless, the rate of weekly benefit payable in the extended benefit period to a claimant without a dependent was 66 2/3% of the average weekly insurable earnings in the qualifying period; for a claimant with a dependent the rate was 75%.

6) Capital income: The estimates based on 1965 Gross Provincial Product data for Nova Scotia show that about 28.5% of gross factor income (including capital consumption allowance) accrued to capital and 71.5% to labour.[1] Assuming that 30/70 capital/labour income ratio is applicable to Cape Breton Island, the capital income on the island is then $2,441,192 per week.[2]

7) The share of capital income to residents: The share of net domestic capital income accruing to residents of the province of Nova Scotia over the period from 1950 to 1965 ranged from a high 65.8 % in 1963 to a low of 49.5% in 1953.[3] For a small economy such as Cape Breton Island, the share of capital income to residents is generally expected to be lower. Fifty per cent was taken to be the appropriate figure for the Island.

8) Government transfer payments other than unemployment benefits: In Nova Scotia as a whole, the ratio of government transfer payments other than unemployment benefits to labour income was 22.54% in 1973 and 24.47% in 1974.[4] For an area with high unemployment such as Cape Breton Island, the ratio would be higher. Hence, 25% was taken as a more likely ratio for the island.

---

[1] See H. Schwartz, "Estimating Capital's Share and Labour's Share of Nova Scotia Income", paper prepared for the Department of Regional Economic Expansion, Government of Canada (February 1976).

[2] The figure was obtained from ((WQ + W'Q')/.7)(.3).

[3] H. Schwartz, op. cit., Table 2.

[4] Statistics Canada, Geographical Distribution of Personal Income, Special Tabulation (October 1975); and Statistics Canada, Statistical Report on the Operation of the Unemployment Insurance Act, (December 1974).

9) Personal income tax rate: For Nova Scotia as a whole, the average personal income tax rate was 11.65% in 1973. The rate in Cape Breton Island is likely to be less and 12% was chosen.

From equation (19) where $G = g\ (WQ + W'Q')$, income multipliers in Cape Breton Island can be computed for various combinations of g, α, and t_s, and are shown in Table 11. For instance, when the proportion of government transfer payments, other than unemployment benefits, to labour income is 0.25 , the ratio of capital income accruing to residents is 0.50 and average personal income tax rate is 0.12, the income multiplier is 1.5362.

TABLE 11

INCOME MULTIPLIERS FOR CAPE BRETON ISLAND

g	α \ t_s	.10	.12	.15	.20
.20	.30	1.6406	1.6343	1.6245	1.6074
	.50	1.5750	1.5686	1.5587	1.5415
	.70	1.5216	1.5153	1.5055	1.4855
.25	.30	1.6006	1.5942	1.5844	1.5671
	.50	1.5426	1.5362	1.5264	1.5093
	.70	1.4948	1.4885	1.4789	1.4621
.30	.30	1.5654	1.5590	1.5491	1.5319
	.50	1.5136	1.5073	1.4976	1.4807
	.70	1.4706	1.4644	1.4549	1.4394

III.2 DECLINE IN BASE SECTOR ACTIVITY

The Sydney Steel Corporation is part of the base sector of Cape Breton Island. Over the past few years it has experienced sizeable fluctuations in the size of its work force. Since 1972, the highest work force of the company was 4,309 employees in August 1973, but between 1972-74, 1,710 workers were laid off by the company.[1] The amount of permanent employment can be calculated as the difference between the maximum work force and the temporary-sector workers who experienced unemployment (i.e. 2,599 man-years).

In March 1976 the work force of the company was 2,677. There were thus about 78 workers in the temporary sector who were employed about 75% of the time[2] and worked the equivalent of 59 man-years. With the Sysco labour force at its March, 1976 size about 2,658 man-years of work would have been performed. By the end of June, 1976 we expect that Sysco will have reduced its labour force to 2,600 employees who will all be working full-time.

Table 12 shows that average annual earnings at Sysco based on the expected June, 1976 labour force is to be $11,048 (in January 1976 dollars). On average the weekly earnings become $212.50 which is composed of the weighted average of $284.1 for salary employees and $199.4 for unionized workers.

---

[1] This figure was obtained from a special tabulation for Sysco, the Unemployment Insurance Commission.

[2] The average duration of unemployment of those recently laid-off at Sysco is about three months. See J.C. Evans and C.T. Kuo, "Characteristics of Workers Recently Ladi-off from Sysco", Department of Regional Economic Expansion, Government of Canada, (November 18, 1975). Appendix 8 to Annex "A" to Part 6.

TABLE 12
AVERAGE ANNUAL EARNINGS FOR SALARY EMPLOYEES AND UNIONIZED WORKERS IN JANUARY 1976 DOLLARS

Salary Employees [a]		Average Earnings	
	No.	Annual	Weekly
Technical	64	$ 15,504	$ 298.2
Secretary	19	8,904	171.2
Clerical	75	13,980	268.8
Foreman	252	15,465	297.4
Others (security, etc.)	28	13,008	250.2
	438	14,775	284.1
Unionized Workers (Job Class) [b]			
Unskilled (1-3)	2	8,895	171.1
Semi-skilled (4-9)	124	10,004	192.4
Skilled (10 -)	159	10,676	205.3
	285	10,371	199.4
Total [c]			
Salary Employees	400	14,775	284.1
Unionized Workers	2,200	10,371	199.4
	2,600	11,048	212.5

Source:

[a] Data on salary employees were obtained from Mr. Errol Pretty, Sydney Steel Corporation. The figure does not include senior executives and hourly paid workers.

[b] Data on unionized workers were obtained from 10.65% sample.

[c] The total work force at Sysco is assumed to be 2,600 employees by the end of June 1976, of which 400 will be salary workers and 2,200 will be unionized workers.

Since Sysco has been running a financial loss over the past several years which is expected to continue into the future, the capital income from the company can reasonably be assumed to be zero. If the company were closed on June 30, 1976, 2,600 man-year jobs would be destroyed immediately. The workers affected could expect to receive unemployment insurance benefits of $133 per week.[1] The impact on the economy of Cape Breton Island can be obtained by solving the system of equations (20), (22), (24), (25), and (27) where the value of all parameters and the initial value of variables are summarized below:

Q_o = 18,022, B_p = .4994, B_T = .5006, W_s = $147, UIC_s = $ 98;

Q_o' = 21,920, S_p = .5880, S_T = .4120, W_s' = $139, UIC_s' = $ 93;

P_{so} = .54, P_s^* = .54, f_s = .60, J_{To} = 18,052,

LF_{To} = 33,430, α = .5, t_s = .12 M = 1.5362, b = .5

and $dQ = -2,600$ (including $B_p^* dQ = -2,600$ and $B_T^* dQ = 0$)

W_s^* = $212.50 UIC_s^* = $133

---

[1] From January 1976, the unemployment benefit rate became 66 2/3% of the average weekly insurable earnings for all claimants. The average earnings at Sysco ($212.5) is more than the maximum weekly insurable earnings in 1976 ($200).

The results of the company's closure from July 1976 to the end of 2007 are shown in Table 13. The unemployment rate in the temporary sector plays a significant role in determining migration flows; the unemployment rate increases considerably in the first year and then decreases over time because of out-migration. Nevertheless, it takes 10 years to fall to 47%.

Total out-migration over the 31 and a half years would involve 6262 workers of which 34% would take place in the second and third years. The breakdown of migrants between the base and secondary sectors is assumed to be the same as the proportion of the temporary sector in the base and secondary sectors.

