A SOCIO-ECONOMIC IMPACT MODEL USED AS A TOOL TO AID IN THE FORMULATION OF THE CAPE BRETON COUNTY REGIONAL DEVELOPMENT PLAN

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Introduction

While many of the important decisions that can affect any region are beyond federal, provincial and municipal influence, all levels of government can, within certain limits, maximize or minimize the adverse effects of any changes in the local economy. One of the tools is a regional development plan. In Nova Scotia a regional development plan is a statement of provincial policy. While in the past it has been used mainly to control the use of land, it is not limited to physical planning; it can be used to state general economic and social policies as well.

The Cape Breton County region of Nova Scotia is at a stage in its development when major external decisions regarding the future of one of its basic industries - steel - are being made. While it is not necessary to have a very sophisticated model to know that dramatic changes in steel employment would have a significant impact on the local economy and the natural and man-made environments, the degrees of the impact are not as easy to assess.

This paper describes a model that the authors developed as part of a comprehensive planning exercise in Cape Breton, Nova Scotia. It outlines the purpose of the model and describes its general structure. One of its fourteen components, migration, is examined in some detail, and selected results are illustrated.

Historical Background

In order to understand the extent of the problems and prospects which the Cape Breton region faces, it is important to have an appreciation of the economic history of the region. The main theme of the region's economic history has been isolation - a separateness and distinctiveness from both the mainland and from the rest of Canada.

The boom of coal mining during the second half of the nineteenth century, and especially the establishment of a steel plant in 1901, brought a major influx of residents. From a town of approximately 2,500 in 1899, Sydney mushroomed into a city of 20,000 by 1913.

Since the coal and steel industries were essentially operated by the same company, the region assumed the characteristics of a cluster of company towns. The concentrated
economic base contrasted sharply with that of more diversified industrial areas where many establishments have an advantage. The effects of the changing fortunes of steel and coal upon Cape Breton were great. When they prospered, the region thrived.

Coal employment peaked during the First World War, and never returned to that level. During the 1960s it was anticipated that coal mining in Cape Breton had not yet reached its peak, and that the coal mines would eventually be phased out. As a result, in 1967 the federal government established the Cape Breton Development Corporation (CBDC) to undertake the rationalization of the coal industry and to aid in the development of a broader, more diversified regional economy. In more recent years substantial changes in the energy situation have greatly improved the outlook for coal so that while employment has declined somewhat from 1971 to 1976, it is expected to grow in the future.

Over time, changes in the location of markets for steel reduced the competitiveness of Sydney as a steel-making site. New technologies developed, and the scale required for competitive production expanded. Operating costs of the traditional methods increased, and the maintenance, repair, and replacement requirements of the Sydney plant grew. The Dominion Steel and Coal Corporation (DOSCO), the British corporation which operated the steel plant, announced in 1967 its intention to cease steel production in Sydney. Only the acquisition of the steel plant by the Province in that year allowed production to continue.

In the late 1960s and early 1970s, the combination of favourable market conditions, a strong spirit of cooperation between workers and management, and a low and constant coke cost, gave rise to optimism about the future of Sydney Steel Corporation (SYSCO). A major investment program was undertaken to modernize and rehabilitate the plant. Unfortunately, the recent return of adverse market conditions, compounded with on-going difficulties associated with the aging and physical deterioration of the equipment, have undermined the viability of the plant.

It has become clear that the prospects of returning the SYSCO operation to its former levels of activity have diminished. Although the life of the plant may be extended through careful management and repair, the most realistic long-term means of maintaining a basic steel-making industry in the region is through building a new, technologically advanced steel complex. A provincial agency, CANSTEEL, was established to attract a modern, new steel plant to Cape Breton County. CANSTEEL has brought together a consortium of steel-making companies which are presently conducting technical studies to determine the feasibility of establishing a new steel-making complex either on the urban site, the existing SYSCO site, or in a new location in the rural part of the county.

