

**AN ECONOMIC IMPACT
ASSESSMENT MODEL FOR
THE PRINCE ALBERT MODEL
FOREST REGION**

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Ma Maw Wechehetowin

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EXECUTIVE SUMMARY

Within an economic framework, every type of activity impacts on some other agent within the economy. In a modern economy, no one industry, consumer, or government may subsist in isolation from others. Economic interdependencies exist which result in a network of linkages between industries and those who depend on them for their products or for household income. Even within a small regional economy like the region in and around the Prince Albert Model Forest, the impacts of economic interactions on the smaller scale often correspond closely to those of a larger economic region.

Economic changes initiated by industries or consumers are referred to as direct impacts. Introducing these changes into the regional economy causes a series of repercussions. The economic changes resulting from the direct impacts are considered secondary impacts. These secondary impacts are of two types: indirect impacts through inter-industry purchases of goods and services, and those of a more removed nature which are induced by the spending of household incomes incurred through the indirect changes in the economy. The total economic impact of a project or activity is assessed as the combination of the direct activity and all secondary impacts which transpire.

The measurement of direct impacts is fairly straightforward. These impacts provide detailed knowledge of the nature of option. The difficulty in assessing total economic impacts lies in the estimation of the ensuing secondary impacts. An input-output model which assesses total economic impacts has been created for this reason. This model has been designed to evaluate economic impacts especially due to forest-related activities within the PAMF region. An assessment of the impacts of a proposed economic change within the PAMF is exemplified.

In accordance with PAMF objectives, the analytical framework of this model allows for specification of many economic variables which are characteristic of this distinctive region. These characteristics can be related to either production or consumption activities at the regional level or the provincial level. On the production side, industrial sectors were categorized into those industries which are especially important to the PAMF. In addition, employees of these industries have been distinguished by ethnicity and place of residence. From the consumer viewpoint, household consumption has been organized to reflect similar concerns such as the labour force. The population

of the PAMF region is outlined in terms of aboriginal households located on-reserve, aboriginal households off-reserve, and non-aboriginal households.

Surveys of aboriginal families of the Montreal Lake Cree Nation and the city of Prince Albert were conducted to provide reference to estimate the impacts related to the aboriginal people of the region and the province.

The Prince Albert Model Forest is attempting to employ the theory of integrated resource management. This economic impact assessment model supplies a tool useful to these types of management practices. To reach this objective, efficient resource planning requires a rational approach with a logical decision-making process to ensure appropriate action and results. Both resource managers and regional developers will find this economic assessment model invaluable for their purposes.

The model's capability in handling forest related use was demonstrated for the recently proposed fee structure at the Prince Albert National Park. In terms of provincial GDP (market prices), this proposal would lead to a loss of \$3.9 million for the PAMF Economic region, much of which would be felt within the PANP. Similarly the loss in GDP (market prices) for the province as a whole is estimated at \$7.7 million.

Accuracy of the above predictions is highly contingent upon the accuracy in predicting the direct impacts. To the extent, direct changes of the proposed measure(s) are not accurate, the resulting economic impacts will be biased.

Another point that the users of this model should be aware of is the unique feature of the model - inclusion of aboriginal people and their economic activities. These activities are confined, to a large extent, within the PAMF region, but their economic impacts, due to their expenditure patterns, will be felt in the regions beyond, particularly in the periphery region. Thus the model, without further modifications, cannot estimate the local impacts (i.e., impacts within the PAMF region) of changes in forest management or adoption of new management strategies. For this reason, in this report, economic impacts that are generated for the entire PAMF Economic region were estimated.

The economic impacts assessment model presented in this report constitutes an important step in prioritizing / evaluating the economic / social desirability of alternative forest management

programs / strategies for the Prince Albert Model Forest region and its periphery. Since the model is based on fixed coefficients, the results are more accurate in depicting short run changes, than those occurring in the long run. Also, the use of such a model in predicting such changes implicitly assumes no major structural changes in the economy of the region. These together with the various assumptions of the input-output model should be kept in mind in its use and interpretation of results in the future.

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Chapter 1

INTRODUCTION

1.1 Background

Awareness and concern regarding the role played by Saskatchewan's forests have been rapidly increasing. The management, harvesting, processing, and marketing of timber and non-timber resources provide many job and economic opportunities, particularly in northern Saskatchewan. At the same time, forests are essential to the social well-being of many of the Province's inhabitants, as well as to its environmental health.

The Prince Albert Model Forest (PAMF), created under Canada's Model Forest Program, was designed to address some of these concerns. The major goals of the PAMF partnership are: one, to ensure a sustainable and predictable supply of forest based ecological, social, and economic benefits through the management of forest ecosystems and people; and two, to raise awareness of and commitment to the concepts of sustainability, integrated resource management, and ecosystem management among forest users, researchers, and managers at the local, regional, national, and international levels (Forestry Canada, 1992). These goals have been translated into several working objectives for the PAMF. Among these, several objectives are related to the socio-economic development within the PAMF and in the vicinity region¹.

1.2 Problem Statement

An integrated resource management framework involves a philosophy of shared decision making, in addition to consultation and coordination between and within the various interest groups. Active participation of various agencies promotes the commitment of these agencies to achieving successful results. This participation would be enhanced by gaining knowledge of implications of adoption (or consequences of non-adoption) of various forest management practices. Among various objectives of the PAMF, one relevant to socio-economic aspects of forest management is “to provide

¹ For more details on these working objectives see Kulshreshtha and Walker (1994).

evidence on the socio-economic effects of historical and recent forest resource use and conservation on people living within and in the vicinity of the model forest” (Kulshreshtha and Walker, 1994, p. 37). Estimation of these socio economic effects requires a framework for identifying, measuring and quantifying various impacts of a certain change in forest use.

Socio-economic effects of resource use changes are wide-ranging including economic development, employment and demographic, fiscal, and social effects². Of these, economic development effects are of particular interest to public officials at the regional level, as well as to local residents who directly or indirectly depend upon the forest for their livelihood. Estimation of these effects requires development of an analytical tool.

Although economic effects of a change can be isolated (and possibly estimated) by naked-eye examination or through intuitive retrospection, conclusions from these cannot be considered sufficient for the PAMF for the following reasons:

- i) Assessments of direct impacts, which are obvious to many even intuitively, provide only partial answers. Frequently a change in forest use results in impacts beyond those which are directly affected by it. For example, if the regional pulp production was to increase, economic changes would be felt not only by Weyerhaeuser Canada (Saskatchewan Division) and its employees, but also by many retail outlets in the city of Prince Albert. Thus, the direct impact of the sales of the company measures only a part of the total economic impacts on the region.
- ii) The economic system that prevails in various parts of Saskatchewan is complex. With trends towards specialization, more and more firms depend upon others for a part of their input requirements. The same trends are occurring in terms of regional specialization through consolidation and agglomeration effects. Interdependencies are not limited to the Canadian economy, as more and more of the Canadian and Saskatchewan industries operate at least in the North American, if not in the

² For a more detailed discussion on various impacts of forest use, see Kulshreshtha (1995, Chapter 1).

- international, market arena. International trade (both exports and imports) plays a very significant role in determining the economic activity within a region.
- iii) Naked eye perception of regional impacts can be misleading. In a simpler economic system, the effect of a change in one industry on others can be easily visualized. However, with increasing interdependencies in the economic system, interrelationships between any two sectors are more difficult to observe. For example, change in the pulp production resulting in a different level of input purchases, and wages and salaries, would lead to a different pattern of sales by local firms. Exact information on shopping patterns, and on the source of inventory for local firms is essential, in neither case can the facts be casually assumed, nor are they easily ascertainable. Thus, it is felt that a naked eye assessment of changes may not be close to the total economic changes brought about by the change in forest use.
 - iv) Prioritization of forest management options should be based on total impacts. Direct impacts, although a significant part of total economic change, are still only a part of the total. If decisions are made only in terms of direct impacts, these may be consistent with a private accounting perspective, but not necessarily with a societal one. Given that the PAMF forest management options are to be assessed and deemed to be desirable from the societal accounting perspective, knowledge of total economic impacts is more desirable than that of direct impacts only.

For these reasons the estimation of economic development effects based on intuitive retrospection is not adequate and, therefore, not recommended. Thus, the development of a systematic tool capable of estimating such effects in a region of interest becomes necessary.

Changes in forest use lead to some direct changes in the economic activities. These changes occur in those parts of the economy that are directly related to the changed forest use. Direct economic changes can affect the region's economic development in the short as well as in the long run. In the short run, changes may result from (i) inter-industry transactions of various goods and services, and (ii) respending of incomes of the income generated both under the direct changes as well as under (i) above. Both of these types of changes are based on the interdependencies that exist among various industries in the region, as well as on the interdependence of one region with the

outside economy (larger region). The long-run effects are brought about by, in addition to the above two changes, agglomeration economies that may exist between the directly changed industries and other industries that have economic linkages with them. These economies make it more profitable for new firms to move (leave) into (from) a region than is possible without the direct change. However, the estimation of such long-term changes requires development of appropriate analytical tools. These tools must be capable of addressing some of these changes.

1.3 Need for the Study

The total economic effects, also known as economic impacts, of a change in forest use can be divided into types of impacts: direct impacts and secondary impacts. In the short run these secondary impacts will include the changes brought about by the interindustry linkages as well as responding of consumer incomes in the region. In the long-run, as noted above, these secondary impacts may also be contributed to by change in the economic structure of the region. The estimation of total economic impacts is needed for selecting the optimum forest use.

The economic impacts of forest use changes can be estimated using a variety of tools, including an econometric model, a computable general equilibrium model, a regional simulation model, an economic base model, and an input-output model. In the context of the PAMF and predicting the economic impact of forest use on the region, the input-output model has some advantages over the other approaches³. Such a model has been used to estimate provincial level impacts in British Columbia (see Davis 1986), and Ontario (see Butterfield and Kubursi 1993). For Saskatchewan, earlier economic impact assessment attempts involved borrowing economic multipliers from neighbouring provinces of Ontario and Manitoba⁴. For the PAMF region, no such model existed, and the present study was undertaken to fill this void.

³ Relative efficacy of various models is discussed in Chapter 2 of this Report.

⁴ For example, Ondro & Williamson (1985) based economic impacts of Saskatchewan forest sector using Ontario multipliers, whereas Steele, Boylen and Baumgartner (1988) used multipliers for Manitoba in a similar estimation.

1.4 Objectives of the Study

The primary objective of this study is to develop a methodology to estimate the impacts of changes in the use of the forest sector in the Prince Albert Model Forest region⁵. These impacts are evaluated at two levels - regional and provincial. The region specified in this study is that of the trading region of the PAMF. In particular, the objectives of this report are as follows:

- i) To develop a two-regional input-output model for Saskatchewan - Region 1 being the PAMF Economic Region, and Region 2 being the Rest-of-Saskatchewan;
- ii) To disaggregate the forest sector into several economic activities of particular interest to the PAMF Association; and
- iii) To demonstrate the use of the model for a selected forest use.

The case study used for economic impact estimation is that of change in the users' fees proposed for the Prince Albert National Park.

1.5 Scope of Study

The study is focused to emphasize the estimation of short-run economic impacts of changes in forest use in the PAMF. The long-run impacts through generation of agglomeration economies (or diseconomies) are not estimated here. Such estimations require a more complex and elaborate methodology and, therefore, are considered beyond the scope of this study.

In developing the model, several assumptions were made. These should be kept in mind in interpreting the results. For example, the model presented in this study is based on non-survey methods, both for updating as well as for developing regional models. The results are based on the economic transactions for the year 1992, and using measurements of regional economic activity as it existed in 1992. Therefore, the estimated economic impacts are specifically related to the economic situation of the region as it existed during the year 1992. Any indiscriminate use for other regions should be avoided.

⁵ The forest sector in this report is defined as the sum of all activities that are directly or indirectly related to forest products and their management, and to forestry operations.

1.6 Organization of the Study

The rest of this report is divided into four chapters. In Chapter 2, considerations involved in developing the model for the study are discussed. Chapter 3 presents details on the study methodology, and Chapter 4 the model of economic impact estimation. Chapter 5 demonstrates how the model can be applied in one particular example - impact of proposed entry fees to the Prince Albert National Park. A word of caution should be noted. The last chapter is merely a demonstration of the model's analytical capability. It should not be construed as a comprehensive analysis of this issue.

Chapter 2

CONSIDERATIONS INVOLVED IN SPECIFICATION OF THE STUDY MODEL

The economic impact assessment model for the Prince Albert Model Forest was designed to meet the needs of the PAMF Association in estimating economic impacts on the people living within the PAMF and the vicinity area of various uses of the forest. The development of the study model was guided by a number of considerations. These considerations included:

- i) Selection of appropriate method of estimation of economic effects;
- ii) Regional focus of the model;
- iii) Time period of estimation;
- iv) Representation of forest sector in the model; and,
- v) Disaggregation of personal income/expenditure patterns.

Each of these is discussed in this chapter in the order listed above.

2.1 Selection of Method of Estimation for Economic Impacts

The economic effects of alternative forest uses can be estimated using a variety of techniques. Notable among these are: Economic base models, Input-output models, Social accounting matrices, Computable general equilibrium models, and Econometric models. Each of these is described below.

2.1.1 Economic Base Model

An economic base model is used for estimating the effect of a base sector on the rest of the economy. The base sector, according to Davis (1993, p. 10) consists of all economic activity whose ultimate market lies outside the region. This type of model produces an aggregate multiplier for the region, and shows the effect of a unit change in the base sector on the total regional economy. Thus, its analysis is aggregate in nature, making categorizing of various industries as either base or non-base sectors somewhat difficult. Furthermore, the model assumes a homogenous multiplier effect of various base sectors, regardless of their interrelationships with other sectors of the economy. For estimating impacts of alternative forest uses this was considered too restrictive.

2.1.2 Input-Output Modelling

Most studies of regional development impacts have utilized the input-output method of assessment. For example, this model has been used to describe the role of forestry activities in Canada by Jacques (1988), and for Saskatchewan by Steele, Boylen, and Baumgartner (1988). The usefulness and applicability of input-output analysis to land and forest management planning have also been demonstrated for the USDA Forest Service by Alward and Palmer (1981).

Input-output techniques perform economic analysis ideal for the purposes of resource management and regional development. The linkages between forest management actions and other sectors of the economy, along with corresponding estimates of changes in final demands, are readily estimated when utilizing input-output analysis for impact estimation. In fact, according to Miller and Blair (1985), the input-output is the only model which can provide detailed disaggregated sector-by-sector information, thereby identifying the interlinkages within the economy.

The total economic impacts using this technique are obtained by adding secondary impacts to those directly related to the scenario⁶. The secondary impacts of any economic change are based on the established nature of economic relationships that exist in an economy at a point in time. These are captured in the form of a transactions table. One feature of the input-output model is that the economic transactions can be prepared for any size region - from a single community level to a national level. This feature is useful for the PAMF impact analysis tool. The second feature of the model is that economic development impacts can be linked with other economic, social and environmental changes for the region. Thus an input-output model can be linked with an employment module, or with pollution emissions if such impacts are desired by the decision-maker. This feature is also relevant to PAMF economic impact estimation.

⁶ A scenario is the development event which is being considered by the decision-maker. the context of the PAMF, a scenario might be related to a given use of the forest resources.

2.1.3 Social Accounting Matrices (SAM)

Social accounting matrices provide information of economic impacts which are beyond those provided by simple economic impact analyses. According to King (1985, p. 17), a SAM has two principal objectives: (i) to organize information about the economic and social structure of a region (country, province or a sub-provincial area) in a particular year; (ii) to provide the statistical basis for the creation of impact analysis. This model sets up a series of accounts in which each incoming and outgoing transaction is recorded, similar to regional economic accounts. However, the development of a SAM involves extending the I-O model by adding two accounts: a capital account for each of the institutional sectors, and the rest-of-the-world account including exports and imports of goods and services and the inflows and outflows of funds. Such models are more typically constructed for larger regions, such as a country. However, subject to availability of data, these models can be built for smaller economies. For example, Troster (1986) utilizes the SAM model to find measurements for analysis of dependence of the institutions within a First Nation's reserve economy, interdependence of producers on exports and imports, and leakages regarding institutional spending. After the impacts of a project on a reserve's economy are calculated, they are applied in a social cost-benefit analysis of the project alternatives.

2.1.4 Computable General Equilibrium Models

Modelling by computable general equilibrium is a further extension of social accounting matrices and the input-output models. The SAM is combined with an econometric model to capture the price and quantity effects when a project results in major direct changes. Although this type of model provides the best estimates of welfare changes related to a given project, its excessive data requirements are a great hindrance. Such models have, however, been developed for British Columbia (see Binkley et al. 1994).

2.1.5 Econometric Models

Econometric models are applied for regional economic policy evaluation. For example, the Province of Saskatchewan, Department of Finance, houses an econometric model (called Saskatchewan Econometric Model - SEM) which is used to predict various items of government

revenues and expenditures. Since many of these variables are related to economic activities such as value of sales, income, and employment, such models can be used for estimating economic impacts for a region such as a province. However, such models have yet to be developed on a subprovincial level in Saskatchewan, although Treyz et al. (1988) has reported examples of their use in the United States.

This type of analytical tool provides the utmost flexibility regarding factor prices and production proportions. As opposed to the Leontief assumptions of fixed technological coefficients and static economic equilibrium in input-output methodology, econometric models may be constructed to accommodate dynamic impact estimation with flexible technology and pricing. The constraining disadvantage of this type of modelling is the extensive data requirements given the necessity of time series data. Lack of effective data is a consistent obstacle in small region analysis and is obviously evident in the needs of the proposed study.

2.1.6 Selection of the Modelling Approach

The major objective of this study, as noted in Chapter 1, was to measure the economic impacts for the province and the PAMF region of changes in forest use. Each of the above five tools was evaluated in light of this objective.

The selected methodology for the study was the input-output model. This methodology was selected because it offered the best compromise in terms of data requirements (and data availability) and nature of economic impacts generated. Other methods did not offer as much comparative advantage, for the following reasons:

- i) The economic base model was considered too aggregate for a provincial or regional level impact analysis. Even for the PAMF region, it was felt that identification of base sectors may not be accurate, nor a clear cut distinction between base and non-base sectors established. Furthermore, for the PAMF regions, the presence of several base sectors complicates the development of such a model.
- ii) Social accounting matrices are more data intensive, and are perhaps more useful in tracing the distributive effects of changes in economic activity. Although the objectives

of the SAM are admirable, the resource requirements to build such models were considered beyond those available for this study.

- iii) The computable general equilibrium (CGE) models are more appropriate for a somewhat larger region (something larger than a sub-provincial area), and where the initial (direct) change brings forth a major realignment of the economy in terms of prices and level of output of various sectors. If the latter types of changes are not present, which is likely the case with the PAMF forest use changes, given the enormous data requirements for a CGE, this approach was not considered cost-effective.
- iv) Regional simulation or econometric models are very similar in content to economic base models. However, a number of additional features, such as the extension of economic activity to demographic changes, and inter-linking multiple regions, have some appeal. Even then the rather aggregate nature of such models would make it difficult to assess various types of forest use changes. For this reason, this approach was not considered any further.

Thus, the approach that serves the objectives of the PAMF Association the best, and in the most cost-effective manner, was the input-output model. This approach was selected for this study.

2.2 Selection of Regional Focus for the Model

Having decided on the method of analysis, the next major question was the regional focus of the model. Although knowledge of provincial level changes is desirable, that of local economic impacts is equally important. For this reason, two other regions were considered: (i) the Prince Albert Model Forest boundary; and (ii) an economic trading region for the Prince Albert Model Forest. Initially, it was decided to divide Saskatchewan into three regions: (i) PAMF; (ii) PAMF economic region excluding PAMF; and (iii) Rest-of-the-Province, defined as the total provincial economy less the other two regions.

The creation of the PAMF region required information on various economic activities. The use of secondary data was rejected since, as suggested by Kulshreshtha et al. (1994, p. 111), such data are subject to random rounding and confidentiality regulations. A primary data collection was considered as the next option. Various surveys were planned, as described in the next chapter. Due

to a poor response rate on these surveys, the development of the PAMF region's economic impact model was not carried out.

In light of the above decision, the first two regions, PAMF and PAMF economic region excluding PAMF, were combined, leading to a single region - Economic region of the PAMF (including PAMF). This led to Saskatchewan being divided into two regions:

- i) PAMF Economic Region; and
- ii) Rest-of-Saskatchewan region.

The first region was defined by a 77 km radius around the PAMF boundaries. The length of the radius was selected so that the city of Prince Albert was included, since it offers the most linkages with the PAMF economic activities. Approximate boundaries of the first region are shown in Figure 2.1. The boundaries were selected so that an entire census subdivision was included in the region. This was necessary in order to obtain data from secondary sources.