The total reduction in man-years of employment in the secondary sector over the 31 and a half years would be 2,715. Of these 2,715 man-years, 49% would occur in the first year because of the large number of workers being laid off from the Company as well as the substantial reduction in income in the area as wage earnings cease and unemployment insurance benefits commence. From July 1977 on, however, the annual impact on the secondary sector would start to decline. This is because the decrease in spending in the local economy is a result only of out-migration.[1]

It is interesting to note that the number of unemployed workers on Cape Breton Island would increase in the first few years because of the immediate closure of Sysco and then start to decline because of out-migration. In the year 2007, the number of unemployed workers in Cape Breton would be reduced by approximately 945 as compared to the situation before Sysco is closed.

In order to estimate the social opportunity cost of jobs lost by the closure of Sysco in each period, the value of leisure time and social opportunity cost of migrants must be

---

[1] J. Vankerkamp, "The Effect of Out-migration on Regional Employment", Canadian Journal of Economics, (November 1970).

TABLE 13

THE IMPACT OF SYSCO'S CLOSURE ON THE ECONOMY OF CAPE BRETON ISLAND, JULY, 1976 - DECEMBER, 2007

Period	Migration: Flow in Period	Migration: Cumulative Base	Migration: Cumulative Secondary	Secondary Sector: Change of Man-year in Period Total	Permanent	Temporary	Annual Gross Loss from Initial Period	Change of Unemployment from Initial Period: Base	Secondary	Unemployment Rate: Temporary Sector	Overall
6/76	0	-	-	-	-	-	-	-	-	0.4600	0.278
7/76-6/77	0	0	0	-1330	-782	-548	$ -9619985	2600	1330	0.5245	0.349
7/77-6/78	1187	593	594	-262	-154	-108	-11517365	2006	999	0.5138	0.340
7/78-6/79	962	1074	1075	-212	-125	-87	-13055434	1525	730	0.5047	0.332
7/79-6/80	780	1464	1466	-172	-101	-71	-14302235	1135	512	0.4969	0.325
7/80-6/81	632	1780	1782	-139	-82	-57	-15312926	819	335	0.4904	0.319
7/81-6/82	512	2036	2039	-113	-66	-46	-16132220	563	192	0.4850	0.315
7/82-6/83	415	2244	2247	-91	-54	-37	-16796363	355	76	0.4805	0.311
7/83-6/84	337	2412	2415	-74	-43	-30	-17334735	187	-17	0.4768	0.308
7/84-6/85	273	2549	2552	-60	-35	-24	-17771155	50	-93	0.4737	0.305
7/85-6/86	221	2660	2663	-48	-28	-20	-18124928	-60	-155	0.4712	0.303
7/86-6/87	179	2749	2753	-39	-23	-16	-18411707	-149	-205	0.4691	0.302
7/87-6/88	145	2822	2825	-32	-19	-13	-18644178	-222	-246	0.4674	0.300
7/88-6/89	117	2881	2884	-26	-15	-11	-18832625	-281	-279	0.4660	0.299
7/89-6/90	95	2929	2932	-21	-12	-9	-18985385	-329	-306	0.4649	0.298
7/90-6/91	77	2967	2971	-17	-10	-7	-19109217	-367	-327	0.4640	0.297
7/91-6/92	62	2999	3002	-13	-8	-5	-19209599	-399	-345	0.4632	0.297
7/92-6/93	50	3024	3028	-11	-6	-5	-19290971	-424	-359	0.4626	0.296
7/93-6/94	41	3045	3049	-9	-5	-4	-19356933	-445	-371	0.4621	0.296
7/94-6/95	33	3062	3065	-7	-4	-3	-19410404	-462	-380	0.4617	0.295
7/95-6/96	27	3075	3079	-6	-3	-3	-19453749	-475	-387	0.4614	0.295
7/96-6/97	22	3086	3090	-4	-2	-2	-19488886	-486	-394	0.4611	0.295
7/97-6/98	17	3095	3099	-3	-2	-1	-19517368	-495	-399	0.4609	0.295
7/98-6/99	14	3102	3106	-3	-2	-1	-19540457	-502	-403	0.4607	0.295
7/99-6/00	11	3108	3112	-2	-1	-1	-19559174	-508	-406	0.4606	0.295
7/00-6/01	9	3113	3117	-2	-1	-1	-19574346	-513	-409	0.4605	0.294
7/01-6/02	7	3117	3120	-1	-1	0	-19586645	-517	-411	0.4604	0.294
7/02-6/03	6	3120	3124	-1	-1	0	-19596615	-520	-412	0.4603	0.294
7/03-6/04	5	3122	3126	-1	-1	0	-19604697	-522	-414	0.4603	0.294
7/04-6/05	4	3124	3128	0	0	0	-19611248	-524	-415	0.4602	0.294
7/05-6/06	3	3126	3130	0	0	0	-19616559	-526	-416	0.4602	0.294
7/06-6/07	2	3127	3131	0	0	0	-19620864	-527	-417	0.4601	0.294
7/07-12/07	1	3129	3133	0	0	0	-19622609	-528	-417	0.4601	0.294

The total out-migrants are 6262 persons

estimated. The maximum value of leisure time per worker, which is determined from equation (3), is equal to $4,036.24 per year for those working in the base sector and $3,807.44 for those in the secondary sector.

The social opportunity cost of retaining a migrant on Cape Breton Island can be estimated from equation (6). However, the variables in the destination area of migrants such as W_o, UIC_o, P_o, f_o, and t_o have to be measured first.

i) W_o and UIC_o: Based on the movements of the male working age population (ages 16-64) derived from the files of income tax returns, the distribution of out-migrants from Cape Breton Island over the period 1966-71 was 46.37% to Ontario, 31.86% to other parts of Nova Scotia, 5.21% to New Brunswick, 4.49% to Newfoundland, 4.37% to Quebec, 2.90% to Alberta, 2.63% to British Columbia, 1.06% to Manitoba, 0.75% to Prince Edward Island, and 0.36% to Saskatchewan.[1] The increase in the wage rate in the destination areas over the sending area should be measured by the weighted average of wages in all destination areas and by the wage in the sending area. This differential in wages is found to be 13% for migrants from Cape Breton Island.[2] The

---

[1] The percentages were calculated from Statistics Canada, Intercounty Migration Data Base, (December 1973). See also C.Y. Kuo, "Labour Mobility and Unemployment in Cape Breton Island", Department of Regional Economic Expansion, Government of Canada, (May 1975). Appendix 4 to Annex "A" to Part 6.

[2] 13% is equal to $(\sum_{i=1}^{10} k_i W_i / W_{ns}) - 1$ where W_i and k_i are weekly wage rate and the proportion of migrants coming from Cape Breton Island in i-th province, W_{ns} is wage rate in Nova Scotia. Average weekly earnings in each province can be obtained from Statistics Canada, Employment, Earnings, and Hours, Cat. 72-002.

average weekly wage rate of out-migrants is equal to $166.11 for those previously working in the base sector and $157.07 for those in the secondary sector. These people would receive weekly unemployment benefits of $111 and $105, respectively, if they were to become unemployed.

ii) P_o: The proportion of time the temporary employed workers spend not working was 46% on Cape Breton Island when the unemployment rate was about 11.4% in 1972-74. Over the same period, people moving out from the island faced an average 5.7% unemployment rate in the receiving areas.[1] If the relationship between the proportion of time the temporary work force spends out of employment and the unemployment rate is fixed, migrants from Cape Breton Island would spend approximately 23% of their time not working and 77% in employment in the receiving areas.

iii) f_o: Because migrants face a lower unemployment rate in the receiving region, they are expected to have a lower duration of unemployment. As a consequence, the proportion of the unemployed time that an individual can collect unemployment benefits in the receiving regions must be higher than that in Cape Breton Island and is assumed to be 0.8.

iv) t_o: Migrants from Cape Breton Island are expected to earn more in the receiving regions because they face a market with a lower unemployment rate and higher wage rate. The average income tax rate is expected to be higher and is assumed as 15% in this study.