The region, therefore, faces three distinct possible futures:

1. A new steel plant would be established in the rural part of the region.
2. A new steel plant would be established on the existing urban site in Sydney.
3. No new steel plant would be attracted to the region and the existing steel-making operation would be consolidated.

Modelling Approach

Purpose of the Model

In order to assess the validity of any model, it is necessary to have a clear understanding of the purpose for which it is to be used. The Cape Breton County Socio-Economic Impact Model was constructed to aid in the preparation of a regional development plan. The model was not constructed to formulate policy, either economic or land use, but was intended to provide a consistent and thorough tool to be used by policy makers in estimating the impact of proposed policies. The model was designed essentially to answer the question, "What happens if...?"

Modelling Technique

The Cape Breton Socio-Economic Impact Model was constructed using Systems Dynamics, the computer simulation language developed and initially applied at the Massachusetts Institute of Technology. The most widely known application of this particular modelling technique is the work undertaken by Professor J. Forrester and his colleagues at MIT. Their work includes such well-known books as Limits to Growth, Urban Dynamics and World Dynamics. Over the years this modelling technique has been used to analyze a wide range of problems in diverse fields.

Systems Dynamics was selected as the modelling technique because it places a great deal of emphasis on developing model structure and hypothesizing both relationships and feedback loops, rather than deriving statistical relationships from existing data.

Statistical techniques work very well when the preconditions for their use are satisfied; however, in the real world these preconditions are often inaccuracies in data, inadequacies in measurement, and multi-collinearity. When the underlying assumptions of statistical analysis are isolated the results of statistical estimation techniques can be misleading [4]. In addition to normal hazards, because most socio-economic data are reported as a series, there is a strong temptation to derive high $R^2$ by simply correlating a large number of time series variables with a particular dependent variable.

From a policy maker's point of view the use of statistically derived models of social systems has two serious drawbacks:

1. Difficult to Explain Model Behaviour

   Once a calibrated model with high $R^2$ has been developed, it is difficult to explain the forecast results to a policy maker in terms of causal changes in the real world.
2. Difficult to Identify the Influence of Existing or Proposed Policies

Despite the fact that many social systems are influenced by man-made policies, the statistical model with the high R² may not easily identify the impact of present policies or changes in policy.

Although Systems Dynamics models do not guarantee better forecast results than statistically based models, the process of building them (with the emphasis on developing model interrelationships and feedback loops) provides the model builder and the policy maker with an insight into the forces which affect the system being modelled.

The construction of System Dynamics models of this kind is mathematically akin to the construction of a differential equation where the behaviour of one variable is directly or indirectly a function of itself. While it is sometimes possible to solve by analytical techniques models of this kind with four or five variables, it is difficult, if not impossible, to find an analytical solution when 50 to 100 variables are involved.

Although mathematical analysis is of little use in solving a large differential equation system, the digital computer provides an excellent tool for iterative solutions to such equations. The computer finds the solution, not by sophistication, but by pure brawn - by simply calculating successively small incremental changes in each variable. For example, the model is started off at some time period (1961 in our case) and then calculates successive values incrementally. The estimated values of key years are then compared to the actual historical data and events. If the model values are not near to the actual values, the structure is then refined and the process is repeated. This entire process is repeated until actual and estimated values are judged to be sufficiently close to satisfy the requirements of the user.

Information Used in the Model

In order to develop a proper structure, Systems Dynamics relies on the knowledge of those familiar with the system being modelled. The past experience and the insights of people knowledgeable in specific fields are given at least equal, and in some cases greater, weight in developing model structure than hypotheses resulting from statistical analysis. In Systems Dynamics Models the knowledge of policy makers or experts is combined with other published information or data to arrive at the model structure.

Structure of the Model

The Cape Breton County Socio-Economic Model was constructed in fourteen major module components (see Figure 1). Each module consisted of a set of endogenous variable relationships and exogenous variable influences. The modules were developed and tested initially in isolation until the structure and behaviour of the module was considered to be consistent with observed behaviour and/or expert knowledge. Testing of the modules consisted in making varying input assumptions regarding the behaviour of one exogenous variable and observing...
Once all of the component modules were considered to be behaving in an acceptable fashion, they were joined together and the overall model behavior observed. At this stage, some internal relationships were refined to track the observed behavior of key variables more closely.

