THE REGIONAL ECONOMIC IMPACT
OF A LARGE-SCALE, NON-PROFIT INSTITUTION

by
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We accept this thesis as conforming to the required standard:

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ABSTRACT

Regional planners are often faced with having to estimate the various impacts of a new or existing project on the regional economy and to place these estimates in a regional planning context. Their concern is not only with impacts directly attributable to the project itself, but also with the multiplier effect which occurs as a result of successive rounds of respending in the local economy as a result of the project.

There are theoretical and practical problems connected with the derivation of the multiplier values. Much of the research in regional economic impact analysis has focused on ways to correct for potential errors in the analysis and on the use of appropriate models for analysis.

In this thesis three models are examined: economic base, income expenditure and input-output. Theoretical weaknesses and practical problems associated with each particular model or common to the three models are identified. The relative strengths and weaknesses of the models are evaluated to determine appropriate uses for each.
Research has also focused on the particular impacts generated by unique types of projects and on particular regional economies. A growing awareness that there are significant impacts from large, non-profit institutions on regional economies has stimulated an interest in identifying and quantifying these impacts.

In this thesis a number of empirical studies utilizing each of the three models to analyse the impact of a large, non-profit institution on a regional economy is reviewed. In the context of this review, the specific advantages and disadvantages of the different models are discussed.

The thesis, then, develops a viable methodology through the appropriate use of an existing model to indicate the extent of economic impact of a complex institution on a regional economy. A case study is presented of the regional economic impact of the Pacific National Exhibition complex - a large, non-profit institution in the Lower Mainland of British Columbia. The study demonstrates the economic impact of the PNE Complex by isolating income, employment and expenditure impacts generated in the regional economy by the Complex for the base year 1977.

The thesis concludes by considering the role of regional economic impact analysis in the context of regional planning and policy formulation.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Abstract</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Table of Contents</td>
<td></td>
</tr>
<tr>
<td></td>
<td>List of Tables</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acknowledgement</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>INTRODUCTION TO REGIONAL ECONOMIC IMPACT ANALYSIS</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>I. The Thesis Framework</td>
<td>6</td>
</tr>
<tr>
<td>II</td>
<td>REGIONAL ECONOMIC IMPACT MODELS</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>I. Introduction</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>II. Economic Base Analysis</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>A. Overview</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>B. The Structure of the Economic Base Model</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>C. Procedural Steps of the Model Elaborated</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>1. The Definition of the Region</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>2. Measuring the Base Sector</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>a. Simple Judgment</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>b. Survey</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>c. Location Quotient</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>d. Minimum Requirements</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>e. Regression Analysis</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>3. Equation Specification</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>4. Demand Identification</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>5. Estimates of Future Impacts</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>D. Critique of the Economic Base Model</td>
<td>23</td>
</tr>
</tbody>
</table>
III. Income Expenditure Analysis
   A. Overview
   B. The Structure of the Income Expenditure Model
      1. The Conventional Model
      2. Modifications to the Model
      3. Extension of the Model
   C. Critique of the Income Expenditure Model

IV. Conclusion

V. Input-Output Analysis
   A. Overview
   B. The Structure of the Input-Output Model
      1. The Transaction Table
      2. The Table of Direct Requirements
      3. The Total Requirements Table
   C. Critique of the Input-Output Model

CHAPTER III
APPLICATION OF ECONOMIC IMPACT MODELS TO NON-PROFIT INSTITUTIONS
I. Introduction

II. Economic Base Studies
   A. The Caffrey-Isaacs Model
   B. The Manning-Viscek Model
   C. The Wilson-Raymond Model
   D. The Wilson Model
III. Income-Expenditure Studies
   A. The Brownrigg Model
IV. Input-Output Studies
   A. The Blake-McDowall Model
V. Conclusion

CHAPTER IV
A CASE STUDY OF A LARGE-SCALE NON-PROFIT INSTITUTION
I. Introduction
II. Overview of the Pacific National Exhibition Study
III. Description of the Model Chosen for the Impact Study
   A. Transaction Table
   B. Table of Direct Requirements
   C. Table of Direct Plus Indirect Requirements
IV. Methodology Developed to Analyse the Regional Economic Impact of the PNE Complex on the Economy of the Lower Mainland
   A. The Data Base
   B. Direct Impact
   C. Indirect Impact
      1. Sales Generated Through Commodity Purchasing and Wage Payments
         a. Commodity Purchasing
         b. Wage Payments
      2. Payrolls
      3. Employment
LIST OF TABLES

CHAPTER ONE

CHAPTER TWO

CHAPTER THREE

I. Transaction Table for the Burgh of St. Andrews

CHAPTER FOUR

I. The Economic Sectors of the Metropolitan Vancouver Input/Output Study

II. Metropolitan Vancouver Sales Multipliers

III. Sales Generated through Commodity Purchasing by the PNE Complex, 1977

IV. Sales Generated through Wage Payments, 1977

V. Indirect Payrolls Generated by the Presence of the PNE Complex, 1977

VI. Indirect Employment Generated by the PNE Complex, 1977

VII. Types of Employment Within the PNE Complex, 1977

VIII. Age Ranges of Persons Employed by PNE, 1977

IX. Breakdown of PNE Complex Sales, Payrolls and Employment by Three Main Sectors of the Economy, 1977

X. Direct and Indirect Impact of the PNE Complex, 1977
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Economic growth in a region, and how this growth is managed, have ramifications in the physical, social and environmental milieux of the region. Development projects therefore tend to be of considerable interest to regional planners and policy makers. Regional economic impact analysis arose out of a desire to measure as accurately as possible the impact of existing and/or potential developments on a regional economy. It is a descriptive, quantitative approach used to measure changes in the regional economy due to the introduction of a new industry, expansion of existing industries or commercial establishments, public investment projects and similar developments.

Central to regional economic impact analysis is the concept of a multiplier. The basic theory of the multiplier is that a monetary injection into an economic system will cause an increase in the level of income and employment in that system by some multiple of the original injection. The multiplier effect is due to successive rounds of respending within the economy. The multiplier concept assumes that the introduction of a monetary stimulus in the regional economy will result in an upward shift in aggregate spending due to an increase in income and employment. This shift results in a process of respending which produces a multiple increase in the aggregate income in the region.
The multiplier thus provides a framework for the analysis of monetary change in the economy.

Lane\textsuperscript{1} points out that the concept of a multiplier was first developed by Kahn in 1931 as a conceptually complete analytical tool in economics. He further points out that Kahn's work was extended by Keynes in \textit{The General Theory of Employment, Interest and Money}. Keynes showed the difference between the income multiplier (which depends upon the marginal propensity to consume) and the employment multiplier (which also depends upon labour and investment elasticities). Lane suggests that by the early 1940's multiplier analysis had become a mainstay in the toolbox of aggregate economic analysis and that the properties of a multiplier had been substantially worked out. In traditional Keynesian theory the income multiplier measures the change in personal household income attributable to an exogenous injection of expenditure into an economy. Thus an injection of expenditure into an economy will raise personal incomes in that area by some coefficient or multiple of itself, i.e. if the amount of expenditure injected is DE, the personal incomes generated within that economy will be $K \cdot DE$ where $K$ is the income multiplier.

In a regional context, much of the initial investment leaks directly out of the recipient economy without generating any income whatsoever to the resident population. Quantifying the leakage process is of concern in economic impact analysis because the degree of leakage increases or decreases the value of the multiplier. The value of the multiplier depends upon:

1. the region's marginal propensity to consume;
2. the region's marginal propensity to import;
3. the region's marginal propensity to save; and
4. the tax rate.²

Regional economic impact analysis is an important source of information for regional planners and policy makers. Besides generating useful information regarding the existing economic relationships within the regional economy, impact analysis assists the planners in anticipating problems (housing, transit, etc.) and in planning to adjust or accommodate for those impacts accompanying a development project. The obvious and immediate value in being able

². 1... determines the proportion of total income that will be respent at each successive round of income creation; 2... determines the proportion of total spending at each round which will leak out of the area and will hence not be available for further respending within the local area; 3... determines the proportion of total income that will be withheld from the local area due to savings; and 4... determines the proportion of earned income that will leak out of the area as a result of taxes.
to assess the influence of existing economic relations in a region and the influence of the potential impact of a change in those economic relations has precipitated a great deal of research in economic impact analysis both by academics and by practitioners.

The research has demonstrated that there are both theoretical and practical problems connected with the derivation of multiplier values. Wilson suggests that while the use of the multiplier concept in economic impact analysis is absolutely correct, the type of multiplier adopted is often inappropriate. Also, as Archer points out, economists do not all agree in the definition of the multiplier itself. It is not reasonable to assume that every type of economic activity which attracts non-local funds will have identical local multiplier effects. Leakages, for example, are often higher in the case of small regions than in larger areas. Also, the influence of a stimulus to the economy is felt differently according to the internal structure of the recipient economy and the manner in which the injection is distributed across


the various sectors of the recipient economy. Much of the research in regional economic impact analysis has focused on ways to correct for potential errors in the analysis and on the correct use of appropriate models for analysis. Research has also, however, focused on the particular impacts generated by unique types of development projects (e.g. pulp and paper mills, smelters, port and rail facilities), on particular regional economies.

Much concern has been expressed recently about the contribution of large-scale non-profit institutions such as hospitals, universities and colleges and recreational facilities to the regional economy. A growing awareness that there are significant impacts from these institutions not only on the physical development of the community, but also on municipal expenditure and financing, and on the socio-economic milieu of the region has stimulated an interest in identifying and quantifying these impacts.


I. THE STUDY FRAMEWORK

This thesis is a case study of the economic impact of the Pacific National Exhibition (PNE), a large-scale non-profit institution, on the regional economy of the Lower Mainland of British Columbia. The study is of interest for two reasons:

1. The PNE is a large-scale multiple-use facility operated by a non-profit society. While the physical impact of the PNE is very explicit, there is little accurate information available on the regional economic impact of this institution.

2. The study is representative of the practical conditions faced by an analyst in attempting to conduct an impact study. The latter is an important aspect to consider when economic impact analysis is placed within a planning and policy making context.

The value of a regional economic impact analysis is the information it generates. Very often, however, conditions exist which limit both the scope and the quality of analysis. The most obvious of these conditions are budgetary and time constraints and the constraint of data availability. In British Columbia, most regional economic impact analyses are initiated in the public sector in response to development proposals. The studies are conducted on a limited budget and because they are
usually a response or reaction to a project already under consideration (or indeed, in the initial construction phase), time is almost always a constraint. The study deadline may seriously limit the scope of the analysis. These two factors, combined with the quality and availability of data, are constraints which influence quite considerably the study methodology.

Despite both theoretical and practical difficulties, regional planners are often faced with having to estimate as accurately as possible the various impacts of development projects and to place these estimates in a regional planning or policy context. Given budgetary and time limitations, and a dependency upon available data, the analyst must design the study as efficiently as possible. The following questions must be clarified at the beginning of the study:

1. What answers will the study be expected to provide?
2. Which impacts must be isolated in order to answer the study questions?
3. What will be the limits of the study area?
4. What is the most appropriate economic impact model to use for this particular study?
5. Can the data requirements be met?
6. Can the analyst develop a study methodology which adequately answers the questions being addressed?
Ideally the analyst will choose the most appropriate model to answer the study questions given the external constraints of time, budget and data availability. In order to make this choice, the analyst should:

1. know the theoretical assumptions, the conceptual and technical difficulties and the relative merits of the model.
2. be familiar with current literature on the economic impact of project developments similar to the study in question; and
3. be able to adapt existing models to include the unique characteristics of the particular study area being analysed.

The case study for this thesis originated in a political context. In 1977 a proposal was put forward by the PNE to renovate and improve its grounds. This proposal has since expanded into a considerably larger project, including the construction of a large multiple-use facility estimated to cost approximately $163 million. Concern has arisen over such issues as congestion, the social impact of such development on the surrounding community, the financial responsibility of the City of Vancouver as well as the provincial and federal governments. The controversy which accompanied the proposal put forth
by the PNE gave rise to questions about the impact of the existing institution on the lower mainland economy. An economic impact analysis was therefore generated.

Using the PNE economic impact analysis as an example, this thesis argues that the maximum accuracy from a regional economic impact study will be obtained if the analyst is familiar with the advantages and disadvantages of the models available, is familiar with studies analogous or similar to the project in question, chooses the most appropriate model and adapts the model to reflect the conditions of the study area. Furthermore, the thesis argues that maximum value from an economic impact study will be obtained only if the information generated by the study is placed in a broader planning and policy context.

Chapter II examines the three main models used in regional economic impact analysis and demonstrates their merits and weaknesses with suggestions as to their most appropriate uses. Chapter III is a review of some current studies of large-scale non-profit institutions, namely universities and colleges. This chapter reviews cases where the three models identified in Chapter II have been applied to specific institutions in particular regional economies. Positive and negative aspects of the model applications are discussed.
Chapter IV is a regional economic impact analysis of the Pacific National Exhibition, using an input-output model. This chapter demonstrates a study methodology using input-output analysis developed under practical conditions likely to be faced by most analysts working in this field. The chapter argues that the model and methodology chosen answer as accurately as possible the study questions. Chapter V relates regional economic impact analysis to the planning process and demonstrates the value of this type of analysis when correctly used by planners and policy makers.

Regional economic impact analysis is a quantitative approach, which, despite theoretical and practical difficulties, can make a useful and constructive contribution to planning and policy making.
CHAPTER TWO
REGIONAL ECONOMIC IMPACT MODELS

I. INTRODUCTION
Regional economic impact analysis provides information on the economic consequences of a monetary stimulus to a regional economy. There are a number of models available to the analyst which will assist in the provision of that information. These models attempt to describe in various degrees of detail the system of economic relationships governing a region, sector, industry or firm. In this chapter, three models are presented: economic base, income-expenditure and input-output. Each model is placed in an historical context. The working concepts and techniques of each model are then described. The relative strengths and weaknesses of the models are evaluated and appropriate uses for each are suggested.

II. ECONOMIC BASE ANALYSIS
A. Overview
Economic base analysis has emerged from both formal economic analysis (aggregate income analysis) and early base studies developed primarily by geographers and planners who argued that the growth of a city should be analysed by dividing its total employment into primary (directly concerned with the functions of the town)
and secondary (concerned with the maintenance of the wellbeing of the primary workers) occupations. They suggested that the relationship between primary and secondary occupations was the basis of urban growth.

Lane suggests that since the mid-thirties, the conception of an urban base study has remained essentially unchanged. "This conception views an urban area's economy as having two sectors: an export sector and a local sector." By producing goods and services which are sold to the "rest of the world", the export sector causes income to flow into the area. Part of the income generated from the export sector is spent locally to purchase consumer products. "This local spending supports those sections of the area's economy which produce non-exported items."

Economic base theory assumes that the rate and direction of growth of a region or city is determined by its function as an exporter to the rest of the world. The income and employment level of an area is dependent upon the economy's ability to export to other areas. For the purpose of analysis, therefore, the economic activities of a region are divided into those which produce for the export market and those which produce for the local market.


2. Ibid., p. 341

3. Ibid., p. 341
Exports may be in the form of goods and services including labour that flow out of the region, or expenditures by foreigners in the region on goods and services that are immobile, such as those connected with the geography, climate, historical significance or relative location of the region.\textsuperscript{4} Allowance is made for such items as the earnings of commuters, capital flows, government transfers and linked industries.\textsuperscript{5} Given these basic or export activities, the level of non-basic or residentiary activities can be determined.

The theory holds that all economic activity in the region can be classified as basic or non-basic and that a stable relationship exists between the basic and non-basic sectors so that changes in base sector employment and income will lead to predictable changes in service sector employment and income and therefore in the total employment and income of the region.

The theory further states that both employment and income in the base sector are a function of exogenous demand.

\begin{footnotes}
\item[5] Ibid.
\end{footnotes}
As this demand increases, the requirement for non-basic sector activities increases and the total regional income and employment will increase by some multiple of the initial increase in demand. The ratio between basic (export) activities and non-basic (service) activities is then used as a multiplier. The base sector directly supports the service sector and the income of the region is therefore assumed to be tied to the level of exports.

B. The Structure of the Economic Base Model
The intent of the economic base model is to measure the impact of a change in demand for export commodities on income and/or employment within the region. The altered level of demand will cause changes in employment and/or income in the export sector and consequently in the service sector, since all service sector activity is dependent upon activity in the base sector. Construction and application of the economic base model requires five steps:

1. Definition of the region or study area.
2. Calculation of total basic employment in the community being studied.
3. Estimation of the relationship between basic and non-basic activities in the region, e.g. simple ratio.
4. Estimation of the change in the base sector initiated by a change in final demand for its export product or service.
5. Calculation of the effects of change in the basic sector on the non-basic sector, assuming the relationship established in (2), the multiplier, remains constant.