---

[1] 5.7% is calculated as $\sum_{i=1}^{10} k_i (UR)_i$ where $(UR)_i$ is the unemployment rate in the i-th province and Nova Scotia other than Cape Breton Island, and k_i is the same as the previous footnote. Unemployment rates for each province can be obtained from Statistics Canada, The Labour Force, Cat. 71-001.

Substituting the above figures into equation (6) yields the social opportunity cost per migrant which is equal to $6,821.88 per year for those who previously worked in the base sector and $6,450.08 for those in the secondary sector.

The total social opportunity cost of jobs destroyed as a result of Sysco's closure on June 30, 1976 would be equal to the value of the increased leisure time plus the social opportunity cost of all migrants, minus the gross loss of foregone output in the secondary sectors affected. As is shown in Table 14, the first two columns indicate the social opportunity cost of released workers from Sysco over the period July, 1976 to December, 2007, under the assumptions that real wages increase at a zero and a two percent rate per year. Their net present values are presented in the next two columns where a 10% social discount rate is used.[1]

Since annual income at Sysco averaged $11,048 the total wage bill in the company with 2,600 man-years would be $28,724,800. It takes about 13 years for the social opportunity cost of released workers to reach 60% of the annual wage bill as of July 1976. (See column 5 of Table 14).

If Sysco were closed on June 30, 1976, the present value of the social loss over 31 and a half years would be $156,423,164 for the case with zero growth in real wages. This negative externality would account for 57% of the total wage bill in the company. If real wages grew at two percent per year at Sysco and elsewhere, the present value of the total social loss over 31 and a half years would then become $181 million in 1976 dollars; the externality as a percentage of the total revised wage bill would remain unchanged.

---

[1] G.P. Jenkins, "Analysis of Rate of Return from Capital in Canada", dissertation submitted to the University of Chicago, (December 1972).

TABLE 14

SOCIAL OPPORTUNITY COST OF RELEASED WORKERS AND THE ECONOMIC EXTERNALITY

	THE SOCIAL OPPORTUNITY COST OF LABOUR					PRESENT VALUE OF EXTERNALITY	
Period	0% GROWTH IN REAL WAGE	2% GROWTH IN REAL WAGE	P.V. 0% GROWTH	P.V. 2% GROWTH	RATIO = SOCL / SYSCO WAGE	0% GROWTH IN REAL WAGE	2% GROWTH IN REAL WAGE
7/76-6/77	$ 5941686	$ 5941686	$ 5941686	$ 5941686	0.2068	$ 22788313	$ 22788313
7/77-6/78	8266959	8432298	7514665	7665951	0.2877	41389216	41763690
7/78-6/79	10151889	10562025	8388313	8729459	0.3534	56739955	57738733
7/79-6/80	11679865	12394766	8772623	9313192	0.4065	69546129	71334025
7/80-6/81	12918485	13983383	8819970	9551961	0.4497	80341286	83025100
7/81-6/82	13922544	15371614	8640483	9545965	0.4846	89530954	93177803
7/82-6/83	14736462	16595650	8313359	9369463	0.5129	97425201	102074913
7/83-6/84	15396247	17685448	7895180	9077298	0.5359	104262735	109936209
7/84-6/85	15931086	18665807	7426026	8709783	0.5545	110228746	116933582
7/85-6/86	16364642	19557262	6933962	8296381	0.5696	115468145	123202446
7/86-6/87	16716094	20376826	6438336	7858457	0.5818	120095395	128850342
7/87-6/88	17000991	21138596	5952192	7411343	0.5918	124201820	133963439
7/88-6/89	17231936	21854262	5484041	6965896	0.5998	127861062	138611455
7/89-6/90	17419147	22533524	5039151	6529653	0.6063	131133155	142851383
7/90-6/91	17570905	23184436	4620495	6107698	0.6116	134067581	146730318
7/91-6/92	17693925	23813693	4229435	5703321	0.6159	136705568	150287600
7/92-6/93	17793647	24426865	3866224	5318497	0.6193	139081830	153556461
7/93-6/94	17874485	25028595	3530364	4954247	0.6222	141225887	156565269
7/94-6/95	17940015	25622759	3220866	4610915	0.6244	143163069	159338495
7/95-6/96	17993135	26212600	2936436	4288363	0.6263	144915299	161897447
7/96-6/97	18036196	26800838	2675608	3986115	0.6278	146501687	164260847
7/97-6/98	18071102	27389761	2436835	3703478	0.6290	147939008	166445273
7/98-6/99	18099398	27981301	2218551	3439612	0.6300	149242063	168465515
7/99-6/00	18122335	28577697	2019219	3193594	0.6308	150423985	170334842
7/00-6/01	18140929	29178546	1837353	2964459	0.6314	151496468	172065231
7/01-6/02	18156001	29786845	1671542	2751225	0.6320	152469968	173667537
7/02-6/03	18168220	30403028	1520454	2552929	0.6324	153353857	175151638
7/03-6/04	18178124	31027994	1382846	2368621	0.6327	154156558	176526554
7/04-6/05	18186153	31662533	1257562	2197392	0.6330	154885659	177800544
7/05-6/06	18192661	32307341	1143533	2038371	0.6332	155548002	178981186
7/06-6/07	18197937	32963045	1039773	1890730	0.6334	156149771	180075446
7/07-12/07	18200076	33296626	992574	1822208	0.6335	156423164	180582595

The proportion of earnings due to adverse working conditions and hazard at Sysco is 35.4% for unskilled workers, 18.1% for semi-skilled workers and 10.5% for skilled workers.[1] This portion of the earnings would not be a social loss if workers left the company because these earnings represent compensation for costs which workers must bear. However, if the released workers found employment in other activities, a certain, but smaller, portion of earnings would have been paid in compensation for hazard. If the proportion in other activities is assumed to be the same as that of salary employees at Sysco, which is again the same as that of skilled workers at Sysco, the wage bill at Sysco due to higher hazards to semi-smilled and unskilled workers over skilled workers would be $763,062 per year. The wage bill after excluding this higher hazard compensation at Sysco would become $27,961,738. As is shown in Table 15, the present value of the real social welfare loss after Sysco's closure would become $148 million if zero growth in real wage is assumed. This loss accounts for 56% of the company's wage bill in terms of present value. If the real wages were to increase annually by two percent at Sysco and elsewhere, the externality would increase to about $171 millions.

Sensitivity Analysis

As mentioned earlier, all the calculations of the social opportunity cost of released workers and the externality were based on the assumption that the value of leisure time to unemployed workers was measured at the maximum amount, the migration adjustment to temporary unemployment rates was moderate (b = .5), the proportion of the income from capital accruing to residents of the region was 50 percent, and so on. This section investigates how sensitive

---

[1] The breakdown of Sysco workers according to skill is unskilled with job class 1 to 3, semi-skilled with job class 4 to 9 and skilled with job class 10 and over. The figures shown here were obtained from a 10.65% sample of unionized workers at Sysco, and all job classes are based on the C.W.S. system.