2.3 Period of Estimation

The development of an input-output model is a very data intensive exercise. Very detailed industry based data, as well as details on consumers, governments, and new capital formation, are required to complete an economic transactions table. For these reasons, such models are developed by agencies that have access to more detailed data and information and more adequate resources, such as Statistics Canada. The major problem is that the input-output model for Saskatchewan was last developed for the year 1984. For the intended use of such a model for PAMF, which would extend over the 1995-1999 period, this model was considered too limiting, on account of the possibility of structural changes. For this reason it was advisable to update the transactions table to reflect a more recent economic situation.

2.4 Disaggregation of Forest Related Sectors

As noted above, the major purpose of the study model was to predict the impact of changes in forest use. "Forest" in this study was defined in terms of all activities directly or indirectly related to forest products. During a typical year, a forest produces a variety of timber and non-timber benefits. Many of these may be complementary with each other, while for others a competitive

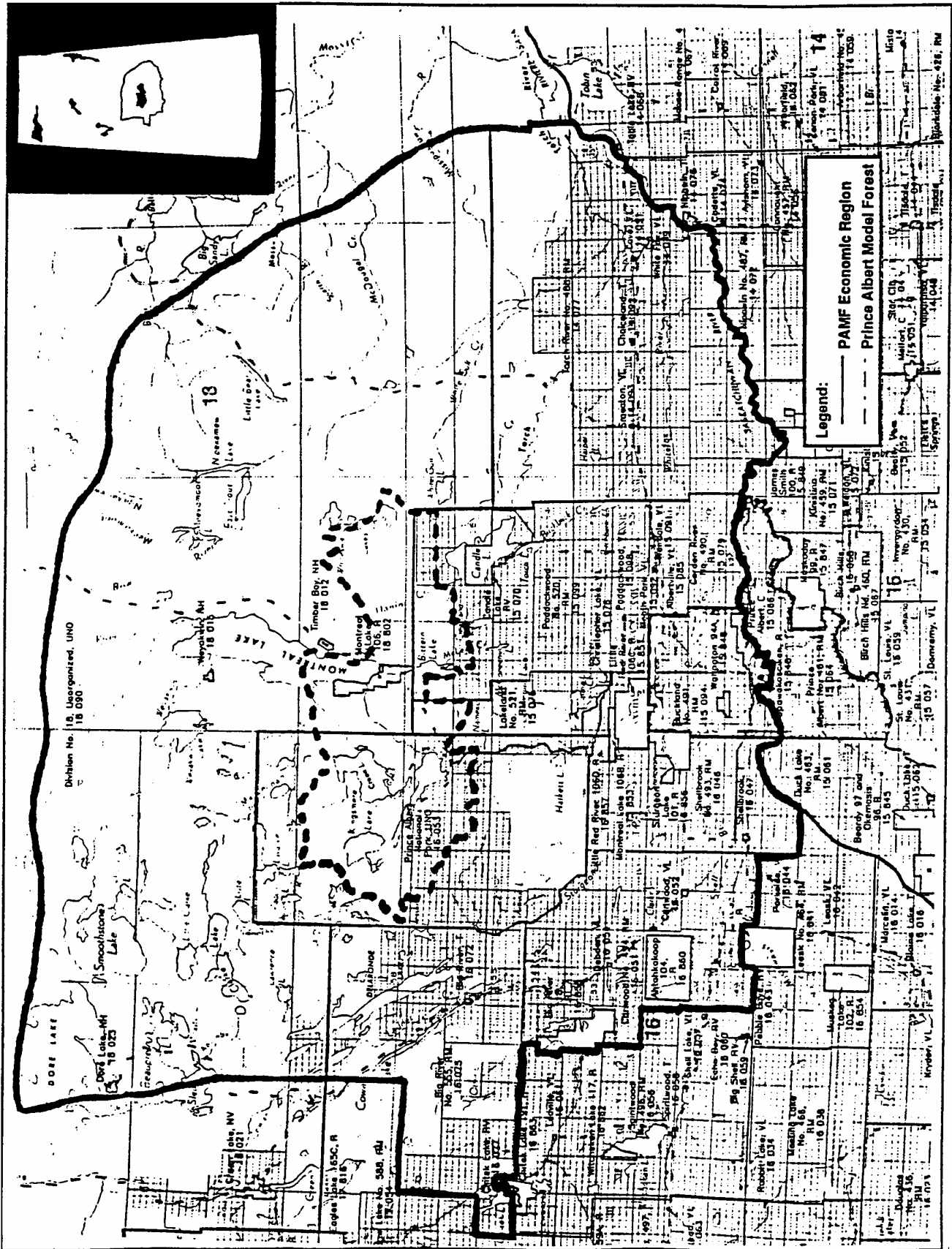


Figure 2.1: Location of the Study Region, PAMF Input-Output Model

situation may exist. Since a forest use scenario may involve these benefits, more attention needs to be paid to the manner in which forest sector and various products are accounted in the model. Thus, a more detailed representation of specific forest related activities is preferred to one that is more aggregated.

2.5 Disaggregation of Induced Impacts

As noted in Chapter 1, the secondary economic impacts of a scenario include those impacts that are generated through a respending of income earned by workers (and proprietors) in the region. This requires the endogenization of the household sector within the economic structure of the region. Provincial input-output models treat all households as a homogenous group of people with identical consumption patterns and equal propensity to save. However, in the context of the PAMF economic region, at least three types of households can be hypothesized that may be different in terms of these assumptions. These are: aboriginal families on-reservations, aboriginal families off-reservation, and non-aboriginal families.

Since it is conceivable that the expenditures and income patterns of these families may be significantly different from each other, it is preferable to have these households disaggregated. This will also enhance the capability of the model to show the economic impact of providing employment to various types of households in the region.

2.6 Summary

In this chapter conceptual considerations in the development of an economic impact analysis model for the Prince Albert Model Forest Association were presented. These considerations were used in deciding the final structure of the model. Details on this model are presented in the next chapter.

Chapter 3

CONCEPTUAL INPUT-OUTPUT MODEL

In this study, the method of estimation of the total economic impacts of forest use changes, as noted previously, was the input-output model. In this Chapter, this model is described in terms of basic conceptual foundations. The chapter is divided into four major sections. Basic types of economic impacts are discussed in the first section, which is followed by a presentation of the conceptual input-output model in Section 3.2 and by a discussion on economic impact estimation in Section 3.3. A discussion of input-output based multipliers is presented in the last section.

3.1 Taxonomy of Economic Impacts

The total economic impacts of a change in an industry fall under two classes: direct impacts and secondary impacts. The direct impacts of an industry are equivalent to the direct contributions of the industry to its economic trading region. The most common measure of this impact is the production levels of goods and services sold by the industry, and the concomitant generation of employment. For example, the direct economic impacts of the forest industry in Saskatchewan include the effects on the economy that are directly generated by the forest sector and are measured by level of its output or sales, employment, household income levels, and contributions to the provincial gross domestic product.

The direct economic activity of an industry creates a series of ripple effects throughout the economic system. Notable ripple effects initiated by this direct sectoral activity are:

- i) The purchase of intermediate input requirements from other sectors in the economy;
- ii) The employment of factors of production such as land, labour and capital. This leads to some expenditures allocated as payments to the owners of the primary inputs. This income received by the owners of the factors of production will be spent on personal consumption and direct and indirect taxes to various levels of government leading to more economic activity;
- iii) The further processing of goods produced by the sector. These sectoral outputs become the inputs in the production process of other sectors in the economy. For example, the

logging and forestry industries produce timber, which is an input into saw mills, and into the production of pulpwood, which is further processed by the paper and allied products industries;

- iv) The industries in (iii) above would purchase additional inputs, and hire additional factors of production. Once again, this will result in another round of reallocated income that will be spent in the economy on consumer goods and services.

In addition to the above four types of economic activities, another type of secondary impact is observed, but only in the long-run. A change in a sector, such as logging, may lead to creating an economic climate which may attract primary and secondary wood processors to the region. Such a change is called "external economic change" or external economies. The external economies create a climate in which it is more profitable for a firm to locate close to the point where the direct change activity is located. The region's attractiveness to other industry increases, and movement of these industries is called "agglomeration effect" or "spin-off effect". In the long-run, secondary impacts would be generated by existing industries as well as by new ones moving into the region.

Input-Output models are based on the current structure of the region; therefore, secondary impacts through spin-off effects are not considered. Thus, the total economic impacts of a change include the four economic impacts listed above. This can be expressed as shown in equation (3.1):

$$\text{Total Impact} = \text{Direct Impact} + \text{Secondary Impacts} \quad (3.1)$$

The four ripple effects are aggregated into two types: (i) Indirect (industrial support) impacts, and (ii) Induced (income-induced) impacts. The former type is the change in the output (or other economic measures)⁷ of various industries which results from purchases of various inputs by the direct impact sector. The Induced impacts contain the change in the output (or other economic measure) of various industries which results from the spending of household incomes generated by primary factor employment in the directly-plus-indirectly impacted sectors.

⁷ Other economic measures include value-added, household incomes, and employment levels.

The above four ripple effects are created through two types of linkages that a directly impacted sector has with other economic sectors:

- i) Supplier of inputs to the direct impact sector, and
- ii) Further processor of goods produced by the direct impact sector.

The first linkage is called backward linkage, and the second one forward linkage. Since both of these linkages would have indirect and induced impacts, the total economic impacts for a given scenario can be written as follows:

$$\begin{aligned} \text{Total Impacts} = & \text{Direct Impacts} + \\ & \text{Backward Linkages-Based Indirect Impacts} + \\ & \text{Backward Linkages-Based Induced Impacts} + \\ & \text{Forward Linkages-Based Indirect Impacts} + \\ & \text{Forward Linkages-Based Induced Impacts} \end{aligned} \quad (3.2)$$

Input-output models are utilized to determine these secondary impacts arising from a given direct change. These models have the capability of estimating the four types of secondary impacts shown in equation (3.2).

3.2 Introduction to Input-Output Model

As noted in Section 3.1, any economic change (as represented by a scenario) creates secondary impacts. These secondary impacts are estimated with the help of an input-output model. The input-output model is based on the established nature of economic relationships that exist in an economy at a point in time. It describes the interlinkages between various economic agents of an economy: producers, owners of primary resources (i.e. labour and capital), consumers and government. A description of these economic transactions is provided in a transactions table.

Input-output models can be presented in two basic formats of transactions tables: (i) square model, and (ii) rectangular model. The square input-output model is based on transactions among various producers - called sectors - in the economy. Each sector produces a single, homogenous bundle of goods and services.

In reality, the assumption of a single good being produced by a sector is found to be too restrictive. Most industries produce more than one product. In the rectangular input-output model, this assumption is relaxed. More details on this model are provided in the next section.

3.2.1 The Rectangular Input-Output (I-O) Model

In a rectangular I-O model, a firm can produce one or more products. The firms, aggregated into an industry, are called a sector. The goods produced are called a "commodity." Commodities are divided into two types: (i) Intermediate commodities, and (ii) Primary commodities. The first type of commodities are those produced by other sectors, while the latter group includes those that are provided by owners of factors of production - land, labour, and capital. As noted above, in this model, the production of multiple commodities in a sector is allowed although all industries within a sector remain homogeneous. Thus, this type of modelling accommodates multi-product and vertically integrated industries. This model is based on a different type of accounting framework.

The rectangular I-O Accounting Framework is based on three accounts:

- i) Commodity account which ensures that production of a commodity is equal to its demand or sales. Two types of commodity demands are acknowledged in these models - intermediate demand and final demand. The former demand is by the goods producing sectors, and used as an input into their respective production. This type of demand can also be called "intermediate inputs." Thus, this account can be written as:

$$\text{Total Commodity Output (C)} = \text{Intermediate Demand (C)} + \text{Final Demand (C)} \quad (3.3)$$

$$= \text{Intermediate Sales to Sectors (C)} \quad (3.3.1)$$

$$= \sum_{S=1}^S \text{Production of Commodity (C) by Sector (S)} \quad (3.3.2)$$

where C (1, . . . , C) is commodity, S is sector (1, . . . , S).

- ii) Sectoral Account, which equates the total value of output of a sector with its outlay (expenditures) on various inputs.

$$\text{Total Sectoral Output (S)} = \text{Intermediate Inputs (S)} + \text{Primary Inputs (S)} \quad (3.4)$$

$$\text{Total Sectoral Output (S)} = \sum_{C=1}^C \text{Production by Sector (S) of Commodity (C)} \quad (3.4.1)$$

- iii) Income and Expenditures Account, which ensures that the gross domestic product using the incomes approach is equal to that using the expenditures approach.

$$L + V = C E + G + I + (X - M) \quad (3.5)$$

where

- L = labour income, including incomes of unincorporated businesses,
- V = other value-added items such as corporate profits, investment income, capital consumption allowances, indirect taxes, and subsidies,
- CE = consumer expenditures,
- G = government's current expenditures,
- I = new capital formation by businesses and government,
- X = Exports to outside regions,
- M = Imports into the region.

This account is the fundamental macro-economic identity which is satisfied by all national/regional income accounting systems.

A rectangular I-O model is created from a rectangular transactions table. This table contains all the above three accounts. An example of this type of transactions table is presented in Figure 3.1. Four types of transactions/relationships among various economic agents in an economy are presented in this type of transactions table. Let S be number of sectors in the economy, C be number of commodities, F_d be number of final demand agencies, and P be number of primary inputs. The four types of transactions are:

- i) Producers-Producers: Intermediate commodity transactions between producing sectors to fulfill input requirements. This is shown as the U matrix in Figure 3.1, which is of C x S dimension.
- ii) Producers-Owners of Primary Resources: Transactions of primary inputs (e.g. labour or capital) from owners to producing sectors. This is shown as the Y matrix in Figure 3.1, and is of P x S dimension.
- iii) Producers-Final Demand Agencies: Final demand transactions from producing sectors to final demand sectors (e.g. households, government agencies, or exporters) for final consumption. This is shown as matrix F in Figure 3.1, and is of C x F_d dimension.

- iv) Owners of Primary Resources-Final Demand Agencies: Transactions of primary inputs to final demand sectors. This is shown as Y^F matrix in Figure 3.1, and is of $P \times F_d$ dimension.

In addition to the above four matrices, there is a matrix of sector output (V), which is of $S \times C$ dimension. Thus, in a rectangular input-output model, commodities are produced by various sectors and their production structure is documented in the make (V) matrix. They are disposed of either by interindustry demand to fulfill input requirements, or by final demand for consumption. The sum of all commodity disposition as sales [Q] equals their production [Q']. Each industrial sector purchases two types of inputs: intermediate inputs from other industries, and primary inputs. Total sectoral output is allocated to these inputs until it is completely exhausted.

3.2.2 Assumptions Of Rectangular Input-Output Modelling

As in every type of economic analysis, assumptions must be made to implement a model. Two major assumptions typically accompany the economic structure inherent in rectangular input-output modelling. These are summarized in the transactions table as follows:

- i) Constant technology and fixed proportion of factors of production whereby the flow of factors of production into a processing sector is directly proportional to the level of output produced by the processing sector only. This assumption of linear production functions implies that, if the output of a given sector doubles, demand for all inputs of that sector would also double.
- ii) Constant market share implying that the share of an industry in producing a commodity remains constant regardless of the level of commodity production. Thus, if the production of a commodity is doubled, it is assumed that all industries producing this commodity double their output of that commodity as well.

	COMMODITIES	PURCHASING SECTORS	FINAL DEMAND	TOTAL OUTPUTS
COMMODITIES		Intermediate Demand Or Input Matrix [U]	Final Demand [F]	Total Commodity Disposition [Q]
PRODUCING SECTORS	Output Matrix [V]			Total Sectoral Output [G]
PRIMARY INPUTS		Primary Inputs By Sectors [Y]	Primary Inputs By Final Demand [Y ^F]	Total Value-Added (GDP) [P]
IMPORTS		Imports By Sectors	Inputs By Final Demand	Total Imports
TOTAL INPUTS	Total Commodity Production [Q']	Total Sectoral Outlay [G']	Total Final Demand [E']	

Figure 3.1: Rectangular Input-Output Transactions Table

These assumptions lead to the creation of two key matrices -- the use matrix, and the make matrix, as described below.

Use Matrix: This matrix involves the intermediate demand or input matrix [U] as shown in Figure 3.1. Given the first assumption, each element u_{ij} is proportional to the output of the purchasing sector (G_j). From this assumption one can estimate the unit requirements for various intermediate inputs. These unit requirements are called b_{ij} , which is the amount of commodity i required to produce one unit of output of sector j . In other words,

$$b_{ij} = \frac{U_{ij}}{G_j}$$

Let B be the matrix of these b_{ij} coefficients with dimensions of C rows by S columns. These can be presented in a matrix form as shown in equation (3.7).

$$B = \begin{bmatrix} b_{11} & \vdots & b_{1s} \\ \dots & b_{ij} & \dots \\ b_{c1} & \vdots & b_{cs} \end{bmatrix} \quad (3.7)$$

The B matrix is known as the use matrix for the region.

Make Matrix: This concept makes use of the constant market share of output assumption as shown in the matrix [V] of the transactions table. Each element of this matrix in sector by commodity space is formulated to reflect the proportion of commodity i produced by industry j in coefficients designated as d_{ij} . These are estimated as shown in equation (3.8).

$$d_{ij} = \frac{v_{ji}}{Q_i} \quad (3.8)$$

The resultant D matrix is made up of the series of d_{ij} coefficients as shown by equation (3.9).

$$D = \begin{bmatrix} d_{11} & \vdots & d_{1c} \\ \dots & d_{ij} & \dots \\ d_{s1} & \vdots & d_{sc} \end{bmatrix} \quad (3.9)$$

Thus, the D-matrix is S x C dimension whereas the B-matrix is C x S dimension. If one premultiplies the D-matrix by B-matrix, the resulting matrix will be S x S dimension.

3.2.3 Determination of Economic Activity

The total industrial output can be estimated from the use and make matrices. Let the output of commodities be a vector Q (C x 1); and the output of different sectors be a vector G (S x 1). From the assumption of constant market share, the production of the sector (G) is a sum of commodity output, whose proportions are shown by D matrix. In other words,

$$G = DQ \quad (3.9)$$

In a similar vein, the output of a commodity is allocated between intermediate demand and final demand. The intermediate input demand is governed by the use matrix B. In other words,

$$Q = BG + F \quad (3.10)$$

In this equation intermediate demand is determined as the product of the commodity requirement per unit of output [B] and the level of industrial output [G].

Substituting equation (3.10) into equation (3.9) produces:

$$G = D[BG + F] \quad (3.11)$$

or

$$G = DBG + DF \quad (3.12)$$

which can be solved for sectoral output [G] by simple matrix manipulation:

$$G = (I - DB)^{-1} DF \quad (3.13)$$

where I is an identity matrix, G is the matrix of total sectoral output, DF is the matrix of final demand expressed in terms of sectors, B is the matrix of direct requirements, D is the matrix of market share coefficients, and $[(I - DB)^{-1}]$ is the matrix of multipliers (Leontief inverse matrix).

The fundamental concept behind input-output theory is summarized in equation (3.13). Herein is portrayed the relationship of the total sectoral output and the final demand. This relation estimates the change in the total sectoral output required to meet modifications in final demand. Again, the growth of the total sectoral output is proportional to a change in its final demand:

$$pG = [(I - DB)^{-1} D] pF \quad (3.14)$$

Thus, the I-O model is totally demand driven. By this method, the change in output levels required to fulfill the needs of a change in final demand can be determined by the Leontief inverse matrix, given the knowledge of the magnitude of the new final demand.

3.2.4 Determination Of Other Economic Activity in the Region

Besides the level of sectoral output, a change in the final demand of commodities produced by the sector also leads to a change in other economic variables. A common variables of such list includes: labour income, gross domestic product, and imports. These activities are related to the level of output as follows.

Let M be a matrix of unit coefficients for any of the above three economic activities. Thus is a $(1 \times S)$ vector of each of these. Suppose the elements in M reflect labour income for unit of output:

$$M_{ij} = \frac{LI_j}{G_j} \quad (3.15)$$

and

$$M = [LI_1 \text{ ---- } LI_i \text{ ---- } LI_S] \quad (3.16)$$

The total labour income change in the region associated with a scenario can be estimated as:

$$pM = M \cdot pG \quad (3.17)$$

Substituting equation (3.14) into equation (3.17) yields

$$pM = M[(I - DB)^{-1} D] pF \quad (3.18)$$

This procedure can be applied to estimate the gross domestic product or imports, by simply including their unit coefficients in the M matrix.

3.2.5 Open vs Closed Input-Output Model

As noted in Section 3.1, various economic impacts can be of three types - direct, indirect, and induced. The I-O model can be manipulated to generate these impacts. Let us define a sector called households (h) in a region. These households receive compensation for their labour and management. This money so received is subsequently spent on household expenditures. The original (DB) matrix in (3.12) is a $S \times S$ system involving only S sectors. Let us include the households income as additional row and their expenditures as additional column as follows:

$$(DB^+) = \begin{bmatrix} DB & : & h \\ & & \vdots \\ \dots & \dots & \dots \\ LI_s & : & LI_h \end{bmatrix} \quad (3.19)$$

Thus, the augmented matrix $(DB)^+$ is a $(S + h) \times (S + h)$ matrix of coefficients involving various goods producing sectors and households.

