CONCEPTUAL FRAMEWORK FOR THE ECONOMIC ANALYSIS OF THE EASTERN CANADIAN STEEL PROJECTS

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Conceptual Framework for the Economic Analysis of the Eastern Canadian Steel Projects

I Background

Eastern Canada currently produces steel at the Sydney Steel Company (SYSCO) plant on Cape Breton Island. SYSCO has productive capacity for approximately 0.85 million tons per year plus a mini-mill for rolling rails. The present day work force numbers about 4,000 with only approximately 1,000 workers involved in actual steel-making and the rest performing maintenance and other operations.

Although owned by the province of Nova Scotia, SYSCO is heavily subsidized by the Government of Canada. The problem with this assistance is that the Federal subsidy calculated on a per worker basis is larger than the average income per worker. This disparity suggests that Canada's resources are being wasted in the operation of an inefficient plant, and at the very least, the Government of Canada ought to be able to find a more efficient way to transfer income to the residents of Cape Breton Island. The Federal Government, indeed, has an obligation to explore any reasonable proposal which would obviate or reduce the need for continuing Federal assistance (beyond the regular Government programmes) to this area.

An Eastern Canadian Steel Project should be studied with the purpose in mind to assist Cape Breton Island to become an economically self-sustaining community with a viable economic base.

II Alternative Projects

In order to assist the Government of Canada in its decision on the appropriate policy to follow with respect to the possible development of an Eastern Canadian Steel Project, we have arrayed five alternative projects which are as follows:

(1) phase out the complete SYSCO plant over time; do not encourage the development of a new steel complex;

(2) phase out the steel-making end of the SYSCO plant, but continue to operate the mini-mill for rails; do not encourage the development of a new steel complex;

(3) continue to operate SYSCO until a new steel complex has been constructed on a new site (greenfield site); then close down SYSCO and operate the new steel plant which could range in capacity output from 3.4 to 12 million tons per year;

(4) continue to operate SYSCO until a new steel complex has been constructed on a new site (greenfield site); then close down the steel-making end of SYSCO, but continue to run the mini-mill for rails along with the new steel plant which could range in capacity output from 3.4 to 12 million tons per year;

(5) develop SYSCO at its current location (brownfield site) and expand its capacity to 3.4 million tons per year.

The Government of Canada must choose between these alternative projects. Alternative (1) is essentially the base case against which the others can be compared. By keeping the mini-mill for rails in operation, alternative (2) implies that the labour force reduction at SYSCO would not be as large; the economic impact of the layoffs which do occur can be analyzed in a manner similar to that for alternative (1).

Alternative (3) allows for a new Eastern Canadian Steel Project on a greenfield site with, as yet, undetermined productive capacity. At3.4 million tons per year the plant would require an average construction labour force of 2,000 workers per year for four years with possible peak manpower requirements of 4,700 workers. Operating personnel would number about 2,750 employees. The economic analysis of this alternative must focus its attention on the direct and indirect effects of these new jobs, given the continued operation, of the SYSCO plant during the construction period of the new steel complex.

Alternative (4) is similar to (3) except that some workers will remain employed at the SYSCO mini-mill even after the new steel plant is operating. Other things being equal, the increase in employment should be largest under alternative (4).

Alternative (5), the further development of SYSCO at its current location (brownfield site), ought to be considered relative to (1) and (2) and separate from (3) and (4) since we do not envisage the simultaneous construction of new facilities on both greenfield and brownfield sites. A crucial issue to be sorted out with respect to this alternative is the extent to which the

existing SYSCO plant can be kept in operation while the new facilities are being constructed. If part of the old plant is shut down, then the economic analysis may be similar to that in alternatives (1) and (2), whereas the new construction activities on the brownfield site might be examined with the methodology used for alternative (3) and (4). The economic analysis of alternative (5) thus becomes more complicated.

III Basic Models of the Labour-Market Impact of Alternative Projects

A.1 Alternatives (1) and (2)

Under alternative (1) approximately 4,000 jobs will be phased out over a period of three to four years. Let us assume that 1,000 workers will be let go each year for four years. The last workers to be released will probably be those with the highest union seniority, hence the average age of those released should increase over the four year period. For the purposes of discussion we can make the assumption that workers ages are distributed according to seniority so that the layoff of workers takes the following pattern:

Number of Workers Released

Age Group of Workers Released	Year 1	Year 2	Year 3	Year 4
<34 (lowest seniority)	1,000			
35-44		1,000		
45-54			1,000	
55-64 (highest seniority)				1,000

The steel industry tends to operate an internal labour market, that is to say it hires workers at the bottom of the occupational ladder and trains them on the job rather than hiring from outside the firm to fill a vacancy at higher skill levels. The distribution of industry-specific skills, on the one hand, can thus be assumed to be highest for older, senior workers, and lowest for younger workers. The distribution of educational attainment, vocational preparation, and general skills, on the other hand, might easily be the reverse since today's younger workers have proportionately higher qualifications than the older, more senior employees. (These assumptions regarding the composition of the SYSCO labour force are necessary at this stage of our analysis due to the lack of detailed data on the characteristics of SYSCO workers.)