C. Procedural Steps of the Model Elaborated

Various options are available to the analyst for each procedural step in the model:

1. **The definition of the region** or study area is arbitrary, e.g. may be an existing administrative area or may be the area of perceived impact. Since export volume is a function of regional size, the multiplier will vary in relation to the size of the study area.

2. **Measuring the base sector** can be done in at least five ways. Each of the techniques available, however, has problems which can cause serious underestimation or overestimation of the base sector employment. This is particularly true in economies made up of many export activities and related industries. While this tendency to error can be corrected somewhat, it does raise serious questions about the accuracy of the economic base model. Base sector employment can be identified in the following ways:
   
   a. **Simple Judgement**: The basic and non-basic sectors are categorized according to the analyst's understanding

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of the structure of a particular regional economy. Basic employment may be understated or overstated in this case, depending on the way industries are assigned to the two broad classes. Multiplier estimates vary according to the assignation given.

b. **Survey:** Surveys are used to generate data on which is based an estimation of the volume of export activity. The costs of these surveys are often prohibitive and results depend on high response rates. There is often error in the respondents' identification of the base sector.

c. **Location Quotient:** The analyst calculates the location quotient for each sector. A location quotient greater than one provides an index of surplus workers (i.e. the difference between actual regional industry employment and the region's pro rata share of national industry employment). The surplus for each sector is summed to yield an estimate of base employment. The rest of the region's labour force is assigned to the non-basic category. Thus, the location quotient, LQi for any industry:

\[
LQ_i = \frac{R_i}{N_i/N} \tag{1}
\]

Where:
- \( R_i = \) employment in the regional sector \( i \)
- \( R = \) total employment in the region
\[ N_i = \text{employment in the national sector } i \]
\[ N = \text{total national employment} \]

And: the base employment for any industry =

\[ B_i + R_i - \frac{N_i}{N} \times R \quad (2) \]

If the ratio is greater than one, regional industry \( i \) is
an exporter. If the ratio is less than one, it is an
importer. If the ratio is equal to one, the region is
self-sufficient in the production of the particular
good being analysed, i.e. it satisfies the regional
demand for that good. The location quotient technique
is dependent upon six main assumptions which, in fact,
give rise to estimation problems:

- assumes that productivity per worker in each region
  is the same as in the national sectors. If labour
  is more productive in the region or sector being
  analysed, the employment requirements would be
different and the location quotient
  technique would understate the base employment as
  compared to the nation;

- assumes that the pattern of consumption in each
  region is identical to that of the nation. If consumption
  in the region is, for example, higher than that
  of the nation, corrections for consumption must be
  made or the base employment will be overstated.
assumes that the pattern of productivity in each region is identical to that of the nation. If productivity is, for example, higher in the region, the requirements for self-sufficiency would be different and base employment could be understated;

assumes no cross hauling, when in fact, within any industry classification (or for that matter within a single firm or establishment) there are different specific products and the region may be importing some and exporting others. Since the location quotient estimates only the net surplus of output over regional consumption, it may seriously understate the gross exports of products of that industry. The model thus assumes that each industry taken over the whole nation produces a single homogeneous product;

assumes that the nation is self-sufficient which is not necessarily so. If a nation is a net exporter the base will be overstated. If the nation is a net importer the base will be understated. Both overestimations and underestimations of the base employment by this technique require some adjustment by the analyst.

Minimum Requirements: In this technique a large number of "similar" regions are selected. For each region the percentage of total employment or income distributed among the various industries is computed. The percentages attributed to each industry are then ranked by order of magnitude. The lowest ranked values for each industry then becomes a minimum requirements profile. The technique assumes that the smallest percentage is the minimum required by any of the regions to satisfy its own needs and therefore all employment in other regions above this percentage is considered as base export employment. This technique possesses all the weaknesses of the location quotient method.

Additionally, Richardson\(^8\) refers to criticism of the technique by Pratt, who points out that there is no objective reason why minima should make a better basis for reference than the average, which forms the basis of location quotient treatment. Pratt also suggests that manipulation of the level of disaggregation can yield almost any results the analyst would like to confirm.

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Regression Analysis: Mathur and Rosen applied econometric techniques rather than the location quotient method to estimate employment in the basic and non-basic sectors. They hypothesized that the basic employment in the region would be sensitive to changes in employment in the rest of the world (W). Therefore the portion of industrial employment in the region that is sensitive to employment in the rest of the world \( E_w \) would be the basic employment, while the portion directly insensitive to changes in the rest of the world employment would be non-basic. They therefore assumed for industry \( i \):

\[
E_r = B_{oi} + B_{li} E_w
\]

(3)

Where:
- \( E_r \) = total employment in the region
- \( B_{oi} \) = non-basic employment
- \( B_{li} E_w \) = basic employment

and:
- \( B_o \) and \( B_i \) are constants.

Estimating the above equation by ordinary least squares method (OLS), they obtained estimated coefficients \( B_{oi} \) and \( B_{li} \). In those industries where coefficients \( B_{oi} \) and
\( B_{li} \) are significant, Mathur and Rosen obtained the average estimated non-localized and localized employment in the \( i \)th industry. The average employment in \( i \)th industry \( (\bar{E}_R^i) \) is:

\[
\bar{E}_R^i = B_{oi} + B_{li} \bar{E}_W
\]  

(4)

Dividing both sides of (4) by \( \bar{E}_R^i \), Mathur and Rosen obtained two proportions \( B_{oi} \bar{E}_R^i \) and \( B_{li} \bar{E}_W \bar{E}_R^i \). The first expression represents the proportion of localized employment, and the second expression is the proportion of non-localized employment in the industry. The amount of estimated localized and non-localized employment is obtained by multiplying the respective proportions and actual employment of the respective industry. Summing these respective components across all the industries, the analysts obtained basic and non-basic employment totals. They felt that using the econometric technique rather than the location quotient technique rendered the economic base model a manageable and feasible method for estimating short-run impact effects.

Despite criticisms of the location quotient technique, it is currently the most common method used by practitioners. The method requires little data and analytical skill. It can be carried out quickly and effectively. Evidence of the inaccuracy of the technique, however, suggests that there is a need for further research and further testing of econometric techniques.
3. The methods of establishing the equation specification to estimate the relationship between basic and non-basic activities in the region vary (e.g. simple ratio, lease square, regression). The method adopted will affect the value of the multiplier.

For example, a simple ratio can be used to derive an employment multiplier by calculating the ratio of total employment to the basic employment. The base multiplier is thus:  

\[ \text{Base Multiplier} = \frac{\text{total employment}}{\text{basic employment}} \]

Because total employment is the sum of basic employment and non-basic employment, the formula can be written algebraically as:

\[ \text{Base Multiplier} = \frac{1}{1 - \frac{S}{R}} \frac{1}{B} \]

Where:  
- \( B \) = employment in the base sector  
- \( S \) = employment in the non-basic sector  
- \( R = B + S \) = total employment

Likewise, if the concern is solely with changes in the sectors due to an outside stimulus in the economy, the formula may be written as:

\[ \text{Base Multiplier} = \frac{R}{B} \]
4. The increase in final demand must be identified outside of the model.

5. Estimates of future impacts rest on present or past base ratios. Thus, the calculation of values for changes in the basic sector on the non-basic sector assumes that the relationship derived from section 3 above is constant. The assumption of a constant relationship gives this model a short-run value only.

However the analyst chooses to approach the above steps, his study may yield vastly different values of the multiplier. Lewis, in his critique of export base theory and multiplier estimation, states:

"Clearly, the availability of several alternatives in each step of the process suggests the possibility of a range of multiplier estimates... the predicted impacts of a given project will vary greatly simply by varying the way the multiplier is obtained." 10

C. Critique of the Economic Base Model

The economic base model has come under increasing criticism, both as an unrealistic theory of regional growth and as an inadequate income determination model. Some analysts have concluded that the concept of the export base is a short-run concept and, as such, may be fairly accurate.

Others suggest that deficiencies in the model are such that the export base model should not be used at all.

Theoretically, the model errs in identifying exports as the sole source of regional income change. As Charles Tiebout states:

"There is no reason to assume that exports are the sole or even the most important autonomous variable determining regional income. Such other items as business investment, government expenditures, and the volume of residential construction may be just as autonomous with respect to regional income as are exports." 11

Tiebout further points out that export volume is a function of regional size. Usually the boundaries of a region are suggested by the variables chosen by the analyst to study or are set by other considerations.

W. Cris Lewis12 furthers Tiebout's argument. He states that export base theory is deficient to the extent that


it fails to consider stimuli arising within the region from the consumer, business and government sectors. The theory implicitly assumes "the price elasticity of demand for commodities and labour to be zero, while the elasticity of the labour supply function is infinite". In other words, the focus of economic base theory on exports has led to the exclusion of such factors as labour input, technological progress and elimination of resource misallocation as sources of growth. Lewis argues that the development and growth of an industrial export base in a region is more likely a symptom of economic growth than a casual factor. The economic base model cannot identify the reason for an increase in export demand. Lewis suggests that base theory per se, with its emphasis on basic and non-basic activities in the regional economy, be largely dismissed from consideration.

Not all the literature, however, reflects Lewis' belief that economic base theory will eventually be excluded from serious economic analysis. Attention has been paid to improving the method of separating the basic and non-basic sectors of the economy; to developing techniques for identifying differential multipliers for distinct

13. Ibid., p. 16.
sectors of export activity\textsuperscript{14} and to the type of application for which the economic model is most suitable.\textsuperscript{15} Also, practical considerations of time and data constraints have led to the continued use of this model because of its relative simplicity.

The major problem with economic base analysis is the assumption of a constant base/service ratio over time. Estimates of future impacts rest on present or past base ratios when, in fact, new developments may bring radical structural changes to the economy. Structural change inevitably expresses itself in a much altered ratio. Equally serious is the assumption that export is the sole engine of growth in a regional economy and the assumption of a homogeneous export sector as well as the failure to allow for internal growth factors. The high degree of aggregation characteristic of this model reduces the value of its application.

\textsuperscript{14} See, for example, S. J. Weiss and E. C. Gooding, "Estimation of Differential Employment Multipliers in a Small Regional Economy", \textit{Land Economics}, 1968: 235-244. These authors use a partially disaggregated economic base multiplier model to estimate for distinct sectors of export activity.

\textsuperscript{15} See, for example, Daniel Garnick, "Differential Regional Multiplier Models", \textit{Journal of Regional Science}, Vol.10, No.1, 1970: 35-47. This author argues that where there are limited objectives in the study, economic base multipliers are cost effective alternatives to other multipliers if the region is small.
Economic base analysis can, however, be a useful tool in analysing small-scale regional economies such as resource communities which tend to be impacted by single "resource-exporting" industries and are characteristically simple in their economic structure.

III. INCOME-EXPENDITURE ANALYSIS

A. Overview

The income-expenditure model is an extension of traditional Keynesian income theory in which the income multiplier measures the change in personal household incomes attributable to an exogenous injection of expenditure into an economy. Much of the earlier work in regional income multipliers occurred in the United Kingdom because of increasing concern over regional disparities and the need to develop mitigating "regional" policies.16

The literature on regional income multipliers is somewhat sparse and most research can be seen, as Brownrigg17 points out, as a further development of the work of Archibald (minimum multiplier values); Brown and Steele (feedback effects from interregional trade); and Wilson (effects from leakages).


Archibald considered the limits within which regional multipliers were likely to be fixed, given certain sensible assumptions. The value of a "minimum" multiplier as analysed by Archibald would seem to be rather limited in practical analysis. He did, however, clarify the distinction between the impact of the initial expenditure and the generalized multiplier. He also demonstrated the initial leakages from different types of expenditures were applicable before any generalized multiplier was operationalized.

Brown documented the relationship between income and employment. Both Brown and Steele concentrated on modifications to the multiplier to include repercussions from interregional trade.18

Wilson broadened the concept of the simple multiplier as applied to the private sector and the public sector.19 He suggests that in many cases a rise in public investment can be expected to induce additional private investment as well as to raise consumption. Wilson also introduced the idea of interregional feedback in the private

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sector. Certain leakages such as taxes may not, according to Wilson, be independent of further feedback relationships with income. Both Wilson and Archibald argue that a gradual and prolonged rise in the level of income and expenditure associated with the growth of a new project, coupled with the inflow of immigrants, will induce a significant amount of additional in-migrant investment in the area.

Wilson suggests that the contribution of income-expenditure to regional policy issues has been minimal except in the area of economic impact analysis where the application of the model to smaller regional economies has been enlightening, particularly in regard to the importance of considering leakages in the impact analysis process.

B. The Structure of the Income-Expenditure Model
Like input-output and economic base, the income-expenditure model attempts to trace the monetary flows through a region once an injection into an economic system has occurred. The model divides economic activity into direct, indirect and induced categories. Direct activity is activity stimulated by an injection in the economy resulting from the presence of a new project or enterprise. Indirect activity is activity by firms in the region that sell inputs to or purchase outputs from the new enterprise. Induced
activity is attributed to consumption spending generated by wages and salaries of direct and indirect employees.

Regional income is increased by an amount greater than direct and indirect income because a portion of this income is spent locally and retained in the economy in the form of wages, salaries and profits. Likewise, a certain portion of these wages, salaries and profits will be spent locally, further increasing the regional income.

1. **The Conventional Model**: The income-expenditure model is based on the standard income multiplier form:

\[ \Delta Y_t = k_r J \]

Where: 
- \( Y_t \) is the total income generated in the regional economy, and
- \( J \) is the income (i.e. wages and salaries) generated directly by the operations of the impacting industry or injection,
- \( k_r \) is the multiplier.

The model assumes that the level of investment (I), government expenditure (G) and regional exports (X) will remain constant and autonomous. Allowances are made for the various leakages which occur during the multiplier process. A leakage is income lost to the regional economy through savings, non-local expenditures
and non-local taxation, all of which take money out of local circulation. The problem of undistributed profits is usually ignored. Brownrigg\textsuperscript{20} presents the following as the basic multiplier formulation toward which all income-expenditure studies move "despite differences in the approach taken":

$$k_r = \frac{1}{1-c (1-t_d-u) (1-m-t_i)}$$

(2)

Where: it is assumed that I, G and X remain constant as mentioned, and:

- \(c\) = the proportion of additional income consumed
- \(t_d\) = direct taxation
- \(u\) = decline in transfer payments with the rising level of regional income
- \(m\) = imported consumer goods
- \(t_i\) = indirect taxation.

2. Modifications to the Model: Brownrigg\textsuperscript{21} suggests that the first main modification to the conventional model concentrated on the problem of injection leakages, since it was pointed out that the injection itself was subject to leakages before undergoing multiplier expansion. For

\begin{itemize}
\item [20.] Brownrigg, "The Regional Income Multiplier: An Attempt to Complete the Model", p.282.
\item [21.] Ibid., p.283.
\end{itemize}
example, if the industrial structure of the region is such that capital goods must be purchased elsewhere, it is likely that the only part of the injection to pass to the multiplier would be the wages and salaries of the workers in the construction phase. The modified multiplicand would be expressed as:

$$\Delta Y_r = k_r J (1-m^*)$$  \hspace{1cm} (3)

Where:

- $\Delta Y_r$ = the change in total income generated in the regional economy
- $J$ = the injection
- $m^*$ = the direct leakage in imported capital goods
- $k_r$ = the multiplier.

A second main modification to the conventional model suggests that a similar injection leakage must be applied to the induced investment component. The argument is that as income and expenditure rise through the multiplier, some additional investment is likely to be induced, particularly if excess capacity is not present. If induced investment does occur, a further component is introduced into the multiplicand with considerable effects on regional income levels.