Let us use the augmented matrix to estimate change in output using equation (3.20):

$$G^+ = [I - (DB^+)^{-1}] [D^+ F] \quad (3.20)$$

where D^+ is augmented make matrix. The resulting output of S sectors plus the labour income (vector G^+) now include direct, indirect, and induced impacts. The model is now called a closed model with respect to the household sector. The model presented in equation (3.13) is called an open model, and includes only direct and indirect impacts.

3.3 Extension of the Input-Output Model to Generate Employment Levels

An input-output model can be integrated with an employment model to make predictions of change in employment levels and patterns associated with a given final demand. Thus, each scenario will result in a different type of employment impact on the region.

Let E_j be the level of employment generated by one unit of output of a sector (G_j), or in other words,

$$E_j = \frac{EMP_j}{G_j} \quad (3.21)$$

where EMP_j is total employment of sector j. Let E be a 1 x S dimension matrix of employment coefficient, such that

$$E = [E_1 \dots E_i \dots E_s] \quad (3.22)$$

The change in employment associated with a scenario can be estimated as shown in equation (3.23):

$$\rho E = E \cdot \rho G \quad (3.23)$$

or

$$\rho E = E \cdot [(I - DB)^{-1} D] \rho F \quad (3.23.1)$$

Thus, prediction of the effect on employment is similar to that for labour income or other value-added categories.

3.4 Input-Output Based Multipliers

3.4.1 Concept of Multipliers

An input-output model can be used to generate a somewhat practical concept called "economic multiplier". The concept of a multiplier is identical to the original Keynesian aggregate

multiplier for an economy. An input-output based multiplier is simply the total change in an economic activity associated with one unit of change associated with the scenario.

3.4.2 Typology of Multipliers

Related to an economic impact analysis, a variety of multipliers can be estimated. Let us divide them into two classes of multipliers: (i) Those based on backward linkages only, which we may call "Simple" multipliers; (ii) Those based on both types of linkages - backward and forward, which we may call "Comprehensive" multipliers. If a sector does not have any forward linkages, only simple multipliers can be estimated.

Each of the multipliers can be categorized differently depending upon a set of three criteria:

- i) Nature of total change - Direct + indirect, or Direct + indirect + induced.
- ii) Nature of direct change - change in final demand or change in output level, or change in direct economic activity.
- iii) Nature of economic activity such as output, labour income, gross domestic product, imports, or employment.

For each economic activity one can identify six types of simple and six types of comprehensive multipliers.

Using criterion (i) above, multipliers are labelled as:

Type I Multiplier - if only direct and indirect changes are included in total change.

Type II Multiplier - if direct, indirect and induced changes are included in the total change.

Thus, if one is interested in all five economic activities under criterion (iii) above, and if a sector has forward linkages, the total number of multipliers that can be estimated would amount to sixty in total.

3.4.3 Estimation of Economic Multipliers

All multipliers in an I-O model are based on the relationship shown in equations (3.13) and (3.20). The key matrix for Type I multipliers is the Leontief inverse matrix as shown in equation (3.24).

$$\text{Leontief inverse matrix} = [(I - DB)^{-1}] \quad (3.24)$$

Since the model used here is an open model, the multipliers matrix reflects direct and indirect changes.

If the model is 'closed' with respect to households, by incorporating labour income as payments to primary resources in an additional row, and personal expenditures as final demand in an additional column in the D and B matrices, then the economic transactions of the households are internalized into the augmented Leontief inverse matrix of $(s + h)$ by $(s + h)$ dimension. This 'closed' multipliers matrix or Type II multipliers is shown as estimated secondary impacts which include income-induced impacts along with the industry-support impacts.

$$\text{Augmented Leontief Inverse Matrix} = [I - (DB)^+]^{-1} \quad (3.25)$$

The second criterion listed in Section 3.4.2 leads to three types of multipliers: conventional, pseudo, and ratio multipliers. Each of these is discussed below.

Conventional Multipliers: In order to estimate the relationship between a change in final demand of a commodity or sector and economic activity, Conventional multipliers are employed. A conventional multiplier shows the change in economic activity (A) for a dollar change in final demand, and is estimated as follows:

$$\text{Final Demand Multiplier} = \frac{\text{Total Economic Change}}{\text{Direct Change in Final Demand}} \quad (3.26)$$

where economic activity (A) is the desired context of the multiplier, such as change in output, labour income, value-added, imports, or employment.

Pseudo Multipliers: These multipliers estimate the relationship between economic activity and a change in sectoral output. These types of impact measurements are required when the economic impacts are initiated by a change in sectoral structure, such as production increases or decreases, or an addition or removal of an entire sector in a region.

The equation for the calculation of these multipliers includes the direct output change as the denominator. The numerator is determined by the context of the multiplier usage (economic activity A) as explained for the Conventional multipliers above.

$$\textit{Pseudo Multiplier} = \frac{\textit{Total Economic Change}}{\textit{Direct Change in Output}} \quad (3.27)$$

These multipliers are interpreted comparable to the Conventional multipliers except for the obvious relation to impacts per one dollar change in sectoral output.

Ratio Multipliers: As the name implies, these multipliers involve a ratio of a common type of economic context. These show the effect of a specific type of change in the same terms as the change itself. Analogous to the Pseudo multipliers, these are used when the economy is impacted by a direct change in economic activity not including final demand.

In the calculation of Ratio multipliers, the denominator is determined by the type of change in economic activity. Since the equation is a simple ratio, the numerator also depends on the type of economic change.

$$\textit{Ratio Multiplier (A)} = \frac{\textit{Total Economic Change (A)}}{\textit{Direct Change in Same Economic Activity (A)}} \quad (3.28)$$

The calculation of various multipliers is decided by a combination of numerator and denominator. Table 3.1 summarizes the items to include the estimation of various multipliers.

**Table 3.1:
 Estimation of Different Types of Economic Multipliers**

Type of Change	Simple Multipliers						Comprehensive Multipliers						
	Conventional		Pseudo		Ratio		Conventional		Pseudo		Ratio		
	Type I	Type II	Type I	Type II	Type I	Type II	Type I	Type II	Type I	Type II	Type I	Type II	
Numerator: Direct Output	X	X	X	X	X	X	X	X	X	X	X	X	X
Backward linkages Based Indirect Impacts	X	X	X	X	X	X	X	X	X	X	X	X	X
Backward linkages Based Induced Impacts	--	X	--	X	--	X	--	X	--	X	--	X	
Forward Linkages Based Indirect Impacts	--	--	--	--	--	--	X	X	X	X	X	X	X
Forward Linkages Based Induced Impacts	--	--	--	--	--	--	--	X	--	X	--	X	
Denominator: Final Demand	X	X					X	X					
Direct Output			X	X					X	X			
Direct Economic Activity					X	X					X	X	

Chapter 4

DEVELOPMENT OF THE MODEL FOR ECONOMIC IMPACT ESTIMATION MODEL

The input-output model developed for estimation of economic impacts of changes in forest use in the Prince Albert Model Forest (PAMF) region is described in this chapter. The development of this model was guided by considerations involved as reviewed in Chapter 2, and the conceptual background of input-output models as presented in Chapter 3. In this chapter empirical methodology in developing the study model is described.

This chapter is divided into seven sections. Section 4.1 contains a review of previous studies. This is followed by an overview of the model, and its specifications in Sections 4.2 and 4.3. Various aspects of model specification - spatial, disaggregative - are described here. Section 4.4 describes creation of the model and various steps involved. These steps include creation of an economic transactions table, which is described in Section 4.5. Disaggregation of the household sector is discussed in Section 4.6 and the method used to calculate employment impacts is described in the last section.

4.1 Review of Past Studies of Forest-Related Impact Assessment

A review of the relevant literature reveals the fact that currently no studies are available which have documented a precise level of regional development impacts associated with forest use and related activities in Saskatchewan. Jacques (1988) calculated the total impacts of forestry activity in Canada and provinces in 1979 on gross domestic product and employment. Ondro and Williamson (1985) made an unsupported assumption of estimating impacts of the forest industry in Saskatchewan utilizing multipliers from Ontario and other regions. A later study by Steele, Boylen, and Baumgartner (1988) also followed the same practice, but the multipliers were for the province of Manitoba. The study employed the Statistics Canada model of the Manitoba economy weighted to the levels of the components of the Saskatchewan economy to compute Saskatchewan impacts. Employing this type of approach to the PAMF is less profitable for two reasons: (i) The model used in these studies is a provincial one which would not yield economic impacts for a region smaller than the province. (ii) Economic impacts in a region are contingent upon the nature of economic

transaction, particularly with respect to (a) interindustry support, and (b) consumers and other final demand agencies' support of local economy. In borrowing multiplier estimates from other provinces, one makes an implicit assumption that the situation in Saskatchewan is exactly the same as in the neighbouring region. Such an assumption should be tested prior to its use for impact analysis.

There also have been economic impact studies of selected forest uses. For example, Lafontaine (1993) calculated several multipliers for employment and labour income for the Canadian Parks Service in Saskatchewan, but the method of derivation of these is unclear. Studies from other provinces, such as Ontario (Econometric Research Ltd., 1993) and British Columbia (M'Gonigle, 1990; Davis, 1986), provide useful reference. However, as argued above, homogeneity cannot be assumed across regions or across provinces. Thus, even as a national input-output model does not realistically reflect the importance of forests to Saskatchewan, so a provincial model lacks the accuracy required for assessment of the PAMF regional economy.

4.2 Overview of the Study

The economic assessment model was designed especially to meet the needs of this study. It was called the Prince Albert Model Forest Input-Output 1992 model, or by its acronym PAMFIO92. Development of this model was guided by considerations outlined in Chapter 2. The following features were highlighted in the model:

- i) Regional disaggregation of the province. As noted above, since for the PAMF decision making a provincial approach is too aggregate, Saskatchewan was divided into two regions: (a) PAMF Economic region (also called periphery region), and (b) Rest-of-Saskatchewan Region. The boundaries of the PAMF Economic Region are shown in Figure 2.1.
- ii) Economic transactions for the province and the two regions reflect those for the year 1992. The selection of this year was guided solely by availability of data. It is accepted that this time period provides an adequate reflection of the nature of economic structure in the province and its two regions.
- iii) The input-output model was made sensitive to three types of consumer incomes and expenditures:

- a) Aboriginal consumers living on reservations;
- b) Aboriginal consumers living off-reservation; and
- c) Rest of the consumers (called non-aboriginal consumers).

Incomes accruing to each of these three groups and their respective consumer expenditures provide the flexibility in terms of estimating economic impacts on the region or province of increasing any one of these incomes.

- iv) The input-output model was linked with an employment module to estimate the change in the employment level associated with various scenarios of change in forest use.
- v) Disaggregation of forest related sectors. In light of potential applications of the model to forest use changes, particular attention was paid to the specification of the forest related industries. More details on this are provided in Section 4.3.

These above features of the PAMFIO92 are considered appropriate in light of its use for PAMF use scenarios.

4.3 Specification of the PAMF Input-Output Model Structure

The PAMFIO model was specified in terms of three basic accounts: Commodity, Sectoral, and Income Expenditure. Each of these accounts is described in this section.

4.3.1 Sectoral Structure of the Model

The original plan for the specification of forest related activities was to identify the following uses:

- i) Grazing use, as a part of agricultural production;
- ii) Commercial fishing;
- iii) Trapping;
- iv) Wild rice production;
- v) Timber production;
- vi) Fuelwood production;
- vii) Sawmills;
- viii) Other primary wood-using industries;

- ix) Secondary wood-using industries;
- x) Pulp and paper production;
- xi) Outfitters;
- xii) Specialty forest products; and
- xiii) Resort area commercial services.

Surveys were designed for each of these forest users. However, on account of the poor response rate, many of these industries were not separated out, as discussed below.

The PAMFIO92 details industry activity of the province through fifty-three sectors. The starting point was the 50 sectors included in Statistics Canada's transactions table of medium level aggregation. As noted above, in order to reflect different types of forest-related sectors, three additional sectors were added. Correspondence between the Statistics Canada sectors and those of this study is shown in Table 4.1.

Table 4.1:
Correspondence between Statistics Canada and PAMFIO Model Forest Sectors

Statistics Canada Sector	PAMFIO92 Sectors
Fishing and Trapping Industries	<ul style="list-style-type: none"> i) Fishing Industries and Industries Incidental to Fishing ii) Trapping Industries
Wood Industries	<ul style="list-style-type: none"> i) Sawmills, Planing Mills, and Shingle Mills Industry ii) Other Wood Industries
Accommodation and Food Service Industries	<ul style="list-style-type: none"> i) Outfitting Industries ii) Other Accommodation and Food Service Industries
Pulp and Paper Industries	Paper and Allied Products Industry

Each of the Fishing and Trapping, Wood, and Accommodation and Food Service industries were disaggregated to yield three new sectors. More details on the description of forest related industries are provided in Appendix A.

The fishing and trapping industries were disaggregated into fishing industries and trapping industries. Since both of these are major uses within the PAMF, this aggregation would lead to a more accurate economic impact assessment.

In the originally proposed model, the primary and secondary wood-using industries were to be disaggregated to detail more specifically economic impacts relevant to the PAMF region. Unfortunately, this procedure required primary data from surveys of the primary and secondary wood-using industries in the PAMF Economic Region which were not available.

Other primary data expected from surveys of outfitters, hunters, trappers, and fishers in the PAMF Economic Region were to provide further breakdown of Statistics Canada's Fishing and Trapping Industries, and Amusement and Recreational Service Industries (as categorized in Statistics Canada's *Standard Industrial Classification 1980*). Wild rice production was also to be isolated from the Agricultural Industries. Once again, the survey participation insufficiently met the needs of the study in terms of both quantity and quality. Subsequently, secondary data provided for some disaggregation, but was not available for some specialized sectors such as wild rice.

In keeping with the objectives of this study, the forest-related sectors of Statistics Canada's Input-Output model are defined according to the sectoral descriptions in Appendix A. Thus, impacts relating to the sectors especially relevant to the PAMF are quantified according to these specifications. The PAMFIO92 sectors are as listed in Table 4.2.

4.3.2 Commodity Structure

The commodities specified in PAMFIO are based on the medium level of commodity aggregation developed by Statistics Canada. These included ninety-two intermediate commodities. These are listed in Table 4.3.

4.3.3 Specification of the Income and Expenditure Categories

The income accounts for the PAMFIO92 model were represented by eight primary commodities. These are shown in the first two columns of Table 4.4. Besides the two categories of imports, indirect taxes and subsidies, labour income and other operating surplus are included as these items. The labour income includes the following elements:

Table 4.2:
List of Model Sectors in PAMFIO92

No.	Sector Description	No.	Sector Description
1	Agriculture & Related Services Industries	27	Nonmetal Mineral Products Ind.
2	Fishing Ind. and Services Incidental to Fishing	28	Refined Petroleum & Coal Products Ind.
3	Trapping Industries	29	Chemical & Chemical Products Industries
4	Logging & Forestry Industries	30	Other Manufacturing Industries
5	Mining Industries	31	Construction Industries
6	Crude Oil & Natural Gas Ind.	32	Transportation Industries
7	Quarry & Sand Pit Industries	33	Pipeline Transport Industries
8	Service Related to Mineral Extraction	34	Storage & Warehousing Industries
9	Food Industries	35	Communication Industries
10	Beverage Industries	36	Other Utility Industries
11	Tobacco Products Industries	37	Wholesale Trade Industries
12	Rubber Products Industries	38	Retail Trade Industries
13	Plastic Products Industries	39	Finance & Real Estate Industries
14	Leather & Allied Products Industries	40	Insurance Industries
15	Primary Textile Products Industries	41	Govt. Royalties on Natural Resources
16	Clothing Industries	42	Owner Occupied Dwelling
17	Sawmill, Planing Mill & Shingle Mill Industries	43	Business Service Industries
18	Other Wood Industries	44	Educational Service Industries
19	Furniture & Fixture Industries	45	Health Service Industries
20	Paper & Allied Products Industries	46	Outfitting Industries
21	Printing & Publishing & Allied Industries	47	Other Accommodation & Food Service Industries
22	Primary Metal Industries	48	Amusement & Recreational Services
23	Fabricated Metal Products Industries	49	Personal & Household Services Industries
24	Machinery Industries	50	Other Service Industries
25	Transportation Equipment Industries	51	Operat. Office, Cafeteria, & Lab Supplies
26	Electric & Electronic Products Industries	52	Travel, Advertising & Promotion
		53	Transport Margins

- i) Wages and salaries,
- ii) Supplementary labour income,
- iii) Military pay and allowances,
- iv) Net income of farm operators from farm production, and
- v) Net income of non-farm unincorporated businesses.

As noted above, three types of labour income were specified: for aboriginal workers on reserves; for aboriginal workers off-reserves; and for non-aboriginal workers.

The "other operating surplus" includes the following three items:

- i) Profits and other investment income,

Table 4.3:
List of Commodities in PAMFIO92

No.	Description	No.	Description
1	Grains	47	Copper & copper alloy products
2	Live animals	48	Nickel products
3	Other agricultural products	49	Other non-ferrous metal products
4	Forestry products	50	Boiler, tanks & plates
5	Fish landings	51	Fabricated structural metal products
6	Hunting & trapping products	52	Other metal fabricated products
7	Iron ores & concentrates	53	Agricultural machinery,
8	Other metal ores & concentrates	54	Other industrial machinery
9	Coal	55	Motor vehicles
10	Crude mineral oils	56	Motor vehicle parts
11	Natural gas	57	Other transport equipment
12	Non-metallic minerals	58	Appliances & receivers, household
13	Services incidental to mining	59	Other electrical products
14	Meat products	60	Cement & concrete products
15	Dairy products	61	Other non-metallic mineral products
16	Fish products	62	Gasoline & fuel oil
17	Fruits & vegetables preparations	63	Other petroleum & coal products
18	Feeds	64	Industrial chemicals
19	Flour, wheat, meal & other cereals	65	Fertilizers
20	Breakfast cereal & bakery products	66	Pharmaceutical
21	Sugar	67	Other chemical products
22	Misc. food products	68	Scientific equipment
23	Soft drinks	69	Other manufactured products
24	Alcoholic beverages	70	Residential construction
25	Tobacco processed unmanufactured	71	Non-residential construction
26	Cigarettes & tobacco mfg.	72	Repair construction
27	Tires & robes	73	Pipeline transportation
28	Other rubber products	74	Transportation & storage
29	Plastic fabricated products	75	Radio & television broadcasting
30	Leather & leather products	76	Telephone & telegraph
31	Yams & manmade fibers	77	Postal services
32	Fabrics	78	Electric power
33	Other textile products	79	Other utilities
34	Hosiery & knitted wear	80	Wholesale margins
35	Clothing & accessories	81	Retail margins
36	Lumber & timber	82	Imputed rent owner occ. dwellings
37	Veneer & plywood	83	Other finance, ms., real estate
38	Other wood fabricated material	84	Business services
39	Furniture & fixtures	85	Education services
40	Pulp	86	Health services
41	Newsprint & other paper stock	87	Amusement & recreation services
42	Paper products	88	Accommodation & food services
43	Printing & publishing	89	Other personal & misc. services
44	Advertising, print media	90	Transportation margins
45	Iron & steel products	91	Operating, office, lab, & food
46	Aluminum products	92	Travel, advertising & promotion

Table 4.4:
List of primary Commodities and Final Demand in PAMFIO92

No. Primary Inputs	No. Final Demand
93 Non-competing imports	1 Aboriginal Households Expenditures on Reserves
94 Unallocated imports & exports	2 Aboriginal Households Expenditures Off-Reserve
95 Indirect taxes	3 Non-Aboriginal Households Expenditures
96 Subsidies	4 Government
97 Labour Income: Aboriginals On Reserve	5 Investment
98 Aboriginals Off-Reserve	6 Exports
99 Non-Aboriginal	
100 Other operating surplus	

- ii) Inventory valuation adjustments, and
- iii) Capital consumption allowances and miscellaneous valuation adjustments.

The sum of various items leads to the gross income estimates or gross domestic product (GDP) estimates. Two types of GDP estimates can be estimated:

$$\text{GDP (Factor Cost)} = \sum_{h=1}^3 \text{Labour Income (h)} + \text{Other Operating Surplus} \quad (4.1)$$

$$\text{GDP (Market Prices)} = \text{GDP (Factor Cost)} + \text{Indirect Taxes} - \text{Subsidies} \quad (4.2)$$

Thus, each scenario can yield change in two types of GDP levels - one in terms of factor costs, and the other in market prices.

The expenditure side of the income accounts is represented by final demand agencies. The PAMFIO92 includes six final demand agencies: 3 types of household expenditures, government sector, investment or new capital formation, and exports. The sum of these six elements leads to the gross domestic expenditure for a region which is equal to the gross domestic product at market prices.