The phasing out of jobs in alternatives (1) and (2) will create an economic loss for the Cape Breton community and for Canada. In order to measure the magnitude of this welfare loss we can proceed by analyzing each group of workers as it is released from employment given the assumed distributions of seniority, age, training in the industry, and education.

In our analysis we want to allow for the following factors:

a) the change through time of the average social opportunity cost of the labour;

b) the possible benefits which accrue to society as the result of worker migration out of Cape Breton;

c) how the above two factors are affected by the age, training and education of the workers laid off.

Each of these factors will be dealt with in turn.

(a) Adjustment Path of the Social Opportunity Cost of Labour Through Time

Workers released by SYSCO initially find themselves unemployed; the social opportunity cost of labour is the value workers attach to their unemployed leisure time(α). If a worker is prepared to give up unemployment, where he can enjoy his leisure time as well as receive (net-of-income tax) unemployment insurance payments $U(1-t)$, in order to take a job at his next best alternative employment which pays (net-of-income tax) $Wn(1-t)$, we can deduce that the maximum value he attaches to his leisure (α) is

$$\alpha = (Wn - U)(1-t)$$

where t is his marginal personal income tax rate.

The impact of 1,000 workers laid off in the first year will for a short time period cause the number unemployed and the unemployment rate to rise. We might expect that with more unemployed workers competing for the remaining employment opportunities the average duration of unemployment will rise in general. Through time the Cape Breton labour market will adjust to absorb the released workers. As the average proportion of workers' time spent in employment rises

the social opportunity cost of labour will also rise so that at time period i

$$SOCLi^{A} = \lambda^{A}_{E_i} (Wn)^{A} + \lambda^{A}_{u_i} (\alpha) \qquad (2)$$

where $\lambda^{A}_{E_i}$ is the proportion of workers' time spent in employment at time i, and $\lambda^{A}_{u_i}$ is the proportion spent in unemployment in Cape Breton (A). The gross-of-income-tax wage, Wn, is the social opportunity cost of $\lambda^{A}_{E_i}$ of his time because Wn reflects the value society attaches to workers' productivity in employment.

To estimate $SOCL^{A}_{i}$ we need to know Wn, and how $\lambda^{A}_{E_i}$ and $\lambda^{A}_{u_i}$ change on the average through time. Any estimation must bear in mind that the experience of the individual workers released may not reflect the exact repercussions of the lay-offs for the labour-market in general. Imagine, for example, that the 1,000 workers released from SYSCO were to find employment in a week. The good fortune of these workers would be offset by the fact that other workers in the labour-market now have to wait longer in order to find a job; the value of $\lambda^{A}_{E_i}$ and $\lambda^{A}_{u_i}$ at the end of the week would not be 1 and 0, respectively, even though this is the experience of the SYSCO workers released. What needs to be analyzed in this case are the changes in the average duration of employment and unemployment of the labour force before and after a set of lay-offs.

(b) Benefits from Worker Migration out of Cape Breton

Based on the data analyzed by C.Y. Kuo in his paper on "Labour Mobility and Unemployment in Cape Breton", we might conclude that especially for younger workers there appears to be a rough equality in the gross migration flows back and forth between Cape Breton and Ontario. Although the magnitude and direction of the predominate flows appears to be influenced by relative unemployment rates in the two areas, a proximate equality in the flows is assumed to exist. Since workers are moving to and from Ontario, we can deduce that the marginal migrant is indifferent between the prospects of the combination of employment and unemployment in Ontario and the employment-unemployment mix in Cape Breton. Thus the private opportunity cost of the worker (POCL) in Ontario (B) is the value he would place on his time in Cape Breton (A),

$$POCL^B = POCL^A = \lambda_E^A (\overset{A}{Wn})(1-t) + \lambda_u^A (U(1-t) + \alpha) \qquad (3)$$