An attempt to include induced investment in the formulation of the multiplier model was made by Archibald.\footnote{Archibald, G.C., "Regional Multiplier Effects in the U.K.", Oxford Economic Papers, March 1967: p.37.}
Considering the case where all employees in a new project were immigrants to the region, he argued that investment would be induced by the immigrants' expenditure; where \( \Delta N \) represents the annual induced investment in both private and public sectors and \( \Delta Z \) represents the total earnings of immigrants, and where \( \Delta N \) is functionally related to \( \Delta Z \), then:

\[
\Delta N = n \Delta Z
\]  \hspace{1cm} (4)

Brownrigg suggests that Archibald's \( \Delta Z \) is identical to the injection \( J \) used in the conventional multiplier model so that the simple multiplicand can be elaborated to include induced investment as:

\[
\Delta Y_r = k_r \Delta Z + k_r \Delta N
\]  \hspace{1cm} (5)

which by substitution and rearrangement becomes:

\[
\Delta Y_r = k_r (1+n) \Delta Z
\]  \hspace{1cm} (6)

Brownrigg also suggests that in a more normal situation where there is some proportion of non-immigrants on the staff of the project then:

\[
\Delta Y_r = k_r J (1-m^*) + k_r \Delta N
\]  \hspace{1cm} (7)

and by substituting from equation (5):

\[
\Delta Y_r = k_r (J (1-m^*) + n \Delta Z)
\]  \hspace{1cm} (8)

23. Brownrigg, "The Regional Income Multiplier: An Attempt to Complete the Model", p.284. Brownrigg also explains that if \( \Delta N = n \Delta Z \), then \( n = \Delta N/\Delta Z \).
Brownrigg suggests that for most regional projects the J component of the multiplicand will have two elements: $J_1$ - the construction expenditure phase of the project, and $J_2$ - the operational expenditure phase of the project. The injection leakage modification is applied to the construction expenditure component. Thus equation (3) is rewritten as:

$$\Delta Y_r = k_r J_1 (1-m^*) + k_r J_2$$

or:

$$\Delta Y_r = k_r (J_1 (1-m^*) + J_2) \quad \text{(3)'}$$

The modification is also applied to the induced investment component. The model is thus restated:

$$\Delta Y_r = k_r J_1 (1-m^*) + k_r J_2 + k_r \Delta N (1-m^*)$$

which by substitution and rearrangement becomes:

$$\Delta Y_r = k_r (J_2 + (J_1 + n \Delta Z) (1-m^*)) \quad \text{(8)'}$$

The values for $J_1$, $J_2$ and $\Delta Z$ will depend upon the nature of each individual project. To derive a value for $n$, Brownrigg claims that if $\Delta N = n \Delta Z$, then $n = \Delta N / \Delta Z$. The value for $m^*$ is usually based on average national data because local data is not available. In the Archibald situation, $\Delta Z = J_2$. In a more normal situation, however, $\Delta Z$ will be a proportion of $J_2$. Varying with the dependence upon immigrant labour $\Delta Z = Z J_2$ therefore. Substituting this into the formulation of the model gives:

$$\Delta Y_r = k_r (J_1 (1-m^*) + J_2 (1+nZ(1-m^*))) \quad \text{(8)''}$$

Once the period of immigration to the project region has finished and the capital requirements of the immigrants

24. Induced investment as normally defined relates to the construction of additional capacity in the service sector.
have been met, $N$ will drop out of the multiplicand as would $J_1$, and the model would revert to the simple

$$Y = kJ^2.$$  \hspace{1cm} (10)

3. **Extension of the Model:** An extension of the simple regional income multiplier model was developed by Davis\textsuperscript{24} for a small-scale regional economy. In this model, local consumption expenditures are disposed of in a way peculiar to the individual tastes and preferences of the population. A certain portion of the income is spent on food, clothing, transportation, etc. In each of the expenditure categories part of the income is lost through leakages, part is taxed by the local government and the remainder stays in the local area in the form of wages and salaries. Successive rounds of expenditures are generated by the proportion of local consumption expenditures and local government expenditures that is captured locally.

The values of the model parameters were gathered from local, provincial and national data sources. Multiplier estimates were then constructed for a major northern city (Prince George), a smaller service centre type town (Kitimat), and a resource development community (Hat Creek). The multiplier values were found to be 1.35, 1.24 and

1.08 respectively. 

The model explicitly considers the contribution made by the local government sector. Provincial per capita grants increase with permanent additions to the region's population. Thus, leakages that have been identified as going to the provincial government will return in the form of a per capita grant through the local government sector. The model recognizes the separate components by which income may be disposed. It is thus possible to deal with transient groups such as construction workers who will leave the region after the construction phase of the project is finished. The consumption patterns of transients are likely to be extremely different from those of other immigrants and the already existing population.

C. Critique of the Income-Expenditure Model

The income-expenditure model is a useful tool in the analysis of small-scale regional economies. Income as a unit of measurement provides a more sensitive indicator of change in economic activity than does employment. Because the model is not tied to a base/service ratio, it can appropriately reflect the increased income in the

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25. For an elaboration of the assumptions of the Davis model and a mathematical representation of the multiplier, see: Ross Taylor "Northeast B.C. Community by Impact Study", Department of Municipal Affairs and Housing, 1978.
service sector. The model thus recognizes the possibility of increased income due to circumstances other than an increase in base employment.

The degree of disaggregation in the model allows greater detail in assigning induced impact to sectors of the local economy. The model is applicable to analyses of new activities in any sector of the economy, and is not therefore restricted to activities taking place in the base sector.

The most advantageous feature of the income-expenditure model, however, is the explicit recognition of leakages from the local economy. The model is less data demanding than is input-output analysis, but is more informative than the rather crude economic base method.

IV. INPUT-OUTPUT ANALYSIS

A. Overview

Input-output analysis is concerned with inter-industry transactions generated by the demand for final production. Basically, total production is divided by industry to derive an inter-industry matrix from which the flow of goods and services can be traced from one production sector to another.26

Preliminary research on the construction of an empirical input-output system was concluded in the 1930's. The model was a simple and elegant system developed by W. Leontief for which statistical information could be compiled with relative ease, and which brought many new insights into the interdependence of prices, outputs and incomes in differential sectors of the economy. Leontief's analysis attempted to retain the form of the general equilibrium models by recognizing the "interwoven web of economic interdependence while it purported to derive its content from empirical reality."

The model provides a format for examining the interdependent structure of an observable economy and offers the possibility of predicting the impact of any change in the data on the entire system.

The application of input-output analysis has spread rapidly. The family of input-output studies generally include:
1. studies applied to national economies;
2. studies on regional and multi-regional levels; and
3. sectoral or enterprise studies.

Other areas in which I-O has been applied recently are environmental protection, short-term forecasting and business cycle analysis.

B. The Structure of the Input-Output Model

Three basic versions of the input-output model emerged from the work of the 1940's and early 1950's: the open static model, the closed static model and the dynamic model. The closed static model has evolved into a partially closed model where the degree of closure is determined by the analyst, and the dynamic model which received a great deal of attention in the late 1950's and the 1960's, is of much less interest today.

The open static model has proved to be very useful in coping with a variety of economic problems. This model was applied first to regional input-output analysis and later as an analysis of the interdependencies of countries linked by trade flows. In this paper it is the application of input-output analysis to regional economies that is of prime concern.

"Input-Output deals with inter-industry transactions generated by the demand for final product." In the input-output table, total regional production is divided by industry to derive an inter-industry matrix from which the flow of goods and services can be traced from one production sector to another. The table can fulfill two separate functions:

1. It is a descriptive framework for showing the relationship between industries between inputs and outputs. As an account, input-output data breaks down the business sector into a large number of individual industries or sectors and records the transactions between sectors in an inter-industry transaction matrix. The matrix is designed to divide the structure of the economy into endogenous and exogenous sectors. The endogenous-exogenous distinction is revealed in the division of outputs into intermediate and final; and of inputs into intermediate and primary.

2. Given certain economic assumptions about the nature of production functions, I-O is an analytical tool for measuring the impact of autonomous disturbances on economic output and income.  

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29. Bendavid, Regional Economic Analysis for Practitioners, p.128.

There are three assumptions which are typically made in input-output analysis. These are:

1. The economy can be divided into a finite number of sectors, each of which produces a simple homogeneous product. Thus there are no joint products since each commodity is supplied by a single industry and via one method of production.

2. There are neither external economies nor diseconomies in production. The linear input function assumption means constant returns to scale and no substitution between inputs. Thus the system is in equilibrium at given prices. (The problem of capital is ignored in static versions of the input-output model by assuming that the supply of each good is perfectly elastic - no capacity constraints).

3. The level of output in each sector uniquely determines the quantity of each input which is purchased. This assumption means that the linear input coefficients remain constant over time and are thus the link between final demand and gross output.
The analysis requires three basic tables of information:

1. **The Transaction Table**
   This table contains basic data concerning flows of goods and services among suppliers and users during the study period. The flows are measured in (or converted to) money terms and are viewed as sales transactions between sellers and purchasers.

2. **The Table of Direct Requirements**
   This table is derived from the transaction table and shows direct requirements coefficients computed by dividing through each processing column of the transaction table by the total. For any estimated output direct input requirements can be computed by multiplying each of the coefficients for each applicable industry by the total output figure.

3. **The Total Requirements Table**
   This table is derived from the technical coefficients table and shows the total purchases of direct and indirect inputs that are required throughout the economy per unit of output delivered to final demand by any sector.
The first task of the analyst is therefore to divide the economy into various sectors. These sectors are usually categorized by an existing code - the Standard Industrial Classification Code - or a combination of convenient codes. Having broken the economy into sectors, the analyst is then interested in the relationships between these sectors in terms of sales and purchases of goods and service. In order to produce outputs both for intermediate and export sales, the sectors exchange goods and services with one another as well as outside the region. The analyst therefore identifies the endogenous and exogenous components of the regional economy. Information on the above is obtained through surveys, interviews and existing statistical data. Each scale
in the economy is recorded as intermediate or final. Since total inputs equal total outputs, a simple computation tells the analyst the distribution of inputs per unit of output for each sector of the economy. A technical production function relationship is therefore described between outputs and inputs.

Usually some sectors play a more significant role in the economy than others. Thus the isolation of interdependent relations in the economy provides a useful structural approach to understanding the working of the regional economy. Furthermore, the technical production function relationship or technical coefficients permit the analyst to calculate direct inputs required for any level of demand for the output of any processing industry.

However, the analyst is interested in more than the direct input requirements. He is also interested in those additional inputs required to produce the direct inputs; the indirect inputs. Basically, what emerges, is a pattern of successive rounds of spending and the output of each round serves as inputs for the round that is one step closer to the final product.

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To capture the effects of the rounds of respending necessary to produce intermediate and final demands (gross output), the analyst uses the Leontief inverse matrix. The inverse matrix is used to express gross output as a function of (exogenous) final demand, i.e. the matrix is post-multiplied by final demand in order to obtain the level of gross output for each industry.

C. Critique of the Input-Output Model

Input-output analysis is a useful tool for regional impact analysis because it recognizes that the total impact on income (output, employment) will vary according to which sector experiences the initial change in final demands. The model enables the analyst to derive sets of multipliers, and to estimate different types of multipliers depending on the information required, i.e. output, income or employment. The employment and income multipliers are not "uniquely determined but are governed by a degree of model closure". The model closure is determined by the allocation of sectors between the endogenous matrix and final demand. In other words, the analyst has a degree of freedom in determining for his own purposes which output will be applied to intermediate demand and which to final demand. The more

32. H. W. Richardson, Input-Output and Regional Economics, p.34.
the model is closed the higher the multipliers but
the base narrows through which exogenous output demands
impact the regional economy. Also, the higher the
multiplier the greater the interdependence of the
sector with the rest of the economy. 33

Input-output has become a useful analytical tool. The
model offers a form of regional social accounts with
built-in consistency checks. The strengths of the model
lie in its ability to:
1. measure the economic interdependence of the region's
   industrial structure;
2. provide a set of disaggregated multipliers that are
   more precise and sensitive than the aggregate
   Keynesian income multiplier;
3. calculate the effects on economic activity in
   individual regions of change in the level and pattern
   of national demand;
4. calculate the economic impacts of any changes in
   final demand; and
5. generate short-run projections.

However, there are some rather critical problems with the
model. The problems lie in both the practical constraint

33. Ibid., p.35.
of heavy data requirements and in the theoretical constraint of the model's operating assumptions. Intra-regional flows of goods and services are usually only obtainable via very costly and time consuming survey methods. Also, there are often difficulties on the part of the respondents in identifying endogenous and exogenous sales/purchase distinctions.

The assumption of no multi-product industries for theoretical purposes is valid in that it is reasonable to assume that an input-output sector consists of plants producing a single homogenous product with similar techniques. Empirically this means lumping together many separate activities into one sector which reduces the accuracy of the analysis and distorts somewhat the industrial structure presented in the analysis.

The emphasis on linear production relationships also leads to difficulties. The essence of the I-O model is the technological relationship upon which the purchase of any sector from any other sector with in the regional economy depends. This relationship is determined by the level of output required by the purchasing sector which is again determined by final demand. The linear production function is assumed to exist between sales, purchases and final demand. However, the notion of
a linear production function is not very meaningful in many non-industrial sectors such as agriculture, trade, services industries and the government sector. Furthermore, by assuming away factor substitution and economies of scale, the model can be quite misleading in identifying real structural changes within the economy. Finally, input-output cannot handle very well the effects of inter-regional trade where changes in one region in technology, output, prices, incomes, etc. significantly affect the region under study. Within the regional economy itself, the model is not equipped to explain or predict important structural changes such as entry of new firms or the obsolescence and disappearance of old ones. Again, the model can be misleading in its presentation of the structural composition of the regional economy.

Richardson\(^{34}\) argues for the model, however, as a tool for regional analysis. He suggests that the departure from reality of the assumptions was intended to reduce the variables in the model to sizeable proportions and the assumptions are not so far off as to render the model

\[^{34}\text{Ibid.}\]
itself meaningless. The assumption of the production function is not too bad when money values are used as a measure of physical purchases in real terms, since relative price changes do not distort too much the input purchase pattern per unit of output. He also suggests that the pace of technological change is slow enough that the assumptions contained in the model will hold at least in the short run.

Despite the heavy data requirements, the input-output model continues to be used extensively and is probably the best analytical tool for measuring the economic impact of developments in a fairly complex regional economy. Once the assumptions of the model are recognized and accepted, its significance is both descriptive: as a set of regional accounts, for triangulation, for observable interdependencies, etc., and analytical: to measure economic impacts, capacity utilization demands, price changes if the value added in all the sectors is exogenously determined, policy implications for fiscal measures, etc. Changes in technology can be incorporated into the model as these changes occur if their influence is thought to be significant in the economy. The model has been found to be a powerful, flexible and instructive tool which yields many insights into the workings of a regional economy.
V. CONCLUSION

Economic impact can be measured in several different ways. Which of these is appropriate will depend upon the purpose of the study, financial and temporal constraints and the availability of necessary data. Usually an economic impact study will be a component of a larger study and, as such, will contribute to development policy decisions. The three models presented in this work represent the mainstream of economic impact analysis research, but by no means do they cover the wide range of work done in this field.

The three models are conditional predictive models: the consequences of a specified external impact are predicted, given an otherwise undisturbed environment. Thus, all three models assume that the parameters of the model remain constant over the study period, i.e. economic base assumes a constant base/service activity ratio, input-output assumes constant expenditure patterns over time. Finally, all three models assume infinite elasticity of supply and that demand is the force of growth and change within the regional economy.

While the degree of sophistication in the models varies, each model has specific advantages and appropriate applicability. The economic base model is best used
to study the impact of changes on very simple regional economies. The categorization of all employment as either basic or non-basic is a gross simplification which does not apply in more complex regional economies but can be a useful way of considering resource communities and single-industry communities. The positive aspects of the economic base model are that data is generally available and costs to construct the model are low. The model suffers from a high degree of aggregation, but is useful to get a general understanding of the flows in a small regional economy.

Income-expenditure is also a highly aggregated model, but it offers the advantage of explicitly accounting for the various leakages from the regional economy (imports, savings, taxes and reductions in transfer payments). Also, income is a more sensitive unit of measurement than is employment. This model is most appropriately applied to small-scale economies where the inter-industry dependencies are easily identified, and in studies where a great deal of structural detail is not necessary. The model is simple to construct and consequently is not costly.

Input-output is appropriately applied only to economies which are sufficiently complex to warrant the modelling
of the economic interdependencies between the various sectors in the region. The model suffers from considerable construction costs and high data demands, the latter being the hardest problem to overcome. The positive aspects of this model are its in-depth presentation of the economic structure of the region, its level of detail, particularly in the presentation of disaggregated sectoral multipliers, and its wide range of usefulness aside from impact analysis. Input-output can present highly interdependent and very complex economies in a simple and logical manner. While it is the most complex and expensive of the three models, it is also the most informative, flexible and consequently useful of the three. However, it should be applied only in instances where such advantages are necessary to answer the study questions.
CHAPTER THREE
APPLICATION OF ECONOMIC IMPACT MODELS TO NON-PROFIT INSTITUTIONS

I. INTRODUCTION

The influence of any development on a regional economy may be marginal or quite considerable, depending upon such factors as the local industrial structure, the size of the project, and the extent to which the project stimulates local trade flows. An area of increasing interest to regional analysts is the economic impact of large-scale non-profit institutions on the regional economy. Many of these institutions (universities, colleges, trade and convention centres, military installations, recreation centres, hospitals and medical centres, etc.) account for substantial inter-regional export of services and constitute a significant source of employment and income to the local economy.

Wilson points out that in the past five to ten years an upsurge of interest in estimating the local economic impact of non-profit institutions has been sparked by increased community awareness of undesirable effects that these institutions have on the local area. Economic impact studies have become vehicles to promote some of

the positive attributes of non-profit institutions for the local area. While less quantifiable benefits are not easily translated into concrete measures, local employment, local income and local trade flows can be subjected to empirical examination. These, then, have become the focus of many recent studies on the economic impact of large-scale non-profit institutions on the local economy.