TABLE 15

SOCIAL OPPORTUNITY COST OF RELEASED WORKERS AND THE ECONOMIC EXTERNALITY BY TAKING HAZARD INTO ACCOUNT

PERIOD	RATIO OF SOCL TO SYSCO WAGE	PRESENT VALUE OF EXTERNALITY 0% GROWTH IN REAL WAGE	PRESENT VALUE OF EXTERNALITY 2% GROWTH IN REAL WAGE
7/76-6/77	0.2125	$ 22025251	$ 22025251
7/77-6/78	0.2956	39932531	40293040
7/78-6/79	0.3630	54652766	55611937
7/79-6/80	0.4176	66885813	68598786
7/80-6/81	0.4619	77159997	79725651
7/81-6/82	0.4978	85876099	89355162
7/82-6/83	0.5269	93339877	97767116
7/83-6/84	0.5505	99786113	105178527
7/84-6/85	0.5696	105396435	111758722
7/85-6/86	0.5851	110312513	117640737
7/86-6/87	0.5977	114645863	122929907
7/87-6/88	0.6079	118485133	127710357
7/88-6/89	0.6162	121901532	132049910
7/89-6/90	0.6228	124952881	136003802
7/90-6/91	0.6283	127686649	139617493
7/91-6/92	0.6327	130142239	142928816
7/92-6/93	0.6362	132352703	145969599
7/93-6/94	0.6391	134346048	148766910
7/94-6/95	0.6415	136146234	151344015
7/95-6/96	0.6434	137773934	153721104
7/96-6/97	0.6449	139247125	155915862
7/97-6/98	0.6462	140581549	157943907
7/98-6/99	0.6472	141791071	159819136
7/99-6/00	0.6480	142887971	161553994
7/00-6/01	0.6487	143883170	163159689
7/01-6/02	0.6492	144786418	164646365
7/02-6/03	0.6496	145606448	166023244
7/03-6/04	0.6500	146351102	167298733
7/04-6/05	0.6503	147027437	168480524
7/05-6/06	0.6505	147641817	169575669
7/06-6/07	0.6507	148199987	170590649
7/07-12/07	0.6508	148453564	171061039

the final results are to some of the above assumptions. The wage bill used in this section excludes earnings attributable to greater hazards and poor working conditions at Sysco and is equal to $27,961,738 per year.

1) The value of leisure time to unemployed workers: The true leisure time may not be worth as much as $4,036.24 per year for those who previously worked in the base sector and $3,807.44 for those in the secondary sector. If the true leisure time is worth 75% or 50% of the above figures, the SOCL and the externality at each point in time are shown in Table 16 where the migration adjustment and the proportion of income from capital accruing to residents remain as before.

As is indicated in Table 16, the social opportunity cost of released workers is lower than before up to June 1984 because the additional unemployed workers on the island place a lower value on their leisure time. The number of unemployed workers after June 1984, however, is smaller than the number in June, 1976 due to out-migration flows cumulating over the years. Once the number of unemployed workers becomes smaller than it was originally, the value of the loss of leisure time due to out-migration becomes smaller because the leisure time is now measured at only 75% or 50% of the value previously used. Since the decrease in leisure time adds to the social cost of out-migrants according to equation (3) the social opportunity cost of released workers starts to rise after June, 1984.

This phenomenon can be seen by comparing the ratios of the SOCL to the Sysco wage on Table 15 and 16. Since the SOCL which has become greater after June, 1984 is smaller in present value terms as compared to the reduction of the SOCL in earlier periods, the total

TABLE 16

RATIO OF SOCL/SYSCO WAGE AND PRESENT VALUE OF ECONOMIC EXTERNALITY UNDER VARIOUS ASSUMPTIONS ON THE VALUE OF LEISURE TIME

	Maximum Value of Leisure Time			75% of Maximum Value of Leisure Time			50% of Maximum Value of Leisure Time		
		P.V. Externality			P.V. Externality			P.V. Externality	
Period	Ratio	If 0% Growth in Real Wage	If 2% Growth in Real Wage	Ratio	If 0% Growth in Real Wage	If 2% Growth in Real Wage	Ratio	If 0% Growth in Real Wage	If 2% Growth in Real Wage
7/76-6/77	0.2125	$ 22025251	$ 22025251	0.0733	$ 25915669	$ 25915669	0.0658	$ 29806087	$ 29806087
7/77-6/78	0.2956	39932531	40293040	0.1892	46528078	46943047	0.0828	53123625	53593054
7/78-6/79	0.3630	54652766	55611937	0.2831	63094752	64183477	0.2032	71536739	72755016
7/79-6/80	0.4176	66885813	68558786	0.3592	76554868	78473006	0.3008	86223923	88347226
7/80-6/81	0.4619	77159997	79725651	0.4209	87611879	90447668	0.3799	98063762	101169684
7/81-6/82	0.4978	85876099	89355162	0.4709	96794509	100592595	0.4441	107712919	111830029
7/82-6/83	0.5269	93339877	97767116	0.5115	104501782	109278978	0.4961	115663687	120790840
7/83-6/84	0.5505	99786113	105178527	0.5444	111036296	116791883	0.5382	122286478	128405240
7/84-6/85	0.5696	105396435	111758722	0.5710	116628814	123351197	0.5724	127861193	134943673
7/85-6/86	0.5851	110312513	117640737	0.5926	121456462	129127407	0.6001	132600411	140614078
7/86-6/87	0.5977	114645863	122929907	0.6101	125656193	134253486	0.6225	136666524	145577065
7/87-6/88	0.6079	118485133	127710357	0.6243	129334777	138833858	0.6407	140184420	149957358
7/88-6/89	0.6162	121901532	132049910	0.6358	132576206	142951162	0.6555	143250880	153852414
7/89-6/90	0.6228	124952881	136003802	0.6451	135447208	146671364	0.6674	145941535	157338925
7/90-6/91	0.6283	127686649	139617493	0.6527	138001347	150047608	0.6771	148316046	160477723
7/91-6/92	0.6327	130142239	142928816	0.6588	140282090	153123152	0.6850	150421941	163317488
7/92-6/93	0.6362	132352703	145969599	0.6638	142325096	155933574	0.6914	152297488	165897550
7/93-6/94	0.6391	134346048	148766910	0.6678	144159942	158508461	0.6965	153973837	168250012
7/94-6/95	0.6415	136146234	151344015	0.6711	145811426	160872687	0.7007	155476618	170401360
7/95-6/96	0.6434	137773934	153721104	0.6737	147300546	163047395	0.7041	156827159	172373687
7/96-6/97	0.6449	139247125	155915062	0.6759	148645257	165050743	0.7068	158043389	174185623
7/97-6/98	0.6462	140581549	157943907	0.6776	149861040	166898479	0.7091	159140532	175853051
7/98-6/99	0.6472	141791071	159819136	0.6790	150961354	168604393	0.7109	160131638	177389651
7/99-6/00	0.6480	142887971	161553994	0.6802	151957979	170180656	0.7124	161027987	178807318
7/00-6/01	0.6487	143883170	163159689	0.6811	152861287	171638090	0.7135	161839405	180116492
7/01-6/02	0.6492	144786418	164646365	0.6818	153680461	172986387	0.7145	162574504	181326408
7/02-6/03	0.6496	145606448	166023244	0.6825	154423665	174234271	0.7153	163240883	182445297
7/03-6/04	0.6500	146351102	167298733	0.6830	155098188	175389635	0.7159	163845274	183480536
7/04-6/05	0.6503	147027437	168480524	0.6834	155710556	176459652	0.7164	164393675	184438781
7/05-6/06	0.6505	147641817	169575669	0.6837	156266628	177450863	0.7168	164891440	185326058
7/06-6/07	0.6507	148199987	170590649	0.6839	156771678	178369250	0.7172	165343370	186147851
7/07-12/07	0.6508	148453564	171061039	0.6840	157001069	178794773	0.7173	165548574	186528507

present value of the SOCL over 31 and a half years is therefore small and the externality is larger. For the case where 75% of the maximum value of leisure time is used, the externality would be $157 million instead of $148 million if a zero growth of real wages is assumed. This externality accounts for about 59% of the Sysco's wage bill. Moreover, if 50% of the maximum value of leisure time is the true value of leisure in the island, the externality would be $166 million which accounts for 62% of the company's total wage bill.