Since the value of unemployed leisure time (α) in Cape Breton can be estimated as

$$\alpha = (\overset{A}{Wn} - U)(1-t) = \overset{A}{Wn}(1-t) - U(1-t),$$

and since $\lambda_E^A + \lambda_u^A = 1$,

then $$POCL^B = POCL^A = \overset{A}{Wn}(1-t) \qquad (4)$$

The Ontario wage net of income tax, $\overset{B}{Wn}(1-t)$, will for most occupations be greater than its counterpart in Cape Breton, $\overset{A}{Wn}(1-t)$. If the migrant values his time in Ontario at $POCL^B = \overset{A}{Wn}(1-t)$, but the prevailing wage which attracts him to Ontario is $\overset{B}{Wn}(1-t)$, we may infer that the differential, $\overset{B}{Wn}(1-t) - \overset{A}{Wn}(1-t)$, which he receives is just sufficient to compensate him for the disutility of being in Ontario rather than Cape Breton. In other words the marginal migrant earns no rents from moving to Ontario. Even though the marginal migrant does not gain in welfare from moving to Ontario, society can enjoy an additional benefit.

The social opportunity cost of labour in Cape Breton was previously estimated as

$$SOCL^A = \lambda^A_E (\overset{A}{Wn}) + \lambda^A_u(\alpha) \qquad (2)$$

To this amount can be added an increase in net output and an increase in income taxes, both of which benefit society, as a result of migration.

The increase in net output results from the fact that generally speaking the time spent unemployed in Ontario is lower than in Cape Bretion, i.e. $\lambda^B_u < \lambda^A_u$, and more time in Ontario is spent in productive employment. The gain in net output occurs as a result of this difference $(\lambda^A_u - \lambda^B_u)$, and is equal to the net of income tax wage in Ontario, $Wn^B(1-t)$, less the differential to compensate for the disutility of living in Ontario, $\overset{B}{Wn}(1-t) - \overset{A}{Wn}(1-t)$, minus the social value of the

foregone unemployed leisure time, α, or

$$(\lambda_u^A - \lambda_u^B)\,(\overset{B}{Wn}\,(1-t) - [(\overset{B}{Wn}\,(1-t) - \overset{A}{Wn}(1-t)] - \alpha)$$

$$= (\lambda_u^A - \lambda_u^B)\,(\overset{A}{Wn}(1-t) - \alpha)$$

$$= (\lambda_u^A - \lambda_u^B)\,U(1-t), \qquad (5)$$

which is just the change in unemployment insurance payments as a result of the worker's migration. Even though umemployment insurance payments are themselves a transfer, therefore, it is possible to show that the change in unemployment insurance payments is equal in amount to the additional net output society enjoys as the result of worker migration to Ontario.

An increase in income tax revenue enables governments to provide more public goods and services which benefit society. Income taxes rise as a result of worker migration because of the higher wages and greater proportion of time spent in employment in Ontario than in Cape Breton. Assuming that the marginal personal income taxe rate (t) is the same in Ontario, the increase in income taxes can be represented as

$$t\,(\lambda_E^B\,(\overset{B}{Wn}) - \lambda_E^A\,(\overset{A}{Wn})). \qquad (6)$$

The social opportunity cost of labour in Ontario, therefore, is labour's social opportunity cost in Cape Breton plus the additional net output and income taxes which benefit society as the result of worker migration; that is

$$SOCL^B = \lambda^A_E (\overset{A}{Wn}) + \lambda^A_u (\alpha) + t (\lambda^B_E (\overset{B}{Wn}) - \lambda^A_E (\overset{A}{Wn})) + (\lambda^A_u - \lambda^B_u) U(1-t). \quad (7)$$

Note that by substituting

$$POCL^A = \lambda^A_E (\overset{A}{Wn})(1-t) + \lambda^A_u (U(1-t) + \alpha) = \overset{A}{Wn}(1-t) \quad (3)$$

the above expression for the $SOCL^B$ can be rewritten as

$$SOCL^B = \overset{A}{Wn}(1-t) + t\lambda^B_E(\overset{B}{Wn}) - \lambda^B_u(U(1-t)) \quad (8)$$

If full employment is assumed for Ontario, we would have an upward biased estimate of the

$$SOCL^B = \overset{A}{Wn}(1-t) + t\overset{B}{Wn}. \quad (9)$$

It is of some theoretical interest to see how migration between Cape Breton and Ontario affects the usual calculation of the social opportunity cost of labour in Ontario, namely

$$SOCL^B = \lambda^B_E (\overset{B}{Wn}) + \lambda^B_u(\alpha^B). \quad (10)$$

The value of unemployed leisure time in Ontario, α^B, would normally be estimated as $\alpha^B = \overset{B}{Wn}(1-t) - \overset{B}{U}(1-t)$.