Throughout the development of the model, the structure and behavior of the modules were reviewed with appropriate provincial staff persons and other expert advisors. The procedure that was followed in constructing the model is summarized in Figure 2. A brief summary of each module follows.

**Population Module**

This module used a variation of the component method to determine the population of the planning region. Population was calculated as a function of births, deaths, migration and aging. Two major populations were considered: the resident population and the imported construction work force population. Six separate age groups were examined:

- 0 - 4 years
- 5 - 14 years
- 15 - 19 years
- 20 - 39 years
- 40 - 64 years
- 65+ years

These were used to estimate such variables as the elementary, junior and high school enrollment, labour force, and the senior citizen age group.

**Migration Module**

The migration rate of the resident population was functionally related to relative change in three basic indicators:

1. Labour Market Conditions
2. Income Per Capita
3. Housing Prices

The relative value of these indicators was compared with the corresponding indicator in Ontario. Ontario was selected as the basis for comparison, as over 50 percent of past migration from Cape Breton has been to Ontario.

**Housing Module**

This module estimates on an annual basis the housing requirement of the region, compares the requirement with the existing housing stock, and determines both the building activity and relative Cape Breton housing price. Housing completions were disaggregated into two categories: single family and other. Housing requirement was estimated from four factors:

1. Household growth
2. Desired vacancy rates
3. Undoubling
4. Demolition

Growth in the number of households was a function of total population calculated in the population component and the average number of persons per household.

**Employment Module**

In this module, Cape Breton employment was defined as the sum of employment in the following sectors:

1. Retail
2. Construction
3. Primary
4. Sysco
5. Cansteel
6. Residual - (government, oil-related, and other employment).

Each of the employment estimates in the above sectors was obtained from the corresponding module. Non-resident construction workers associated with the construction of major projects were also accounted for in this component. In addition to aggregating total employment within the region, the module also estimates regional labour force, participation rate, and unemployment.

The total estimated labour force was a function of two factors - the population in the labour force age group and the participation rate. The participation rate was, in turn, a function of two factors. The first was a variable to reflect that, all other things being equal, the labour force participation rate is expected to increase with time. This reflects lower birth rates and increasing numbers of working women. The Economic Council of Canada has developed projections of the national participation rate in its Twelfth Annual Review [2] and these were used to derive corresponding trend forecasts for Cape Breton. The second factor influencing the Cape Breton participation rate was local unemployment rates. If the rates are high, people who are unemployed for long periods of time have difficulty finding a job and finally drop out of the labour force. This, in turn, tends to lower the participation rate. Similarly, if unemployment rates are low, jobs exist which encourage housewives and part-time workers to enter the labour force, resulting in higher participation rates.

**Primary Module**

This module was the most simplified in the model. It represented employment trends in three economic sectors: agriculture, fisheries, and forestry.

**Retail Module**

This module determined, on an annual basis, total retail sales, retail employment, and retail space requirements in the region. Total retail sales were derived from the regional income estimated in the Income Module. Retail employment and the demand for retail space were estimated from total retail sales.

**Construction Module**

This module consolidated all of the building activity which occurred within the region. The five major elements of this module were:

- Construction activity related to the new steel plant (Cansteel)
- Housing construction activity in the region
- Construction activity related to building of new thermal generating stations
- Other construction

In addition to monitoring building activity, the module also determined the construction employment required in any one year to carry out such projects. This "demand" was compared to "supply" to determine whether there would be in or out migration of construction workers. The construction obsolescence for Cansteel and other large projects were exogenously determined and could be used as policy variables.

**Sysco Module**

This module estimated the annual employment of the existing steel plant operation, production of steel and consumption of Cape Breton coal.