Brownrigg\(^2\) suggests that early studies in this area were primarily inventory studies which stated institutional employment as some specified percentage of total community employment, and institutional expenditure as some portion of local sales. More recent studies have attempted to measure the economic impact through the use of the models outlined in Chapter One. The purpose of this chapter is to consider a series of empirical studies which have utilized the three models, economic base, input-output and income-expenditure to measure the economic impact of similar types of non-profit institutions (universities). The relative merits of the methods chosen will be discussed in light of the advantages and disadvantages of the models described in Chapter One.

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Since practical applications of theoretical models require adjustments and modifications to suit actual regional conditions, the sectoral divisions in this chapter are meant only to aid the reader in distinguishing basic types of approaches. There tends to be an overlap between income-expenditure and economic base analysis, and the Wilson-Raymond and Wilson models could also fall into the income-expenditure section. They are kept in the economic base section because they assume that the university is part of the export sector.

II. ECONOMIC BASE STUDIES
Economic base theory has been used by many institutions to analyse development proposals and the potential economic impacts of growth. The main thrust of this approach when applied to universities is that a university is a part of the export or base sector. The theory assumes that the ratio of basic to service employment is a constant which provides the underpinning for a very simple multiplier determined by the ratio of total (basic and service) to basic employment or income.

Four studies are considered in detail in this section: a model developed by Caffrey and Isaacs and applied to Oakland University, Rochester, Michigan; a modification of the Caffrey-Isaacs model by Manning and Viscek to better suit a college complex and applied to the Metropolitan Community Colleges in Kansas City, Missouri; a considerably revised economic base model developed by Wilson and Raymond which attempts to correct for errors in both the base multipliers and in the local employment impact of student spending and applied to Kent State University; and a revision of the Wilson-Raymond model by Wilson and applied to the University of Tulsa.


5. Sherry Manning and David Viscek, "Measuring the Economic Impact of a Community College System".


A. The Caffrey-Isaacs Model

The purpose of this model is to design a generalized analytical framework which will enable almost any college or university to conduct a useful economic impact study for itself with a reasonable investment of resources.\(^8\) The study concerns itself only with the direct and indirect impacts related to the university on the immediate local environments — the businesses in the local communities, the local government, and the individuals who reside in those local communities. Estimates of direct impacts were obtained through existing data (i.e. university records, state and national statistics) and through simple surveys of the local business community and faculty and student population. Indirect impacts were determined through income and employment multipliers and by deriving a coefficient representing the degree to which local businesses purchase goods and services from local sources.

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The income multiplier used by the study team was 1.9.\(^9\)

The use of a single income multiplier such as the above for the entire community is problematic because the basic portion of the local economy may consist of a number of separate sectors with different expenditure patterns prevailing among the employees of each individual sector. If, in fact, the expenditure patterns of university employees are different from the rest of the community, e.g. a smaller percentage of the employees' total spending is done within the local economy, the multiplier may be significantly mistated.

The employment multiplier used by the study team ranged from 1.2 to 1.5, and was based on an area of approximately 50,000 (including student population) with employment in manufacturing averaging about 4% and in services and

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\(^9\) The income multiplier was derived by the following: The study assumed in the first round, 35 cents of a dollar spent in local business establishments by community residents is returned to the spenders as income. Approximately 65 cents is spent by local business establishments for materials and supplies for other local enterprises (including local taxes) or for goods and services produced outside the community (including non-local taxes). In the second round (after savings, taxes and leakages) on the average, 35 cents out of a dollar spent locally is returned in the form of income. This recycling process continues with diminishing increments at each stage. Eventually income received by local residents from the initial dollar spent totals approximately 66 cents. The ratio of total income, 66 cents, to the initial income received, 35 cents, is almost two to one, 1.9:1.0.
trade (including government and educational institutions), about 55% respectively, of total employment in the community. The study suggests that the multiplier estimates derived by Weiss and Gooding\textsuperscript{10} are acceptable in this case.

The Weiss-Gooding study, however, applied to only small-scale regional studies which rather severely limits the appropriateness of using these multipliers. Also, as Wilson and Raymond point out "in cases where the size of the university is not determined by the size of the local community, the multiplier will be overstated because some portion of the university employment will be defined as service if part of the school's enrolment consists of local residents".\textsuperscript{11} Also, the Caffrey-Isaacs' model may understate the university's impact because it ignores the import substitution effect of this service employment.


\textsuperscript{11} J. Holto Wilson and Richard Raymond, "The Economic Impact of a University Upon the Local Economy", p.431.
Total production requirements due to the presence of the university were analysed by developing a coefficient to represent the additional value of local production generated by one dollar spent by local households in local business establishments. The range of the coefficient was 15 to 30 cents per dollar of expenditures by local residents in local business establishments. Income-induced requirements per dollar of final demand were derived by considering households as business establishments carrying out transactions with other local business establishments. The range determined by the study was: 60 to 80 cents per dollar of expenditures by local residents in local business establishments.

B. The Manning-Viscek Model

The Manning Viscek model considerably modifies the local business section of the Caffrey-Isaacs model. The economic impact of a community college system differs from a university in that expenditures made in the local economy by students who already reside in the community will not be additional expenditures in the community attributable to enrolment in the community college.

The Manning-Viscek model includes three factors particularly important to a community college system:

1. It included expenditures by part-time students (usually completely excluded).
2. It analysed the extent of expenditures by students specifically attributable to the basic activities of the community college.

3. It isolated any difference in expenditure patterns of faculty and staff, based on income.

The major problem identified by Manning and Viscek in the Caffrey-Isaacs model was the assumption of similar expenditure patterns by all persons in all sectors. They attempted to overcome this problem by developing a model for estimating expenditure based on three income levels. The model uses income distributions for faculty and staff derived from payroll records of the institution and income distributions for students derived from student characteristic data usually available from the registrar's files. Expenditure patterns by income class were taken from the U.S. Department of Labour.

For example, expenditures for expenditure category $j$ computed for full-time faculty and staff are:

$$E_j = f \sum_{i=1}^{3} I_i e_{ij} N_i$$

Where:
- $E_j$ = total expenditures in category $j$
- $f$ = proportion of faculty residing locally
- $I_i$ = average income of group $i$
- $e_{ij}$ = proportion of income group $i$ spends for category $j$

\( N_i \) = number of faculty and staff in group \( i \)  
\( i \) = income category (low, moderate, upper income)  
\( j \) = expenditure category (rental housing, goods and services, etc.)

While the inclusion of part-time student expenditures and the differentiation in expenditure patterns by income class probably do more accurately reflect the impact of expenditures in the local economy, Manning and Visceck fail to deal with the more significant problem of using a highly aggregated multiplier. In fact, the multipliers for this study "were selected for guidelines originally presented by Caffrey and Isaacs and were based on a comparison of the Kansas City area to other metropolitan areas". 13

C. The Wilson-Raymond Model

Wilson and Raymond 14 describe both conceptual and statistical errors in the economic base method. The economic base multiplier is prone to errors of over or under estimation depending upon the relationship of the university to the local community. The use of a single multiplier for the entire community tends to mistate the multiplier because of different expenditure patterns in different sectors. To illustrate the latter problem, Wilson and Raymond obtained a multiplier of 1.82 for the Kent University, using standard base techniques.

13. Ibid., p.114
14. J. Holton Wilson and Richard Raymond, "The Economic Impact of a University Upon the Local Economy", p.130
The study team then estimated a local multiplier by using a local value added approach, based on spending emanating specifically from the university sector. This multiplier was estimated to be 1.09.

The Wilson-Raymond model recognized that the primary source of error in economic base analysis is in specifying the appropriate multiplier. They argue that the conventional multiplier, being the weighted average of the appropriate multipliers for each of the basic employment sectors, overstates the size of the multiplier effect because the university community in most cases has a lower propensity to consume locally than the community at large. By introducing expenditure categories and identifying the university faculty and staff expenditure patterns, Wilson and Raymond disaggregated the marginal propensity to consume locally produced goods and services by the university personnel, and thereby considerably lowered the multiplier value and subsequent impact on the local community. They felt that a disaggregated approach gave a more realistic multiplier value to the induced impact analysis.\textsuperscript{15} The study assumes that the university is a part of the base sector of the community.

To reach the multiplier, the study team:

1. determined from survey data the percentage of total

\textsuperscript{15} J. Holton Wilson and Richard Raymond, "The Economic Impact of a University Upon the Local Economy", p.137.
university spending which occurred locally for each category of expenditure ($a_i$); and

2. obtained estimates of the payroll to sales ratio for each category ($b_i$). (This is the proxy for local value added.)

Thus, if total university spending was $X$ dollars, then $a_i X$ dollars would be spent in category $i$ within the local economy, and $b_i a_i X$ dollars of local value added would be generated in category $i$. The following computation was then applied:

$$Z = b_1 a_1 X + b_2 a_2 X + b_3 a_3 X + \ldots + b_n a_n X,$$

where:

- $Z$ = the total dollar amount of first round spending remaining in the local economy
- $X$ = total university spending in category $i$
- $b_i$ = sales/payroll ratios in category $i$
- $a_i$ = percentage of $X$ spent locally in category $i$

Then: dividing both sides of expression (3) by $X$, Wilson and Raymond obtained the proportion of first round spending which stays in the local economy ($\mathcal{E} b_i a_i$). Since $\mathcal{E} b_i a_i$ is the product of two $n$-dimensioned vectors, it is a scalar (denoted) as $m$.

The total local impact $T$ of $x$ dollars of expenditure by the university community is:

$$T = x + mx + m^2 x + m^3 x + \ldots + m^n x,$$

or

$$T = \frac{x}{1-m}, \text{ for } 0 \leq m < 1$$
The local multiplier is \( M = \frac{1}{1-m} \) \( (5) \)

The local multiplier for the Kent State University sector determined by the study team was:

\[
M = \frac{1}{1-m} = \frac{1}{1-0.083} = 1.09 \quad (6)
\]

This multiplier, as Wilson and Raymond admit, is based on the assumption that the propensity to spend locally and the distribution of expenditures are the same for both service sector of the local population and the university sector. "If this is true, \( m \) is constant through successive rounds of spending. If, however, \( m \) is different for the service sector the size of the multiplier will be affected."\(^{16}\)

As the authors suggest, the multiplier for the university sector is not theoretically inconsistent with a community-wide multiplier of 1.82, but the choice between the two is extremely important when the total impact of the university is at issue. "A multiplier of 1.09 gives a total university employment impact of 3359, whereas a 1.82 multiplier yields a figure of 5609."\(^{17}\)

\(^{16}\) J. Holton Wilson and Richard Raymond, "The Economic Impact of a University Upon the Local Community", p.138.

\(^{17}\) Ibid., p.139
Wilson later criticized a study by Moore and Sufrin\textsuperscript{18} because they used an aggregated regional trade multiplier in their study of Syracuse University. Moore and Sufrin argued with Wilson that categorizing local consumption is only relevant in the first round of spending in the local community. Subsequent rounds of expenditure spill over into other subsectors, whose income recipients may also have varying marginal propensities to consume locally. They felt that:

1. there is no evidence to support the Wilson-Raymond contention that there is a significant differential in the propensity to consume locally produced goods and services among the employees of the university; and
2. the Wilson-Raymond disaggregation holds an unrealistic assumption that subsequent rounds of expenditure are isolated in or restricted to the initial subsector in which the income entered the region.

D. The Wilson Model

Wilson\textsuperscript{19} later presented a revision of the original Wilson-Raymond model as a result of the Wilson-Moore-Sufrin discussion. In the revised model, Wilson attempted to incorporate spending dissimilarities. He calculated three possible

\textsuperscript{18} Craig L. Moore and Sidney C. Sufrin, "The Impact of a Non-Profit Institution on Regional Incomes", \textit{Growth and Change}, January 1974: 36-40.

multipliers, $K_1$, $K_2$ and $K_3$ where $K_1$ is the original Wilson-Raymond multiplier demonstrated earlier, $K_2$ is based on the spending characteristics and local value added of businesses of the other end of that spending, and $K_3$ is an integration of $K_1$ and $K_2$.

In the $K_3$ multiplier, the first round effects of the spending unit being investigated (the university facility and staff) are included and in subsequent rounds, the local community's expenditure patterns are taken into account.

The critical factor in determining the differences between the multipliers is the difference in the rate of leakage in the sector being studied and the local economy. Wilson states that particular spending characteristics of the constituents of the activity being analysed should be combined with the structural character of the local economy, and it would not be sufficient to use the spending characteristics of the university nor of the community without combining the two.

The economic base approach is appealingly simple. However, errors in the technique lead to theoretical and practical problems in its application. In identifying the university as part of the export base, errors occur since much of the "output" of the university is consumed locally. Different expenditure patterns suggest that aggregate expenditure
figures may distort the analysis. The use of more detailed expenditure categories indicates a need to better incorporate leakages and the possible use of inter-regional trade multipliers. The inability to measure import substitutions is a serious problem with this method, particularly with studies like universities whose personnel and student expenditures tend to be very service-oriented.

Finally, there exists in such analysis the problems of aggregation and of the assumption of stability of the ratio between sectors over time in face of changing technology and import substitution.

III. INCOME-EXPENDITURE STUDIES

The criticisms of the economic base method lead many analysts to consider the regional income multiplier model a more appropriate approach to analysing the impact of a university on the regional economy. The impact of a university will depend on its impact on employment, both direct and indirect; while direct employment will be governed by the labour requirements of the university, the amount of indirect employment generated will depend upon the income received and spent within the regional economy by those directly employed. The critical impact, therefore, is the income injected into the local economy by the university, together with its subsequent expenditure. The regional income multiplier model is well suited to this type of analysis. This section
considers in detail a study by Mark Brownrigg.  

Brownrigg's study has two main objectives. The first is to provide estimates of the economic impact of a new university on the local economy of Stirling. The study area is a subregion with a population of 92,800 people. The second objective is to show how the regional multiplier approach offers a relatively simple but workable means of assessing quickly the main aspects of the economic impact of a new project.

The model developed by Brownrigg contains three main modifications to the conventional application of the model:

1. It suggests that the economic base used for the model should be a subregion rather than an established administrative region, because it felt that the economic impact of most projects will be concentrated on the former.

2. It recognizes the effects of immigration on the multiplier process. It is felt that the conventional model, by missing the income/employment interactions of immigration, would understate the economic effects of the project.

3. It also recognizes the effects of in-migration inflow in the formulation of the multiplicand.


21. Ibid., p.110
Brownrigg suggests that in order to estimate the impact of the new project on local income levels, it is necessary to distinguish between sources of income generation which constitute the initial injection into the economy (the multiplicant) and the process of income generation (the multiplier). Employment estimates are established consisting of both direct employment in the project and indirect employment generated in the secondary growth. Indirect employment is calculated from the income generation figures. Knowing the estimates for direct and indirect employment, and given the nature of the project and its secondary growth, the study then considers the extent to which staffing needs are met from local and outside resources. Non-local labour supply determines the number of in-migrants which then provide the data from which estimates can be made of adult and child dependents. "The number of immigrants and their dependents represent the impact of the project on the local population." 22

Brownrigg's study was a comprehensive analysis which includes a study of the existing industrial structure and employment characteristics of the region. By analysing the repercussions of the changing industrial structure as measured in the unemployment statistics for the study period, he was able to make a rough analysis of the state of the local labour market. (Analysis of past unemployment trends will show if any

22. Ibid., p.111.
significant surplus or deficit of labour existed in the area). He concluded that there was not any real or lasting surplus of labour supply over labour demand and that there was an evident swing toward employment in the service sector over the study period. This was an important factor in determining the type of modifications necessary to the regional multiplier, (i.e. inclusion of the immigrant feedback) later on in the study. Projections were also done of the study area population.

Employment projections in the study area were done by examining past trends of local growth and decline by industry in employment terms and comparing these to national performance in the same industries over the period in question. National employment projections were then applied to the local industrial structure and corrected for local divergence from the national pattern as observed in the past.

A. The Brownrigg Model

Given an understanding of local population and employment characteristics, and the changing industrial structure of the region, Brownrigg then developed the regional income multiplier model. His starting point was the broad agreement by analysts on the value for the multiplier $k_r$ as described in Chapter II p.

He then focused attention on adjustments to the formulation of the multiplicand. In view of the relatively small economic
base of the study area, it was argued that it is unlikely to cause or receive significant repercussions from inter-regional trade. The feedback effects from this source are therefore ignored. The Wilson leakage modification, on the other hand, was considered essential to the model as was a modification to include a feedback effect from induced investment.