4.4 Empirical Estimation of the Model

The development of the PAMFIO92 model began with a Saskatchewan transactions table provided by Statistics Canada. The table reflected the economic transactions for the year 1984.

The original table contains 43 sectors. In order to use the model for impact analysis, a number of manipulations were done to this base table. These include the following:

- i) Filling in of Confidential Sectors Information. Since, for the Province of Saskatchewan, some sectors are considered confidential and information on their input use or output is not released. These include: (1) leather and plastic fabricated products, (2) pulp and paper products, (3) primary metal products, and (4) petroleum and coal products. In this task, the confidential cells in the table are replaced by new sectors producing these commodities. Creation of these new sectors is based on technology of production in neighbouring provinces, particularly Alberta. Where such information is not available for the neighbouring provinces, data for Canada as a whole were used. This step resulted in a transactions table containing 50 goods producing sectors.
- ii) Adjustments for Trade Flows and Other Leakages. An input-output model portrays the transactions that are locally purchased and in producers' prices⁸. In order to estimate local purchases, one needs to calculate self-supply ratio - the proportion of total requirements of a commodity being met from provincial production.
- iii) Update of the Model to 1992. Since the transactions table reflected economic conditions during 1984, it was not considered representative of the nineties. For this reason the table was updated to 1992 using non-survey method. More details on this are presented in Section 4.5.1.
- iv) Development of Regional Models. As noted above, the PAMFIO92 model was regional in nature. The next step after updating the provincial transactions table was that of regionalizing it. More details on this step are provided in Section 4.5.2.

⁸ The terminology producers' prices, in contrast to purchasers' prices, differs in the following manner:

$$\text{Purchaser's Price} = \text{Producer's Price} + \sum_{i=1}^7 \text{Margins (i)}$$

The seven margins are: (i) Retail Margin; (ii) Wholesale Margin; (iii) Tax Margin; (iv) Transport Margin; (v) Gas Margin; (vi) Storage Margin; and (vii) Pipeline Margin.

- v) Creation of Additional Forest-Related Sectors. As noted in Section 4.3, the forest-related sectors were disaggregated from the existing sectors. The method of creating these additional sectors is described in Section 4.5.3.
- vi) Development of Disaggregated Labour Incomes. Total labour income in the region was disaggregated into three types: for aboriginal households on-reserves; aboriginal households off-reserves, and non-aboriginal households. The method of estimation for this step is described in Section 4.6.
- vii) Extension of the Model for Employment Creation. The input-output model was extended to create employment levels through adding an employment module. Details on this step are shown in section 4.7.
- viii) Development of Economic Impact Analysis Program. The economic impact estimation requires a set of commands which manipulate various data tables on lines prescribed by the input-output theory. This program was developed by, and is described in Florizone, Kulshreshtha, and Siemens (1995).

The completion of the above eight steps marked the end of the model building process. At the end of these steps, the model was ready to be used for economic impact analysis for a hypothetical/real scenario.

4.5 Development of Transactions Table

The transactions table(s) for the PAMFIO92 model involved three major steps as already listed above. These were: (i) updating the model to reflect 1992 economic conditions; (ii) regionalizing the transactions table to create two regional transactions tables; and (iii) creating coefficients for six forest-related sectors. Each of these is discussed in this section.

4.5.1 Method of Updating the Transactions Table

Updating the provincial transactions table to 1992 levels was accomplished by using the H-M technique (McMenamin and Haring, 1974). This updating procedure was chosen because of its relatively straightforward application and cost effectiveness. According to Miller and Blair (1989,

p. 290) to the extent that technological change in the style of production may be reflected in these substitution and fabrication effects, the H-M procedure has a logical economic basis.

This method of updating involves an iterative procedure which converges to a unique solution under equilibrium conditions. At that point the table satisfies all the restrictions. This requires augmenting the base year (1984) regional table for changes in prices, effects of substitution, the effects of fabrication which have taken place between the base year and the modelling year (1992).

Adjustments are made on gross flow values of the entire table, including values for final demand and payments to resources sectors. The method requires 1992 levels of sectoral output plus value-added by primary resources and 1992 levels of sectoral outlay plus final expenditures for this update. Each row and column of the base year is adjusted until it satisfies all row and column totals. Values of these totals for the study model are shown in Appendix B.

4.5.2 Non-Survey Regionalization of the Provincial Model

As previously mentioned, data necessary for a quasi-survey method of regionalization for the PAMF economic region of the original model could not be collected. As a substitute non-survey method of creating a regional transactions table was adopted. The method used was that of location quotients (LQ).

A location quotient is a measure of the concentration of an industry in a region. Using employment level as a proxy for output, an industry in the region that has a proportion of employment in that industry that is greater than the provincial proportion is assumed to meet the regional requirements as well as contributing to provincial exports. Likewise, if the proportion is smaller than that for the province, that sector is assumed unable to meet the regional demands, and is subsequently assumed to be importing a part of its requirements from the larger region.

The LQ method of regionalization is accurate under several assumptions, such as: (i) no cross hauling of goods and services; (ii) uniform consumption patterns; (iii) equal labour productivity across regions; and (iv) no international trade. Despite these drawbacks, LQ is a frequently used measure of local and export production. Compared to the ad hoc determination of exports, LQ is straightforward and well documented (Treyz, 1993).

The location quotient for a sector (i) for a region (R) is estimated as the ratio of employment in an industry to the total employment in the region, and the ratio of the same industry's employment in the province to the total. In other words, it is calculated as:

$$LQ_i = \frac{EMP_i^R / EMP^R}{EMP_i^P / EMP^P} \quad (4.3)$$

where: EMP_i^R = regional employment in sector i,
 EMP^R = total regional employment
 EMP_i^P = provincial employment in sector i, and
 EMP^P = total provincial employment.

Going back to Equation (3.13), recall that sectoral output is expressed as:

$$G = (DB)G + DF \quad (4.4)$$

Let $DB = A$, a matrix of S x S dimensions. The coefficients A_{ij} are the per unit requirements purchased from sector i to produce one unit of output of sector j. Equation (4.4) can be written as:

$$G = AG + DF \quad (4.5)$$

The coefficients for the regional model are obtained using the location quotient in the following manner:

$$a_{ij}^R = \begin{cases} a_{ij} & \text{if } LQ_i \geq 1 \\ a_{ij} \cdot LQ_i & \text{if } LQ_i < 1 \end{cases} \quad (4.6)$$

Where a_{ij} are provincial coefficients. Thus, a location quotient of less than one suggests that the industry in the given region is less prominent relative to the province, therefore unable to meet all the regional demands for its products. In this case, imports from other parts of the province are assumed to fill the demand. The magnitude of these imports is estimated in the supply-demand balancing stage of the calculation of regional coefficients. Then the intra-provincial imports are expressed per unit of output, and added to the imports coefficients matrix.

For the PAMFIO92 model, the location quotient method was followed to create the transactions table for the PAMF economic region. Data used in the calculation of these LQs are

shown in Appendix C. Once the coefficients were estimated using equation (4.6), the transactions table was balanced, and imports into the region from other parts of the province were estimated.

The transactions table for the second region - Rest-of-Saskatchewan - was estimated as a residual. The transactions table for the PAMF economic region was subtracted from the provincial table to yield the second transactions table.

4.5.3 Creation of Coefficients for the Forest-Related Sectors

The six forest related sectors were created from the updated regional transactions table. These disaggregations were accomplished by utilizing proportions of the total sectoral output as provided by various secondary sources.

The proportion of fishing and trapping industries, which was attributed to fishing industries and services, was determined through communication with the Saskatchewan Fisheries branch. Commercial fisheries production for the 1992-93 period was estimated by total payments by the Freshwater Fish Marketing Corporation for that period. Trapping industries were assumed to make up the remainder of output for the larger sector.

The division of sawmills, planing mills and shingle mills industries from the larger wood industries sector was simply accomplished by assuming 1991 proportions as per Statistics Canada (1993c). In that period, wood mills produced forty-three percent of total wood industries production. Thus, the total wood industry production as reported by Statistics Canada at \$157 million was divided in these proportions.

Accommodation and food services were first separated into accommodation services and food services as provided by Statistics Canada (1992). Then, the accommodation services were subdivided into outfitting industries (recreation and vacation camps: SIC 914) and all other accommodation service industries as detailed in the first mentioned publication. Finally, food services and the other accommodation services were re-totaled in the new sector of other accommodation and food services. Thus, outfitting industries were removed from the larger accommodation and food services sector.

4.6 Disaggregation of Household Consumption Expenditures

Since one of the goals of the PAMF partnership was specified as *"to identify specific impacts of forestry management on the indigenous people dwelling within the region"* (PAMF, 1992), treatment of households as single homogenous sector was considered inappropriate. Need for such a disaggregation and the procedure followed to achieve it are described in this section.

4.6.1 Need for Disaggregation of Economic Agents

Regions within Saskatchewan are comprised of distinctive demographic structures. A population within any given region contains various cultural and ethnic backgrounds. Thus, the provincial demographic structure does not necessarily reflect the structure of a region. The PAMF Economic Region is an excellent example of this disparity.

Table 4.5 details the aboriginal and non-aboriginal proportions of Saskatchewan relative to the PAMF Economic Region. A feature of the PAMF economic region is that, relative to rest-of-Saskatchewan, it contains a higher proportion of aboriginal population. During 1991, the PAMF economic region included 14 percent of its total population as aboriginal, as against only 6.7 percent for the province as a whole. Thus, the aboriginal proportion of the population of the PAMF Economic Region was significantly higher than that of the Province. Also, the growth rates of the two populations, of the PAMF Economic Region and of the province, are quite different. The aboriginal population in the province increased by 25.7 percent during 1986 to 1991, as compared to a 19.1 percent increase for the PAMF. Interestingly, the total populations of both regions have decreased during the 1986 to 1991 period while the aboriginal populations in both regions have grown.

Differences in the composition as well as in the growth rates of various population groups between the two regions suggested a need for disaggregating households. Three types of households were identified: aboriginal households living on reserves; aboriginal households living off-reserves; and the non-aboriginal households. The method used to disaggregate their consumption patterns is described below, in Section 4.6.3.

As demonstrated above, the need for making a distinction between the two regions' populations is obvious. The PAMFIO model incorporates these distinct demographic structures

into the final demand sectors as well as the labour income portion of the Gross Domestic Product and employment impacts as detailed in sections 4.6.3 and 4.7 respectively.

**Table 4.5:
 Demographic Structure of the Province of Saskatchewan
 and the PAMF Economic Region, 1986 and 1991**

Particulars	1986	% of total	1991	% of total	% Change in 1991 over 1986
SASKATCHEWAN					
Total Population	1 009 613	100.0	988 928	100.0	-2.0
Aboriginal Population ¹	55 650	5.5	66 275	6.7	19.1
Non-Aboriginal Pop.	953 963	94.5	922 653	93.3	-3.3
PAMF ECONOMIC REGION					
Total Population	55 870	100.0	55 570	100.0	-0.5
Aboriginal Population ¹	6 195	11.1	7 788	14.0	25.7
Non-Aboriginal Pop.	49 675	88.9	47 782	86.0	-3.8

¹ These data define those of single aboriginal origins only.

Source: Statistics Canada, 1986 Census and 1991 Census.

4.6.2 Data Collection

Statistics Canada has obtained extensive data on ethnicity in relation to many demographic and economic considerations. Similarly to the *1991 Census, in Statistics Canada (1991) (Aboriginal Peoples Survey)* gathered information from households which included aboriginal people. Through these means, data were obtained in this study regarding details of general demographics, household structures, and levels and patterns of employment.

In addition, aboriginal household expenditure surveys were completed for Montreal Lake and the surrounding communities of Weyakwin, Timber Bay, and Little Red River, as well as in the city of Prince Albert. The data collected here were compiled into a database and then converted into two distinct models of Aboriginal households consumption expenditures. These effectively depict the expenditure patterns of aboriginal families living on reserves, and those of aboriginal families living off-reserve in urban communities comparable to Prince Albert.

4.6.3 Disaggregation of Household Final Demand Sectors in Saskatchewan

In agreement with the demographic results presented in section 4.6.1, the household structure of the Province is not of similar ethnic makeup. Table 4.6 shows the number of households by corresponding ethnic background. Thus, 7.5 percent of all households in the province are of aboriginal ancestry. More details on the aboriginal households are provided in Table 4.7. The average number of persons per aboriginal household of 3.8 is rather distinctively different from the provincial average of 2.7 persons per household. Given these differences, it appears incongruent for the aboriginal household proportion to be higher than the demographic proportion. This discrepancy is due to the differences in definition of aboriginal peoples between the two data sets. In accordance with the *Aboriginal Data User's Guide*, "comparisons between the Aboriginal and non-Aboriginal populations can be made using only those variables included in the census because the questionnaire containing those variables was answered by both population groups" (Statistics Canada 1991, p.7). Thus, these data are considered useful for the purposes of this model and remain consistent within 1 percent. These data were used to disaggregate the total household expenditure column into three household sectors defined as:

- i) Aboriginal Households On-Reserve: this sector assumes household expenditure patterns as derived from the family expenditure surveys of the people of the Montreal Lake Cree Nation in the communities of Montreal Lake, Weyakwin, Little Red River, and Timber Bay;

**Table 4.6:
 Household Proportions in Saskatchewan by Ethnicity, 1991**

Particulars	Total Number of Households	Proportion of Saskatchewan Households (%)
TOTAL SASK. HOUSEHOLDS	363 150	100.00
ABORIGINAL ¹	27 385	7.54
On Reserves & Settlements	6 425	1.77
Off Reserves & Settlements	20 960	5.77
NON-ABORIGINAL	335 765	92.46

¹It is important to note that these data define aboriginal households as *households in which at least one person reported that they identify with at least one Aboriginal group* (i.e. North American Indian, Metis, or other aboriginal group) whereas Census data use a definition of *single Aboriginal origins*.

Source: Statistics Canada (1991)

**Table 4.7
 Structure of Aboriginal Households in Saskatchewan, 1991.**

Particulars	Number of Households	Proportion of Aboriginal Households	Average Number of Persons/Household
TOTAL ABORIGINAL HOUSEHOLDS	27 385	100.00	3.8
North American Indian	17 185	62.75	4.1
On Reserve & Settlements	6 425	37.39	4.6
Off Reserve & Settlements	10 760	62.61	3.8
Metis	11 780	37.25	3.5

Source: Statistics Canada, (1991)

- i) Aboriginal Households Off-Reserve: this sector reflects the average household expenditure of the Aboriginal families surveyed in the city of Prince Albert; and
- ii) Non-Aboriginal Households: this sector contains the remainder of the households in Saskatchewan.

Utilizing the expenditure patterns associated with each type of household sector, the total personal expenditure in Saskatchewan for the year 1992 was proportioned using data in Table 4.6. The locations of the aboriginal households, on or off-reserve, were determined by the combination of households reporting North American Indian and Metis. This approach compiled Off Reserve North American Indian households with Metis households, with the remaining households being On Reserve.

Since only aboriginal families were surveyed for this study, expenditure patterns of the non-aboriginal households were affected from a previous model. Given the lower proportion of the Aboriginal population in Saskatchewan in 1986 at 5.5 percent, the household final demand coefficients from the 1984 provincial transactions table were assumed appropriate for the non-aboriginal sector of the model.

4.6.4 Disaggregation of Household Final Demand Sectors in the PAMF Economic Region

In the PAMF Economic region of this model, the rate of growth of the aboriginal population is higher than that for the province (at twenty-five percent) during the 1986 to 1991 period. Thus, the differences in personal consumption will have increasing implications within this economy. As shown in Table 4.8, aboriginal peoples make up fourteen percent of this region's population. Once again, these proportions agree with the demographic details and the aboriginal households on-reserves were distinguished from the aboriginal households off-reserves by these measures. As in the provincial household disaggregation, average household expenditures were assumed in accordance with the results of the aboriginal family surveys.

Using the above data for the number of households by type and the household expenditure coefficients as in the Saskatchewan model, the total personal expenditure for the PAMF Economic Region was calculated for the three household sectors as previously defined. Consequently, PAMFIO

has the capacity to estimate induced impacts of the three distinct types, the relative magnitudes of which are applicable specifically to the PAMF Economic Region.

**Table 4.8:
 Household Proportions in PAMF Economic Region, 1991.**

Particulars	Total Number of Households	Proportion of Households of PAMF Region (%)
TOTAL PAMF REGION	19 470	100.00
ABORIGINAL	2 730	14.02
On Reserves & Settlements	695	3.57
Off Reserves & Settlements	2 035	10.45
NON-ABORIGINAL	16 740	85.98

Source: Statistics Canada, Special Tabulation and 1991 Census

4.7 Employment Impacts in the PAMFIO92

Directly associated with economic activity in a region is the creation of employment. The directive of many analyses of regional economies is the employment generating effects of a proposed development or economic change. The PAMFIO92 accommodates this objective in an innovative and comprehensive manner regarding employment ethnicity. Within this model employment impacts are measured in terms of employment of full-time equivalent workers including self-employed, hired, and unpaid family workers.

The magnitude of the employment-generating impact of a sector reflects the relationship between the employment and production levels of a sector. This employment-production function is estimated as:

$$E = \alpha + d G_i \tag{4.7}$$

where E_i is the level of employment in sector i ,

G_i is the level of output of sector i ,

and α and d are the relationship coefficients.

The above equation presents marginal change in employment and may apply to short- or medium-term changes in output. In the long-run, output and employment would be at some equilibrium and would be related in the following manner:

$$E_i = \gamma_i G_i \quad (4.8)$$

where γ_i is the average employment-output ratio. A γ_i coefficient was estimated for each ethnicity of employee for each sector of each of the two regions in terms of jobs per million dollars of output.

4.7.1 Details of Employment Patterns in Saskatchewan

The labour force in Saskatchewan has a diverse combination of ethnic backgrounds and participation levels. As shown in Table 4.9, participation and unemployment rates vary significantly between the aboriginal and non-aboriginal segments of the labour force. The reasons for these discrepancies are many and by no means obvious, but analysis of this phenomenon is a monumental task and not within the scope of this study. Hence, the ethnic cross-sectional relationships supplied by Statistics Canada will be presumed appropriate for these purposes.

**Table 4.9:
 Employment Status of Saskatchewan Population, 1991**

Particulars	SASKATCHEWAN	Aboriginal	Non-Aboriginal
Total Number of Adults (15 years and over)	738 650	49 275	689 375
Employed	470 475	17 365	453 110
Unemployed	35 820	6 555	29 265
In labour force	506 295	23 920	482 375
Unidentified status	300	300	0
Participation rate	68.5	48.5	70.0
Unemployment rate	7.1	27.4	6.1

* Defined as those whom reported identifying with their Aboriginal origins
 Source: Statistics Canada (1991) and 1991 Census

Of all aboriginal peoples fifteen years and over in Saskatchewan, 48.5 percent participate in the labour force, either employed or unemployed and actively looking for work. Of the non-aboriginal labour force seventy percent are in equivalent positions. Within these groups, 27.4 percent of the aboriginal labour force is unemployed, while 6.1 percent of the non-aboriginal set are unemployed.

The aboriginal portion of Saskatchewan's labour force has within it an assortment of rates of labour force participation and unemployment (see Table 4.10). These measures vary depending on the aboriginal group and the location of dwelling place. Of all aboriginal peoples, the Metis have the higher labour force participation at 58.3 percent of adults fifteen years and over while North American Indians participate at a 44.1 percent level. Of the North American Indians, those who live off-reserve have a higher participation rate, 50.1 percent, compared to 44.1 percent for those living on-reserve, although the employment rates are similar at 29.5 and 33.4 percent respectively.

**Table 4.10:
 Employment Status of Saskatchewan Population Reporting Aboriginal Identity
 (On and Off Indian Reserves and Settlements, 1991)**

Particulars	Total Aboriginal	North American Indian			Metis
		Total	On- Reserve	Off- Reserve	
Total Number of adults (15 years or more)	49 275	33 795	16 330	17 465	15 480
Employed	17 365	10 165	4 335	5 830	7 200
Unemployed	6 555	4 730	1 810	2 920	1 825
Not in the Labour Force	25 055	18 655	10 085	8 570	6 400
Unidentified status	300	250	100	150	50
Participation rate	48.5	44.1	37.6	50.1	58.3
Unemployment rate	27.4	31.8	29.5	33.4	20.2

Source: Statistics Canada (1991)

Employment level data were provided by Statistics Canada by ethnic origin for all two and three digit Standard Industrial Classifications in Saskatchewan (see Appendix D). Thus, data on respondents who reported aboriginal origins were distinguished as either North American Indian or Metis. Using the employment levels from the labour income disaggregation, these data were then reorganized in terms of the model's ethnic groups as Aboriginal On-Reserve, Aboriginal Off-Reserve, and Non-Aboriginal.

The method described above provided the means with which to calculate the employment coefficients for each ethnicity of employment at the provincial level. These coefficients in terms of amount of employment generated per million dollars of sectoral output are presented in Appendix E. PAMFIO92 incorporates these to generate three types of employment impacts relative to impacts on output of each of the fifty-three sectors of the model.