**Coal Module**

This module estimated the coal work force necessary to meet the coal production requirements for local and external markets.

**Cansteel Module**

This module estimated the Cansteel work force necessary to match forecast sales. Since the construction of the plant will take many years, the steel producing capacity of the new plant acts as a constraint to actual production.

**Income Module**

This important module computes, on an annual basis, the total income of the region. Two types of income were represented in the module - earned income and transfer income. Both were treated in constant 1971 dollars. Earned income was a function of the number of jobs and the average wage rate. This average wage rate was a function of three factors. The Economic Council of Canada [2] has forecast that, even in constant dollars, earned income per employee will increase over time. In the module this national trend was one of the factors influencing earned income per employee in the Cape Bre-
ton region. (The employees in the major industries in Cape Breton are represented by large international unions accustomed to sophisticated wage bargaining.) The resulting wage settlements of these unions depend, in part, on the success that they experience in similar industries in other parts of Canada and the United States. Further, because of their importance in the Cape Breton economy, the salary settlements in the coal and steel industry have an indirect impact on wages paid in other sectors.

The second factor influencing earned income per job relates to the local market conditions. When unemployment rates are high there are relatively high numbers of people competing for a small number of jobs, which would exert a downward pressure on wages. Alternatively, when unemployment rates drop there are relatively few people competing for a growing number of jobs which can exert an upward pressure on wages. Since it is unlikely that short-term unemployment fluctuations would have a direct impact on the wage level, the wage levels were not adjusted instantly, but delayed by a two-year period.

The third factor influencing income per job in the model was a variable to reflect the overall strength of the economy. It was assumed that if the total number of jobs in the economy is above the historical average, the local economy would be expanding and local wage rates would be increasing. Similarly, if total employment was less than the historical average, the economy would be contracting, resulting in a downward pressure on wages.

There were six types of transfer payments directly related to either demographic or economic variables included in the model. These were:

1. Old Age Pensions
2. Family Allowance Payments
3. Labour Market Condition Transfer Payments (e.g., unemployment insurance)
4. Manpower Training Allowances and Employment Programs
5. Welfare Payments
6. Other Transfer Payments to Individuals

Residual Employment Module
The Residual Employment Module identified all of the employment not included in the Coal, Cansteel, Sysco, Construction, Primary, and Retail Modules. It included, for example, all civil servants, teachers and hospital workers; employees in the service, finance, insurance, and transportation sectors; as well as jobs created by special government programs and initiatives.

Municipal Finance Module
This module was the largest and most complex in the Socio-Economic Impact Model. The module was designed to represent the existing finance system of a municipal unit in Nova Scotia. Due to the complexity of the municipal finance system, the numerous changes made to its regulations, and the difficulty in obtaining comparative data for extended periods, the historical tracking of this module was begun in 1971 rather than 1961.

There were two major elements in the municipal finance component - one which analyzed the aggregate finances of the seven urban communities (Sydney, Sydney Mines, North Sydney, Glace Bay, New Waterford, Dominion, and Louisbourg) and one which analyzed the municipal finances of the rural part of Cape Breton County. Although different parameters were used, the structure of the two elements was identical. Each structure contained five major components:

1. Municipal Expenditures
2. Grants to the Municipality
3. Rate of Borrowing
4. Assessment
5. Tax Revenue

This module, unlike many of the others, is unique to Nova Scotia and is not necessarily transferable to another region. It is interesting to note that the complexity of the module was determined entirely by the accumulation of marginal policy changes made in the municipal finance system over the last twenty years.

Urban/Rural Disaggregation Module
This module was used to disaggregate total regional forecasts to urban and rural areas. This component disaggregated population, housing completion, housing stock and the requirement for housing, elementary school enrolment, junior high school enrolment, and senior high school enrolment.