Brownrigg brought together the Wilson-Archibald modifications in the context of a "more normal situation where there is some proportion of non-immigrants on the staff of the new project, (i.e. $\Delta Z < J$)." 23

Because the construction phase of the university was to be spread over a period of fourteen years, Brownrigg felt that it was essential to include the construction expenditure and leakage involved in setting up and equipping the project. A similar injection leakage is applied to the induced investment component since capacity utilization is assumed to be maximized before the project is introduced. The basic model used by Brownrigg to estimate the effect of the new university on regional income is:

$$\Delta Y_r = k_r \left[ J_1 (1-m^*) + J_2 (1 + nz (1-m^*)) \right]^{24}$$

---


Brownrigg generalizes his model using the basic formulation:

$$\Delta y_r = k_r (J_1 + J_2 + J_3 + \ldots + J_n)$$

to include, for any given project, all significant sources of income generation, so long as these are stated net of all leakages from the region and deductions are made to avoid double counting.

The values for $m^*$, $n$ and $z$ have been stated as 0.75, 2.4, and 0.09 respectively. A specific value for the multiplier $k_r$ can be set for any given region, provided that all the coefficients of the multiplier can be estimated for that region. However, Brownrigg suggests that in most cases it should be sufficiently accurate to use a range of probable multiplier values. He suggests that such a range could be set from a lower multiplier value of 1.30 to an upper multiplier value of 1.45 unless exceptional circumstances exist. The $J$ values were taken from existing data and project requirements information; ($J_1$ = the annual expenditure on construction work on the university campus for year $X$; $J_2$ = the annual total income figure for year $X$ of all income of staff and students), as was the $\Delta z$ value, which is the annual earnings of immigrants to the University in year $X$.

Brownrigg then analysed the effect of the university on local employment. The overall impact of the new university on

25. Ibid., p.69.

26. Brownrigg used the multiplier values for $k_r$ derived by Brown and Grieg in their studies.
employment levels in the local economy is made up of different employment in university staff, maintenance staff, and staff in the service sector within the university itself. Indirect employment in construction and in the local economy for the year X is estimated in the following way:

1. Construction employment is estimated by taking 30% of the total cost of construction to represent wages paid to construction workers. Average earnings of construction workers were then divided into the total wage figure to arrive at the number of construction workers required.

2. Indirect employment in the local economy is estimated through an employment multiplier model developed by Grieg. The model estimates total direct employment in two stages: firstly, it estimates indirect employment arising from the first round of expenditure ($\Delta E_a$), then adds to this an estimate of indirect employment generated by the second and subsequent expenditure rounds ($\Delta E_b$).

Indirect employment, in the first round of expenditure ($\Delta E_a$) is made up of:

1. additional public service employees needed by the new direct employees ($E_{d\theta}$);

2. additional employees in the private sector ($\Delta V$); and

3. the additional public service employees required by (2): ($\Delta V \cdot \theta$), so that:

\[ \Delta E_a = E_d \theta + \Delta V (1 + \theta) \]  

(1)

Where:  \( \Delta E_a \) = indirect employment generated in the first round of expenditure

\[ E_d = \text{direct employment} \]

\[ \theta = \text{ratio of public service to other employees} \]

\[ V = \text{additional local value added from expenditure of direct employees' incomes} \]

\[ \ell = \text{income needed to create an additional job} \]

Induced employment in the second and subsequent rounds of expenditure (\( \Delta E_b \)), is estimated from taking the additional income from these stages of the multiplier, \((E_d w_d (k_a - 1) (k_b - 1))\), and dividing this by an income figure reflecting the additional income needed to create an additional job in the private \((l)\) and public \((W_p)\) sectors, so that:

\[ \Delta E_b = \frac{E_d w_d (k_a - 1) (k_b - 1)}{\ell (1 - \theta_1) + w_p \theta_1} \]  

(2)

Where:  \( E_b \) = induced employment generated in the second and subsequent round of expenditure

\[ E_d w_d = \text{income of direct employees} \]

\[ k_a = \text{first round multiplier} \]

\[ k_b = \text{second and other rounds multiplier} \]

\[ w_p = \text{average wage in public service}. \]

The model is written thus:

\[ \Delta E_i = \Delta E_a + \Delta E_b, \text{ or} \]  

(3)

\[ \Delta E_1 = E_d \theta + \Delta V (1 + \theta) + \frac{E_d w_d (k_a - 1) (k_b - 1)}{\ell (1 - \theta_1) + w_p \theta_1} \]  

(4)
Where: \( \Delta E_1 \) = total indirect employment.

Brownrigg actually modified Grieg's model to better suit a university situation. By using lower multiplier estimate using the Brown value for \( k_r \), Brownrigg eliminated the link between income and employment in public services. This involved discarding the ratios \( \Theta \) and \( \Theta_1 \) and also \( w_p \). He also used a modified formulation for \( \Delta V \) so that:

\[
\Delta V = E_d w_d (1-s-t) (1-m)
\]

(5)

Where: 
- \( s \) = average propensity to save
- \( t \) = average propensity to tax
- \( m \) = average propensity to import

By substitution and rearrangement, then, Brownrigg's model using the Brown \( k_r \), becomes:

\[
\Delta E_1 = E_d w_d (1-s-t) (1-m) + \frac{(k_a-1)(k_b-1)}{(k_r-1)}
\]

(6)

Where: 
- \( k_a = 1.35 \)
- \( k_b = 1.25 \).

When applying the upper multiplier value, Brownrigg used the Grieg value for \( k_r \) so that in the context of employment the full Grieg formulation with its additional boost from public sector employment was used as in equation (4). Some modifications were necessary because students were defined as part of direct employment in the university model. This direct employment differs in nature from the \( E_d \) figure used by Grieg "in that the students have a much lower level of expenditure, a much smaller household size background than
the typical direct employee, and normally use public service facilities for only part of the year."²⁸

Brownrigg estimated a rough income equivalent of four students to one normal direct employee: $E_d^1$. Brownrigg estimated additional local value added from expenditure of direct employees' concerns, $\Delta V$, to be the same as the Grieg formulation, $\Delta V = E_d w_d V$. His upper multiplier value model was therefore:

$$\Delta E_i = E_d^1 + E_d w_d V (1+\Theta) + E_d w_d (k_a - 1) (k_b - 1) \frac{1}{\lambda (1-\Theta) + w_d \Theta}$$

Where: $k_a = 1.40$
and: $k_b = 1.35$

Finally, Brownrigg attempted to relate indirect employment to various sectors of the industrial structure of the region. He made two basic assumptions:

1. that the pattern of indirect employment generally will follow the expenditure pattern of university incomes;
and

2. that this expenditure pattern will be similar to that estimated for Scotland as a whole over the study period. The similarity of indirect employment and expenditure patterns will only occur if capacity in all expenditure sections is already fully utilized and if the relationship

between employment, productivity and expenditure is the same for all sections.

Brownrigg argues that the main economic questions raised by an economic impact study can be answered by the type of multiplier constructed in the model. The advantages offered by this approach are modest data requirements, relative simplicity and speed of operation. The model has, however, some problems. The first is the assumption of maximum capacity utilization. This assumption is critical because only in such a situation is the generation of additional employment for existing capacity and induced investment in capacity extension likely. If the university were built where there exists a considerable degree of underutilized capacity in both labour and capital, it would be difficult to estimate clearly the full income and employment effects of the project. The capacity utilization assumption is not restricted solely to the income-expenditure model.

The second problem with the model is again a problem not solely related to this type of analysis, that is, the problem of timing in the multiplier process. Brownrigg points out that "even assuming a reasonable degree of capacity utilization, it is difficult to estimate how quickly the various multiplier lags will operate, and the income, expenditure, employment generation and income cycle will be completed." Likewise, it is difficult to estimate how quickly construction on the
project and an induced investment will take effect on income levels, or for how long after its completion it will continue to influence incomes.\(^\text{29}\).

Two other problems arise in this type of analysis. Firstly, the assumption of stable coefficients over time – a problem common to all impact analysis models – makes the analysis less than satisfactory over the long term. And secondly, the recognized need to be able to see the project within the context of the whole structure of the regional economy suggests that the model is not, in fact, suited to more complex economies. Structural analysis of complex economies is best accomplished by input-output tables. Because Brownrigg's subregion is small, the analyst can probably draw a fairly accurate picture of the economic structure (recognizing "other world" constraints), but his dependence on national unemployment statistics is rather tenuous. The dependence on aggregated data sources is a continuing problem throughout Brownrigg's study.

IV. INPUT-OUTPUT STUDIES

The need for a more detailed framework against which the impact of a new project can be measured has been widely recognized. As Moore and Sufrin point out, the only way to trace the total impact of both direct and indirect income

\(^{29}\). Ibid., p.112
and employment, is through the use of input-output analysis. Furthermore, the only way to analyse in depth the economic structure of the region is through input-output analysis. Nevertheless, the expenditure of effort and time due to problems of data availability, collection and processing, have tended to preclude this type of analysis from the budget of non-profit institutions. Even when constructed, the models are open to criticism on the set of industries chosen, the data used and the accuracy and stability of the coefficients which have been calculated.

A. The Blake and McDowall Model

A study by Blake and McDowall in the Burgh of St. Andrews in Scotland, provides some interesting insights into the input-output approach. The study was not an impact analysis of some future development, but a study of the relative impact on St. Andrews of its two main industries: tourism and the university. The model developed was an "open" model wherein the economy is divided into internal and external sectors, with only the former self-balancing. The Burgh is the lowest unit of political control in Scotland, and


St. Andrews' population was only 10,000. Therefore, the study ignored any feedback from imports or exports as part of the adjustment of outputs to a change in external demand. Households were included as an internal sector.

Because they conceived their transaction table as an account of resident economic agents functioning as both producers and consumers in their relationship with each other and the rest of the world, Blake and McDowall drew no fundamental distinction between intermediate and final goods or services, i.e. they dealt only with locally produced and/or processed goods and services, which were actually less than one half of the absorption of local outputs of goods and services. The study team also classified tourism and the university as "outside" the town's economy, although they treated hotels (whose raison d'etre is to provide tourist accommodation) and the households of the specially qualified people (largely migrant) who teach in the university, as natural parts of the domestic economy.

A method of successive approximation was used to refine the sectoral totals to better reflect the unique characteristics of this particular area. The following Table I represents the inter-sectoral flows identified by the study team.

As the table shows, there are twelve internal sectors whose mutual transactions represent the structural interdependence...
of the community. In addition, there are columns for "injections" into the town of demand from outside sources (outside employers, outside buyers, unrequited receipts, tourism and the university); and rows for leakage out of the study region to external recipients, (outside employees, outside suppliers, unrequited payments).

Table 1

Transaction Table for the Burgh of St. Andrews (1965) (in '000's)

(see following page)

33. Ibid., p. 236.
From the table itself, Blake and McDowall could draw the following inferences:

1. Occupations can be ranked according to their contribution toward total earned incomes paid directly to St. Andrews' households.  

<table>
<thead>
<tr>
<th>Per Cent.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>University</td>
<td>26.5</td>
</tr>
<tr>
<td>Banking, etc.</td>
<td>14.5</td>
</tr>
<tr>
<td>Distributive Trades</td>
<td>14.5</td>
</tr>
<tr>
<td>Outside Employment</td>
<td>13.0</td>
</tr>
<tr>
<td>Hotels and Catering</td>
<td>7.5</td>
</tr>
<tr>
<td>Construction</td>
<td>6.0</td>
</tr>
<tr>
<td>Other Services</td>
<td>5.5</td>
</tr>
<tr>
<td>Garages</td>
<td>4.0</td>
</tr>
<tr>
<td>Manufacture</td>
<td>3.0</td>
</tr>
<tr>
<td>All Other</td>
<td>5.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100.0</td>
</tr>
</tbody>
</table>

2. The "value added" figure for each internal sector can be computed:  

34. Ibid., p.230.

35. Ibid., p.231
<table>
<thead>
<tr>
<th>Sector</th>
<th>'000's</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distributive Trades</td>
<td>827.0</td>
</tr>
<tr>
<td>Banking, etc.</td>
<td>584.5</td>
</tr>
<tr>
<td>Hotels and Catering</td>
<td>309.5</td>
</tr>
<tr>
<td>Other Services</td>
<td>220.0</td>
</tr>
<tr>
<td>Construction</td>
<td>214.5</td>
</tr>
<tr>
<td>Garages</td>
<td>181.0</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>138.5</td>
</tr>
<tr>
<td>Town Council</td>
<td>80.0</td>
</tr>
</tbody>
</table>

(This figure cannot be compared with a local GDP, although Blake and McDowall's calculation is based on approximate GDP of 2,750,000, the estimate is not dependable.)

3. A local "balance of trade" can be abstracted

| Import of Goods and Services | 4,719,500 |
| Export of Goods and Services |          |
| (inc. sales to university and tourism) | 5,350,500 |

Balance + 631,000.

While the value of 1 and 2 is evident in their demonstration of the relative importance of various sectors of the St. Andrews economy, both in terms of income and value added, the value of 3 is somewhat questionable, given the size of the region and the dependence of the university on federal

36. Ibid., p.231.
funding. Clearly the transaction table does offer a picture of the internal workings of the St. Andrews economy and of the leakages which are affecting the stability of that economy.

In considering the impact of tourism and the university, however, indirect as well as direct effects must be calculated, either by deriving input-output coefficients from the transaction table and computing the effects of successive rounds of spending through the system, or by inverting the matrix and multiplying each component in the sector by the corresponding component in each row of the inverse. The matrix method was used by Blake and McDowall to establish the overall impact of these sectors on household incomes.

While the direct expenditure totals as shown in Table I are very similar for tourism (1259.0) and the university (1390.0), the combined direct and indirect household income attributable to tourism was found to be 425,400 (roughly $1,063,500.0 in Canadian dollars), and the combined direct and indirect household income attributable to the university was found to be 1,197,500 (roughly $2,993,750.0 in Canadian dollars). 1 of university expenditure generated 16/11d. of household income and 1 of tourism expenditure generated 6/9d. Thus, the university multiplier was approximately 1.8, while the tourism multiplier was approximately 1.34.
The study did not analyse direct and indirect employment generation. Nor was it able to consider occupational distribution. The latter two were not considered due to a lack of available data.

The Blake-McDowall study has some problems quite apart from the standard criticisms of the input-output approach mentioned earlier. It is the feeling of this writer that the region itself was not appropriate for input-output because of its size. The study team itself points out that "linear production and consumption functions just do not carry much plausibility when related to the facts of economic life on such a small scale."\(^{37}\) At the scale of St. Andrews, even small changes in the economic structure reverberate through the economy rather quickly. The dependence on government funding for the university creates a very volatile economic situation, subject to federal budget allocations which can change significantly from year to year. The interdependence of the two sectors in question, particularly tourism, suggests considerable mutual interaction. It is possible that without the university, tourism would not be a viable industry, (the university provides accommodation, etc.). The model does not consider capacity constraints. Finally, the model assumes that the consumption-expenditure pattern throughout the population

\(^{37}\) Ibid., p.233.
is homogenous - a highly unlikely assumption given that the two main employers in the region generate quite different income levels.

The study does, however, present a useful illustration of the economic structure of the St. Andrews economy and does show that while the expenditures of the two sectors are very similar, the actual impact of the two are significantly different. Income-expenditure would probably have been a less costly and equally as effective method to use in this case. Unless tables are available, input-output is better suited to larger regions and more complex economies.

V. CONCLUSION

The series of studies reviewed in the previous sections are practical applications of economic impact methodologies. They are not directly comparable, but they do demonstrate the advantages and limitations of the three approaches. It is increasingly clear that the type of model chosen should be determined not only by budget and time constraints, but also according to the size of region, the economic complexities involved, the data availability and the exact nature of the questions being asked in the impact analysis.

It is the opinion of this writer that the disadvantages of the economic base model (the arbitrary dichotomy
between base and service sectors, the tendency to regard the university as solely part of the base sector, the use of highly aggregated multipliers, the inability to identify backward leakages and import substitutions, as well as the assumption of a constant base-service ratio) would suggest that this model be disregarded despite the advantages of simplicity and data availability. The model is simply too crude for the types of non-profit institutional developments that would be of concern.

Income-expenditure, on the other hand, is also relatively simple and does not suffer from data availability constraints. This model, as Brownrigg demonstrated, has the important advantage of being able to identify leakages from the regional economy, and to estimate indirect and induced impacts on regional incomes resulting from an injection into the local economy. If the multiplicand is carefully quantified, the income-expenditure multiplier is comparable to smaller input-output studies and is more realistic than the economic base multipliers. This model has the added advantage of being less costly to construct than the input-output models. It does not, however, offer any insights into the structural interdependencies of the regional economy, and it is dependent upon the ability of the analyst to adjust aggregated data to reflect local conditions without (possibly) a thorough knowledge of the industrial structure of the region.
The disadvantages of income-expenditure are for the most part overcome by input-output analysis, which presents a detailed representation of the economic structure of the region. This approach allows for analysis of the production and distribution characteristics of the main industries of the region, as well as their trading inter-relationships between each other and with other regions. The Blake-McDowall study presented a matrix which allowed them to analyse the component sectors of the industrial structure in relation to each other. Their study is a simple demonstration of what the input-output model offers if the problem of data availability, collection and processing can be overcome. It clearly has the advantage of in-depth analysis with disaggregated multipliers which allows for a closer scrutiny of the impact of a project on various sectors.