4.7.2 Details of Employment Impacts in the PAMF Economic Region

The above method was duplicated for the PAMF Economic Region as for the province. Although employment level data were available only for the two digit SIC industries, this affected the estimation of only two groups of sectors: fishing and trapping industries, and outfitting and other accommodation services. The employment levels for the disaggregation of these sectors were assumed according to location quotient theory (see Appendix D, Table D.2). Since these sectors have at least as much importance to the PAMF Economic Region's economy as to the provincial one, an LQ of one is assumed which allowed for approximations to be made. These employment coefficients are also expressed per millions of dollars of sectoral output as shown in Appendix E (Table E.2).

4.7.3 Disaggregation of Labour Income Portion of Gross Domestic Product

The input-output transactions table contains the value-added component comprising household income and other value-added items. Total household income, or labour income, is generated by wages and salaries, supplementary income, net income to farm operators, and income of unincorporated non-farm businesses. Labour income is often considered a component of concern for regional economic development. The effects of a project on the household incomes of the people within a region can become an important variable when determining the costs and benefits. For these

reasons, it was deemed necessary to disaggregate the labour income component of value-added into the three types of household sectors as used to disaggregate consumer expenditures.

Province: Given the employment rates, as presented in the previous sections, proportions of labour income received by each of the three sectors of the labour force were determined. For each of the fifty-three sectors of the model, the total labour income (wages and salaries, supplementary labour income, and net income of unincorporated businesses) was disaggregated into the three labour force sectors: Aboriginal off-reserve, Aboriginal on-reserve, and Non-Aboriginal. The aboriginal employment levels presented in Appendix E were reorganized by place of dwelling, on or off reserve, with adjustments made for differing employment rates, and used as proportion of total sectoral employment. These proportions were then multiplied by each sector's total labour income sector to produce three labour income estimates per sector.

PAMF Economic Region: The labour force of the region around the PAMF has a slightly different composition from that of the province (see Table 4.11). The aboriginal labour force is 7.79 percent of the total in the PAMF, while in the province this group is lower at 4.72 percent. This increased participation of the aboriginal labour force sectors influences labour income impacts within this region. The allocation of the employment income earned in the PAMF Economic Region will have an impression on this region's labour force distinctive from that of the province.

**Table 4.11:
 Employment Structure of PAMF Economic Region**

Particulars	Aboriginal On Reserve	Aboriginal Off Reserve	Non- Aboriginal	Total
Total Labour Force (All industries)	884	1 236	25 095	27 215
% of Total	3.25	4.54	92.21	100

Source: Statistics Canada, Special Tabulation.

The labour force sectors in this region were defined in the same way as for the province. The sectoral employment levels by ethnic group, shown in Appendix E, were reorganized according to the dwelling location proportions applicable to the PAMF Economic Region. These employment level proportions were then used to allocate the relative amount of sectoral labour income to the appropriate one of the three labour force sectors. Consequently, PAMFIO92 has the capability of not only estimating labour income impacts for the three labour force sectors at the provincial level, but also of predicting these for the labour force of the PAMF region.

These provisions of the PAMFIO92 model allow for detailed analysis of impacts which are region-specific and directly related to the objectives of this study. The comprehensive manner in which the ethnicity of the population influences the economy of a region was accounted for in all applicable aspects of the model. The considerations of alternative spending patterns and consumption levels are contained in the household final demand sectors. The flow of income and its allocation to the various labour force groups are accommodated within the division of the labour income share of value-added. Lastly, the effects of employment disparities due to ethnicity and dwelling location are captured within the employment impacts portion of the model. Due to these capabilities, PAMFIO92 provides the analyst with an extensive tool with which to assess the myriad of diverse impacts of any type of economic activity within the directly affected region and beyond its boundaries.

Chapter 5

ASSESSMENT OF ECONOMIC IMPACTS OF FEE STRUCTURE CHANGE IN THE PRINCE ALBERT NATIONAL PARK

The Prince Albert National Park (PANP) occupies nearly half of the 156 813 ha of land demarcated as the Prince Albert Model Forest. Included within the PAMF is one of two major centres of economic activity - Waskesiu Lake town site. Given the natural beauty of its setting combined with its commercial facilities, it has been a major attraction for Saskatchewan residents for recreational activities. Recently, the PANP has proposed a new fee structure for entry into and use of Park facilities. The new fees are considerably higher and this increase may have some economic impact on the PANP and on the surrounding region.

In this Chapter, the total impacts of the proposed fees level are estimated using the PAMFIO92 model. Like any economic change in a region, this scenario is expected to generate economic impacts in three regions: One, within the PAMF region or its economic region; Two, in other parts of the province of Saskatchewan; and Three, in other parts of Canada. These impacts are realized through the interindustry linkages that exist through trade in various commodities. In this report, the first two types of impacts are estimated. Furthermore, these two are combined together to form the provincial level impacts. The third set of impacts are not estimated in this study. This is because of the limitations of the scope of the PAMFIO92 model. The model, being provincial in nature, only estimates the total value of imported goods and services from rest of Canada. Since the origin of these imports is not specified in the model, and furthermore, since economic transactions for these other province are not known (for the sake of using the PAMFIO92 model), such impacts, although important, cannot be estimated. Where appropriate presence of these impacts is noted in the discussion of the impacts of the selected scenario.

The Chapter is divided into eight sections. The scenario analyzed here is discussed in Section 5.1. The direct impacts of the proposed change are described in Section 5.2. The method of estimation of economic impacts is presented in Section 5.3, which is followed, in Section 5.4, by results of impacts on the local economy as well as surrounding region. Provincial level economic impacts are described in Section 5.5. The multiplier effect of changes in the accommodation and

other personal services industries on the rest of the PAMF region and on the province is described in Section 5.6, which is followed, in Section 5.7, by a discussion of expected (but not estimated) impacts on rest of Canada. The last section provides a discussion on the limitations of this analysis.

5.1 Description of the Scenario

In July of 1994, Parks Canada (now called Canadian Heritage, Canadian Park Service) announced a general modification of their revenue generation. Under the new proposal, national parks are to aim for higher self-sufficiency through instituting or increasing user fees. In response to this, the PANP has proposed a major fee restructuring beginning in 1995.

Prior to the increase, fees within the PANP were on a per vehicle basis at five dollars per day, ten dollars for four days or twenty dollars per year. The proposed fees are shown in Table 5.1. To appreciate the magnitude of increase, let us calculate the cost for a family of four - two adults and two children under the age of sixteen years. Under the old fee structure the cost to this family for a typical weekend (two days) would be \$10.00. The proposed fees would amount to \$24.00 dollars for the trip -- an increase of 140 percent.

**Table 5.1:
 Proposed Fee Schedule for Prince Albert National Park, 1994**

Visitor Type	Daily	Annual
Adult (over 16 years)	\$ 4.00	\$ 28.00
Child (6 - 16 years)	\$ 2.00	\$ 14.00
Family (parents & dependent children)	\$ 10.00	\$ 70.00
Senior Citizen (65 years & over)	\$ 3.00	\$ 21.00
Educational Group Rate	\$ 2.00/ person	

Source: Parks Canada (Undated)

The increase in the entrance fees is translated into cost to the users, and is tantamount to an increase in the price of a commodity (in this case - recreation experience). Assuming rationality on the part of recreationists, one would expect a decreased use of the Park. Public responses to the proposed change are very similar to this hypothesis. In fact, Loewen and Kulshreshtha (1995, p. 26) have predicted that this fee increase would result in an overall decrease of 36 percent of visitors to the PANP. Such a decrease would undoubtedly have a significant economic impact on the local businesses, as well as on the surrounding region.

At the very outset, one caveat of this analysis should be noted. The scenario selected for analysis and the results presented here are more for purposes of demonstrating the use of economic impact analysis, using the PAMFIO92 model. The use of these results for PAMF forest use option selection requires a much more comprehensive analysis than that presented here. Furthermore, on account of the limitation of the model as presented above, the accounting stance for this analysis is that of the "Province".

5.2 Direct Impacts of PANP Fee Restructuring

A change in the visitation rate to the PANP will lead to two possible types of changes: One, visitors expenditures will be different under the new fee structure; and Two, the revenues to the PANP will also change, and along with that their ability to purchase various economic goods and services. Let us illustrate the second effect. If the reduced visitation rates lead to lower revenues to the Park from entrance fees, and assuming that the Park's ability to maintain visitor services is proportional to this revenue, this may result in less new investment in facilities, fewer people hired to provide such services, and perhaps fewer purchases of goods and services for providing visitor services. However, the assumption of equating visitor fee revenues to visitor services expenditures can be invalid and it should not be made without a proper study of PANP operations. For this reason, this study was limited to an analysis of change in visitor expenditures.

Park visitors not only make purchases not only within the PANP, but also en route and in preparation for their stay. Businesses within the Park purchase many of their inputs, including service of seasonal employees, from the surrounding economic trading area (PAMF Economic Region) as well as from other centres within Saskatchewan. However, since these purchases are in response to

visitor expenditures, we do not have to concern ourselves with their estimation at this time. Such impacts would be the focus of secondary impacts estimation using PAMFIO92.

The direct impact of the increase PANP fee restructuring would be a change in visitors' expenditures - within the Park as well as outside. The total visitor expenditures are a result of visitation rates translating into number of visitors, and their level of expenditures by place of purchase. The estimation of these is described below.

5.2.1 Calculation of Impacts on Visitor Attendance

The estimation of number of visitors to the PANP under the new fee structure is based on information contained in Loewen and Kulshreshtha (1995) on the change in the visitation rate, and Lafontaine (1993) on the total number of visitors during 1992-93. The information on change in visits is based on a sample of 86 PANP visitors, of which 38 were day visitors, 15 guests of commercial accommodation, 13 campers, and 18 multiple type visitors. Details on the method of estimating the decline in the number of visitors to the PANP are shown in Table 5.2.

Table 5.2:
Estimation of Number of Visitors to the PANP under the New Fee Structure

Type of Visitor	Actual No. of Visitors during 1992-93 *	Expected Change** (%)	Average Length of Stay ** (Days)	Loss in Visitor Days
Accommodation Guests	51 461	26	7.67	102 624
Campers	17 707	16	5.7	16 149
Day Visitors	108 186	81	1	87 631
Total	177 354	-	-	206 404

* Based on Lafontaine (1993).

** Based on Loewen and Kulshreshtha (1995).

Visitors to the PANP were divided into three categories - day visitors, campers, and accommodation guests. Since their use of the Park is different, and, furthermore, since their response to the new fee structure, as reported by Loewen and Kulshreshtha (1995), is also different, such disaggregation was necessary. Multiplying the number of visitors by expected change, we arrive at the loss in number of visitors to the PANP for the three types of visitors. Multiplying these further by their length of stay, we obtain loss in visitor days. As shown in Table 5.1, the overall decrease in attendance translates to a total of 206 404 visitor days. In terms of type of visitor, this total includes 102 624 days by accommodation guests, 16 149 days by campers, and 87 631 day visitors.

5.2.2 Average Expenditures by Visitors⁹

The typical daily expenditures by the three types of visitors are provided by Loewen and Kulshreshtha (1995, Appendix C). A typical accommodation guest spent \$32.54 per day, whereas average expenditures for a camper and a day visitor were \$9.04 and \$19.32 per visitor-day, respectively. The total loss of visitor revenues for the PANP can be estimated by multiplying these numbers with loss in visitor-days. This results in a total loss of \$5.18 million worth of expenditures. It should be noted these expenditures include park users fees of \$0.91, \$5.72, and \$1.64 per visitor-day, for accommodation guests, campers, and day visitors, respectively. Removing these user fees results in a total expenditure loss of \$4.85 million annually. It should be understood that these figures are of expenses incurred within the Park boundaries, and do not account for those incurred elsewhere.

5.2.3 Regional Incidence of Change in Direct Expenditures

The change in the expenditures of park visitors will be felt in the region of origin of these visitors, and the relative magnitude of the expenditures in different regions. According to Loewen and Kulshreshtha (1995, p. 17), 75.6 percent of the visitors to the PANP were from the Prince Albert and the vicinity region. The remaining 24.4 percent of the visitors were from other parts of Saskatchewan, mostly from north-central part of the province. No out of province visitor was recorded during the survey period. However, Lafontaine (1993) has reported that about 12 percent

⁹ These include only the in-Park expenditures. Total (in-Park and en route) expenditures are described in Section 5.5.

of total park visitors were from out of the province origins. Given that in this study their reaction to the change in the user fees was not known, it was assumed that all visitors to the PANP are from the province of Saskatchewan.

The information on the distribution of total expenditures of the park visitors was obtained from Loewen and Kulshreshtha (1995). This information together with origin of the visitors was instrumental in estimating the direct impact of change in park visitation.

5.2.4 Direct Economic Impacts of PANP Fee Restructuring

In order to estimate total economic impacts of PANP fee restructuring, it is not enough to know the total expenditures. One has to translate this information into implications for various goods producing sectors. This is accomplished by dividing the total expenditures into various items of expenditures. The information for this allocation was obtained from Loewen and Kulshreshtha (1995). The results are shown in Table 5.3.

Table 5.3: Details of In-Park Expenditures Associated with Proposed Attendance Decrease

Type of Expenditure	Amount (\$ 000)
Dining/bar	1 578
Accommodation	1 843
Groceries	336
Retail/souvenirs	440
Transport	210
Equipment rentals	176
Golf	207
Docking/launching	15
Equipment purchase	23
Other (film, etc.)	21
Total	4 849

Source: Estimated using information in Loewen and Kulshreshtha (1995).

Major items of expenditures that are affected by this change in fee structure are: accommodation, and dining/bar expenses. These two items claim over two-thirds of the total. Thus, the major economic impact of this fee restructuring would be through the accommodation guests on the accommodation and food industries in the region.

To conform to the format of the PAMFIO92 commodity accounts, the various categories of expenditures in Table 5.3 were reorganized into the appropriate I-O commodities, which were listed in Chapter 3. For example, the "groceries" category was disaggregated into the more specific food commodities such as meat products, fish products, dairy products, bakery/cereals, fruits and vegetables, sugar, miscellaneous food products, and beverages. These proportions were assumed to be similar to Statistics Canada's average weekly food expenditures by households in Saskatchewan (Statistics Canada 1993b). In addition to these food commodities, the resulting vector included: accommodation and food services, other manufactured products, transportation and storage, amusement and recreational services, and other personal and miscellaneous services.

Since the initial impact vector is in purchasers' prices, it was converted into producers' prices by removing margins. The various margins, as estimated by Statistics Canada, are: transportation margin, pipeline margin, storage margin, wholesale margin, retail margin, and tax margin. After removal of these margins from the expenditures in purchasers' prices, the vector reverted to initial impacts in producers' prices. Since this vector reflected total visitor purchases made in the PANP, and since these are purchases for the region, no adjustment for imports from outside the region was made. This direct impact vector is now referred to as the initial impacts vector in producers' prices. The results are shown in Table 5.4.

The major commodities that are affected by the proposed fee increases are those of the accommodation and food services industry (hotels, motels, restaurant meals, cafeteria, and bars), followed by amusement and recreation services, and retail margins. Indirect taxes collected by various levels of the government are also affected to the amount of \$309 thousand.

5.3 Method of Impact Estimation and Details of Presentation of Impact Results

The secondary impacts of the direct impacts of the scenario, as presented in Table 5.4, were estimated using the PAMFIO92 model. Both Type I (which include direct and indirect) and Type II

Table 5.4:
List of Commodities Impacted by Visitor Scenario

No.	Commodity Description	Value in \$ 000
14	Meat Products	60.4
15	Dairy Products	47.3
16	Fish Products	6.0
17	Fruits & Vegetables	48.1
20	Breakfast Cereals & Baking	35.8
21	Sugar	7.5
22	Misc. Food Products	28.2
23	Soft Drinks	8.2
62	Gasoline & Fuel Oil	88.3
69	Other Manufactured Products	200.6
73	Pipeline Transport	1.1
74	Transport & Storage	20.7
80	Wholesale Margins	12 1.7
81	Retail Margins	208.3
87	Amusement & Recreational Services	214.4
88	Accommodation & Food Services	3 250.1
89	Other Personal & Misc. Services	170.7
90	Transportation Margins	22.7
	Indirect Taxes	308.9
	Total	1,601.9

(which include direct, indirect, and induced impacts) were calculated. The model was run following steps outlined in Florizone et al. (1995) for the PAMF Economic Region (or as called in the computer program - the Periphery region).

Results are presented in terms of the following economic measures:

- (i) value of goods and services produced by various sectors, also referred to as output;
- (ii) labour income generated as wages and salaries, supplementary income, net income of farm operators, and income of unincorporated non-farm businesses;
- (iii) gross domestic product (GDP) evaluated in two alternate ways: factor cost and market prices.
- (iv) imports and other leakages which include foreign and interprovincial imports into the region; and
- (v) employment of full-time equivalent workers (including self-employed, hired, and unpaid family workers).

The results are presented in terms of total impacts, as well as in terms of multipliers. The total impacts are shown using a combination of tabular and graphical displays.

5.4 Economic Impacts of the Scenario on the PAMF Economic Region

The total impacts of the scenario are presented in terms of various economic activities within the PAMF Economic Region. Among the various economic activities of interest are: value of output, labour income, GDP, imports, and employment.

5.4.1 Total Impact on Value Of Output in PAMF Economic Region

The impact of this scenario on sectoral output is equal to the value of goods and services produced by various industries affected on by the direct economic change. This change in final demand of various industries of the PANP would affect the output of many other industries within the PAMF Economic Region. Table 5.5 outlines the total economic impacts in terms of indirect (industry-support) impacts and household income induced impacts which would take place within the regional economy. Under the scenario, this region would experience a loss in output estimated at \$6.9 million; \$6.2 million through purchases of inputs from local industries, and another \$723 000 through the re-spending of the incomes received by employees of the affected industries. A majority of these impacts would be felt by the business and personal service industries. This aggregated sector

includes accommodation and food service industries and amusement and recreational services which are the most greatly affected industries within the PANP.

Figures 5.1 and 5.2 show the five most affected sectors based on the fifty-three sector disaggregation, and Type I and Type II impacts, respectively. The order of importance remains the same with the large majority of impacts occurring in the accommodation and food sector, followed by the retail trade, food manufacturing, and agriculture industries. The distribution of these impacts remains unchanged for both Type I or Type II impacts.

Table 5.5:
Impact of Final Demand Change on Output, PAMF Economic Region,
in Thousand Dollars, 1994

Sector	Direct & Indirect Impact	Induced Impact	Total Impact (Type II)
Agriculture	334	33	367
Fishing & trapping	3	0	3
Forestry	21	2	23
Mining, quarries & oil wells	148	24	172
Manufacturing	842	73	915
Construction	32	6	38
Transport/storage	74	12	86
Communication	71	34	105
Electricity, gas & other utilities	125	42	167
Wholesale trade	211	16	228
Retail trade	385	120	506
Finance, insurance & real estate	178	213	391
Business & personal services	3 498	115	3 613
Other Sectors	236	33	269
Total	2663	723	3273

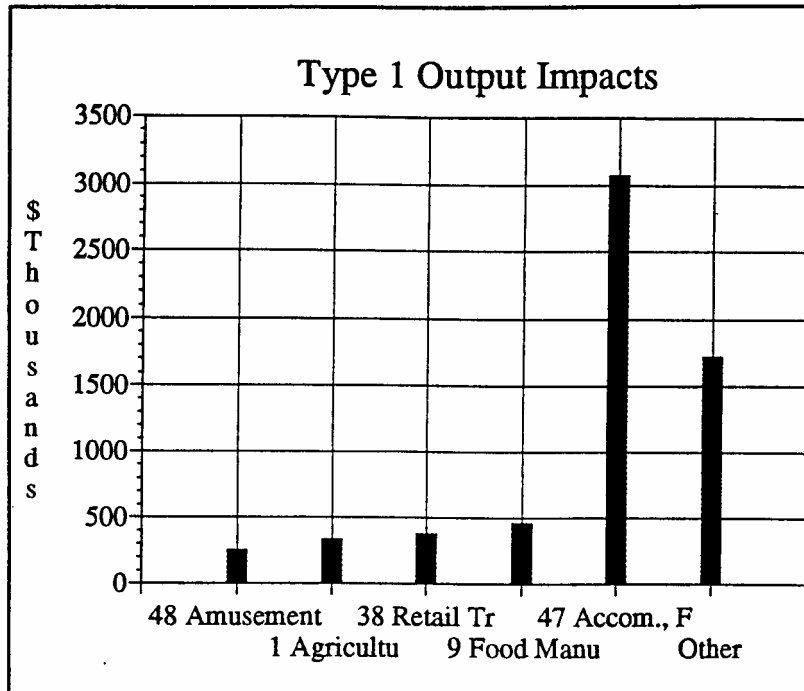


Figure 5.1: Total Impacts of the Scenario on Value of Output, Type I, by Sectors

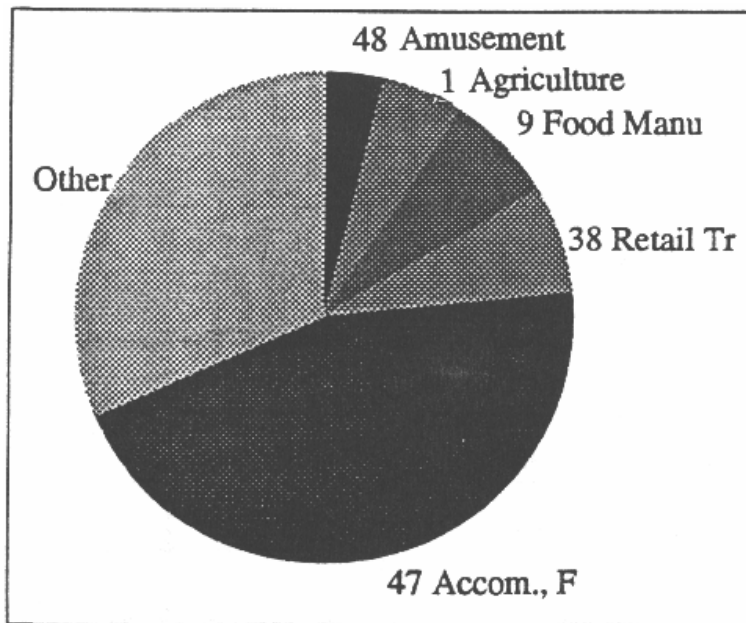


Figure 5.2: Total Impacts of the Scenario on Value of Output, Type II, by Sectors

5.4.2 Total Impact on Value-Added Activities and Imports in the PAMF Economic Region

The economic impact of this scenario was estimated for several value-added activities as well as for imports and other leakages. As described at the beginning of this section, GDP has two methods of valuation (at factor cost and in market prices), and both of these are included here. The total impact of the scenario in terms of change in labour income in the region was estimated at \$2.5 million. Of this, \$2.3 million results from indirect impacts and \$183 000 through induced impacts (Tile 5.6). Here again, over seventy-two percent of these labour income impacts are generated in the business and personal services sectors.