The Migration Module
As can be seen from the above descriptions, the scope and complexity of each module varied considerably. The level of complexity of each module was determined by:

i) the importance of the sector in determining the behaviour of the Cape Breton economy,

ii) the degree to which major changes were anticipated as occurring in a particular sector, and

iii) the sectors in which federal, provincial or municipal government policy instruments would have the most direct impact.

In order to illustrate the scope and complexity of the modules, we have selected migration as a topical example for a more detailed discussion.

In the Eleventh Annual Review, the Economic Council of Canada [11] suggested well-being and equity for individuals as basic goals for Canadian society. The recently released re-
A reduction in unemployment levels between regions may require an increase in wage differentials.

Attempts by individuals to improve their incomes through relocation may conflict with the goals of population growth and cultural survival in the poorer regions.

The Economic Council notes that, "at a deeper level the conflict is between the well-being of those who move and the well-being of those who remain."

In addition to cultural considerations, the tax burden on stayers may be increased by out-migration because young adults are disproportionately represented among movers. When they leave they no longer pay local taxes, and they take with them the fruits of the education paid for by the province in which they grew up. A disproportionate number of those left behind receive government assistance in one form or another - medical care for the aged, housing assistance, welfare payments, and so on" [3, p. 29].

The migration module, although not overly complex, is a very important control mechanism within the overall model. The module attempts to represent in a quantifiable manner the kinds of forces noted by the Economic Council.

As was pointed out previously, the region's population was forecast using a modified component technique. The number of people in each age cohort was forecast as a function of births, deaths, migration, and aging. In many socio-demographic studies, a great deal of effort is placed on estimating and projecting birth and death rates, while relatively little effort is devoted to forecasting major migration patterns. Usually, however, migration is by far the most volatile element of the population equation and has a major impact on the size of the future population.

In the Cape Breton County Socio-Economic Impact Model, migration is functionally related to the relative changes in three indicators:

- labour market conditions
- income per capita
- house prices.

Changes in the relative values of these three indicators determine net migration to, or from, Cape Breton County. In each case, the Cape Breton indicator was compared to its corresponding Ontario indicator. Ontario was selected as the basin for comparison because in the past the majority of Cape Bretoners have migrated to Ontario (over 50 percent). The concept of using relative measures is important. For example, if economic conditions are equally as bad in Ontario as in Cape Breton, then it is unlikely that, regardless of the absolute value of the Cape Breton indicator, there will be significant migration.

The structure of the migration module of the model is illustrated in Figure 3.

The Labour Market Condition Ratio (LMCR) was defined to be a measure of the comparative labour market conditions in Cape Breton and Ontario:

$$\text{LMCR} = \left( \frac{\text{CBEMP}}{\text{CBLFA}} \right) \left( \frac{\text{ONTEMP}}{\text{OLFAG}} \right)$$

where

- CBEMP = Cape Breton Employment
- CBLFA = Cape Breton Labour Force Age Group
- ONTEMP = Ontario Employment

In order to reflect the differences in both unemployment and participation rates, labour market conditions were compared using the ratio of total employment and labour force population (population of 15 years and over). For Cape Breton, total employment was calculated in the Employment Component and a population in the working age groups was derived in the Population Component. The corresponding figures for Ontario were derived from published Statistics Canada population forecasts using unemployment and participation rates forecast in the Twelfth Annual Review of the Economic Council of Canada [2]. The value of the Labour Market Condition Ratio was used to determine the Labour Market Condition Multiplier (LMCM). This multiplier was a measure of the change in migration resulting from a change in relative labour market conditions. Data which measures only the direct impact of labour market conditions on migration does not exist. In general, less migration was expected as the Cape Breton labour market improved relative to Ontario. A series of hypotheses were developed and tested in preliminary versions of
the model; these were adjusted until the model successfully tracked historical events.