Assumptions of maximum capacity utilization, assumptions in the timing of the multiplier process and stability assumptions, are all problems common to the three models and, consequently, must be recognized in all economic impact analysis.
CHAPTER FOUR

CASE STUDY OF A LARGE-SCALE
NON-PROFIT INSTITUTION

I. INTRODUCTION

The studies cited in Chapter III are illustrative of economic impact analyses applied to non-profit institutions which are producing homogeneous products (i.e. education) and all aspects of the institution are oriented to the production of that product. In many cases, however, large-scale non-profit institutions are not, in fact, single entities but a complex of interrelated agencies involving many different activities and producing quite different products. The following is a case study of the economic impact of a large-scale non-profit institution composed of many different agencies producing many different products. The study describes the institution chosen for analysis - the Pacific National Exhibition, explains the model chosen and the perceived advantages of using that model - the Metropolitan Vancouver Input-Output Model, outlines the study methodology and summarizes the conclusions of the study.

II. OVERVIEW OF THE PACIFIC NATIONAL EXHIBITION STUDY

The Pacific National Exhibition (PNE) was established by an Order-in-Council in 1908 as a non-profit society with lands set aside in a Crown trust and a mandate
to manage those lands for the enjoyment and recreation of the public of British Columbia. The Society is governed by a sixteen-person board of directors. The original activity of the Society was a large yearly exhibition. Through the years, however, the PNE has expanded its own activities and has become the landlord of several other agents, some of which are also non-profit societies and some of which are private enterprises.

The objective of this study is to analyse the economic impact of the PNE with all its interrelated activities (referred to as the PNE Complex) in the greater Vancouver area. The study methodology consists of developing a data base from which could be analysed the direct and indirect impact of the PNE Complex on employment, payrolls and sales by sector in the local economy. Direct impacts are those jobs, incomes and sales by sector directly attributable to the various components of the PNE Complex. Since increased production is needed in various sectors of the lower mainland economy to support the direct purchases of the PNE Complex, successive rounds of spending and respending occur to produce inputs necessary to the Complex. Employment is created by this increase in production requirements, and consequently there is an increase in household consumption. These
additional activities, which occur due to the presence of the PNE Complex, are called the indirect impacts. The assumption for the purpose of this analysis was that should the PNE Complex not exist, these indirect activities would not exist. To the extent that in fact other activities would take the place of the PNE, this assumption overstates the impact of the PNE Complex.

The Complex itself consists of five major components, categorized primarily by the type of activity involved. The five components are:
1. The Pacific National Exhibition Society (including property management and a 17-day Fair);
2. sports activities (professional and otherwise);
3. the midway and related services;
4. the racetrack; and
5. trade/consumer and other shows.

The indicators used to gauge the economic impacts of the PNE Complex are:
1. the total number of man-years of work directly and indirectly related to the PNE Complex;
2. the total payrolls supporting employment directly and indirectly related to the PNE Complex; and
3. the total sales generated through activities related to the PNE Complex.

These indicators were further broken down by the following:
1. types of jobs generated in selected sectors;
2. age categories of persons employed by the PNE; and
3. percentage breakdown by major industrial sectors of impacts generated.

The base year chosen for the study was 1977.

III. DESCRIPTION OF THE MODEL CHOSEN FOR THE IMPACT STUDY

Because the PNE Complex contains a variety of very different agencies with different expenditure and employment patterns, and because the lower mainland economy is a very complex and interdependent economy, input-output analysis was felt to be the most appropriate model to use in this study. An existing model, the Metropolitan Vancouver Input-Output Model,¹ had already been developed and was available for the purposes of this study. The model was developed in 1972 under the joint auspices of the Faculty of Commerce, U.B.C. and the Vancouver Board of Trade. The study area was

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equivalent to the Vancouver Census Metropolitan Area (CMA) with an approximate population of 1.5 million. The delimitation of the study area made it possible to use 1971 census data corresponding to the same area.

While Brownrigg,\(^2\) in his study of the University of Stirling, argued for smaller subregions because he felt that it is in the subregion that the major impact would be felt, the location and activities of the PNE Complex are such that its impact is felt throughout the Vancouver CMA. The residences of the PNE employees were found to be scattered throughout the area, particularly in Burnaby, Vancouver, North Vancouver, Coquitlam and Port Coquitlam, but also in Surrey, Richmond, New Westminster and Port Moody. The purchases by the PNE Complex also tended to be scattered throughout the region, although the largest proportion occurred in the Vancouver/Burnaby areas. The Vancouver Metropolitan Input-Output Model was felt to be ideally applicable to an analysis of the economic impact of the PNE on the lower mainland.

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The model itself can be mathematically summarized as follows: 3

A. Transaction Table

Total sales or output of any sector of an n sector model as expressed as:

\[ \sum_{j=1}^{n} x_{ij} + Y_i = x_i \quad (i=1, \ldots, n) \]  

(1)

Where: 
- \( x_{ij} \) = the value of the output of sector \( i \) purchased by sector \( j \)
- \( Y_i \) = the final demand for the output of sector \( i \); and
- \( x_i \) = the value of the total output of sector \( i \).

The economy is thus conceptualized by \( n \) linear equations, each equation expressing the transactions of a particular sector with the processing sectors, and with final demands (sales). Equation (2) represents the major portion of our first table, the Transactions Table. As such, it is merely a set of balance equations or accounting identities.

To complete the mathematical descriptions of the Transactions Table, we write:

\[ \sum_{i=1}^{n} x_{ij} + p_j = x_j \quad (j=1, \ldots, n) \]  

(2)

Where: 
- \( p_j \) = final purchase (purchases of imports and other factors) by sector \( j \)
- \( x_i = x_j \) for all \( i = j \).  

(3)

B. Table of Direct Requirements

The Table of Direct Requirements can be expressed as

the matrix \( (a_{ij}) \) where:

\[
 a_{ij} = \frac{x_{ij}}{x_j} \quad (i, j = 1, \ldots, n)
\]  

Substituting (4) into (1) yields:

\[
 x_i = \sum_{j=1}^{n} a_{ij} x_j + y_i \quad (i = 1, \ldots, n)
\]  

which may be expressed more compactly as:

\[
 X = AX + Y
\]  

Where:

\[
 x = \begin{pmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{pmatrix}, \quad A = \begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{pmatrix}, \quad Y = \begin{pmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{pmatrix}
\]  

C. Table of Direct Plus Indirect Requirements

It may now be shown that total output minus intermediate demand equals the net output of the system or final demand.

\[
 X - AX = (I-A) X = Y \quad (A-8)
\]

where I is an \( n \times n \) identity matrix. Given the exogenous or final demands on the economy, it is possible to solve the system for total outputs:

\[
 X = (I-A)^{-1} Y \quad (A-9)
\]

where \((I-A)^{-1}\) is the third table of the I-O Model, the Table of Direct Plus Indirect Requirements, which is
customarily written in transposed form, \((I-A)^{-1}T\), for convenience of reading tabular information.

The published version of the model divides the regional economy into eighteen economic sectors (initially twenty-seven), defined at the two-digit Standard Industrial Classification (SIC) level.\(^4\)

The economic sectors of the study are listed in Table I below:

<table>
<thead>
<tr>
<th>Sector Name</th>
<th>1970 SIC Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Agriculture, Forrestry, Fishing and Mining</td>
<td>1-9</td>
</tr>
<tr>
<td>2. Construction</td>
<td>40-42</td>
</tr>
<tr>
<td>3. Food and Beverages</td>
<td>10</td>
</tr>
<tr>
<td>4. Wood Industries</td>
<td>25</td>
</tr>
<tr>
<td>5. Paper and Allied Products</td>
<td>27</td>
</tr>
<tr>
<td>6. Chemicals and Petroleum</td>
<td>36-37</td>
</tr>
<tr>
<td>7. Non-Metallic Industries</td>
<td>35</td>
</tr>
<tr>
<td>8. Metal Fabricating</td>
<td>30</td>
</tr>
<tr>
<td>9. Printing and Publishing</td>
<td>28</td>
</tr>
<tr>
<td>10. Manufacturing nec*</td>
<td>15-18, 23-24, 26, 29, 31-33, 39</td>
</tr>
<tr>
<td>11. Trade and Transport</td>
<td>50-52, 60, 69</td>
</tr>
</tbody>
</table>


The table of interindustry transactions was constructed from data generated in a questionnaire. The table demonstrates the dollar flows of sales and purchases between the producing sectors of the regional economy as well as those flows between the producing sectors and the final sales and purchase categories. It also illustrates the distribution of final sales over the eighteen producing sectors and in some categories, over the final purchases categories as well.

The transaction table also enabled some detailed structural analysis of the regional economy. Employment and employee compensation data from Statistics Canada were applied to the transaction table to analyse various measures of the contribution of each sector to the region's economy. The study grouped the eighteen sectors into eight major categories to summarize these contributions.
The regional counterpart of GNP, Gross Regional Product (GRP), for Metropolitan Vancouver (1971), was calculated from the transactions table to derive this area's share of the nation's GNP. Also, by examining the final sales categories, expenditures upon final goods and services were derived and presented in four expenditure categories similar to the format of the national GNP accounts. The contribution of each of the producing sectors to the total value added for the Vancouver region was also learned from the transactions table.

The input-output format was particularly appropriate in the case study of the PNE Complex because the sales/purchase patterns of each of the agents within the Complex were very different. Sectoral impacts were therefore of considerable interest. Through the input-output method, it was possible to identify direct and indirect sales as their impact was felt on each of the producing sectors. The total sales impacts derived do not, however, represent the contribution of the PNE Complex to the Gross Regional Product of the lower mainland economy, since the latter is a measure of final sales only. The estimates constructed in this study measure sales to final consumption as well as sales of commodities which will undergo further processing within the region.
Similarly, the input-output format was a useful method in scrutinizing the contribution of the PNE Complex to local employment. The distribution of that employment could also be analysed across the eighteen sectors presented.

The Metropolitan Vancouver Model, through the table of Direct Coefficients, demonstrates the extent to which various sectors of the economy depend upon the regional economy for inputs. The table of Direct Sales per Dollar of Total Output shows the percentage sales of each of the eighteen sectors to all other sectors and to the various final sales categories. It thereby demonstrates variations in the concentration of markets within the region. Finally, the table of Direct Plus Indirect Requirements "reveals the economic impact upon the regional economy, sector by sector, of an increase in the final demand for the production of any one of the regional economic sectors".6

In this particular model, the multipliers are derived for the various sectors of the Vancouver regional economy, but the calculations are limited to the

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estimated effects of increased household consumption. This is a "closed" version of the input-output model in which the Household Consumption column, as well as a portion of the Value Added row is transferred into the processing matrix in order to incorporate into the multiplier values the income and consumption processes of households. The following is a table of the sales multipliers derived for the Metropolitan Vancouver Model:

<table>
<thead>
<tr>
<th>Sector</th>
<th>Sales Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Agriculture, Forestry, Fishing &amp; Mining</td>
<td>1.61</td>
</tr>
<tr>
<td>2. Construction</td>
<td>1.68</td>
</tr>
<tr>
<td>3. Food &amp; Beverages</td>
<td>1.63</td>
</tr>
<tr>
<td>4. Wood Industries</td>
<td>1.49</td>
</tr>
<tr>
<td>5. Paper &amp; Allied Products</td>
<td>1.64</td>
</tr>
<tr>
<td>6. Chemicals &amp; Petroleum</td>
<td>1.18</td>
</tr>
<tr>
<td>7. Non-Metallic Products</td>
<td>1.97</td>
</tr>
<tr>
<td>8. Metal Fabricating</td>
<td>1.63</td>
</tr>
<tr>
<td>9. Printing &amp; Publishing</td>
<td>1.67</td>
</tr>
<tr>
<td>10. Manufacturing, nec</td>
<td>1.50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>11. Trade &amp; Transport</th>
<th>1.69</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. Communications</td>
<td>1.64</td>
</tr>
<tr>
<td>13. Utilities</td>
<td>1.54</td>
</tr>
<tr>
<td>14. Fire</td>
<td>1.69</td>
</tr>
<tr>
<td>15. Health &amp; Welfare</td>
<td>1.64</td>
</tr>
<tr>
<td>16. Education</td>
<td>1.68</td>
</tr>
<tr>
<td>17. Business Services</td>
<td>1.67</td>
</tr>
<tr>
<td>18. Other Services</td>
<td>1.61</td>
</tr>
</tbody>
</table>

Interindustry employment multipliers were derived by converting dollars of sales to units of employment. The model assumes that the ratio of employment per dollar of sales for each sector remains constant.

Despite the limitations of the input-output model, its ability to analyse in-depth the economic structure of the region gives a contextual value to a study such as the PNE Complex analysis. The interdependence of the Complex itself, combined with a desire to relate its impact to specific sectors in terms of both income and employment, made the existing model a useful tool of analysis. Although the model was developed on the basis of 1971 data, it was felt, as Richardson has pointed out, that the assumption of the production function is not unacceptable when money values are used as a measure of physical purchases in real terms,
since relative price changes do not distort too much the input purchase patterns per unit of output. The employment multipliers were adjusted to reflect 1977 conditions as will be explained in the methodology section. Since the data gathered was all done through personal interviews or a review of company accounts by the writer, it was felt that the data would be a reasonably accurate representation of the interindustry transactions of the PNE Complex in the lower mainland.

IV. METHODOLOGY DEVELOPED TO ANALYSE THE REGIONAL ECONOMIC IMPACT OF THE PNE COMPLEX ON THE ECONOMY OF THE LOWER MAINLAND

The study methodology consists of developing a data base that accurately reflects the employment, payrolls and sales by sector directly attributable to the various components of the PNE Complex - the direct impacts. The direct impacts then provided the input for the calculation of those indirect sales, payrolls and employment generated in other parts of the regional economy because of the presence of the Complex - the indirect impacts. Analysis of the indirect impacts was undertaken through the use of the input-output model described above. The total impact of the Complex was derived from a synthesis of the direct and indirect impacts. Also, from the direct and indirect impacts, it was possible to indicate which sectors benefit
most from the presence of the PNE Complex and the type of employment generated, both directly and indirectly, as a result of PNE activities.

There has been no estimate of forward linkages in this analysis, although the impact of such linkages as radio and television advertising and sales generated in trade and consumer shows has a considerable impact on the regional economy. It should be assumed that forward linkages would considerably increase the indirect impact total. On this basis, the study may be seen to be conservative in nature.

A. The Data Base

The following approach was taken to develop the data base:

1. The PNE Complex was divided into five components defined primarily by activity type. Support activities (e.g. cafeterias, feed supply store) were seen as an integral part of each component.

2. Agencies within each component were identified for the purpose of requesting data.\(^8\)

3. Each agency was contacted and the appropriate contact person interviewed.

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\(^8\) See Appendix A.
4. Sales/purchase data were gathered, either directly through a review of invoicing for the year 1977, or through a series of interviews with the various contact persons. Only a few of the smaller trade shows were not included in the data, primarily due to time constraints.

5. Payrolls and employment data were also gathered from the various agencies.

6. Purchasing data were subdivided and grouped by major industry classification derived from the Standard Industrial Classification Code and stored in a computer file.

7. Employment data were translated into man-years then subdivided into full-time (12 months), seasonal (six months), part-time (four months) and casual (one month or less).

8. All agency data were then aggregated into a single unit to find total sales, payrolls and employment for the entire Complex.

B. Direct Impact

From the aggregated data base the impacts of economic activities directly attributable to the PNE Complex were identified. Direct impacts were defined in the following way:
1. All employment generated by agencies directly related to the PNE Complex.

2. All payrolls in the form of wages and salaries generated by the PNE Complex.

3. All sales generated within the PNE Complex, namely: tickets, programs, novelties, food, space rentals, radio and television broadcasts.

While the total numbers of persons employed by the entire PNE Complex reached 21,218 in 1977, this figure gives a very inflated version of the employment base because many of these jobs are seasonal and part-time. A more realistic picture of employment would be the number of man-years generated by the PNE Complex on an annual basis. Employment was thus translated into man-years:

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total persons employed</td>
<td>21,218</td>
</tr>
<tr>
<td>Total man-weeks worked</td>
<td>84,550</td>
</tr>
<tr>
<td>Total man-years</td>
<td>1,691</td>
</tr>
</tbody>
</table>

Payrolls were aggregated with the addition of 90% of the racetrack purse. Since 90% of the racetrack purse is distributed in the lower mainland, it was determined to be a form of payroll distribution. Disaggregated information on the distribution of the purse was not available. Payrolls were thus the sum of:
Payrolls in the Complex $16,264,277
and 90% of the purse $ 3,618,900
Total Payrolls $19,883,177

Sales revenues were categorized and aggregated in the following:

Ticket sales $14,369,847
Program sales $1,568,493
Novelties $ 2,975,612
Food $ 2,645,121
Rentals $10,086,695
Radio & TV Broadcasting $1,463,500

Total Sales Revenues $33,109,268

C. Indirect Impact

The direct impacts then provided the input for the calculation of indirect impacts using input-output analysis. The purchases by the PNE Complex from local area industries are regarded by the model as a stimulus to the local economy which will increase income, employment and expenditure in the region by some multiple of the initial stimulus.