**Table 5.6:
 Impact of Final Demand Change on Labour Income, PAMF Economic Region, in Thousand Dollars, 1994**

Sector	Direct & Indirect Impact	Induced Impact	Total Impact (Type II)
Agriculture	21	2	23
Fishing & trapping	2	0	2
Forestry	6	1	7
Mining, quarries & oil wells	6	1	7
Manufacturing	126	8	134
Construction	10	2	12
Transport/storage	20	3	23
Communication	30	15	45
Electricity, gas & other utilities	12	4	16
Wholesale trade	78	6	84
Retail trade	205	64	269
Finance, insurance & real estate	36	16	52
Business & personal services	1719	61	1780
Total	2271	183	2454

The relative impacts on the incomes generated in the five most affected sectors are portrayed in Figures 5.3 and 5.4. The most impacted sector remained the same as for loss in output - the accommodation and food sector, followed by retail trade, amusement and recreation sector, and other manufacturing.

Decreases in contributions of this demand change on the GDP (factor cost) of the PAMF Economic Region are outlined in Table 5.7. Once again the largest impact was on the business and personal services sector. The total impact on the GDP of this region in factor cost is estimated at \$3.24 million. The distribution of this total for various sectors is summarized in Table 5.8. If the regional GDP is measured in market prices, the loss to the region will be \$3.95 million. Similarly, regions outside the province would also lose \$510 000 in terms of export sales to the province through reduced demand for their products in the PAMF Economic Region.

5.4.3 Total Impact on Employment Levels in the PAMF Economic Region

The total impact on employment caused by this change in visitor expenditures within the PANP is estimated to be in the order of 189 full-time equivalent jobs throughout the PAMF Economic Region. These employment impacts are displayed in terms of sectors in Figures 5.5 and 5.6. Retail trade, amusement and recreation industries, and agriculture are the next three largest losses in terms of employment under the scenario. Over seventy-six percent of these jobs would be in the business and personal services sector. Consistent with the other impact results, the largest extent of the impacts of this scenario were received by the service sector. Table 5.9 shows more details on the distribution of employment by economic sectors.

5.4.4 Estimated Multipliers for the PAMF Economic Region

To appreciate the multiplier activity derived from this change in final demand, the total impact levels from the previous tables were converted into conventional multipliers. These multipliers estimate the change in economic activity resulting from a one dollar change in the final demand under this scenario. Conventional multipliers were calculated in terms of output, labour income, GDP at factor cost and market price, imports and leakages, and employment. Results are shown in Table 5.10

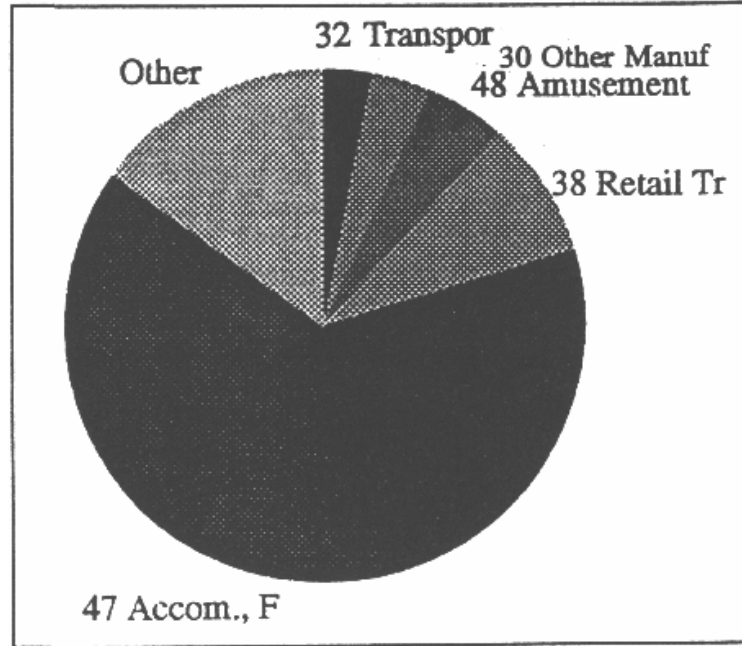


Figure 5.3:
Total Impacts of the Scenario on Labour Income, Type I, by Sectors

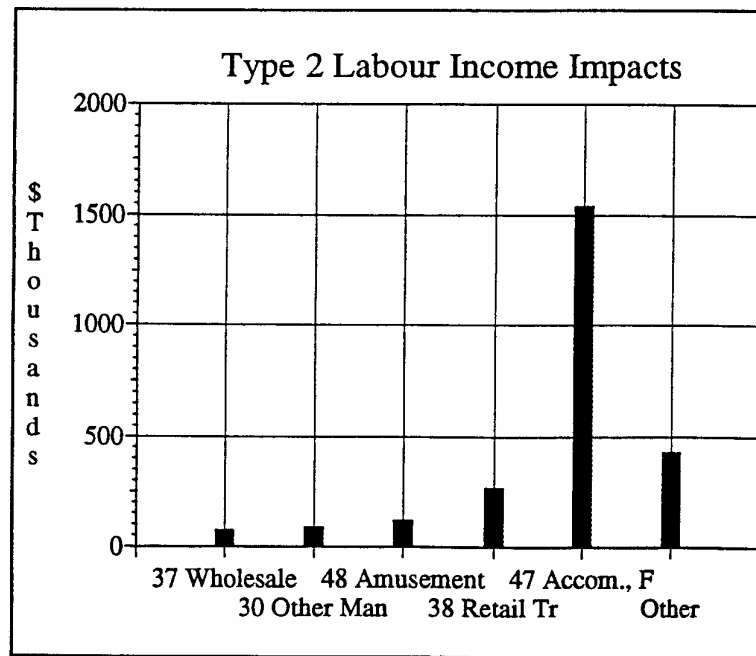


Figure 5.4:
Total Impacts of the Scenario on Labour Income, Type II, by Sectors

Table 5.7:
Impact of Final Demand Change on Gross Domestic Product (Factor Cost),
PAMF Economic Region, in Thousand Dollars, 1994

Sector	Direct & Indirect Impact	Induced Impact	Total Impact (Type II)
Agriculture	66	7	73
Fishing & Trapping	2	0	2
Forestry	9	1	10
Mining, quarries & oil wells	29	5	34
Manufacturing	151	11	162
Construction	12	2	14
Transport/storage	46	7	53
Communication	48	23	71
Electricity, gas & other utilities	37	12	49
Wholesale trade	98	8	106
Retail trade	254	79	333
Finance, insurance & real estate	62	26	88
Business & personal services	2 169	75	2 244
Total	816	256	997

Table 5.8:
Impact of Final Demand Change on Gross Domestic Product (Market Prices) and
Imports and Leakages, PAMF Economic Region in Thousand Dollars, 1994

Sector	Direct & Indirect Impact	Induced Impact	Total Impact (Type II)
GDP (market price)	3 385	263	3 948
Imports & other leakages	473	37	510

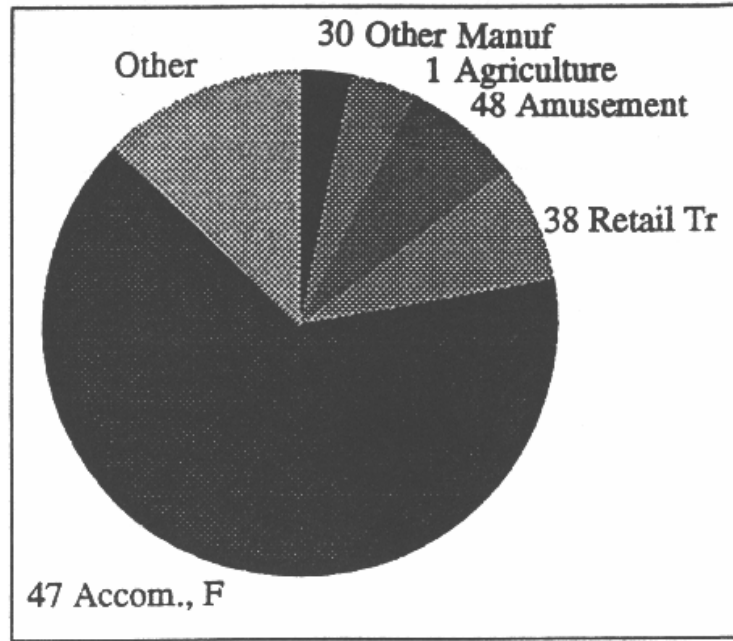


Figure 5.5:
 Total Impacts of the Scenario on Employment Levels, Type I, by Sectors

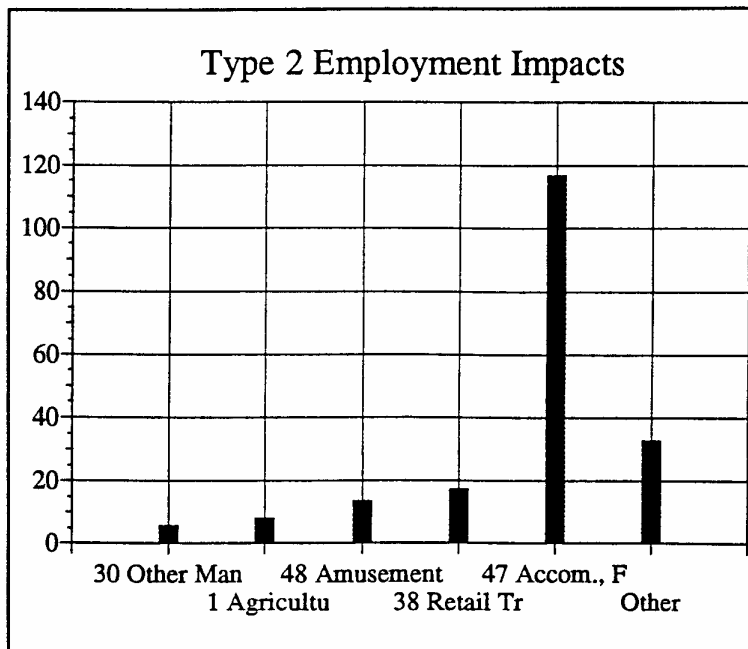


Figure 5.6:
 Total Impacts of the Scenario on Employment Levels, Type II, by Sectors

Table 5.9:
Impact of Final Demand Change on Employment, PAMF Economic Region,
Number of FTE* Workers, 1994

Sector	Direct & Indirect Impact	Induced Impact	Total Impact (Type II)
Agriculture	7	1	8
Fishing & trapping	0	0	0
Forestry	0	0	0
Mining, quarries & oil wells	0	0	0
Manufacturing	9	0	9
Construction	0	0	0
Transport/storage	1	0	1
Communication	1	0	1
Electricity, gas & other utilities	1	0	1
Wholesale trade	5	0	5
Retail trade	13	4	17
Finance, insurance & real estate	1	1	2
Business & personal services	135	10	145
Total	173	16	189

* Full-time Equivalent

The Type I multipliers range from 0.098 for imports and leakages to 1.270 for output. Thus, for every dollar of this final demand, Type I change in output is \$1.27 and Type II change in output is \$1.42. Thus, for every dollar loss of expenditures by PANP visitors, another 42 cents is lost in the Rest-of-Saskatchewan region either through fewer sales to other businesses. Similar interpretations may be used for the other multipliers.

**Table 5.10:
 Selected Multipliers for the Final Demand Change, PAMF Economic Region**

Economic Activity	Conventional Multipliers	
	Type I	Type II
Output	1.270	1.419
Labour income	0.468	0.506
GDP (factor cost)	0.615	0.668
GDP (market price)	0.706	0.760
Imports & leakages	0.098	0, 105
Employment*	35.878	39.512

*Employment in number of jobs per \$ million of direct change.

The multiplier effect in terms of employment was less significant than it appears in relation to the other multipliers. For this scenario, Type I impacts affect 35 jobs for every million dollars of final demand and Type II impacts affect over 39 jobs per million dollars.

5.5 Economic Impacts of Scenario on the Province of Saskatchewan

The procedure to estimate the impacts of the change in visitor expenditures in the PANP on the entire Province of Saskatchewan was the same as for the PAMF Economic Region. These details are presented in this section on lines similar to that for the PAMF Economic Region. The starting point of this analysis was the estimation of direct impacts of the scenario on the province. These changes were used to estimate the total impacts on various provincial level economic activities.

5.5.1 Estimation of Visitors Expenditures for the Province

Visitors to the PANP, as estimated by Loewen and Kulshreshtha (1995), spent a part of the total expenditures within the Park boundaries, whereas a part of this expenditure takes place outside the Park but within the provincial boundaries. If there were going to be fewer visitors to the PANP under the new fee structure, the province would lose not only from in-Park, but also from out-of-Park expenditures. For a typical visitor to the Park, only 72 percent of the total expenditures are

within the Park; the rest are outside the Park boundary. It is assumed that these out-of-Park expenses occur in regions outside the PAMF Economic Region.

The procedure for the estimation of total expenditures for the scenario was the same as used for the PAMF Economic Region. The decrease in the number of the three types of visitor-days was multiplied by their respective level of in-park and out-of-Park expenditures. These were subsequently classified into various input-output model commodities. These expenditures were converted into producers' prices using the PAMFIO92 model. Results are shown in Table 5.11.

**Table 5.11:
 Change in Direct Expenditures of Park Visitors in the Province under the New Fee Structure**

No.	Commodity Description	Value in \$ 000	% of Total
14	Meat Products	82	1.2
15	Dairy Products	64	1.0
16	Fish Products	8	0.1
17	Fruits & Vegetables	63	0.9
20	Breakfast Cereals & Baking	49	0.7
21	Sugar	10	0.1
22	Misc. Food Products	41	0.6
23	Soft Drinks	11	0.2
62	Gasoline & Fuel Oil	274	4.0
69	Other Manufactured Products	553	8.2
73	Pipeline Transport	3	0.0
74	Transport & Storage	64	0.9
80	Wholesale Margins	312	4.6
81	Retail Margins	499	7.4
87	Amusement & Recreational Services	214	3.2
88	Accommodation & Food Services	3 341	49.5
89	Other Personal & Misc. Services	572	8.4
90	Transportation Margins	50	0.7
	Indirect Taxes	561	8.3
	Total	3433	100.0

The total expenditures of the Park visitors are estimated at \$6.77 million, of which \$4.85 million was spent within the Park. Among the major items of expenditures, those of the accommodation and food industry products are the highest. These expenditures constituted almost half of the total. The next highest ranking sectors were travel expenses (notably gasoline and fuel oil), and other personal and miscellaneous services.

5.5.2 Total Impact on Provincial Value of Output

The impact of this scenario on sectoral output is slightly diluted at the provincial level. In the provincial economy, forty-three percent of the output impacts were felt in the service sectors. The total impact on output levels of various provincial industries was \$13.8 million of which \$9.8 million was through indirect impacts and \$4.0 million through income-induced impact (Table 5.12).

The succession of the most impacted sectors is displayed in Figure 5.7. These sectors in order of greatest magnitude of impacts are: accommodation and food, agriculture, retail trade, food manufacturing, and finance and insurance industries.

5.5.3 Total Impact on Provincial Value-Added Activities and Imports

The change in visitation level at the PANP would result in a loss of \$9.89 million worth of gross domestic product in market prices, and a loss in labour income of \$4.65 million annually. The impact of this activity is most intense upon the service sectors of the province. Over sixty-one percent of the total impact on labour income occurred within the business and personal services sectors. Of the total, about \$3.52 million of these impacts were due to industry-support and the remaining \$1.1 million was through income-induced impacts (Table 5.13).

The amount of gross domestic product (in factor cost) lost to the provincial economy was \$7.1 million. Of this total, \$5 million would have resulted from indirect impact from industry-support and the remaining \$2 million induced by household spending of labour income earned within the province.

Impact on provincial GDP due to lost visitor expenditures rises to \$7.76 million when evaluated in market prices. As noted in Chapter 4, this measure included, besides payments to resources, indirect revenues to the government sector. The total reduction in indirect taxes under the

scenario are estimated at \$1.49 million, which is compensated in part, by a reduction of \$795,000 of subsidy payments to various sectors. Much of the loss is triggered by a direct loss of \$561,000 through direct purchases of various commodities.

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Table 5.12:
Impact of Final Demand Change on Output, Saskatchewan, in Thousand Dollars, 1994

Sector	Direct & Indirect Impact	Induced Impact	Total Impact (Type II)
Agriculture	812	469	1 281
Fishing & trapping	4	2	6
Forestry	27	9	36
Mining, quarries & oil wells	405	211	616
Manufacturing	1 672	487	2 159
Construction	73	64	137
Transport/storage	312	180	492
Communication	153	180	333
Electricity, gas & other utilities	200	212	412
Wholesale trade	537	128	665
Retail trade	829	414	1 243
Finance, insurance & real estate	439	953	1 392
Business & personal services	3 871	436	4 307
Other sectors	503	246	749
Total	4298	3991	3455

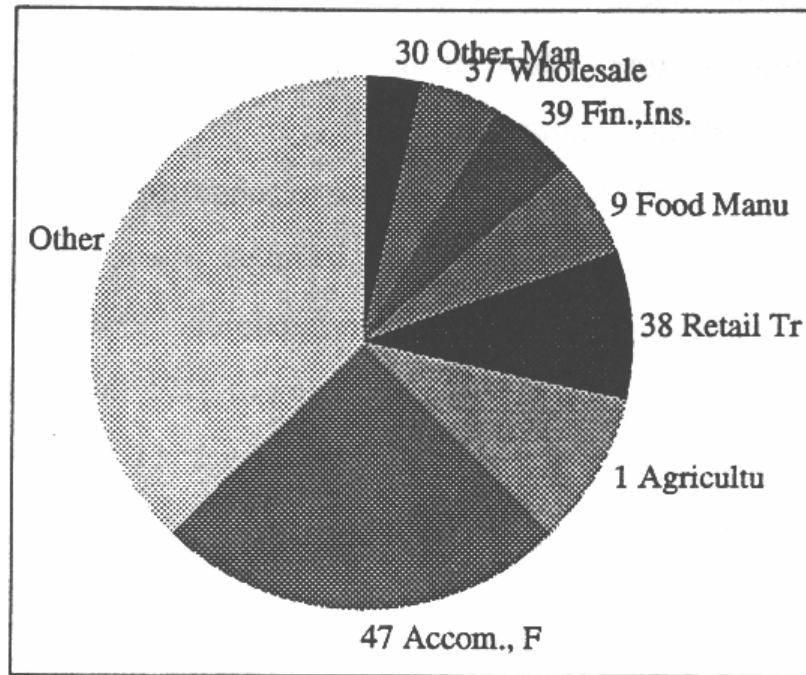


Figure 5.7: Total Impacts on Value of Provincial Output, Type II, by Major Sectors

The decrease in imports into the province was estimated at \$1.53 million, also largely due to the initial decreased demand for imported commodities (Table 5.15). About eleven percent of these imports were from foreign sources, and the remaining 88 percent (or \$1.3 million) from other Canadian provinces. This reduced level of final demand will have impact on these regions as well. However, on account of the provincial scope of the model, these impacts could not be estimated.