The second factor used to estimate changes in migration patterns was real disposable personal income per capita. This ratio (PCIR) was defined as a ratio of Cape Breton and Ontario income per capita and was used to estimate the impact of relative changes of income on migration.

\[ \text{PCIR} = \frac{\text{CBINCPC}}{\text{ODINCPC}} \]

where \( \text{CBINCPC} = \) Cape Breton Income per Capita
\( \text{ODINCPC} = \) Ontario Income Per Capita

The Cape Breton Income Per Capita was calculated in the Income Component and the Ontario estimates were based on historical data and on Economic Council of Canada projections. In general, out-migration was expected to decline as income per capita in Cape Breton approached the Ontario value. Again, specific data relating the causal impact of changes in income on migration did not exist. As was the case with the labour market multiplier, the income migration multiplier hypotheses were tested until the model successfully tracked historical data.

The third factor influencing net migration was derived from the Housing Component of the model. The Housing Relocation Cost Ratio (HRCR) was defined as:

\[ \text{HRCR} = \frac{\text{ONHP} - \text{CBHP}}{\text{CBINCPC}} \]

where \( \text{ONHP} = \) Ontario Housing Price
\( \text{CBHP} = \) Cape Breton Housing Price
\( \text{CBINCPC} = \) Cape Breton Income Per Capita

HRCR represents a measure of the relative housing cost of relocating, normalized to reflect changes in income levels. In general, the higher the Housing Relocation Cost Ratio, the greater the barrier to migration. The Cape Breton Housing Price was calculated in the Housing Component module as a function of both the existing supply/demand conditions in the housing market and the projected trend in overall construction costs. The Ontario Housing Price was derived from CMHC data and forecasts published by the Economic Council of Canada.

As was the case for the Labour Market Condition Multiplier and the Per Capita Income Multiplier, several alternative hypotheses were tested for the Housing Relocation Cost Multiplier. These were adjusted until the behaviour of the model was satisfactory.

These three indicators - labour market conditions, relative incomes and housing relocation costs - were then aggregated to estimate the net migration to, or from, Cape Breton as a percent of the total population. Total migration was then distributed among the various age groups to reflect the fact that the migrants are not evenly distributed but tend to be concentrated in the 18 to 24 age group.

In this way, the forces affecting migration in Cape Breton were endogenized and made partly dependent on changes in the local economy. In the case of all three factors affecting migration, a hypothesis was developed to relate either the Housing Relocation Cost Ratio, the Per Capita Income Ratio, or the Labour Market Condition Ratio to migration. In general, the ratios operate within a relatively narrow range; however, during the testing and development of the model, policies which resulted in extreme in- or out-migration were deliberately constructed for "destructive" testing purposes. The results of these test runs helped to refine the migration hypotheses at the extreme ranges. In general, the nearer the ratios were to Canadian averages, the less likely was migration to occur. In order to reflect the fact that some Cape Bretoners return to the region when local economic conditions improve, even though the average income levels and local job market are less appealing than those in Ontario, some in-migration was hypothesized to occur before the Cape Breton estimates actually reached those of Ontario.

Policy Testing

The Cape Breton Socio-Economic Impact Model evolved during the development of the Draft Cape Breton County Regional Plan. The model was used interactively; first, to determine the impact of the three possible futures:

A new steel plant located in the rural part of the region
A new steel plant located in Sydney
No new steel plant.

The model was used as a tool to test, under each of the three alternative futures, the implications of continuing existing policies and the possible effects of new policies.

The key assumptions used in the policy testing analysis are summarized in Table 1 (assuming a continuation of existing policies) and Table 2 (for policies that are recommended in the Regional Plan).

In addition to these detailed policy assumptions, there were a number of other assumptions, largely relating to external conditions beyond the control of either the municipal or provincial government, which were assumed for all three futures, both with and without the recommended Plan policies. For the most part, these assumptions were tied directly to existing forecasts prepared by agencies such as the Economic Council of Canada and Statistics Canada.

The forecast results, assuming existing policies, were reviewed by the planning team to identify possible future problems. Based on the perceived future problems and objectives, new policies were identified by the planning team. These new policies were subjected to the normal qualitative evaluation as well as testing in the model. Eventually, a collection of prime objectives and policies emerged for inclusion in the recommended plan.

