An Expenditure Based Analysis of Community Dependence: A Case Study of the Foothills Model Forest

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I Introduction

The economy of the Foothills Model Forest (FMF) is heavily dependent on extractive resource based industrial sectors such as forestry, oil and gas, and mining. The service sector which includes tourism is also an important economic contributor. Dependency on a particular sector raises important questions about the region's economy. How much will the introduction of new, or the expansion of current industrial activities, contribute to the welfare of the region's or community's economy ? Conversely, will the elimination or curtailment of these industries have an equally direct negative impact? Another related question revolves around whether or not the diversification and expansion of other sectors (services and tourism) will contribute to the long run sustainability of a region's economy. An accurate measurement of the level of dependency helps to inform long term economic development strategy in a region. This report will use three methods, two established in the literature and a third developed by the authors, to measure the economic dependence of the Foothills Model Forest region and its communities on the different sectors that make up their economies.

The report begins by briefly reviewing the literature on community forest sector dependence. This will include a discussion of the potential of a new method for determining community forest sector dependence based on the level of leakages of consumers' discretionary expenditures.

The next section provides a detailed discussion of how leakages of household expenditures from the FMF were measured. The results will show how much consumers spend and where they make their expenditures. These results are presented in detail as we believe the information will be useful not only to determine sector dependence but also to community planners who wish to have a greater understanding of their local economies.

The study of household expenditure leakages is followed by the calculation of sector dependency indices (SDI) using employment, income, (both based on previous literature) and household expenditure data (a new method developed for this paper). The Location Quotient (LQ) methodology in Fletcher (1991) is used to calculate SDIs . A comparison and discussion of the different dependency measurements can be found in the Technical Compendium in Appendix B. The purpose of this paper is to illustrate in a *non-technical* manner the levels of sector dependency in the towns of Hinton, Edson, and Jasper as well as the FMF Region (including Edson). The results of this report are also valuable for economic and sociological impact studies already underway in the FMF. Finally, a discussion of the findings and suggestions for future research are highlighted.

II Literature Review

Over the past thirty years there have been a number of key Canadian studies that measure levels of resource dependence in rural communities (DREE 1979, White *et al* 1986, Pharand 1988). These studies identified communities dependent on natural resource sectors as being different from other rural communities. The level and type of sector dependence were identified. Fletcher *et al* 1991, Horne and Penner 1992, Horne and Robson (1993), and Korber (1997) are recent contributions to the dependency literature. Estimations of sector dependency in these studies are

different from the earlier studies because they rely on economic base theory and the location quotient (LQ) method. According to economic base theory a community's economy is divided into basic and non-basic sectors. The basic sector is any economic activity that creates a flow of income into a community (i.e. a pulp and paper mill, a coal mine, tourism) (Korber 1997). A community is usually dependent upon basic sector activity for its long term viability. The non-basic sector is activity that relies on flows of income from *within* in the community. The non-basic sector provides goods and services to the basic sector (Fletcher 1991) (i.e., grocery stores, pharmacies). Therefore, the non-basic sector is dependent upon the basic sector for its long term survival and growth. Sectors can be wholly basic or non-basic or a combination of both. For example, a restaurant or gas station serves both local citizens and visitors. A change to the basic sector will have an indirect effect on a community's non-basic sector. The LQ method is used to measure the portion of a sector's employment in a community that is over the national average for that sector's activities .

In their studies of community dependency, Fletcher (1991) and Korber (1997) used employment data in their calculation of LQ's. Fletcher *et al's* (1991) study of forest dependent communities in Canadian prairie provinces used highly disagregated census data to determine location quotients. Communities were ranked according to the percentage of economic base employment which was directly attributable to the forestry industry. Forest sector base employment, divided by total base employment is the forest dependence index (FDI). The method is detailed in Appendix B.

Recently, two studies have applied income-based data in the calculation of LQ levels. The first is Horne and Penner's (1992) report on forest community dependency in British Columbia. They argued that income levels are higher or lower depending on sector of employment. Thus, the contribution of high income sectors to the economic base of a region should be greater than that of a low income sector. The second study by Horne and Robson (1993) identified the need to include transfer payments. The results of this study found resource sector dependence much lower than was originally estimated by Horne and Penner (1992).

There are no known studies that use household expenditure data as a measurement of community dependence on resource-based economies. Measuring local expenditures provides an indication of the strength and diversity of the service sector. If consumers are not spending their money locally, the service sector is not as strong or diverse as it could be. This could cause hardship on the community's lower income families by driving up local prices due to lack of competition, or in the form of smaller stores without the ability to purchase large quantities at a discount, or by forcing consumers to make purchases outside the community because local demand is not sufficient to justify the retail sector locating in the community or region.