The order of the most affected industries in the provincial economy is outlined in Figure 5.8. In terms of Type II impacts on provincial GDP (market price), the four most impacted sectors are: accommodation and food services, retail trade, finance and insurance industries, and agriculture industries.

Table 5.13:
Impact of Final Demand Change on Labour Income, Saskatchewan,
in Thousand Dollars, 1994

Sector	Direct & Indirect Impact	Induced Impact	Total Impact (Type II)
Agriculture	96	55	151
Fishing & trapping	3	1	4
Forestry	8	2	10
Mining, quarries & oil wells	31	20	51
Manufacturing	365	75	440
Construction	23	20	43
Transport/storage	109	63	172
Communication	79	93	172
Electricity, gas & other utilities	30	32	62
Wholesale trade	288	69	357
Retail trade	440	219	659
Finance, insurance & real estate	115	250	365
Business & personal services	1 930	236	2 166
Total	1 588	1 135	2 488

Table 5.14:
Impact of Final Demand Change on Gross Domestic Product (Factor Cost),
Saskatchewan, in Thousand Dollars, 1994

Sector	Direct & Indirect Impact	Induced Impact	Total Impact (Type II)
Agriculture	297	172	469
Fishing & trapping	3	1	4
Forestry	11	4	15
Mining, quarries & oil wells	233	123	356
Manufacturing	436	103	539
Construction	28	25	53
Transport/storage	252	145	397
Communication	124	146	270
Electricity, gas & other utilities	93	99	192
Wholesale trade	365	87	452
Retail trade	546	273	819
Finance, insurance & real estate	223	551	774
Business & personal services	2 432	294	2726
Total	2 613	2 023	7 066

Table 5.15:
Impact of Final Demand Change on Gross Domestic Product (Market Prices) and
Imports and Leakages, Saskatchewan, in Thousand Dollars, 1994

Sector	Direct & Indirect Impact	Induced Impact	Total Impact
GDP (market)	5 621	2 136	7 757
Imports & leakages	1 141	393	1 534

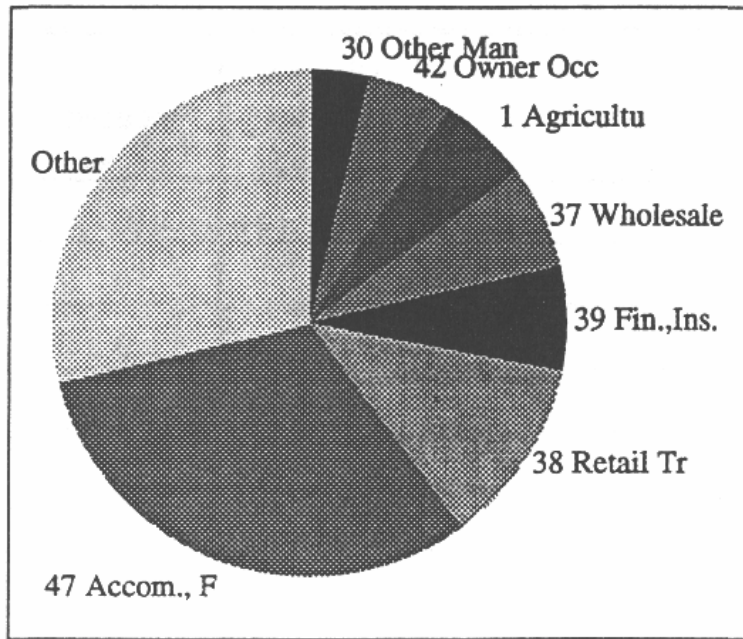


Figure 5.8: Total Impacts on Provincial GDP (market price), Type II, by Sectors

5.5.4 Total Impact on Provincial Employments Levels

About 320 jobs throughout the province would be impacted by the reduced visitor expenditures to the PANP under the proposed fee increase scenario. Almost seventy-eight percent of these were due to indirect impacts in the employing sectors. Much of these job losses are in the service industries where 186 jobs are affected. Approximately 43 jobs in the retail trade sector would also be affected across the Saskatchewan economy. The impact on employment in the agriculture sectors was also relatively high, at over 28 jobs within the province. Details are shown in Table 5.16.

These employment impacts are delineated in Figures 5.9 and 5.10 which show most affected sectors. The order & importance of the first four sectors remains similar to other economic activity; i.e., accommodation and food industries, retail trade industries, agriculture industries, and amusement and recreation services.

Table 5.16:
Impact of Final Demand Change on Employment, Saskatchewan,
Number of Full-time Equivalent Workers, 1994

Sector	Direct & Indirect Impact	Induced Impact	Total Impact (Type II)
Agriculture	18	10	28
Fishing & trapping	0	0	0
Forestry	1	0	1
Mining, quarries & oil wells	1	1	2
Manufacturing	21	3	24
Construction	1	1	2
Transport/storage	4	2	6
Communication	2	2	4
Electricity, gas & other utilities	1	1	2
Wholesale trade	12	3	15
Retail trade	28	14	42
Finance, insurance & real estate	4	4	8
Business & personal services	156	30	186
Total	249	71	320

5.5.5 Estimated Multipliers for the Province of Saskatchewan

The multipliers calculated here may be interpreted in the same fashion as for those calculated for the PAMF Economic Region in Section 5.4.4. These multipliers for the Province of Saskatchewan ranged from 0.17 for Type I impacts on imports and leakages to 2.04 for Type II impacts on provincial output. The change in provincial employment levels was 47.3 per million dollars of visitor expenditures.

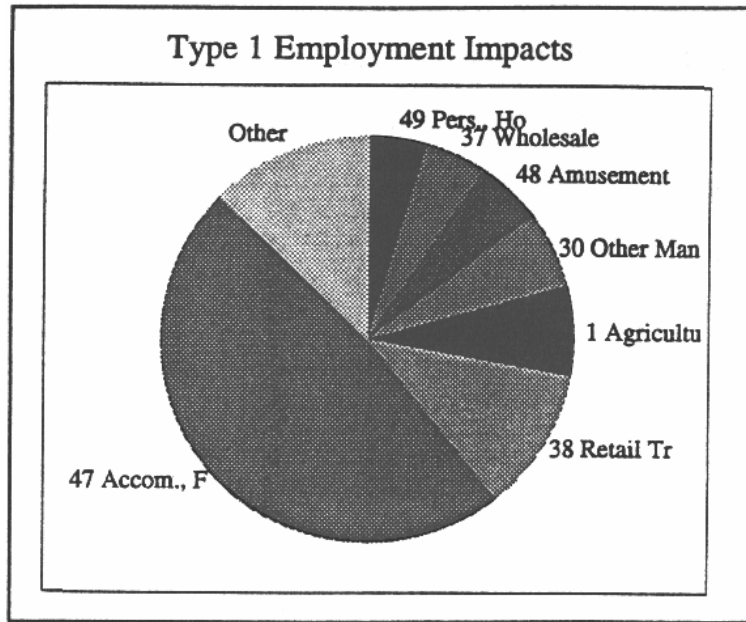


Figure 5.9: Total Impacts on Levels of Employment, Type I, by Sectors

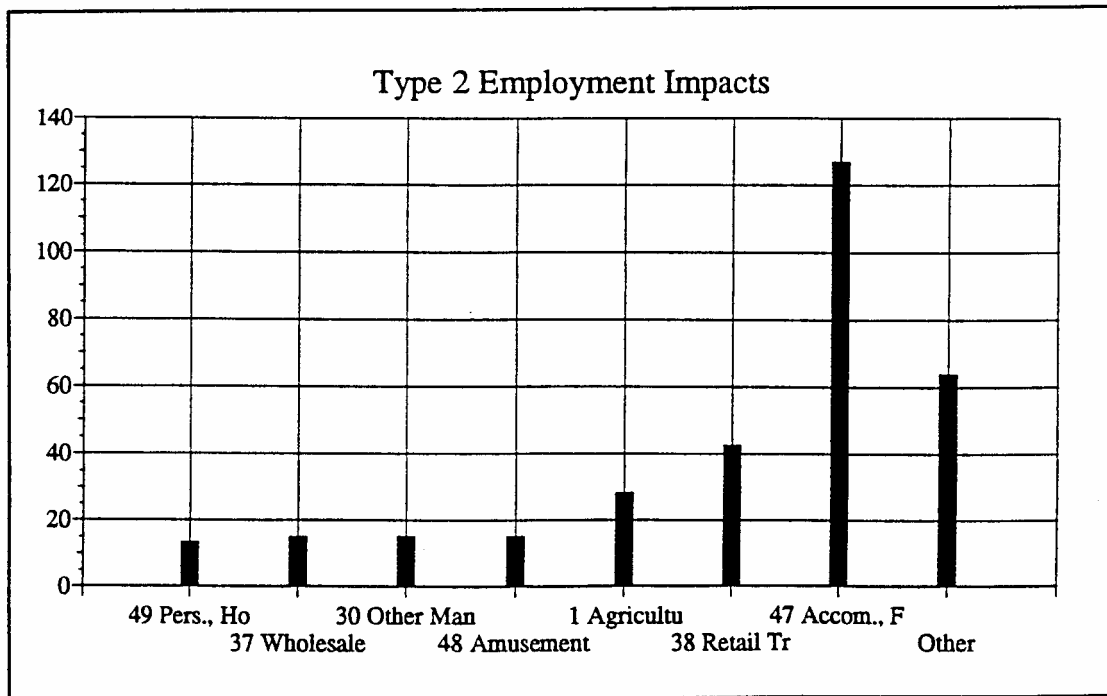


Figure 5.10: Total Impacts on Levels of Employment, Type 11, by Sectors

As expected, the magnitude of multiplier activity was greater for the larger provincial economy than for the smaller PAMF Economic Region. All of the main multipliers increased in magnitude. Although the model has the capability of estimating aboriginal and non-aboriginal employment and labour income, these are not presented here, since the scenario being analyzed does not have any specific connotation of aboriginal people.

**Table 5.17:
 Selected Multipliers for the Final Demand Change, Saskatchewan**

Conventional Multipliers Economic Activity	Type I	Type II
Output	1.45	2.04
Labour income	0.52	0.69
GDP (factor cost)	0.74	1.04
GDP (market price)	0.83	1.15
Imports & leakages	0.17	0.23
Employment*	36.73	47.30

* Employment in number of jobs per \$ million of direct change.

5.6 Change in Employment Associated with the Accommodation and Food Sector

In this Section, results of the changes under the above scenario are presented in a different format. Here the focus of attention is the personal services sector, and within that, on the Accommodation and Food Sector. Using the information contained in Tables 5.4 and 5.11, and the employment coefficient presented in Appendix E, loss of direct jobs can be estimated. Similarly the loss of indirect and induced jobs in this sector can be taken from tables 5.9 and 5.16. These results are shown in Table 5.18. An implicit assumption made for these calculations is that Accommodation and Food Sector is synonymous with the Business and Personal Services Sector. This assumption is justifiable for this scenario, since most of the direct changes in the Business and Personal Sector are through the Accommodation and Food Sector.

Table 5.18:
**Estimated Multiplier Effect of Change in Accommodation and Food Sector Expenditures
 on Employment (in Full-time Equivalent Jobs) in Various Regions of the Province**

Particulars	PAMF Economic Region	Rest of the Province Region	Province of Saskatchewan
Loss of Direct Jobs	121		
Loss of indirect Jobs	14	24	38
Loss of Indirect and Induced Jobs	24	41	65
Total Loss of Jobs	145	41	186
Estimated Employment Multiplier			
Type I	1.116	-	1.289
Type II	1.198	-	1.537

Source: Estimation using information presented in Tables 5.4, 5.9, 5.11, and 5.16, as well as in Appendix E

Results shown in Table 5.18 suggest that the scenario will lead to a loss of employment in the PAMF economic region of 121 workers. These workers are primarily employed by various accommodation and food establishments within the PANP. After all the purchases of these establishments are taken into account, another 14 jobs are lost in the PAMF Economic Region. The lost wages of all these workers would further lead to a decrease in demand for various goods and services, creating a loss of another 10 jobs. Thus, the employment multiplier of the accommodation and food sector under this scenario is estimated at 1.198 for the PAMF Economic Region.

Because of the interdependence between the PAMF Economic Region and the Rest-of-the-Province region, loss of employment would also be felt in other parts of the province. For the province as a whole, loss of these jobs is estimated at 65, of which 38 jobs are through the purchase of economic goods and services by the PAMF Economic Region firms. Thus, for every lost job under this scenario, another 0.54 jobs are lost elsewhere in the province.

5.7 Economic Impacts on Rest of Canada

The economic impacts on other parts of Canada will be triggered by a loss of \$1.14 million worth of lost exports of other Canadian provinces, although a small part of this total is also foreign imports. These lost exports would constitute a direct change in the demand for the goods and services produced by these provinces, and would generate a multiplier effect. However, given the scope of the model, it is not possible to estimate the total impact of the change in the PANP visitors' expenditures on rest of Canada. This is not to suggest that these impacts are insignificant or not worthy of consideration by the decision makers. It is simply that estimation of these impacts requires a different model, which was not available to this study.

5.8 Limitations of the Analysis

The results presented in this Chapter should be viewed merely as a demonstration of the application of the PAMFIO92 model for economic impact assessment. These results are subject to various types of limitations: Limitations of the scenario selected and estimation of the direct impacts under the scenario; and Limitations of the technique and the model used for impact assessment. Both of these are discussed in this section.

5.8.1 Limitations of the Selected Scenario

The scenario analyzed in this report was based on several underlying assumptions. The major limitations of this analysis are related to these assumptions which were used in creating the direct impacts. These include:

- (i) It was assumed that responses to the question regarding entry fee changes as recorded by Loewen and Kulshreshtha (1995) are an accurate reflection of future levels of recreation-related visits by Saskatchewan people. At the time of analysis there was no way of checking whether the responses would be more a short-lived reaction or a permanent change in the behaviour of the respondents;
- (ii) It was assumed that there would be no substitution effect resulting from the fee increase. Two rationales can be offered for this assumption:

- 1) If entry fees at other recreation sites were to increase, the substitution effects should be very close to zero;
- 2) Since the national park setting offers a unique wilderness experience, Saskatchewan residents might decide to attend sites offering a similar experience, outside the province.

In both cases, the losses to the provincial economy would be as reported here;

- iii) The nature of expenditures by visitors was based on average household expenditures for Saskatchewan. Lack of primary data on the nature of business activities within the PANP led us to make this assumption;
- iv) It was assumed that 90 percent of the families travel to the Park by automobile, while the rest use the bus services. Lack of appropriate information on Park visitors was the reason behind this assumption;
- v) It was assumed that the effect on PANP local expenditures would be negligible. This assumption can be removed if further analysis of the relationship between Park visitor revenues and PANP expenditures is carried out.

Most of these assumptions were made on account of available information. It is hoped that future impact estimation for this type of scenario would be based on more realistic data and information, thereby removing the effect of the above assumptions. Needless to say, accuracy of the above predictions is highly contingent upon the accuracy in predicting the direct impacts. To the extent, direct changes of the proposed measure(s) are not accurate, the resulting economic impacts will be biased.

5.8.2 Limitations of the Technique of Impact Assessment

The second set of limitations arise from the assumptions made in the development of the tool used for the analysis - PAMFIO92, and those behind the application of the tool for impact assessment. Among the major limitations of the model, the following ones are noteworthy: linear production and consumption relationships, stability in these relationships for the forecast period, fixed technological coefficients, and no major structural change in the economy experiencing the scenario related changes. These assumptions should also be kept in mind while interpreting these results.

One should also be cognizant of another limitation of the above results: the distribution of impacts, both spatial and for various sectors, is entirely scenario specific. If a scenario of pulp and paper and production is selected, the spatial and sectoral distribution of impacts would be significantly different than that presented above.

Another point that the users of this model should be aware of is the unique feature of the model - inclusion of aboriginal people and their economic activities. These activities are confined, to a large extent, within the PAMF region, but their economic impacts, due to their expenditure patterns, to the periphery region. Thus, the model, without further modifications, cannot estimate the local impacts (i.e., impacts within the PAMF region) of changes in forest management practices or adoption of new management strategies. The local impacts can only be estimated through obtaining a better picture of the local economy. For this reason, in this report, economic impacts that will be felt in the PAMF region were included under a somewhat broader region - PAMF Economic region.

The economic impacts assessment model presented in this report constitutes an important step in prioritizing / evaluating the economic / social desirability of alternative forest management programs / strategies for the Prince Albert Model Forest region and its periphery. Since the model is based on fixed coefficients, the results are more accurate in depicting short run changes, than those occurring in the long run. Also, the use of such model in predicting such changes implicitly assumes no major structural changes in the economy of the region. These together with the various assumptions of the model should be kept in mind in its use and interpretation of results in the future.

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APPENDIX A: DISAGGREGATION OF FOREST-RELATED SECTORS IN PAMFIO92

In the PAMFIO92 model, the disaggregated forest-related sectors from Statistics Canada's Input-Output model were defined in the following manner (parts of some definitions taken from Standard Industrial Classification 1980).

Logging & Forestry Industries [041]: Establishments primarily engaged in producing round wood either on an own-account or a contract basis as well as establishments primarily engaged in forestry patrol, fire inspection and fire fighting, and in forest nurseries, reforestation and other forestry services. Included are establishments in the combined activities of driving, booming, sorting, rafting, and towing of wood as well as the cutting of fuelwood.

Sawmill, Planing Mill and Shingle Mill Products Industries [251]: Establishments primarily engaged in manufacturing lumber (rough and dressed), shingles and other sawmill or planing mill products.

Other Wood Industries [252/254/256/258/259]: Establishments primarily engaged in manufacturing veneer and plywood; prefabricated wooden buildings; wooden cabinets, wooden doors and windows, and other millwork products. Also included are establishments primarily engaged in treating wood and wood products against normal decay; manufacturing particle and wafer board and other wood products not elsewhere classified.

Paper and Allied Products Industries [27]: Establishments primarily engaged in manufacturing wood pulp and paper (incl. Pulp and paper industries [271]; Asphalt roofing industry [272]; Paper box and bag industries [273])

Fishing Industries and Services Incidental to Fishing [031 and 032]: Establishments primarily engaged in commercial fishing and in services incidental to fishing. Also included are establishments primarily engaged in operating fish farms, fish hatcheries, fishery inspection and protection services.

Trapping Industries [033]: Establishments primarily engaged in hunting and trapping wild animals for furs and skins.

Outfitting Industries (Recreation and Vacation Camps [914]): Establishments primarily engaged in operating hunting, fishing, and other recreation and vacation camps. [Establishments primarily engaged in renting equipment, providing guide services, and/or accommodation for fishing, hunting, canoeing, and other recreational activities.]

Other Accommodation and Food Service Industries (Hotels, Motels and Tourist Courts [911]; Lodging Houses and Residential Clubs [912]; and Camping Grounds and Travel Trailer Parks [913]): Establishments primarily engaged in operating hotels, motels, camping grounds, etc.