Model Results

There are approximately seven hundred variables in the Cape
<table>
<thead>
<tr>
<th>Characteristic</th>
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<th>New Steel Plant in Sydney</th>
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<tr>
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**Municipal Borrowing Required for New Housing Units**
- Remain at existing levels.
- Approximately $3,000/unit in the county and $750/unit in the urban areas.
- Municipal tax revenue in Sydney drops by $850,000 in 1981.

**Cansteel Municipal Taxes**
- Not applicable.
- 5.825 million per year paid to the Municipality of the County of Cape Breton beginning in 1983 rising to $11.1 million per year in 1986.

**SYSCO Municipal Taxes**
- Municipal tax revenue in Sydney drops by $850,000 in 1981.
- Not applicable.
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## Key Assumptions Used in Alternative Futures with Recommended Policies and Controls

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### Equalized Assessment
- Property tax base is converted to an equalized basis by 1986.
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- Because the Regional Plan would encourage new homes to be built on land that is already serviced, the cost of growth to the Municipality of the County of Cape Breton would decrease to $1,900/unit. Borrowing per new unit in the urban areas would be $500.
- Municipal tax payment phasing proportionate to completed construction. Total taxes paid by 1991 = $44 million. This tax revenue is shared - $2.68 million to the urban municipalities and $1.32 million to the rural municipality.
- Municipal tax payments to Sydney decrease by $200,000 in 1984, $400,000 in 1985 and $850,000 in 1986.

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### Cansteel Municipal Taxes
- Municipal tax payment phasing proportionate to completed construction. Total taxes paid by 1991 = $44 million. This tax revenue is shared - $2.68 million to the urban municipalities and $1.32 million to the rural municipality.
- Municipal tax payments to Sydney decrease by $200,000 in 1984, $400,000 in 1985 and $850,000 in 1986.

### SYSCO Municipal Taxes
- Municipal tax payment phasing proportionate to completed construction. Total taxes paid by 1991 = $44 million. This tax revenue is shared - $3.4 million to the urban municipalities and $5.6 million to the rural municipality.
- Municipal tax payments to Sydney decrease by $200,000 in 1984, $400,000 in 1985 and $850,000 in 1986.
Breton County Socio-Economic Impact Model. In order to provide some insight into the difference between each of the possible futures under existing and proposed policies, we have selected seven variables as key indicators. These are:

- population
- labour force
- unemployment rate
- migration
- total income
- housing construction
- municipal taxes per household

Population

Total population in the Cape Breton region was remarkably constant from 1961 until 1973-74, hovering around 130,000 persons. Since 1975, there appears to have been a sharp and rapid decline in the population of the region. In general, the estimated population resulting from the recommended policies was slightly higher than if existing policies were to continue. The total population of the region in 1991 would be approximately the same, whether the new steel plant was located in the county or on the existing Sysco site. However, even with the new steel plant, the anticipated level of population would be somewhat below that experienced in the 1960s and early 1970s. Without the establishment of the new steel plant, the economic base would not be able to support the existing population and, by 1991, the population would be considerably lower than it is at present.

Labour Force

The pattern illustrated for total labour force is somewhat different from that illustrated for total population. While population remained constant over much of the period from 1961 to 1974, the labour force has been growing continuously and quite rapidly. The growth in labour force reflects the entrance of the post-war baby boom into the labour force age group. If the recommended policies are adopted, the total labour force will be somewhat higher than if present policies continue. Again, the location of the new steel plant in the Cape Breton region is not expected to have a significant impact on the size of the total labour force. However, if the new steel plant is not built, the size of the labour force will be considerably smaller than if a new steel plant were to be constructed.