The rough equality of gross migration flows back and forth between Cape Breton and Ontario suggested that

$$POCL^B = POCL^A = \overset{A}{Wn}(1-t) \quad (4)$$

which was less than $\overset{B}{Wn}(1-t)$. The difference in the net of tax wages, $\overset{B}{Wn}(1-t) - \overset{A}{Wn}(1-t)$, was imputed to be the differential

necessary to compensate workers for the disutility of living in Ontario. This compensation must be subtracted from $SOCL^B$ so that when the migrant is the marginal worker in Ontario the

$$SOCL^B = \pi^B_E (W^B_n) + \pi^B_u(\alpha^B) - (W^B_n(1-t) - W^A_n (1-t)). \quad (11)$$

Since $\pi^B_E + \pi^B_u = 1$, this expression can be rewritten as

$$SOCL^B = \pi^B_E (W^B_n) + \pi^B_u(\alpha^B) - (\pi^B_E + \pi^B_u)(W^B_n(1-t) - W^A_n(1-t)$$

or

$$SOCL^B = W^A_n(1-t) + t\pi^B_E W^B_n + \pi^B_u (U^B(1-t)). \quad (12)$$

where

$$\alpha^B - W^B_n(1-t) = U^B(1-t).$$

/ Note that the worker's marginal valuation of leisure rises in Ontario to reflect the compensating differential since

$$\alpha + (W^B_n(1-t) - W^A_n(1-t) = W^B_n(1-t) - u(1-t)$$
$$= \alpha^B \text{ if } U = u^B. /$$

Expression (12) for the $SOCL^B$ is the same as (8) if $U^B = U$ which would certainly occur for those occupations whose wages are sufficiently high to provide workers with the maximum unemployment insurance payments.

Migration between Cape Breton and Ontario thus raises the social opportunity cost of labour in Cape Breton and lowers it in Ontario to the extent that migration takes place. In his paper on labour mobility, C.Y. Kuo has determined that most migrants between these areas are young and well educated. The impact of worker lay-offs from SYSCO on migration, therefore,

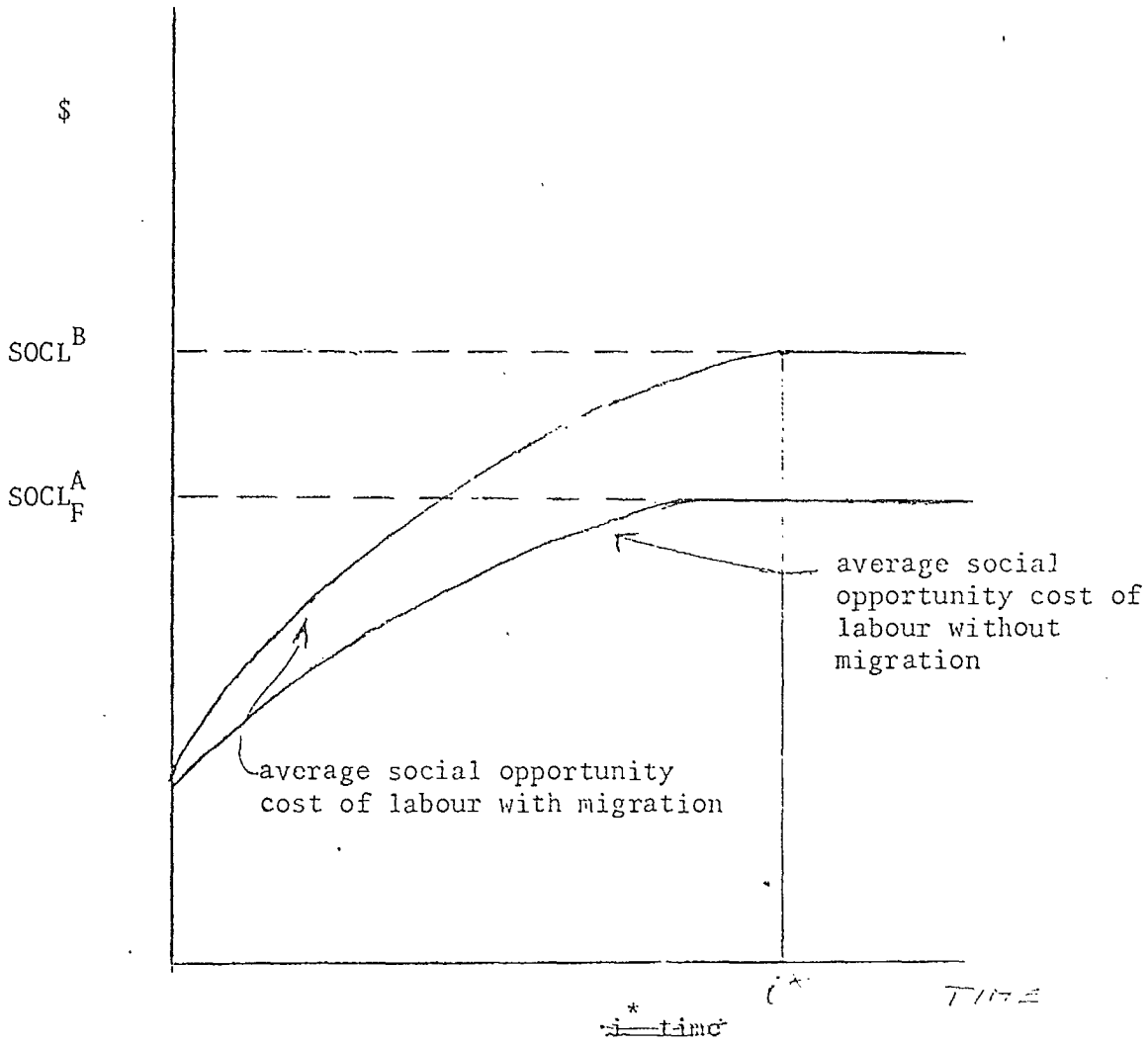
would depend on the age education-skill characteristics of the workers released, i.e. on their ability to compete with young, well-educated workers for employment in the Cape Breton and Ontario labour markets. The workers laid off may not migrate themselves, but by effectively competing for employment they may induce others to do so. In our empirical research we must trace through the migration-unemployment experience of any workers recently released from SYSCO at the same time as we examine the duration of employment and unemployment in the labour force.