**APPENDIX B:
DATA USED FOR UPDATING BASE YEAR TRANSACTIONS TABLE**

Table B. 1: 1992 Saskatchewan Gross Output and Gross Outlay Vectors (in Millions of Dollars)

Saskatchewan Output Vector 1992		Saskatchewan Outlay Vector 1992	
1 Agriculture & Related Services Ind.	4129.5	1 Agriculture & Related Services	4129.5
2 Fishing Ind. and Services	4.90	2 Fishing Ind. and Services	4.90
3 Trapping Industries	3.62	3 Trapping Industries	3.62
4 Logging & Forestry Industries	86.68	4 Logging & Forestry Industries	86.68
5 Mining Industries	1384.12	5 Mining Industries	1384.12
6 Crude Oil & Natural Gas	1755.79	6 Crude Oil & Natural Gas	1755.79
7 Quar & Sand Pit Industries	17.84	7 Quarry & Sand Pit Industries	17.84
8 Service Related to Mineral Ext.	392.61	8 Service Related to Mineral Ext.	392.61
9 Food Industries	964	9 Food Industries	964
10 Beverage Industries	88	10 Beverage Industries	88
11 Tobacco Products Industries	0	11 Tobacco Products Industries	0
12 Rubber Products Industries	0	12 Rubber Products Industries	0
13 Plastic Products Industries	26	13 Plastic Products Industries	26
14 Leather & Allied Products Ind.	8	14 Leather & Allied Products Ind.	8
15 Primary Textile & Prod. Ind.	14	15 Primary Textile & Prod. Ind.	14
16 Clothing Industries	14	16 Clothing Industries	14
17 Sawmill and Planing Mill Ind.	67.53	17 Sawmill and Planing Mill Ind.	67.53
18 Other Wood Industries	89.47	18 Other Wood Industries	89.47
19 Furniture & Fixture Industries	5	19 Furniture & Fixture Industries	5
20 Paper & Allied Products Ind.	412.07	20 Paper & Allied Products Ind.	412.07
21 Printing Publish & Allied Ind.	198	21 Printing, Publish. & Allied Ind.	198
22 Primary Metal Industries	290.77	22 Primary Metal Industries	290.77
23 Fabricated Metal Products Ind.	176	23 Fabricated Metal Products Ind.	176
24 Machinery Industries	209	24 Machinery Industries	209
25 Transport Equipment Industries	76	25 Transport Equipment Industries	76
26 Electrical & Electron Products Ind.	231	26 Electrical & Electron Products Ind.	231
27 Nonmetal Mineral Products Ind.	76	27 Nonmetal Mineral Products Ind.	76
28 Refined Oil & Coal Products Ind.	495.6	28 Refined Oil & Coal Products	495.6
29 Chemical & Products Industries	278	29 Chemical & Products Industries	278
30 Other Manufacturing Industries	33	30 Other Manufacturing Industries	33

Table B. 1: Concluded

Saskatchewan Output Vector 1992		Saskatchewan Outlay Vector 1992	
31 Construction Industries	3060	31 Construction Industries	3060
32 Transport Industries	1162.93	32 Transport Industries	1162.93
33 Pipeline Transport Industries	186.15	33 Pipeline Tramp. Industries	186.15
34 Storage Warehouse Industries	493.95	34 Storage & Warehouse Industries	493.95
35 Communication Industries	872.36	35 Communication Industries	872.36
36 Other Utility Industries	985.71	36 Other Utility Industries	985.71
37 Wholesale Trade Industries	997.55	37 Wholesale Trade Industries	997.55
38 Retail Trade Industries	1736.04	38 Retail Trade Industries	1736.04
39 Finance & Real Estate Industries	2075.03	39 Finance & Real Estate Industries	2075.03
40 Insurance Industries	535.47	40 Insurance Industries	535.47
41 Govt. Royalty Natural Resources	229	41 Govt. Royalty Nat. Resources	229
42 Owner Occupied Dwellings	1675.92	42 Owner Occupied Dwellings	1675.92
43 Business Service Industries	618.37	43 Business Service Industries	618.37
44 Education Service Industries	54.4	44 Education Service Industries	54.4
45 Health Service Industries	446.48	45 Health Service Industries	446.48
46 Outfitter Industries	13.39	46 Outfitter Industries	13.39
47 Other Accom. & Food Services	850.25	47 Other Accom. & Food Services	850.25
48 Amuse. & Recreation Services	116.66	48 Amuse. & Recreation Services	116.66
49 Personal Household Services	148.48	49 Personal Household Services	148.48
50 Other Service Industries	170.36	50 Other Service Industries	170.36
51 Operat. Off, Cafe Lab, Supp.	1088.95	51 Operat., Office, Care, Lab, Sup.	1088.95
52 Travel, Advert., Promotions	644.75	52 Travel, Advert., Promotions	644.75
53 Transport Margins	619.35	53 Transport Margins	619.35
54 Unallocated Imports and Exports	69	54 Personal Expenditure	13088
55 Indirect Taxes	3491	55 Investment Expenditure	4102
56 Subsidies	-1875	56 Government Expenditure	4728
57 Wages and Salaries	9054.5	57 Foreign Exports	2807.4
58 Supplementary Labour Income	895.5	58 Interprovincial Exports	2499.6
59 Net Inc., Unincorp. Bus.	1373		
60 Other Operating Surplus	7059		
61 Imports and Other Leakages	7158		
Target Total	57533.05	Target Total	57533.05

APPENDIX C: ESTIMATION OF REGIONAL LOCATION QUOTIENT

Table C. 1: Sectoral Employment, Location Quotients, and Proportion of Saskatchewan Employment for the PAMF Economic Region.

	Sector	Total PAMF Employment	Total SASK Employment	LQ	% of SASK Employment
I	Agric. & Related Serv.	2560	91080	0.54	2.81
2	Fishing Ind. and Services	40	195	3.92	20.51
3	Trapping Industries	5	10	9.56	50.00
4	Logging & Forestry	680	1690	7.70	40.24
5	Mining Industry	170	5865	0.55	2.90
6	Crude Oil & Nat Gas	25	2180	0.22	1.15
7	Quarry & Sand Pit Industry	35	410	1.63	8.54
8	Service Related Min Ext	35	3445	0.19	1.02
9	Food Industry	120	4860	0.47	2.47
10	Beverage Industry	90	840	2.05	10.71
11	Tobacco Products Industry	0	10	0.00	0.00
12	Rubber Products Industry	0	35	0.00	0.00
13	Plastic Products Industry	0	280	0.00	0.00
14	Leather & Allied Products	0	95	0.00	0.00
15	Primary, Textile & Prod.	0	200	0.00	0.00
16	Clothing Industry,	15	550	0.52	2.73
17	Sawmill and Planing Mill Ind.	127	750	3.24	16.93
18	Other Wood industries	78	925	1.61	8.43
19	Furni. & Fixture Industry,	0	360	0.00	0.00
20	Paper & Allied Products	1025	1460	13.43	70.21
21	Printing Publish & Allied	130	4265	0.58	3.05
22	Primary Metal Industry	10	13 15	0.15	0.76
23	Fabricat Metal Products	55	2315	0.45	2.38
24	Machin. Industry	55	2290	0.46	2.40
25	Transport Equip. Industry	35	965	0.69	3.63
26	Elec. & Electron Products	0	1405	0.00	0.00
27	Nonmetal Mineral Products	0	810	0.00	0.00
28	Refined Oil & Coal Products	10	1150	0.17	0.87
29	Chemical & Prod. Industry	15	1090	0.26	1.38
30	Other Mfg. Industry	15	1055	0.27	1.42
31	Construction Industry	1725	25485	1.29	6.77
32	Transport Industry	1000	17705	1.08	5.65
33	Pipeline Transp. Industry	0	675	0.00	0.00
34	Storage Warehou. Industry	65	2550	0.49	2.55
35	Communication Industry	485	11280	0.82	4.30
36	Other Utility Industry	165	5005	0.63	3.30
37	Wholesale Trade Industry	805	22480	0.68	3.58

Table C. 1: Concluded

	Sector	Total PAMF Employment	Total SASK Employment	LQ	% of SASK Employment
38	Retail Trade Industry	3765	59610	1.21	6.32
39	Finance, Real Est Industry	750	17990	0.80	4.17
40	Insurance Industry	185	4755	0.74	3.89
41	Govt. Royalty Nat Res	N/A	N/A		
42	Owner Occupied Dwelling	N/A	N/A		
43	Business Service Industry	780	16125	0.93	4.84
44	Educate Service Industry	2305	37130	1.19	6.21
45	Health Service Industry	2750	48665	1.08	5.65
46	Outfitter Industries	25	425	1.13	5.88
47	Other Accom & Food Serv	2240	3 1625	1.35	7.08
48	Amuse. Retreat. Services	485	6015	1.54	8.06
49	Personal Household Services	700	12160	1.10	5.76
50	Other Service Industry,	720	12820	1.07	5.62
51	Operat. Off, Care Lab, Sup	N/A	N/A		
52	Travel, Advert., Promot.	N/A	N/A		
53	Transport Margins	N/A	N/A		
TOTAL INDUSTRIAL EMPLOYMENT		24280	464400		5.23
Government Service		2935	34780		
TOTAL EMPLOYMENT		27215	499180		5.45

Source: Statistics Canada, Special Tabulation

**APPENDIX D:
ABORIGINAL AND TOTAL EMPLOYMENT BY SECTORS**

Table D.1: Employment by Aboriginal Origins and Totals by Industry, Saskatchewan, 1991

		North American Indian	Metis	TOTAL
1	Agric. & Related Serv.	205	175	91080
2	Fishing Ind. and Services	40	35	195
3	Trapping Industries	0	0	10
4	Logging & Forestry	100	125	1690
5	Mining Industry	65	110	5865
6	Crude Oil & Nat Gas	10	0	2180
7	Quarry & Sand Pit Industry	10	0	410
8	Service Related Min Ext	20	50	3445
9	Food Industry	55	35	4860
10	Beverage Industry	10	0	840
11	Tobacco Products Industry	0	0	10
12	Rubber Products Industry	0	0	35
13	Plastic Products Industry	0	20	280
14	Leather & Allied Products	15	15	95
15	Primary Textile & Prod.	0	0	200
16	Clothing Industry	15	0	550
17	Sawmill and Planing Mill Ind.	10	35	750
18	Other Wood industries	5	20	925
19	Furn. & Fixture Industry	0	10	360
20	Paper & Allied Products	25	25	1460
21	Printing Publish & Allied	35	15	4265
22	Primary Metal Industry	30	10	13 15
23	Fabricat Metal Products	35	10	2315
24	Machin. Industry	15	0	2290
25	Transport Equip. Industry	10	15	965
26	Eke. & Electron Products	0	10	1405
27	Nonmetal Mineral Products	10	10	810
28	Refined Oil & Coal Products	0	0	1150
29	Chemical & Prod. Industry	20	15	1090
30	Other Mfg. Industry	0	10	1055
31	Construction Industry	450	500	25485
32	Transport Industry	140	160	17705
33	Pipeline Transp. Industry	10	0	675

Table D. 1: Concluded

		North American Indian	Metis	TOTAL
34	Storage Warehou. Industry	10	10	2550
35	Communication Industry	40	80	11280
36	Other Utility Industry	40	40	5005
37	Wholesale Trade Industry	140	135	22480
38	Retail Trade Industry	395	415	59610
39	Finance, Real Est Industry	110	90	17990
40	Insurance Industry,	40	30	4755
41	Govt. Royalty Nat Res	0	0	0
42	Owner Occupied Dwelling	0	0	0
43	Business Service Industry	135	55	16125
44	Educate Service Industry	510	350	37130
45	Health Service Industry	570	500	48665
46	Outfitter Industries	185	135	425
47	Other Accom.& Food Serv	275	345	31625
48	Amuse, Recreat, Services	50	140	6015
49	Personal Household Services	110	100	12160
50	Other Service Industry	175	150	12820
51	Operat. Off, Care Lab, Sup	0	0	0
52	Travel, Advert., Promot.	0	0	0
53	Transport Margins	0	0	0
	Total Industrial Employment	4125	3985	464400
	Government Service	805	625	34780
	Total Employment	4930	4610	499180

Source: Statistics Canada, Special Tabulation

Table D 2: Aboriginal Origins by Industry in the PAMF Economic Region, 1991

		North American Indian	Metis	TOTAL
1	Agric. & Related Serv.	25	15	2560
2	Fishing Ind. and Services	20	0	40
3	Trapping Industries	5	0	5
4	Logging & Forestry	90	60	680
5	Mining Industry	25	10	170
6	Crude Oil & Nat Gas	0	0	25
7	Quarry & Sand Pit Industry	0	0	35
8	Service Related Min Ext	10	10	35
9	Food Industry	10	0	120
10	Beverage Industry	10	0	90
11	Tobacco Products Industry	0	0	0
12	Rubber Products Industry	0	0	0
13	Plastic Products Industry	0	0	0
14	Leather & Allied Products	0	0	0
15	Primary, Textile & Prod.	0	0	0
16	Clothing Industry	0	0	15
17	Sawmill and Planing Mill Ind.	5	20	127
18	Other Wood Industries	5	10	78
19	Furn. & Fixture Industry	0	0	0
20	Paper & Allied Products	25	0	1025
21	Printing Publish & Allied	0	0	130
22	Primary Metal Industry	0	0	10
23	Fabricat Metal Products	0	0	55
24	Machin. Industry	10	0	55
25	Transport Equip. Industry	10	0	35
26	Elec. & Electron Products	0	0	0
27	Nonmetal Mineral Products	0	0	0
28	Refined Oil & Coal Products	0	0	10
29	Chemical & Prod. Industry	0	0	15
30	Other Mfg. Industry	0	0	15
31	Construction Industry	90	50	1725
32	Transport Industry	30	35	1000
33	Pipeline Transp. Industry	0	0	0
34	Storage Warehou. Industry	0	0	65
35	Communication Industry	5	0	485
36	Other Utility Industry	10	15	165

Table D.2: Concluded

		North American Indian	Metis	TOTAL
37	Wholesale Trade Industry	0	25	805
38	Retail Trade Industry	55	85	3765
39	Finance, Real Est Industry	20	20	750
40	Insurance Industry	0	0	185
41	Govt. Royalty Nat Res	0	0	0
42	Owner Occupied Dwelling	0	0	0
43	Business Service Industry	25	15	780
44	Educate Service Industry	140	55	2305
45	Health Service Industry	130	90	2750
46	Outfitter Industries	5	0	25
47	Other Accom & Food Serv	105	65	2240
48	Amuse. Recreat. Services	15	55	485
49	Personal Househld Services	20	0	700
50	Other Service Industry	40	0	720
51	Operat. Off, Care Lab, Sup	0	0	0
52	Travel, Advert., Promot.	0	0	0
53	Transport Margins	0	0	0
Sectoral Total		940	635	24280
Government Service		430	115	2935
Total Employment		1370	750	27215

Source: Statistics Canada, Special Tabulation

APPENDIX E: EMPLOYMENT COEFFICIENTS

**Table E.1:
 Employment Coefficients (No. of Jobs Generated per \$ Million of Sectoral Output),
 Saskatchewan, 1991**

		Non-Aboriginal	On Reserve	Off Reserve
1	Agric. & Related Serv.	21.9639	0.0240	0.0680
2	Fishing Ind. and Services	24.5033	3.9475	11.3671
3	Trapping Industries	2.7604	0.0000	0.0000
4	Logging & Forestry	16.9012	0.5576	2.0382
5	Mining Industry	4.1109	0.0227	0.1037
6	Crude Oil & Nat Gas	1.2359	0.0028	0.0029
7	Quarry & Sand Pit Industry	22.4215	0.2709	0.2896
8	Service Related Min Ext	8.5963	0.0246	0.1537
9	Food Industry	4.9481	0.0276	0.0658
10	Beverage Industry	9.4318	0.0549	0.0587
11	Tobacco Products Industry	0.0000	0.0000	0.0000
12	Rubber Products Industry	0.0000	0.0000	0.0000
13	Plastic Products Industry	10.0000	0.0000	0.7692
14	Leather & Allied Products	8.1250	0.9062	2.8438
15	Primary Textile & Prod.	14.2857	0.0000	0.0000
16	Clothing Industry	38.2143	0.5178	0.5536
17	Sawmill and Planing Mill Ind.	10.4405	0.0716	0.5948
18	Other Wood industries	10.0588	0.0270	0.2524
19	Furni. & Fixture Industry	70.0000	0.0000	2.0000
20	Paper & Allied Products	3.4217	0.0293	0.0920
21	Printing Publish & Allied	21.2879	0.0854	0.1671
22	Primary Metal Industry	4.3849	0.0499	0.0877
23	Fabricat Metal Products	12.8977	0.0961	0.1596
24	Machin. Industry	10.8852	0.0347	0.0371
25	Transport Equip. Industry	12.3684	0.0636	0.2654
26	Elec. & Electron Products	6.0390	0.0000	0.0433
27	Nonmetal Mineral Products	10.3947	0.0636	0.1996
28	Refined Oil & Coal Products	2.3204	0.0000	0.0000
29	Chemical & Prod. Industry	3.7950	0.0348	0.0911
30	Other Mfg. Industry	31.6667	0.0000	0.3030

Table E. 1: Concluded

		Non-Aboriginal	On Reserve	Off Reserve
31	Construction Industry	8.0180	0.0711	0.2394
32	Transport Industry	14.9665	0.0582	0.1998
33	Pipeline Transp. Industry	3.5724	0.0260	0.0278
34	Storage Warehou. Industry	5.1220	0.0098	0.0307
35	Communication Industry	12.7929	0.0222	0.1154
36	Other Utility Industry	4.9964	0.0196	0.0615
37	Wholesale Trade Industry	22.2595	0.0678	0.2078
38	Retail Trade Industry	33.8702	0.1100	0.3566
39	Finance, Real Est Industry	8.5734	0.0256	0.0708
40	Insurance Industry	8.7493	0.0361	0.0946
41	Govt. Royalty Nat Res	0.0000	0.0000	0.0000
42	Owner Occupied Dwelling	0.0000	0.0000	0.0000
43	Business Service Industry	25.7694	0.1055	0.2017
44	Educate Service Industry	666.7279	4.5309	11.2779
45	Health Service Industry	106.6005	0.6170	1.7795
46	Outfitter Industries	7.8438	6.6792	17.2256
47	Other Accom. & Food Serv	36.4656	0.1563	0.5729
48	Amuse. Recreat. Services	49.9314	0.2071	1.4215
49	Personal Househld Services	80.4822	0.3580	1.0563
50	Other Service Industry	73.3447	0.4965	1.4113
51	Operat. Off, Cafe Lab, Sup	0.0000	0.0000	0.0000
52	Travel, Advert., Promot.	0.0000	0.0000	0.0000
53	Transport Margins	0.0000	0.0000	0.0000

Source: Statistics Canada, Special Tabulation.

Table E.2:
Employment Coefficients (No. of Jobs Generated per \$ Million of Sectoral Output),
PAMF Economic Region, 1991

		Non-Aboriginal	On Reserve	Off Reserve
1	Agric. & Related Serv.	21.7113	0.1041	0.2405
2	Fishing Ind. and Services	17.6968	8.5529	9.1440
3	Trapping Industries	0.0000	2.8901	3.0899
4	Logging & Forestry	15.1962	1.2471	3.0537
5	Mining Industry	3.3650	0.3012	0.5712
6	Crude Oil & Nat Gas	1.2416	0.0000	0.0000
7	Quarry & Sand Pit Industry	22.9821	0.0000	0.0000
8	Service Related Min Ext	3.7605	1.2116	3.8024
9	Food Industry	4.6214	0.2030	0.2171
10	Beverage Industry	8.4848	0.5126	0.5480
11	Tobacco Products Industry	0.0000	0.0000	0.0000
12	Rubber Products Industry	0.0000	0.0000	0.0000
13	Plastic Products Industry	0.0000	0.0000	0.0000
14	Leather & Allied Products	0.0000	0.0000	0.0000
15	Primary Textile & Prod.	0.0000	0.0000	0.0000
16	Clothing Industry	39.2857	0.0000	0.0000
17	Sawmill and Planing Mill Ind.	8.9205	0.2113	1.9751
18	Other Wood Industries	8.3501	0.3203	1.6678
19	Fumi. & Fixture Industry	0.0000	0.0000	0.0000
20	Paper & Allied Products	3.4567	0.0418	0.0447
21	Printing Publish & Allied	21.5404	0.0000	0.0000
22	Primary Metal Industry	4.5225	0.0000	0.0000
23	Fabricat Metal Products	13.1534	0.0000	0.0000
24	Machin Industry	8.9648	0.9628	1.0294
25	Transport Equip. Industry	9.0695	1.7533	1.8745
26	Elec. & Electron Products	0.0000	0.0000	0.0000
27	Nonmetal Mineral Products	0.0000	0.0000	0.0000
28	Refined Oil & Coal Products	2.3204	0.0000	0.0000
29	Chemical & Prod. Industry	3.9209	0.0000	0.0000
30	Other Mfg. Industry	31.9697	0.0000	0.0000

Table E.2: Concluded

		Non-Aboriginal	On Reserve	Off Reserve
30	Other Mfg. Industry	31.9697	0.0000	0.0000
31	Construction Industry	7.6525	0.2100	0.4659
32	Transport Industry	14.2349	0.2207	0.7689
33	Pipeline Transp. Industry	0.0000	0.0000	0.0000
34	Storage Warehou. Industry	5.1625	0.0000	0.0000
35	Communication Industry	12.7971	0.0644	0.0689
36	Other Utility Industry	4.3082	0.1487	0.6206
37	Wholesale Trade Industry	21.8354	0.0000	0.6999
38	Retail Trade Industry	33.0600	0.2424	1.0344
39	Finance, Real Est Industry	8.2074	0.1117	0.3507
40	Insurance Industry	8.8800	0.0000	0.0000
41	Govt. Royalty Nat Res	0.0000	0.0000	0.0000
42	Owner Occupied Dwelling	0.0000	0.0000	0.0000
43	Business Service Industry	24.7394	0.4039	0.9333
44	Educate Service Industry	624.7950	20.0355	37.7062
45	Health Service Industry	100.2773	2.4902	6.2295
46	Outfitter Industries	25.4090	3.0700	3.2822
47	Other Accom.& Food Serv	33.9926	0.8333	1.9583
48	Amuse. Recreat. Services	44.1184	0.7707	6.6710
49	Personal Household Services	79.5567	1.1309	1.2090
50	Other Service Industry	71.0717	2.0205	2.1602
51	Operat. Off, Cafe Lab, Sup	0.0000	0.0000	0.0000
52	Travel, Advert., Promot.	0.0000	0.0000	0.0000
53	Transport Margins	0.0000	0.0000	0.0000

Source: Statistics Canada, Special Tabulation.