In other words, the PNE buys food, equipment, hardware, wood and other items to provide facilities for other
components of the Complex, to maintain the buildings and the grounds, to provide concessions, and to produce various types of entertainment. The provision of these inputs requires, in turn, a variety of items purchased by the various industries producing for the PNE Complex. Thus rounds of spending and respending are generated. A board, for example, purchased by the PNE from a local lumber yard, may have been purchased from a local sawmill. In this case, the sales/purchase relationships reflect backward linkages.

The input-output model assumes that an increase in final and intermediate sales within the region promotes an increase in employment and income. For instance, space rented for a trade show may stimulate employment in the promotion agency, caterers, advertising agencies, retail stores, rentals and others, because of the purchases required to initiate and promote the show. The promotion agency then subcontracts to the special trades to set up the show's facilities. The subcontracting may stimulate employment in transportation, cartage and storage, signs and display companies, photographic services, auto and truck rentals, and others.

The process of spending and respending which occurs as a result of the availability of space within the
Complex results in increases in personal income within the regional economy. Increases in personal income related to employment increases results in expanded household consumption within the region and thus, a further increase in final sales which initiates successive rounds of increased economic activity in the lower mainland.

1. Sales Generated Through Commodity Purchasing and Wage Payments.

a. Commodity Purchasing

The sales multipliers of the Metropolitan Vancouver Input-Output Model were applied to determine sales generated through commodity purchasing. For example, sector 3 (Food and Beverage Industries) has a multiplier of 1.63 according to the input-output model. Direct purchases by the PNE Complex of food and beverages produced and/or processed in the lower mainland economy, amounted to one million, three hundred and sixty-four, four hundred and sixty-two dollars ($1,364,462). The indirect purchasing amounts to the total direct purchases times the multiplier value: $1,364,462 x 1.63 = $2,224,073. The indirect purchases by each industry multiplied by each sectoral multiplier value is then aggregated to reflect total sales generated through commodity purchasing. Total indirect purchases thus equals $17,741,337.
The following Table III lists sectoral sales from the lower mainland economy to the PNE Complex through direct commodity purchasing. The impact of direct purchases on the rest of the regional economy through successive rounds of respending is obtained by multiplying the direct sectoral purchases by the model's multiplier values to give total sectoral sales generated in the regional economy due to the presence of the PNE Complex. These sectoral sales are then summed to give a figure for total sales generated through commodity purchasing by the PNE Complex.

<table>
<thead>
<tr>
<th>Sectoral Purchases</th>
<th>I-O Multiplier</th>
<th>Total Sales Generated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. $35,148</td>
<td>1.61</td>
<td>$56,588</td>
</tr>
<tr>
<td>2. $1,327,014</td>
<td>1.68</td>
<td>$2,229,384</td>
</tr>
<tr>
<td>3. $1,364,462</td>
<td>1.63</td>
<td>$2,224,073</td>
</tr>
<tr>
<td>4. $147,515</td>
<td>1.49</td>
<td>$219,797</td>
</tr>
<tr>
<td>5. $160,800</td>
<td>1.64</td>
<td>$263,712</td>
</tr>
<tr>
<td>6. $29,824</td>
<td>1.18</td>
<td>$35,192</td>
</tr>
<tr>
<td>7. $62,780</td>
<td>1.97</td>
<td>$123,676</td>
</tr>
<tr>
<td>8. $43,651</td>
<td>1.63</td>
<td>$71,161</td>
</tr>
<tr>
<td>9. $633,055</td>
<td>1.67</td>
<td>$1,057,202</td>
</tr>
<tr>
<td>10. $617,585</td>
<td>1.50</td>
<td>$926,377</td>
</tr>
<tr>
<td>11. $951,544</td>
<td>1.69</td>
<td>$1,608,109</td>
</tr>
<tr>
<td>12. $193,204</td>
<td>1.64</td>
<td>$316,855</td>
</tr>
<tr>
<td>13. $374,741</td>
<td>1.54</td>
<td>$577,101</td>
</tr>
</tbody>
</table>
### Table of Sectoral Purchases

<table>
<thead>
<tr>
<th>Sector</th>
<th>Sales Pre-Multipliers</th>
<th>Sales Post-Multipliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.</td>
<td>$380,794</td>
<td>1.69</td>
</tr>
<tr>
<td>15.</td>
<td>$363,827</td>
<td>1.64</td>
</tr>
<tr>
<td>*16.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>$2,374,119</td>
<td>1.67</td>
</tr>
<tr>
<td>18.</td>
<td>$1,755,971</td>
<td>1.61</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Sectoral Purchases - Review of invoices of each agent in the Complex for the year 1977. I-O Multipliers - The Metropolitan Vancouver Input-Output Model.

* There were no purchases made in the education sector.

### Wage Payments

Total payrolls generated directly by the PNE Complex ($19,883,177) were multiplied by sectoral consumption coefficients and by the sectoral sales multipliers to determine sales generated through wage payments. The sectoral consumption coefficients were taken from the input-output model. For example, sector 8 (Metal Fabricating Industries) has a sectoral consumption coefficient of .0024 according to the existing model, and a sales multiplier of 1.63. Sales generated through wage payments in this sector are thus:

\[
\text{Total Sales} = \text{Payrolls} \times \text{Consumption Coefficient} \times \text{Sales Multiplier}
\]

\[
\text{Sales in Sector 8} = 19,883,177 \times .0024 \times 1.63 = 77,873
\]

The individual sectors are then summed to find the total sales generated through wage payments - $18,446,339.
The following Table IV shows the sales generated through wage payments as a result of the presence of the PNE Complex:

Table IV
Sales Generated Through Wage Payments, 1977

<table>
<thead>
<tr>
<th>Total Payrolls</th>
<th>Sectoral Consumption</th>
<th>Sales Multipliers</th>
<th>Sales Generated From Wage Payments</th>
</tr>
</thead>
<tbody>
<tr>
<td>$19,883,177</td>
<td>.0033</td>
<td>1.61</td>
<td>$105,639</td>
</tr>
<tr>
<td>$19,883,177</td>
<td>.0028</td>
<td>1.68</td>
<td>$ 93,530</td>
</tr>
<tr>
<td>$19,883,177</td>
<td>.0670</td>
<td>1.63</td>
<td>$2,171,442</td>
</tr>
<tr>
<td>$19,883,177</td>
<td>.0008</td>
<td>1.49</td>
<td>$ 23,701</td>
</tr>
<tr>
<td>$19,883,177</td>
<td>.0032</td>
<td>.164</td>
<td>$ 104,347</td>
</tr>
<tr>
<td>$19,883,177</td>
<td>.0162</td>
<td>1.18</td>
<td>$ 380,087</td>
</tr>
<tr>
<td>$19,883,177</td>
<td>.0003</td>
<td>1.97</td>
<td>$ 11,751</td>
</tr>
<tr>
<td>$19,883,177</td>
<td>.0024</td>
<td>1.63</td>
<td>$  77,783</td>
</tr>
<tr>
<td>$19,883,177</td>
<td>.0058</td>
<td>1.67</td>
<td>$ 192,588</td>
</tr>
<tr>
<td>$19,883,177</td>
<td>.0039</td>
<td>1.50</td>
<td>$ 116,317</td>
</tr>
<tr>
<td>$19,883,177</td>
<td>1.638</td>
<td>1.69</td>
<td>$ 5,504,101</td>
</tr>
<tr>
<td>$19,883,177</td>
<td>.0203</td>
<td>1.64</td>
<td>$  661,951</td>
</tr>
<tr>
<td>$19,883,177</td>
<td>.0284</td>
<td>1.54</td>
<td>$  869,611</td>
</tr>
<tr>
<td>$19,883,177</td>
<td>.1216</td>
<td>1.69</td>
<td>$ 4,086,072</td>
</tr>
<tr>
<td>$19,883,177</td>
<td>.0256</td>
<td>1.64</td>
<td>$  834,775</td>
</tr>
<tr>
<td>$19,883,177</td>
<td>.0096</td>
<td>1.67</td>
<td>$  318,767</td>
</tr>
<tr>
<td>$19,883,177</td>
<td>.0904</td>
<td>1.61</td>
<td>$ 2,893,877</td>
</tr>
</tbody>
</table>

Total Sales Generated from Wage Payments $18,446,339

Source: Total Payrolls = sum of payrolls reported in Annual Financial Reports of each agency in the Complex. Sectoral Consumption Coefficients: The Metropolitan Vancouver Input-Output Model. Sectoral Sales Multipliers: The Metropolitan Vancouver Input-Output Model.
Total sales generated are then calculated as:

- Sectoral sales generated through commodity purchases: $17,741,337
- Sectoral sales generated through wage payments: $18,446,339
- Total indirect sales generated by the presence of the PNE Complex: $36,187,676

2. Payrolls.

Indirect sectoral payrolls were estimated by adding direct sales plus commodity purchases through wage payments divided by sales/payroll ratios established in the input-output model. For example, sector 4 (Wood Industries) sold directly to the PNE commodities amounting to $219,797. Sales generated from wage payments amounted to $23,701. The sales/payroll ratio for that sector derived from the I-O model was 2.9. Indirect payrolls for sector 4 are therefore:

\[
\text{Direct Commodity Sales} + \frac{\text{Commodity Purchases through Wage Payrolls}}{\text{Sales/Payroll Ratios}} = \text{Indirect Payrolls}
\]

\[
$219,797 + \frac{$23,701}{2.9} = $83,965.
\]

The following Table V shows the indirect payrolls generated by the presence of the PNE Complex:
Table V
Indirect Payrolls Generated by the Presence of the PNE Complex, 1977

<table>
<thead>
<tr>
<th>Direct Sales</th>
<th>+</th>
<th>Indirect Sales</th>
<th>÷ Sales/Payroll Ratio</th>
<th>= Indirect Payroll</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. $56,588</td>
<td></td>
<td>$105,639</td>
<td>7.6</td>
<td>$21,346</td>
</tr>
<tr>
<td>2. $2,229,384</td>
<td></td>
<td>$93,530</td>
<td>1.9</td>
<td>$1,222,586</td>
</tr>
<tr>
<td>3. $2,224,073</td>
<td></td>
<td>$2,171,442</td>
<td>5.0</td>
<td>$879,103</td>
</tr>
<tr>
<td>4. $219,797</td>
<td></td>
<td>$23,701</td>
<td>2.9</td>
<td>$83,965</td>
</tr>
<tr>
<td>5. $263,712</td>
<td></td>
<td>$104,347</td>
<td>4.2</td>
<td>$87,633</td>
</tr>
<tr>
<td>6. $35,192</td>
<td></td>
<td>$380,087</td>
<td>19.4</td>
<td>$21,046</td>
</tr>
<tr>
<td>7. $123,676</td>
<td></td>
<td>$11,751</td>
<td>3.5</td>
<td>$38,693</td>
</tr>
<tr>
<td>8. $71,161</td>
<td></td>
<td>$77,783</td>
<td>3.5</td>
<td>$42,555</td>
</tr>
<tr>
<td>9. $1,057,202</td>
<td></td>
<td>$192,588</td>
<td>3.1</td>
<td>$403,158</td>
</tr>
<tr>
<td>10. $926,377</td>
<td></td>
<td>$116,317</td>
<td>2.9</td>
<td>$359,549</td>
</tr>
<tr>
<td>11. $1,608,109</td>
<td></td>
<td>$5,504,101</td>
<td>2.1</td>
<td>$3,386,768</td>
</tr>
<tr>
<td>12. $316,855</td>
<td></td>
<td>$661,951</td>
<td>2.4</td>
<td>$407,836</td>
</tr>
<tr>
<td>13. $577,101</td>
<td></td>
<td>$869,611</td>
<td>6.2</td>
<td>$233,341</td>
</tr>
<tr>
<td>14. $643,542</td>
<td></td>
<td>$4,086,072</td>
<td>3.6</td>
<td>$1,313,782</td>
</tr>
<tr>
<td>15. $596,676</td>
<td></td>
<td>$834,775</td>
<td>1.8</td>
<td>$795,251</td>
</tr>
<tr>
<td>16.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. $3,964,779</td>
<td></td>
<td>$318,767</td>
<td>2.3</td>
<td>$1,862,411</td>
</tr>
<tr>
<td>18. $2,827,113</td>
<td></td>
<td>$2,893,877</td>
<td>2.2</td>
<td>$2,600,450</td>
</tr>
</tbody>
</table>

Total Indirect Payrolls $13,759,832

Source: Direct Sales - see Table III, Indirect Sales - see Table IV, Sales/Payroll Ratios - taken from I-O Model.
Indirect sectoral payrolls generated by the presence of the PNE Complex were then summed to find the total indirect payrolls - $13,759,832.

3. Employment

Indirect employment was derived by dividing indirect payrolls per sector by payroll/employment ratios. The ratios were taken from Statistics Canada\textsuperscript{9} payroll/employment ratios which were adjusted\textsuperscript{10} to reflect as closely as possible 1977 conditions, and multiplied by payroll/employment ratios per sector which reflect the lower mainland conditions as identified in the input-output model.

For example, sector 12 (Communications Industries) yields an indirect employment of 38.84 derived from the following:

\[
\text{Indirect Payrolls ÷ Payroll/Employment Ratios from the I-O Model} \times \text{Adjusted Statistics Canada Ratios} = \text{Indirect Employment}
\]

Thus, in sector 12:

\[
\frac{1978 \text{ weekly earnings}}{1978 \text{ employment}} = 311.58 \quad \frac{17.2}{17.2}
\]

\[
\frac{1971 \text{ employment}}{1971 \text{ weekly earnings}} = 10.331 \quad \frac{147.02}{147.02}
\]

Payroll/employment ratios from the I-O Model = \frac{89.33}{10.800}

Indirect Payrolls in sector 12 = $407,836

\text{10. Statistics Canada ratios were adjusted by multiplying 1978 weekly earnings by 1971 employment weekly earnings}
Indirect employment is therefore:

\[ \frac{407.836}{10.800} \times \frac{89.33}{17.2} \times \frac{311.58}{147.02} = 38.84. \]

The assumptions implied by the adjustment are that employment is not rising as quickly as wages and salaries and that the adjustment would prevent an over-estimation of the indirect employment impact. Indirect employment was then aggregated by summing each sector.

The following Table VI indicates the indirect employment in man-years generated by the PNE Complex:

<table>
<thead>
<tr>
<th>Indirect Payrolls ($000)</th>
<th>Adjusted Payroll Employment Ratios</th>
<th>Indirect Employment in Man-Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.* $21,346</td>
<td>1.82</td>
<td>11.73</td>
</tr>
<tr>
<td>2. $1,222,586</td>
<td>23.03</td>
<td>53.09</td>
</tr>
<tr>
<td>3. $879.103</td>
<td>13.86</td>
<td>63.42</td>
</tr>
<tr>
<td>4. $83.965</td>
<td>20.43</td>
<td>4.11</td>
</tr>
<tr>
<td>5. $87.633</td>
<td>17.82</td>
<td>4.92</td>
</tr>
<tr>
<td>6.* $21.406</td>
<td>18.69</td>
<td>1.15</td>
</tr>
<tr>
<td>7.* $38.693</td>
<td>17.77</td>
<td>2.18</td>
</tr>
<tr>
<td>8. $42.555</td>
<td>18.04</td>
<td>2.36</td>
</tr>
<tr>
<td>9.* $403.158</td>
<td>14.69</td>
<td>27.44</td>
</tr>
</tbody>
</table>
### Adjusted Payroll/Employment Ratios

<table>
<thead>
<tr>
<th></th>
<th>Payroll</th>
<th>Ratio</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.*</td>
<td>$359,549</td>
<td>14.69</td>
<td>24.48</td>
</tr>
<tr>
<td>11.*</td>
<td>$3,386,767</td>
<td>14.48</td>
<td>233.89</td>
</tr>
<tr>
<td>12.</td>
<td>$407,836</td>
<td>10.50</td>
<td>38.84</td>
</tr>
<tr>
<td>13.</td>
<td>$233,341</td>
<td>17.52</td>
<td>13.32</td>
</tr>
<tr>
<td>14.</td>
<td>$1,313,782</td>
<td>12.98</td>
<td>101.22</td>
</tr>
<tr>
<td>15.</td>
<td>$795,251</td>
<td>10.83</td>
<td>73.43</td>
</tr>
<tr>
<td>16.</td>
<td>$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>$1,862,411</td>
<td>14.26</td>
<td>130.60</td>
</tr>
<tr>
<td>18.*</td>
<td>$2,600,450</td>
<td>7.88</td>
<td>330.01</td>
</tr>
</tbody>
</table>

**Total** | **1,116.11**

*1. Assumed ratio of 2.
*6,7. Figures for Durable Manufacturing used.
*9,10. Figures for Non-durable Manufacturing used.
*18. Derived for Business and Personal services.