Combining the additional benefits from worker migration, i.e. the migration externality, with the adjustments through time of the average social opportunity cost of labour in Cape Breton, discussed in section (a), yields an equation such that

$$SOCL_i^A = \pi^A_{E_i}(\bar{W}n^A) + \pi^A_{Ui}(\alpha) + \gamma_i\left[t(\pi^B_E(\bar{W}n^B) - \pi^A_E(\bar{W}n^A)) + (\pi^A_u - \pi^B_u)\,U(1-t)\right] \quad (7)$$

where γ_i is the number of migrants at time i per worker laid-off. Depicted diagrammatically this equation becomes the curved adjustment path in Figure 1; γ_i is assumed to equal $\hat{1}$ at time period i*. $SOCL_F^A$ is the social opportunity cost of labour in Cape Breton with no migration ($\gamma_i = o$) and "full absorption" of workers into the local labour market, i.e. $\pi^A_{E_i}$ and $\pi^A_{u_i}$ are at their long-run, equilibrium values.

FIGURE 1


$
SOCL^B
SOCL_F^A
average social opportunity cost of labour without migration
average social opportunity cost of labour with migration
t*
time

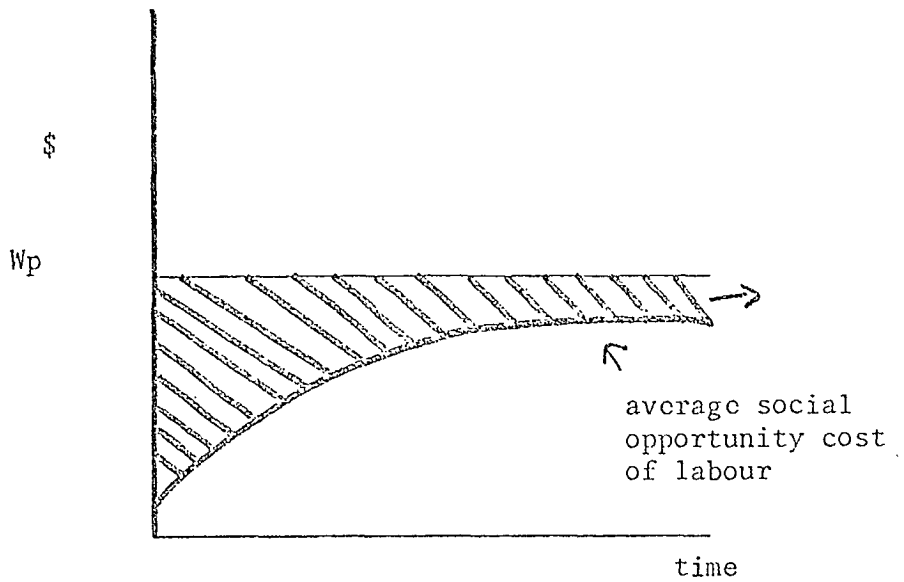
(c) How the Adjustment Path of the SOCL Depends on the Characteristics of SYSCO Workers Laid-off