2) The response of migration to the unemployment rate in the temporary sector: The SOCL and externality are affected considerably by the assumption on the migration adjustment to the unemployment rate in the temporary sector. If 70% rather than 50% of the unemployment rate differential between the actual and the long run unemployment rate is closed each year by migration, about 46% of total out-migrants would take place in the first three years and 60% in the first four years. No migration was assumed to occur in the first year because a maximum of 51 weeks of unemployment insurance benefits scheme would probably allow people considerable time to determine if migration was the best alternative (see Table 17). It is quite clear, however, that the migration response under the faster response assumption is much greater than the under slower response assumption where only 34% of the total migration would occur in three years and 47% in four years.

As in shown in Table 18, because of more migrants in the earlier years under the faster response assumption, the social opportunity cost of released workers from Sysco increases considerably during the early period and then slowly in the later period, particularly after the

TABLE 17

THE IMPACT OF SYSCO'S CLOSURE ON THE ECONOMY OF CAPE BRETON ISLAND, JULY, 1976 - DECEMBER, 2007
WITH A FASTER RESPONSE OF MIGRATION

Period	Migration			Secondary Sector				Change of Unemployment from Initial Period		Unemployment Rate	
	Flow in Period	Cumulative		Change of Man-year in Period			Annual Gross Loss from Initial Period			Temporary Sector	Overall
		Base	Secondary	Total	Permanent	Temporary		Base	Secondary		
6/76	-	-	-	-	-	-	-	-	-	0.4600	0.278
7/76-6/77	0	0	0	-1330	-782	-548	$ -9619985	2600	1330	0.5245	0.349
7/77-6/78	1662	830	831	-367	-216	-151	-12276317	1769	866	0.5094	0.336
7/78-6/79	1221	1441	1443	-270	-158	-111	-14228399	1158	525	0.4974	0.325
7/79-6/80	897	1890	1892	-198	-116	-81	-15662942	710	274	0.4881	0.317
7/80-6/81	659	2219	2222	-145	-85	-60	-16717157	380	90	0.4810	0.312
7/81-6/82	484	2462	2465	-107	-63	-44	-17491878	138	-45	0.4757	0.307
7/82-6/83	356	2640	2643	-78	-46	-32	-18061203	-40	-144	0.4716	0.304
7/83-6/84	261	2771	2774	-57	-34	-23	-18479588	-171	-217	0.4686	0.301
7/84-6/85	192	2867	2870	-42	-25	-17	-18787050	-267	-271	0.4663	0.299
7/85-6/86	141	2937	2941	-31	-18	-12	-19012998	-337	-310	0.4647	0.298
7/86-6/87	103	2989	2993	-23	-13	-9	-19179042	-389	-339	0.4635	0.297
7/87-6/88	76	3027	3031	-16	-9	-7	-19301064	-427	-361	0.4625	0.296
7/88-6/89	56	3055	3059	-12	-7	-5	-19390735	-455	-376	0.4619	0.296
7/89-6/90	41	3076	3080	-9	-5	-3	-19456633	-476	-388	0.4614	0.295
7/90-6/91	30	3091	3095	-6	-3	-2	-19505060	-491	-396	0.4610	0.295
7/91-6/92	22	3102	3106	-4	-2	-2	-19540647	-502	-403	0.4607	0.295
7/92-6/93	16	3111	3114	-3	-2	-1	-19566800	-511	-407	0.4605	0.295
7/93-6/94	12	3117	3120	-2	-1	-1	-19586019	-517	-411	0.4604	0.294
7/94-6/95	8	3121	3125	-2	-1	-1	-19600143	-521	-413	0.4603	0.294
7/95-6/96	6	3124	3128	-1	-1	0	-19610522	-524	-415	0.4602	0.294
7/96-6/97	4	3127	3130	-1	-1	0	-19618150	-527	-416	0.4602	0.294
7/97-6/98	3	3128	3132	0	0	0	-19623755	-528	-417	0.4601	0.294
7/98-6/99	2	3130	3133	0	0	0	-19627874	-530	-418	0.4601	0.294
7/99-6/00	1	3131	3134	0	0	0	-19630901	-531	-418	0.4601	0.294
7/00-6/01	1	3131	3135	0	0	0	-19633126	-531	-419	0.4600	0.294
7/01-6/02	1	3132	3136	0	0	0	-19634760	-532	-419	0.4600	0.294
7/02-6/03	0	3132	3136	0	0	0	-19635962	-532	-419	0.4600	0.294
7/03-6/04	0	3132	3136	0	0	0	-19636845	-532	-419	0.4600	0.294
7/04-6/05	0	3133	3136	0	0	0	-19637493	-533	-420	0.4600	0.294
7/05-6/06	0	3133	3137	0	0	0	-19637970	-533	-420	0.4600	0.294
7/06-6/07	0	3133	3137	0	0	0	-19638321	-533	-420	0.4600	0.294
7/07-12/07	0	3133	3137	0	0	0	-19638449	-533	-420	0.4600	0.294

The total out-migrants are 6270 persons

TABLE 18

SOCIAL OPPORTUNITY COST OF RELEASED WORKERS AND THE EXTERNALITY JULY, 1976 - DECEMBER, 2007
WITH A FASTER RESPONSE OF MIGRATION

	THE SOCIAL OPPORTUNITY COST OF LABOUR					PRESENT VALUE OF EXTERNALITY	
Period	0% GROWTH IN REAL WAGE	2% GROWTH IN REAL WAGE	P.V. 0% GROWTH	P.V. 2% GROWTH	RATIO OF SOCL TO SYSCO WAGE	0% GROWTH IN REAL WAGE	2% GROWTH IN REAL WAGE
7/76-6/77	$ 5941686	$ 5941686	$ 5941686	$ 5941686	0.2125	$ 22025251	$ 22025251
7/77-6/78	9197068	9381009	8360134	8528441	0.3289	39087062	39430550
7/78-6/79	11589378	12057589	9576083	9965535	0.4144	52619527	53513372
7/79-6/80	13347438	14164405	10025118	10642865	0.4773	63600079	65170547
7/80-6/81	14639395	15846152	9994904	10824406	0.5235	72699329	75024967
7/81-6/82	15588828	17211325	9674597	10688449	0.5574	80381318	83511993
7/82-6/83	16286546	18341296	9187816	10355008	0.5823	86970639	90938402
7/83-6/84	16799284	19297097	8614656	9904499	0.6007	92697399	97522612
7/84-6/85	17176084	20124520	8006362	9390443	0.6142	97727385	103422147
7/85-6/86	17452987	20857935	7395111	8848139	0.6241	102182313	108752404
7/86-6/87	17656476	21523146	6800531	8300543	0.6313	106153468	113599488
7/87-6/88	17806017	22139544	6234038	7762283	0.6367	109710892	118028999
7/88-6/89	17915911	22721707	5701714	7242389	0.6406	112909617	122092060
7/89-6/90	17996669	23280611	5206221	6746140	0.6435	115793896	125829464
7/90-6/91	18056017	23824531	4748061	6276325	0.6456	118400098	129274529
7/91-6/92	18099631	24359720	4326412	5834093	0.6472	120758711	132455080
7/92-6/93	18131681	24890913	3939673	5419534	0.6483	122895726	135394825
7/93-6/94	18155235	25421712	3585815	5032062	0.6492	124833621	138114322
7/94-6/95	18172543	25954867	3262613	4670680	0.6498	126592060	140631662
7/95-6/96	18185263	26492495	2967791	4334153	0.6502	128188405	142962961
7/96-6/97	18194611	27036235	2699109	4021126	0.6506	129638095	145122708
7/97-6/98	18201480	27587371	2454416	3730197	0.6508	130954938	147124033
7/98-6/99	18206528	28146923	2231683	3459971	0.6510	132151329	148978903
7/99-6/00	18210238	28715711	2029013	3209085	0.6511	133238434	150698270
7/00-6/01	18212964	29294410	1844649	2976230	0.6512	134226338	152292194
7/01-6/02	18214968	29883586	1676970	2760161	0.6513	135124157	153769935
7/02-6/03	18216440	30483721	1524489	2559705	0.6514	135940152	155140038
7/03-6/04	18217522	31095242	1385843	2373754	0.6514	136681808	156410393
7/04-6/05	18218317	31718531	1259786	2201279	0.6514	137355919	157588297
7/05-6/06	18218901	32353940	1145182	2041311	0.6514	137968650	158680503
7/06-6/07	18219331	33001796	1040995	1892952	0.6515	138525597	159693260
7/07-12/07	18219489	33332106	993638	1824159	0.6515	138778721	160162810