Source: Indirect Payrolls - see Table V.

Adjusted Payroll/Employment Ratios - (see Footnote 10), multiplied by the I-O model payroll/Employment ratios, indirect employment was thus aggregated and rounded to a total of 1,116 man-years of employment.

### D. Other Indicators

Other indicators which reflect the impact of the PNE Complex on the greater Vancouver area are the types of employment generated in selected sectors of the economy and the demographic characteristics of the persons employed as a result of the presence of the PNE Complex.

Table VII below gives the actual breakdown of the types of direct employment provided by the PNE Complex.
As this table indicates, a major portion of the employment base in the Complex is seasonal, part-time and casual. It should be recognized that much of this employment base consists of unskilled and semi-skilled jobs which are allocated to that part of the work force often most difficult to employ: females, older persons and students.

Table VII indicates the types of employment generated within the PNE Complex itself:

<table>
<thead>
<tr>
<th>Type of Employment</th>
<th>No. of Employees</th>
<th>Man-Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year-round (12 months)</td>
<td>378</td>
<td>378</td>
</tr>
<tr>
<td>Seasonal (6 months)</td>
<td>691</td>
<td>345</td>
</tr>
<tr>
<td>Part-Time (4 months)</td>
<td>586</td>
<td>188</td>
</tr>
<tr>
<td>Casual (1 month)</td>
<td>1,421</td>
<td>57</td>
</tr>
<tr>
<td>Sub-Total</td>
<td>3,076</td>
<td>968</td>
</tr>
<tr>
<td>Fair-Time Only</td>
<td>15,143</td>
<td>723</td>
</tr>
<tr>
<td>Total Man-Years of Employment</td>
<td>18,219</td>
<td>1,691</td>
</tr>
</tbody>
</table>

Source: Employment information was taken by reviewing the 1977 payroll sheets in each agency within the PNE Complex. One man-year = 50 weeks of employment.

In order to get a clearer picture of this employment pattern, the PNE component of the study may be isolated
and more closely scrutinized. Excluding the actual Fair-Time employment, the PNE employs 1,739 persons. 168 of these persons are employed full time; 800 are employed part-time but on a year-round basis; and 771 persons work at casual jobs lasting no longer than one month. Of the total PNE employment base, 15%, or 450 persons employed are female.

A sample of 200 persons illustrates the age ranges of those persons employed by the PNE, either on a full-time, part-time or seasonal basis. As Table VIII indicates, 17% of the employment is allocated to persons under 25 years of age, and another 15.50% is allocated to persons over 60 years of age:

<table>
<thead>
<tr>
<th>Age Ranges</th>
<th>% of Employed</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 25</td>
<td>17.0</td>
</tr>
<tr>
<td>26-49</td>
<td>45.0</td>
</tr>
<tr>
<td>50-59</td>
<td>22.50</td>
</tr>
<tr>
<td>+ 60</td>
<td>15.50</td>
</tr>
<tr>
<td>Total</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

During the annual 17-day Fair sponsored by the PNE Society, casual employment increases by five times the normal employment base, and much of this employment is allocated to students seeking summer employment only.

The input-output analysis demonstrated indirect employment generated by the Complex. This employment was aggregated into sectors of the economy: primary (I-O Model-1), secondary (I-O Model 2-10), and tertiary (I-O Model 11-18 inclusive). The indirect employment generation tends to be concentrated in service and allied sections of the tertiary sector of the economy. Sales and payrolls could also be categorized according to the three main sectors above, and reflect the same concentration as employment as the following Table IX indicates:

<table>
<thead>
<tr>
<th>Sector</th>
<th>% of Sales</th>
<th>% of Payrolls</th>
<th>% of Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>.57</td>
<td>.16</td>
<td>.88</td>
</tr>
<tr>
<td>Secondary</td>
<td>25.37</td>
<td>27.46</td>
<td>34.51</td>
</tr>
<tr>
<td>Tertiary</td>
<td>74.06</td>
<td>72.38</td>
<td>64.61</td>
</tr>
<tr>
<td>Total</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: % breakdowns were calculated from summing by sector the indirect impacts in each of the three categories listed. Each category then represents a % of the total indirect impact.
Of the employment generated in the tertiary sector, 35% occurs in hotels, motels, restaurants and other service industries. These jobs are similar to the PNE Complex jobs in that they tend to be unskilled or semi-skilled and employ a high percentage of women.

E. Total Impact

The total impact of the PNE Complex was derived from the sum of the direct and indirect impacts. Table X summarizes the total impact of the Complex:

Table X
Direct and Indirect Impact of the PNE Complex, 1977

<table>
<thead>
<tr>
<th>Impact</th>
<th>Direct</th>
<th>Indirect</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment*</td>
<td>1,691</td>
<td>1,116</td>
<td>2,808</td>
</tr>
<tr>
<td>Payrolls**</td>
<td>$19,883,177</td>
<td>$13,759,832</td>
<td>$33,643,009</td>
</tr>
<tr>
<td>Sales</td>
<td>$33,109,268</td>
<td>$36,187,676</td>
<td>$69,296,944</td>
</tr>
</tbody>
</table>

* Employment in man-years  
** Payrolls in $.

Source: Direct employment - man-years generated by PNE Complex in 1977. Indirect Employment - see Table VI. Direct Payrolls = sum of all payrolls in the Complex plus 90% of the racetrack purse. Indirect Payrolls - see Table V. Direct Sales - total sales revenues of the Complex gathered by interview. Indirect Sales - see Table IV.

The table can briefly be summarized thus:

1. The PNE Complex generated approximately 3,000 man-years of employment in 1977; 1,691 man-years are directly related to the Complex (i.e. about 60%
was directly attributable to the Complex).

2. This employment generated payrolls of $33,643,009 (33.6 million dollars) in 1977, with over half (19.8 million) directly related to the Complex.

3. Sales and revenues generated by the PNE Complex in 1977 totaled $69,386,944 (69.3 million dollars). Direct sales amounted to $33,109,268 (33.1 million dollars).

It should be noted that in determining the sales/purchase relationships between the PNE Complex and the greater Vancouver area, only those goods produced and/or processed in the region were included. All sales of items produced and/or processed from outside the region were excluded, e.g. only 13% of all food purchases are reflected in the above figures since only 13% of the food purchased was produced in the region. Tobacco products are wholly excluded, but 85% of all lumber products are included.

The multipliers for the above employment and payrolls are 1.66 and 1.69 respectively. The multipliers are

11. The Metropolitan Vancouver Input-Output Model contains coefficients which account for wholesale handling and distribution of goods within the region. The wholesale trade sector has thus been built into the sales multipliers used in the analysis.
derived by dividing direct employment and payrolls into the total employment and payrolls for the entire Complex. The multipliers indicate that:

1. for every man-year of employment in the PNE Complex, .66 man-years of employment are generated in the greater Vancouver area;

2. for every $1 of income earned in the Complex, 69 cents of sales are generated in the greater Vancouver area.

Again it should be emphasized that the total sales impacts presented here measure both sales to final consumption and sales of commodities which will undergo further processing within the region.

V. CONCLUSION

The objective of this case study was to arrive at quantitative indicators which would accurately estimate the impact of the PNE Complex on the greater Vancouver area. To analyse the impact of the PNE Complex on the regional economy, the direct and indirect impact of sales, payrolls and man-years of employment were isolated. Further indicators isolated particular types of employment generated and specific sectors of the local economy which were especially affected by the direct and indirect impacts.
The study dealt only with those impacts generated in the local economy which would remain within the local economy. Certain leakages, however, such as those incurred by hotels, motels and restaurants owned and operated from outside the region were not documented. Furthermore, the study dealt only with backward linkages, i.e. those linkages which exist in order that the PNE function in its various capacities.

Recognizing the limitations of the data, i.e. that it could not incorporate forward linkages and that it was not totally comprehensive, and recognizing the stability assumption in applying a model developed in 1971 to 1977 data, it is maintained the results from the above study are a reasonable indication of the impact of the PNE Complex on the lower mainland economy. Payroll/employment ratios were adjusted to reflect 1977 conditions; sales/purchase data were collected in actual 1977 dollar values. Changes in the coefficients of the impact model applied due to changes in technology, import substitution, product mix and the location of new firms within the local economy, were simply outside the scope of the study.
CHAPTER FIVE

CONCLUSION

I. INTRODUCTION

Regional economic impact analysis has been defined in this thesis as a quantitative approach used to measure the impact of changes in the economy. It has been stressed in the thesis that the value of regional economic impact analysis is the information which it generates and that this information must be presented with a clear understanding of its meaning and its limitations. The usefulness of this type of analysis cannot be fully assessed, however, until it is placed in the context of regional planning and policy formulation. The following chapter considers the role of regional economic impact analysis in the regional planning and development processes.

II. REGIONAL ECONOMIC IMPACT ANALYSIS AND REGIONAL PLANNING

The case study presented in this thesis illustrates the relationship between a complex institution and the regional economy. The influence of such an institution, or indeed any major project extends, as the case study demonstrates, much further than the mere direct employment offered by it to the local labour market. Because these projects do have a significant influence in the regional economy, they must be seen as an integral part of the development process of a region. As such, they are of concern to regional planners.
An important stage in the regional planning process is evaluation. Evaluation is "a procedure by means of which the pros and cons of alternative projects are described in a logical framework so as to assess their various net benefits".\textsuperscript{1} Evaluation studies take place within the context of quite explicit planning objectives and policies. Through evaluation studies, options are explored, alternatives considered, and proposals tested against existing objectives.

Evaluation methodologies are dependent upon scientific types of information which range from intangible social conceptions to explicitly isolated "facts". The importance of impact analysis is its ability to provide some of this information. An impact study is a useful source of information necessary to plan, to adjust or accommodate for the inevitable impact of social, physical and economic change in the region. As such, impact analysis is essentially a descriptive approach to analysis. That these studies can be predictive does not alter the fact that they are descriptive rather than evaluative in nature.\textsuperscript{2}

\begin{enumerate}
\end{enumerate}
An impact study is a careful documentation which attempts to usefully describe existing relations and to measure change by organizing and abstracting from empirical evidence and applying both technical skills and logical, analytical thought. The impact studies may be social, physical (environmental) and economic, or a combination thereof. The "facts" presented in an impact analysis do not speak for themselves - they have to be interpreted. Since these facts are not pure, they do not suggest unqualified policy implications. Their value is conceptual, i.e. within an existing planning framework.

The "facts" presented in an impact study must be carefully scrutinized. Regional economic impact analysis, which has been the focus of this thesis, can be used to consider the following areas:

1. The repercussions of changes in one sector of the economy on other sectors.
2. Linkages among sectors of the economy.
3. The magnitude of initial economic impacts plus the economic reverberations which accompany development projects.
4. Leakages from the regional economy.
5. Industrial and demographic trends.
At present this information is used as an educative tool to gain an understanding of the economic relationships at work in the region, and as a component in cost-benefit, cost-effectiveness and other technical frameworks presented for use by regional decision-makers.

III. THE CONTEXT OF THE PNE CASE STUDY

The PNE case study is illustrative of the ability of the input-output model to answer specific impact questions, despite the practical and theoretical constraints under which the analyst worked. The study was to demonstrate the significance of the PNE Complex in the lower mainland by isolating income, employment and expenditure impacts generated in the regional economy due to the presence of that Complex. Given the nature of the regional economy, an existing model, the Metropolitan Vancouver Input-Output Model, was chosen by the analyst. The most serious constraints in the study were time and data availability. The study had to be completed in five weeks. 1977 was chosen as the base year because historical data could be gathered for that year from company records. It is argued in Chapter IV that the study methodology developed by the analyst and the use of an existing model answers with reasonable accuracy the study questions, despite recognized practical and theoretical constraints.
The PNE regional economic impact analysis is also a practical and useful source of information in the evaluative stages of the planning process. Clearly the study has given the PNE Society credibility in its claim that the influence of the Complex in the region extends considerably further than the mere direct employment offered by the Complex to the local labour market. Regional decision-makers are able to incorporate the study into evaluative frameworks which weigh the benefits of the existing PNE Complex to the regional economy in terms of income and employment against the costs to the region in the provision of services to the PNE Complex and the surrounding area. From the cost-benefit scenario, regional planners can project a possible framework should the Multiplex proposal mentioned in Chapter I go ahead.

The analysis provides regional planners with information with which to examine the presence and impacts of large-scale non-profit institutions such as the PNE Complex against established developmental goals for the region. It may also be used to compare the impacts of this type of project with the impacts of other types of development projects, such as a trade and/or
convention centre. The contextual value of the study is therefore evaluative.

IV. SOME PROBLEMS ASSOCIATED WITH THE USE OF REGIONAL ECONOMIC IMPACT ANALYSIS

There are problems associated with the use of regional economic impact analysis. One problem is that the theoretical constraints and limitations of the models used to derive multiplier values are often forgotten. These constraints and limitations must be acknowledged as sources of inaccuracy in the model estimates and the information in the studies must be considered in light of these possible inaccuracies.

A second problem is the implicit assumption in the presentation and use of the information in impact studies that, should the studied project cease to exist, the employment, income and expenditure generated by the project would also cease to exist. The above is unlikely, but in many cases time, budget and data constraints prevent the consideration of opportunities foregone in the impact studies. This limitation must be acknowledged when the study information is incorporated into an evaluation framework.

A third problem is that without knowledge of the local economy, it becomes difficult to assess whether internal
forces and the studied project are complementary or competing sources of growth. A changing industrial structure, changing propensities to import, changes in productivity and technology, might well disturb various stability assumptions in the models.

A study of regional economic impact should present the actual impact analysis of the project within the context of the local economy. The study presentation should therefore have two parts:

1. **The Project** - The project itself must be studied to determine its existing and/or potential impacts in such areas as employment, income and expenditure. Chapter IV of this thesis is a good example of this part of the study.

2. **The Local Economy** - A brief analysis of the local economy should be presented so that decision-makers can more easily assess the influence of the impacts of the project studied on an industrial structure which is continually changing. This section of the study should include a brief analysis of the regional economic system, including such aspects as industrial structure and growth trends, trends in the population of the study area, and the state of the labour market. Brownrigg's study of the University of Stirling is an example of this type of analysis.
In the case of the PNE Complex study, three comments should be made about the use of this study. The first is that the study is educative in the sense that it is a study of a large-scale non-profit institution and, as such, represents an area little studied but widely recognized to be a significant influence on the regional economy. Secondly, the study could be considered to be incomplete. An economic impact study is a very singular source of information from a planning point of view. This study could be a component of a study which also considers the social and physical impacts of the PNE Complex. Thirdly, the study should be supplemented by a section such as mentioned above on the local economy, which will assist decision-makers in their assessment and evaluation of the project in the context of the region as a whole.

V. CONCLUSION
This thesis is a study of regional economic impact analysis as applied to a large-scale non-profit institution. The case study is an illustrative approach to the selection of an appropriate impact methodology and its subsequent application. It is a valuable example of the way in which a complex institution interacts in a regional economy and consequently affects the economic well-being of the study area.
The PNE Complex:

1. The Pacific National Exhibition and Independents

2. The Racetrack
   a. The Jockey Club
   b. Toncessionaire Company
   c. The B.C. Racing Commission
   d. H.B.P.A.
   e. The B.C. Thoroughbred Breeders Association

3. The Midway and Independents
   a. Burrard Amusements
   b. Oaks Park Amusements Ltd.
   c. Sky Glider Recreations Ltd.
   d. Plus forty-two rides, shows, concessions.

4. Sports
   a. The B.C. Lions
   b. The Vancouver Canucks
   c. The Vancouver Whitecaps
   d. Other sports activities

5. Trade/Consumer and other shows*
   a. Rock Concerts (twenty-nine)
   b. Religious Assembly (four)
   c. Dog Shows (four)
   d. Northwest International Horseshow
   e. Arabian Horse Show
f. The Home Show

g. The Gift Show

h. Recreational Vehicles Show

i. The Boat Show

j. Link Hardware

k. Festival of Forestry

l. Motorama

m. Speed Sport Show

n. Western Construction

* Time constraints prevented the inclusion of approximately five of the smaller shows.
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Wilson, J. Holton, "The Impact of a Non-Profit Institution on Regional Income: A Discussion", *Growth and Change*, July 1975: 45-46.