We started off our discussion of alternatives (1) and (2) with the assumption that low seniority workers, who were also assumed to be younger, better educated, but less skilled in industry-specific jobs, would be let go first, and that high seniority workers would be able to retain their positions until the end. When laid-off, young workers ought to have a different impact on the labour market than older workers both in terms of the changes through time of $\lambda^{A}_{E_i}$ and $\lambda^{A}_{u_i}$ and γ_i. Bernd Zechel's paper on "The Social Opportunity Cost of the Release from Employment of Mature Workers" focuses more explicitly on this question.

A.2 Measuring the Welfare Loss of SYSCO Lay-offs

When workers are laid off they forego their employment wage, W_p, which also measures the social value of their productivity foregone (net of any sales taxes). This social loss is offset in part by the social value of alternative uses of the workers' time as measured by the average social opportunity cost of labour. The net welfare loss to society is thus the difference between the workers' wage at SYSCO and the social opportunity cost of labour at each point in time, as is depicted by the shaded area in Figure 2.

FIGURE 2

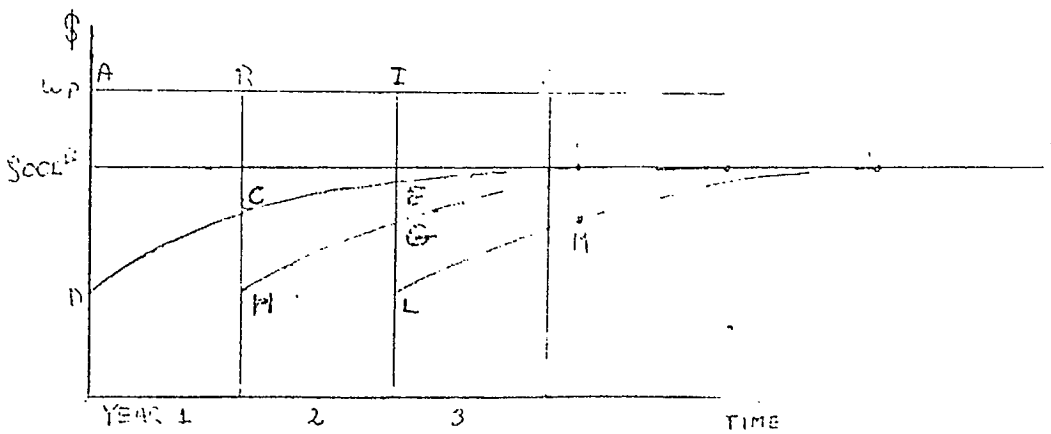


Since layoffs occur each year for four years during the phasing-out of SYSCO, we would expect a series of such welfare losses. The decision to phase out SYSCO, rather than close it down immediately, however does create some net economic benefits as suggested in a paper by C. Montmarquette, G. Krivicky, and G. Jenkins entitled "Evaluation of the Social Opportunity Cost of Labour in the Aircraft Industry".

They implicitly assume that the adjustment path over time of the average social opportunity cost of labour is not a function of the number of workers laid off at any point in time. If all the workers were laid off in the first year, then the welfare loss would be equal to the present value of

the shaded area in Figure 2. Phasing-out SYSCO, however, means that only the first 1,000 workers released generate these costs. The 1,000 workers released in the second year enjoy an economic benefit during the first year equal to the difference between their wage Wp and the adjustment path of the SOCL, they otherwise would have been on in the first year, area ABCD in Figure 3. The cost associated with this benefit is that when these workers are released in year 2 they have a lower SOCL than if they had been released in year 1; the measure of this cost is equal to the present value of area CEKFGH. Similarly for the 1,000 workers

FIGURE 3



released in year 3, there is social benefit equal to the present value of AIED and a cost equal to the present value of EKNML. The present value of the net benefits from postponing layoffs one year should be rising through time since the present value of the social cost of these lay-offs falls each year they are delayed.