year 1998. In terms of present value, the total social loss would have become smaller compared to the one in Table 15, and would be equal to $139 million which accounts for 52% of Sysco's wage bill if no growth in real wage is assumed. If the real wage grows by two percent annually at Sysco and elsewhere, the externality from Sysco's immediate closure would be approximately $160 million.

If the value of leisure time is 75% of the value used before, the social opportunity cost of labour in the first five years is smaller and then greater from June, 1982 on because migration outflow reduces the number of unemployed in Cape Breton Island. Because the changes in the first few years really matter much more in terms of present value, however, the externality over 31 and a half years has only increased by two percent. Similarly, the externality would have increased about four percent if the true value of leisure time were 50% of the calculated maximum value of leisure time.

3) The proportion of the income from capital that accrues to residents of Cape Breton Island: This proportion was assumed to be 50% in the initial analysis. If a 70% proportion is assumed, the labour income multiplier in the island would decrease to 1.4885. On account of a smaller regional labour income multiplier, the total number of migrants will also decline to 5,817 over 31 and a half years. The externality would be $146 million which accounts for 55% of Sysco's wage if zero growth of real wage is assumed.

The social welfare loss after Sysco's immediate closure at the end of June, 1976 and the ratio of the externality to the Sysco's wage are summarized in Table 19 where different assumptions on the value of leisure time, migration

TABLE 19

EXTERNALITY AND RATIO OF EXTERNALITY TO SYSCO'S WAGE AT ZERO GROWTH IN REAL WAGE

(unit: $ million)

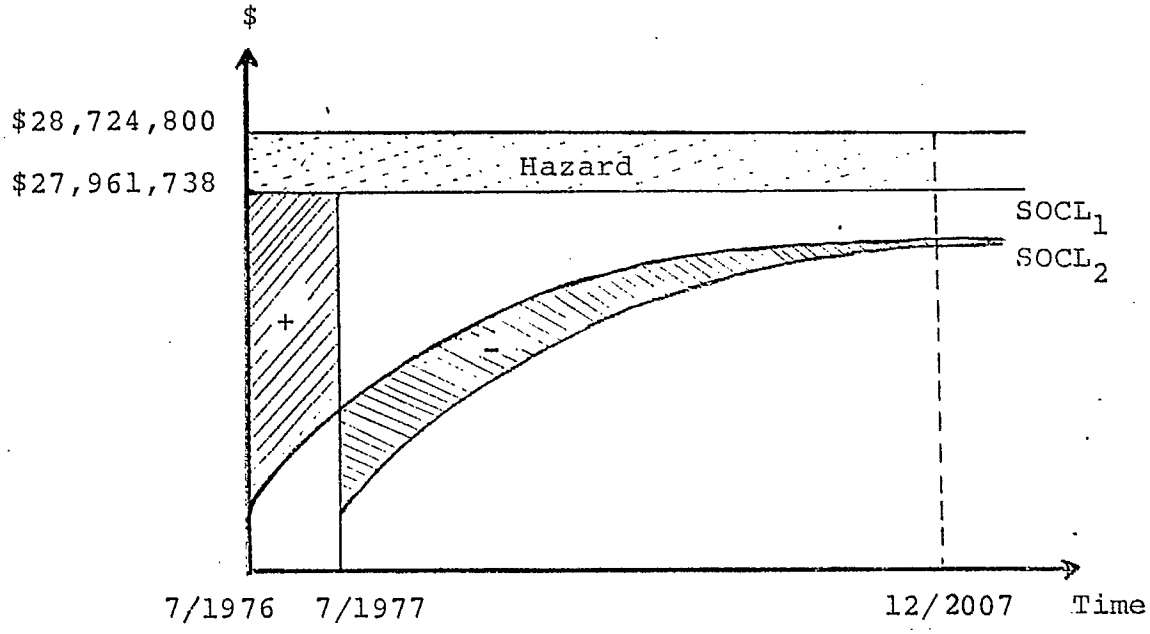
Proportion of Leisure Value to L_s	Share of Capital Income to Residents (Multiplier)	MIGRATION RESPONSE			
		Slower (b=.5)		Faster (b=.7)	
		Externality	Extern. Wage	Externality	Extern. Wage
		$	%	$	%
100%	.7(1.4885)	146.3	55.1	137.2	51.6
	.5(1.5362)	148.5	55.9	138.8	52.2
75%	.7(1.4885)	154.9	58.3	142.2	53.5
	.5(1.5362)	157.0	59.1	143.5	54.0
50%	.7(1.4885)	163.4	61.5	147.1	55.4
	.5(1.5362)	165.5	62.3	148.3	55.8
25%	.7(1.4885)	171.9	64.7	152.1	57.2
	.5(1.5362)	174.1	65.6	153.0	57.6

adjustment response, and the proportion of income from capital accruing to residents of Cape Breton Island are made. The last item does not seem to have affected the externality a great deal. An increase in the speed of migration response to the temporary sector unemployment rate could make the externality much larger. Table 19 shows as well that if the true leisure time is worth 50% of its calculated maximum amount, a 20% point difference in the migration adjustment response would have reduced the externality by about $17 million.

Now, the real social welfare loss in our typical example would have been $148.5 million if Sysco were closed at the end of June 1976. Canada would enjoy a gross social benefit (on labour alone) of about $14.0 million if Sysco's closure was

to be postponed one more year.[1] This can be sen from the difference between the shaded areas in Figure 3. Similarly, the society would enjoy a gross social benefit on labour alone of about $74.9 million at present value if Sysco's closure were postponed by seven years. These figures assume Sysco's labour force would remain at 2,600 employees through the intervening period.

FIGURE 3



---

1 G.P. Jenkins and C. Montmarquette, "The Social Opportunity Cost of Displaced Workers", paper prepared for the Department of Industry, Trade and Commerce, (September 1975)

III.3 Increase in Base Sector Activity

A steel mill has been proposed to start operation on Cape Breton Island in January, 1984 and should create 3,125 man-years of employment.[1] Of these 3,125 man-years approximately 2,813 or 90% will begin immediately while the remaining 312 or 10% will follow on January 1, 1986. At a new steel mill 90% of this employment is expected to be permanent and only 10% temporary.