Unemployment Rate

The unemployment rate in the Cape Breton Socio-Economic Impact Model was calculated in two steps. Initially, the total number of people employed was subtracted from the estimated labour force to estimate the total number of people unemployed. This figure was then divided by the estimated labour force to derive the unemployment rate. The model appears to have tracked this volatile indicator extremely well. The model indicates that during periods of heavy construction related to the new steel plant, unemployment rates for Cape Breton would be quite low (under 10%). However, as construction finishes, the unemployment rate would creep up to what appears to be an equilibrium value. This long-run equilibrium level appears to be around 12%, if existing policies are allowed to continue, and slightly over 10% if the recommended policies are adopted. The model implies that this equilibrium level will occur whether or not a new steel plant is built. In effect, the jobs created by Cansteel would largely replace jobs that were lost because of the phase-down of Sysco. The model indicates that if additional jobs are created, fewer workers would leave Cape Breton, which, in turn, would tend to stabilize the unemployment rate. Similarly, if the unemployment rate exceeds the equilibrium level out-migration increases, again stabilizing the unemployment rate. Although the unemployment rates would dip below their equilibrium levels during the construction of a steel plant, they would return to their equilibrium levels once this period of very heavy construction ends.

Migration

Migration is an extremely volatile variable. It is quite sensitive to labour market conditions, relative income levels and housing relocation costs. On a five-year basis, the model appears to track past conditions quite well. If Cansteel is built, the model indicates that there will be a period of in-migration during the construction phase. If Cansteel is not built, the heavy out-migration would depress the housing market, lowering the housing price and increasing the Housing Replacement Cost Ratio. Residents would become reluctant or unable to sell their homes, and this would act as a powerful constraint to continued out-migration. The long-run impact of this type of policy, thus, appears to be marginal.

Income

Total personal disposable income, in constant 1971 dollars, rose from $215 million in 1961 to $401 million in 1976. This was in spite of a stable economic base and the fact that total employment increased by only slightly over 2,000. This increase in income was mainly the result of two factors: increased transfer payments to individuals by all levels of government; and an increase in average earned income per employee which exceeded inflation. Because these trends are projected to continue, total income in the region was forecast to increase under each of the alternative futures. The location of Cansteel does not have a significant impact on total income in the region; however, as expected, the decision to build or not to build does have a significant impact.
If existing policies continue, total personal disposable income is forecast to reach $726 million by 1991 if a new plant is built, and $633 million if it is not. If the recommended policies were adopted, regional income would increase to $808 million and $708 million respectively.

Housing Construction

Since 1975, there has been a sharp decline in the number of housing completions. This trend is projected to continue for the next two to three years. If a new steel plant is constructed, there will be a marked increase in housing activity. This will partially reflect the construction of housing units for people migrating to the region for work during the construction phase. Increased construction will be particularly high in the early 1980s. After the peak construction period for the new plant is over, housing activity will decline sharply to very low levels. Under the existing policies, the peak construction activity would be high and not recover after the mid-1980s. Under the recommended policies, the peak construction activity is stretched out over a longer period and some construction resumes after the mid-1980s. If no new steel plant is constructed, new housing construction will virtually cease by about 1981.

Municipal Taxes Per Household

The decline in average tax per household in both the urban and rural areas in constant dollars between 1974 and 1977 is due to the provincial policy of absorbing an increasingly large proportion of the residential share of education costs. This policy has now reached its limit (100%) and will not pick up any further of the municipal share of the cost of education. Municipal taxes are expected to increase in the future due to the implementation of equalized assessment and due to an increase in the cost of non-shareable public services. Under the recommended policies, municipal taxes per household are reduced for both urban and rural areas. Urban areas generally would experience the more significant savings.

Conclusions

In addition to providing the authors with an extremely interesting challenge, the development of the Cape Breton Socio-Economic Impact Model brought home some important conclusions about model building.

1. Need to Develop Models Which Policy Makers Can Understand and Use

Although mathematical modelling techniques continue to improve and develop, policy makers are finding it increasingly difficult to understand and use models. There is an urgent need to adopt a modelling approach which is versatile and capable of handling complex problems but is, at the same time, understandable and relevant to policy makers. If the gap is not breached model makers may find themselves increasingly building models for their own sake rather than assisting in solving problems.