What complicates this analysis somewhat is the fact that we are comparing the workers' situation during the phase-out with the adjustment path of the SOCL which would result from the lay-off of all 4,000 workers in the first year. The difficulty arises in trying to estimate how the adjustment path for the release of all 4,000 SYSCO employees would differ from the paths which result from 1,000 workers being laid-off each year for 4 years, where each group of 1,000 consists of workers with distinctly different characteristics. The path for 1,000 young, well-educated workers, for example, could lie above the path for all 4,000 on account of (a) the higher skill level leading to faster absorption, and (b) the greater geographic mobility of younger workers. The sheer impact of 4,000 unemployed workers, however, might cause an even faster migration so that the adjustment path of the SOCL, following an immediate closure of SYSCO, could conceivably lie above that of the 1,000 young workers themselves. This question awaits further empirical investigation.

In evaluating alternatives (1) and (2), in any case, we must include what ever net benefits are realized as the result of keeping some workers in employment at SYSCO during the phase-out period.

B. Alternatives (3) and (4)

Alternatives (3) and (4) involve keeping Sysco operating with its full complement of workers until a new Eastern Canadian Steel Project has been constructed and is ready for operation, at which time SYSCO would be either closed down completely (alternative (3)) or closed down except for the mini-mill for rails (alternative 4).

B.1 Measuring the Social Benefit of keeping SYSCO in Operation.

The analysis of the social benefit from keeping SYSCO in full operation for four years can proceed in a straight forward fashion from our discussion in section III.A.2. Reference is made to Figure 4, where the social benefit to keeping the plant in operation is the present value of area ADQC. The cost of shutting Sysco down at the end of

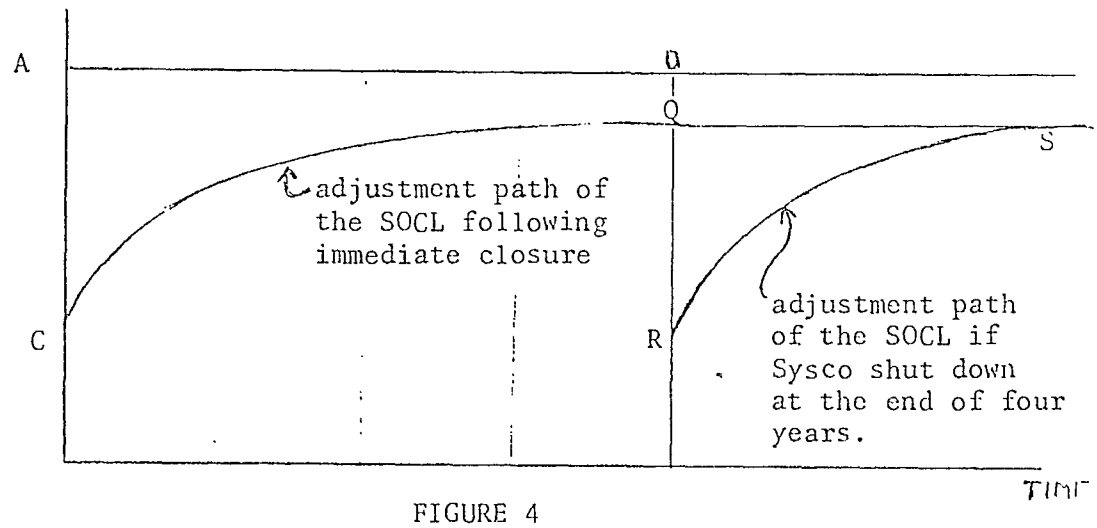


FIGURE 4

the fourth year is the fact that the SOCL would then be below where it would have been if SYSCO had been closed down immediately; the cost is measured as the present value of area QRS. Since the benefits occur earlier than the costs,

the present value of net benfits in positive. Since these net benefits accrue to all 4,000 SYSCO workers, rather than to subsets of them as in the case of the phasing - out proposal, we can be sure that the present value of net benfits from keeping SYSCO in full operation for four years will exceed the present value of net benefits from the phasing-out provisions of alternatives (1) and (2).

For this analysis we shall need to know the shape of the adjustment path of the average social opportunity cost of labour for the release of 4,000 workers from employment in SYSCO.

B.2 Analysis of a New Eastern Canadian Steel Project

To the extent that a new steel project in either its construction or operating phase hires from unemployed workers in Cape Breton, the social opportunity cost of labour can be measured along the adjustment path discussed in section III.A.1. Some problem arises, however, in measuring the impact of the steel project on unemployed workers in Cape Breton versus its impact on labour markets outside Cape Breton. To tackle this problem we can separate the construction and operating activities of the new plant.