In a small economy like that of Cape Breton Island, it is difficult to find all the manpower required for such a large steel project particularly personnel such as foreman, and senior management, etc. Let us assume they represent 5% of the total required manpower and that they are all permanent employees.

Since this is a new steel mill, the composite labour in terms of skill required to operate the plant is likely to be higher than Sysco. The average wage rate in the new mill is assumed to be $240 per week[2] and the directly imported foreman and other management are assumed to earn $300 per week. In addition, since the new mill is owned by residents outside of the island, the proportion of income from capital accruing to residents will be assumed to be zero.

---

1 Arthur G. McKee and Company of Canada Limited provided this figure. The effect of additional employment during the construction phase is not taken into consideration in this paper.

2 This figure is hypothetical and is about 13% more than the average earnings at Sysco.

The population in Cape Breton Island has not increased for years. It is not unreasonable to assume, therefore, that in the next six years population, labour force and other characteristics of labor force would remain as they are now. Hence the initial values for labour characteristics are the same as those in the previous section. This implicitly assumes, of course, that Sysco continues operating at its current size.

The labour income multiplier is taken as before to be 1.5362 for Cape Breton Island. The in-migration response is likely to be fairly quick because of the creation of attractive jobs on the island. The impact on the economy of Cape Breton Island can be obtained by solving the system of equations (27), (28), (29), (30), and (31) where the value of all parameters and the initial value of variables at the end of 1983 are summarized as follows:

Q_o = 18,022, B_p = .4994, B_T = .5006, W = \$147, UIC = \$98.

Q_o' = 21,920, S_p = .5880, S_T = .4120, W' = \$139, UIC' = \$ 93.

P_{so} = .54, P_s^* = .54, f_s = .60, J_{To} = 18,052,

LF_{To} = 33,430, α = .5, t_s = .12, M = 1.5362, b = .7

and dQ = 3,125, B_p^* = .90, B_T^* = .10,

δ = .05, W* = \$236.5, W** = \$300, UIC_o = \$133,

γ_t = .9 for t = 1984, 1985 and γ_t = 1.0 for t > 1985.

The effect of additional employment at a new steel mill on the economy of the island can be seen in Table 20. The unemployment rate in the temporary sector drops considerably by almost 10 percent and then gradually rises over time due to the injection of migrants into the labour force of the region. The unemployment rate in the temporary sector takes about nine years to reach 45%.

The total induced in-migrants over 24 years from 1985 to 2007 would be 8,886 of whom 41% would migrate in the first three years and 57% in the first four years (where migration was assumed not to occur in the first year). In addition, the total increase in man-year jobs in the secondary sector due to this project over 24 years would be 4,197. Of these 4,197 man-years, about 48% would have taken place in the first year because of substantial new hiring in that year and the increased income in the area which is contributed by the higher wages paid by the company over the loss of unemployment benefits. The size of the positive impact on the secondary sector would start to decline from the second year onwards since the only stimulus is the migration effect on the economy.

The number of unemployed workers in Cape Breton Island would be smaller in the first five years after the new steel plant begins to operate. However, the number of unemployed workers from the sixth year on would increase to as much as 1,720 persons by the year 2007. This increase in unemployment occurs because in-migrants are added to the temporary labour force and compete for temporary employment thus driving up the average duration of unemployment.

In the start up case, it is impossible to identify whether unemployed workers are hired by either the base or secondary sectors. Nor can we distinguish migrants coming to either the base or secondary sector. The average maximum value of

TABLE 20

THE IMPACT OF THE COMPANY'S START UP ON THE ECONOMY OF CAPE BRETON ISLAND, 1984-2007

Period	Migration		Secondary Sector				Change of Unemployment from the end of 1983	Unemployment Rate	
	Flow in Period	Cumulative Migrants from 1984	Change of Man-year in Period Total	Permanent	Temporary	Annual Gross Gain of Output		Temporary Sector	Overall
1983*	-	-	-	-	-	-	-	0.4600	0.278
1984	0	0	2009	1181	828	$ 14526284	-4681	0.3584	0.193
1985	-2122	-2122	469	276	193	17916850	-3028	0.3897	0.214
1986	-1559	-3682	568	334	234	22022535	-2334	0.3995	0.220
1987	-1382	-5064	305	179	126	24230353	-1257	0.4171	0.233
1988	-1015	-6079	224	132	92	25852831	-466	0.4293	0.242
1989	-746	-6825	165	97	68	27045156	115	0.4379	0.249
1990	-548	-7374	121	71	50	27921370	542	0.4439	0.253
1991	-403	-7777	89	52	37	28565281	856	0.4483	0.257
1992	-296	-8073	65	38	27	29038477	1087	0.4515	0.259
1993	-218	-8291	48	28	20	29386219	1256	0.4538	0.261
1994	-160	-8451	35	21	14	29641767	1381	0.4554	0.262
1995	-117	-8568	26	15	11	29829564	1473	0.4567	0.263
1996	-86	-8655	19	11	8	29967572	1540	0.4575	0.264
1997	-63	-8718	14	8	6	30068991	1589	0.4582	0.264
1998	-47	-8765	10	6	4	30143521	1626	0.4587	0.265
1999	-34	-8799	7	4	3	30198292	1652	0.4590	0.265
2000	-25	-8824	5	3	2	30238542	1672	0.4593	0.265
2001	-18	-8843	4	2	2	30268121	1686	0.4595	0.265
2002	-14	-8856	3	2	1	30289858	1697	0.4596	0.265
2003	-10	-8866	2	1	1	30305832	1705	0.4597	0.265
2004	-7	-8874	1	1	0	30317571	1710	0.4598	0.266
2005	-5	-8879	1	1	0	30326198	1715	0.4598	0.266
2006	-4	-8883	0	0	0	30332537	1718	0.4599	0.266
2007	-3	-8886	0	0	0	30337196	1720	0.4599	0.266

The total in-migrants are 8,886 persons

Note: * denotes the end of 1983

leisure time per person across sectors on Cape Breton Island is thus equal to $3,910.92 per year in January 1976 dollars, and the social oppoortunity cost of each migrants is approximately $6,614.40. In addition, the proportion of new hires in Cape Breton Island that were previously in a state of unemployment is estimated to be approximately 50%.[1]

The social opportunity cost of hiring 3,125 man-years in new steel mill in period t is calculated according to equation (32) and shown in Table 21. The first two columns indicate the SOCL over the period from 1984 to 2007 where real wages are assumed to grow at either a zero rate or two percent per year. Their present values are also displayed in the next two columns where a 10% social discount rate is used.

The annual wage bill paid by the company when it is operating at full capacity would be $38,947,188 in January 1976 dollars. The ratios of SOCL to this wage bill are increasing over time and remain constant at approximately 62% from the year 2001 on. The social benefits attributable to the project would be $82.1 million if a zero growth rate in real wages were assumed.[2] This is a positive externality of the company's wage bill in present value terms. If real wages at the company and elsewhere increases by two percent per year, the social benefit due to this project would have been increased to approximately $110.3 million.

---

[1] J.C. Evans and C.Y. Kuo, "Characteristics of Workers Recently Laid-Off from Sysco", Department of Regional Economic Expansion, Government of Canada, (November, 1975). Appendix 8 to Annex "A" Part 6.

[2] If the true value of leisure time in the island is ony 75% of the value previously used, the externality would be $83.8 million.