With respect of construction labour requirements we first plan to study the distribution of construction occupations among unemployed workers in order to compile an inventory of unemployed skills in the Cape Breton area. These figures could establish a lower bound on the percentage of jobs filled by unemployed workers in Cape Breton. We also plan to investigate a number of recent construction projects in the Cape Breton -

Straits of Canso area in order to learn, among other things, the sources of construction labour for these projects.

The construction phase of the project will likely rely more on migrant labour than the operating phase. Many heavy construction skills will just not be available in Cape Breton but more important, contractors on the project may have their own work crews which they move in for the job. An analysis of the past behaviour of the major constractors most likely to bid for different parts of the construction phase might prove worth while.(The names of the contractors ought to be available from the companies whose recent experience we examine.) Some discrete inquiries at union locals could also be carried out. These sources plus the case studies of recent construction projects appear to be the only data available.

It should be noted that the overall construction contract signed by contractors and union locals for the project might stipulate that Nova Scotia labour gets "first crack" at any jobs available. The economic analysis of the project should be sufficiently flexible to take such provisions into account.

The social opportunity cost of migrant construction labour is different from the social opportunity cost of labour adjusted to allow for migration to occur. The supply price of the migrant is the wage he receives, hence the wage on the project (Wp) is the social opportunity cost of migrant construction labour.

The end of construction activity will create welfare losses for the local labour employed in this phase of the project; these losses would be measured by the shaded area of Figure 2 as discussed in section III.A.2. There will be no welfare loss associated with laying off migrant construction labour.

The impact of the operating phase of the steel project on local labour markets is complicated by the fact that SYSCO will be shutting down and releasing its workers at the same time as the new plant is starting up operations.

We require a detailed knowledge of the existing SYSCO work force in order to determine how many workers will transfer to the new plant. The degree of transferability is made more difficult to determine because (a) many of the SYSCO workers are older, and (b) the new plant will employ a technology different from that at the existing plant, and hence some worker retraining will be necessary.

Bernd Zechel's study of mature workers and alternative pension policies should help us to determine whether older workers will be pensioned off or retrained for work at the new plant. The union contract, which is negotiated for the new plant, may also contain some stipulation about hiring from the existing SYSCO work force; the Labour - Management Relations Module ought to be able to give us some insight into this possibility.

The proposed design of a 3.4 million ton capacity plant calls for a technology centred on the basic oxygen furnace (BOF) as opposed to the open hearth process in use at the existing SYSCO plant. Workers transfering from SYSCO, plus any new workers, of course, will thus need to go through a period of training. The measure of social benefits accruing from this upgrading of worker skills is being undertaken by Peter Chinloy.

In section III.B.1 of this paper we discussed benefits of keeping SYSCO in operation for four years, then the costs of closing it down. To measure the social opportunity cost of operating labour for the new steel project, we shall continue to assume that all SYSCO's workers have been laid off, and, therefore, that the social opportunity cost of labour can be measured along the adjustment path. For the workers who transfer directly from SYSCO to the new plant this procedure means that the project will have a net social benefit equal to the difference between the wage paid and the long run social opportunity cost of labour measured on the adjustment path. This situation is depicted in Figure 4. The benefit of hiring the worker immediately RO is partly offset by the cost of his being laid off RQ which leaves a net benefit QO just equal to his wage minus his social opportunity cost of labour which has been fully adjusted to reflect the forgone benefits of worker migration to Ontario. Both new and transfering production workers can this be treated in the same fashion; the benefit from having transfer workers will have an offsetting cost which we shall capture in our assessment of the impact of shutting down SYSCO.

If the new steel project is to have a capacity much over 3.4 million tons, and hence a larger work force, we may have to examine the problem of migrant production workers as well.

C. Alternative (5)

The analysis of constructing a new steel project on the site of the existing SYSCO plant (the brownfield site) requires an examination of the way in which SYSCO is phased out or shut down. The complicating factor for alternative (5) is the difficulty of determining the extent to which SYSCO can be kept operating while at the same time the new steel project is being constructed around it; this factor will set the timing for any lay-offs at SYSCO and thus influence the magnitude of costs and benefits. The theoretical framework outlined in sections IIA. and B still applies.

IV Indirect Effects & Regional Multipliers

Harvey Schwartz's paper on "Measuring the secondary Effects of a Major Investment Project" usefully summarizes the theoretical basis for estimating different types of regional multipliers. As he rightly emphasizes, the proper specification of the multiplicand is as important as the multiplier. Given the multiplier, in fact, the size of the multiplicand will vary from one alternative to another depending upon the timing and degree of the SYSCO shut down and the capacity of a new steel project.