TABLE 21

SOCIAL OPPORTUNITY COST OF HIRING WORKERS AND THE EXTERNALITY, 1984-2007

	THE SOCIAL OPPORTUNITY COST OF LABOUR					P.V. OF EXTERNALITY	
YEAR	0% GROWTH IN REAL WAGE	2% GROWTH IN REAL WAGE	P.V. if % GROWTH	P.V. if 2% GROWTH	RATIO OF SOCL TO WAGE	0% GROWTH IN REAL WAGE	2% GROWTH IN REAL WAGE
1984	$ 10078819	$ 11808942	$ 4698083	$ 5510253	0.288	$ 11641071	$ 13653499
1985	18225760	21781471	7722548	9239912	0.520	18770816	22184134
1986	16720399	20382073	6439994	7860480	0.429	27331637	32633240
1987	19255421	23941696	6741487	8394130	0.494	34225891	41217590
1988	20161424	25569561	6416346	8150122	0.518	40204433	48811611
1989	21222665	27453730	6139463	7955420	0.545	45331923	55455735
1990	22002548	29031895	5785852	7648151	0.565	49787731	61345742
1991	22575667	30383876	5396334	7276864	0.580	53701067	66622810
1992	22996841	31569734	4996781	6873724	0.590	57166775	71390347
1993	23306352	32634520	4603205	6459791	0.598	60255973	75725496
1994	23533805	33612069	4225149	6048623	0.604	63023218	79687021
1995	23700956	34527817	3867939	5648736	0.609	65511365	83320705
1996	23823791	35400900	3534179	5265211	0.612	67754869	86663073
1997	23914060	36245736	3224741	4900929	0.614	69782041	89743951
1998	23980397	37073206	2939421	4557238	0.616	71616608	92588242
1999	24029146	37891544	2677365	4234517	0.617	73278798	95217162
2000	24064971	38706997	2437353	3932523	0.618	74786100	97649106
2001	24091298	39524329	2217978	3650616	0.619	76153815	99900257
2002	24110646	40347191	2017761	3387936	0.619	77395447	101985032
2003	24124863	41178403	1835226	3143485	0.619	78523010	103916391
2004	24135312	42020162	1668943	2916216	0.620	79547242	105706077
2005	24142990	42874201	1517552	2705068	0.620	80477786	107364793
2006	24148633	43741906	1379777	2508995	0.620	81323329	108902333
2007	24152779	44624405	1254433	2326991	0.620	82091712	110327696

BIBLIOGRAPHY

1. Barnes, W.F., "Job Search Models, the Duration of Unemployment and the Asking Wage: Some Empirical Evidence", the Journal of Human Resources, Vol. X, No. 2, (Spring 1975) pp. 230-240.

2. Berman, B. "Alternative Measures of Structural Unemployment", in Employment Policy and the Labour Market, A.M. Ross (Berkeley: University of California Press, 1965).

3. Chapin, G. "Unemployment Insurance, Job Research, and the Demand for Leisure", Western Economic Journal, (March 1971), pp. 102-107 and Reply, (December 1971), pp. 451-452.

4. Courchêne, T.J. "Interprovincial Migration and Economic Adjustment", Canadian Journal of Economics, (November 1970).

5. Cragg, J.G. "Some Statistical Models for Limited Dependent Variables with Application to the Demand for Durable Goods", Department of Economic, University of British Columbia, Discussion Paper No. 8, (August 1968).

6. Denton, F. "A Simulation Model of Month-to-Month Labour Force Movements in Canada", International Economic Review., Vol. 14, No. 2, (June 1973), pp. 293-311.

7. Evans, J.C. and Kuo, C.Y. "Characteristics of Workers Recently Laid-off from Sysco" Department of Regional Economic Expansion, Government of Canada, (November 1975).

8. Evans, J.C. and Kuo, C.Y., "Description of the Active Sysco Work Force", Department of Regional Economic Expansion, Government of Canada, (November 1975).

9. Evans, J.C. and Kuo, C.Y. "Labour Turnover at Sysco" Department of Regional Economic Expansion, Government of Canada, (December 1975).

10. Goldberger, A.S., Econometric Theory, (New York: John Wiley, 1964).

11. Gordon, R.J., "The Welfare Cost of Higher Unemployment", Brooking Papers on Economic Activity, 7, (1973) Washington, pp. 133-205

12. Hall, R.E., "Turnover in the Labour Force", Brooking Papers on Economic Activity, 3, (1972), Washington, pp. 709-764.

13. Hall, R.E., "Why is the Unemployment Rate so High at Full Employment", Brooking Papers on Economic Activity, 3, (1970), Washington, pp. 369-410.

14. Harberger, A.C., "On Measuring the Social Opportunity Cost of Labour", in Project Evaluation, (University of Chicago Press, 1972), Chapter 7.

15. Harris, J.R. and Todaro, M.P., "Migration, Unemployment and Development, A Two Sector Analysis", American Economic Review, (March 1970), pp. 126-142.

16 Haveman, R.H. and Krutilla, J.V., Enemployment, Idle Capacity, and the Evaluation of Public Expenditures, (The John Hopkins Press, 1968).

17. Howe, J., Monds, K., and Evans, J., "On Estimating the Social Opportunity Cost of Labour for a Hydro Electric Project in a Remote Construction Site and for Alternative Generation Facilities Near the Metropolis," paper prepared for the Department of Industry, Trade and Commerce, Government of Canada, (March 1975).

18. Jenkins, G.P. "Analysis of Rate of Return from Capital in Canada", Dissertation Submitted to the University of Chicago, (December 1972).

19. Jenkins, G.P. and Montmarquette, C., "The Social Opportunity Cost of Displaced Workers", paper prepared for the Department of Industry, Trade and Commerce, Government of Canada, (September 1975).

20. Kingston, J.L. and Burgess, P.L., "Unemployment Insurance Job Search and the Demand for Leisure: Comment", Western Economics Journal, (December 1971), pp. 447-450.

21. Kuo, C.Y. "Labour Mobility and Unemployment in Cape Breton Island", Department of Regional Economic Expansion, Government of Canada, (May 1975).

22. Martin, D. and Otsuki, T., "Forecasting Shortrun Variations in Labour Market Activity", Review of Economics and Statistics, (February 1968), pp. 68-77.

23. Schwartz, H., "The Long Run Employment Multiplier for Cape Breton County", paper prepard for the Department of Regional Economic Expansion, Government of Canada, (January 1976).

24. Schwartz, H., "Estimating Capitals's Share and Labour's Share of Nova Scotia Income", paper prepared for the Department of Regional Economic Expansion, Government of Canada, (February 1976).

25. Selig, B.M. and Harvey, A., "Nova Scotia Population Projections, 1972-81", Institute of Public Affairs, Dalhousie University, (November 1974).

26. Sheppard, H.L. and Belitsky, H., The Job Hunt: Job Seeking Behavious of Unemployed Workers in a Local Economy, (John Hopkins Press, 1966).

27. Statistics Canada, Intercounty Migration Data Base, (December 1973).

28. Statistics Canada, Labour Force and Industrial Income, Catalogue 94-704, Vol: III - Part I.

29. Statistics Canada, 1971 Census of Canada - Industries, Catalogue 94-741, Vol: III - Part 4.

30. Statistics Canada, Employment, Earnings and Hours, Catalogue 72-002.

31. Statistics Canada, Geographical Distribution of Personal Income, Special Tabulaion, (October 1975).

32. Statistics Canada, Unemployment Insurance Act, (December 1974).

33. Statistcis Canada, The Labour Force, Catalogue 71-001.

34. Tobin, J., "Estimation of Relationships for Limited Dependent Variables", Econometrica, (1958), pp. 24-36.

35. Vanderkamp, J., "Migration Flows, Their Determinants, and Effects of Return Migration", Journal of Political Economy, (September/October 1971).

36. Vankerkamp, J., "The Effect of Out-migration on Regional Employment", Canadian Journal of Economics, (November 1970), pp. 541-49.