This type of analysis is conceptually different than the two previously mentioned

approaches because it considers levels of consumption, an output, rather than labour-related contributions, an input, as its unit of analysis. The location and amount of expenditures made on various household goods and services may differ from community to community despite exhibiting similar employment and income structures. The income earned within a community as well as its employment structure may not necessarily reflect household expenditures made in that community. In other words, a community in British Columbia and a community in Nova Scotia may exhibit the same level of dependence based on employment and income data but may differ when household expenditures are considered in calculating the LQ. This can alter the overall structure of the community by influencing the size of the community's service sector. By definition this would affect the employment multipliers in these communities. In addition to employment and income sector dependence indices, dependency can also be measured according to the level of expenditures made within the community rather than outside. While communities are not compared here, this paper compares and contrasts the three different dependency measures in one geographic location.

The literature illustrates that there is no universal method for determining levels of resource sector community dependence. Employment data is generally easily accessible and accurate. However, employment figures alone do not account for differences that exist between incomes in various sectors. By incorporating income into the analysis, a somewhat clearer picture of community dependence is provided. Income data is heavily upon the assumption that income earned in a community is spent within that community. This paper is the first to measure dependency using household expenditures. The advantage of this approach over the employment and income methods is that it provides, in addition to a dependency index measurement, a specific measure of dependency found in the leakages of household income that flow from the FMF for the purchases of various household goods and services.

III The FMF Household Expenditure Study

The 2.7 million hectare FMF encompasses Weldwood of Canada's Forest Management Area (FMA), Jasper National Park, Wilmore Wilderness Area and various Crown lands including Switzer Park, Cache Pecotte Forest and several Crown Forest Management Units. The FMF has a population of 28,680 or 9,945 households in the communities of Brule, Edson[1],

[1] The town of Edson is not officially in the FMF but its close proximity has important consequences for expenditure behaviour. The FMF's current boundaries skirt the Town of Grande Cache. However, the study was conducted just prior to Wilmore Wilderness Area being added to the FMF. As a result, Grande Cache was a considerable distance from the then boundaries of the FMF.

Hinton, Jasper, and Robb, and rural households in the surrounding areas (Improvement District 12 and part of Improvement District 14) (Statistics Canada 1991).

The FMF is an appropriate location for community dependence analysis because resource based industries are the primary source of economic activity. The FMF is one of the few areas in Alberta where forestry, oil and gas, mining, as well as tourism are all significant contributors to the economic wealth of the region. The communities within the FMF are relatively self-contained; that is, most goods or services can be obtained within the FMF. However, the study area is also relatively close (300-400 km) to Edmonton and surrounding communities, offering a metropolitan area of over 800,000 people. The proximity of the FMF to such a major centre where all goods and services can be purchased provides households a choice of purchase location.

Detailed household expenditure data from FMF were derived from two sources: a household expenditure survey conducted by the authors and Statistics Canada's *Family Expenditure in Canada 1992* (Statistics Canada 1994) survey. A household expenditure survey was administered by telephone to a random sample of households in the FMF in July 1996. The survey sample of 1002 captured approximately 10% of the total number of households in the region. A total of 1308 households were contacted for a response rate of 76.6%. Of the 306 non-responses, there were 113 refusals (8.6%), 32 business telephone numbers (2.5%), and 22 respondents with language barriers (1.7%). The remainder could not be contacted.

Respondents to the household expenditure survey were asked to provide detailed information about household family structure, source of household income by sector of employment, total household income, and the type and location of household expenditures. The type of household expenditures was divided into a bundle of goods which included 17 separate commodities of household goods and services as well as a category for vacation expenditures. These bundles were determined on their availability in both the FMF and outside the region and to fit Statistics Canada definitions. Non-discretionary goods or services such as rent, mortgage payments, taxes, and utilities were omitted from the survey because there was no option as to where to make these types of expenditures. They were made either exclusively within or outside of the FMF.

Statistics Canada's (1994) *Family Expenditure in Canada 1992* survey provided an estimate of annual household expenditures. Expenditure data relating to household size, area of residence, age, income, and gender from the FMF survey was combined with the 1992 survey from Statistics Canada (1994) to reflect individual household expenditures of the 17 commodity groups purchased within the FMF.[1] These 17 goods and services were also divided into two

[1] See Table 1 (page 16) Data was derived from five tables in the Statistics Canada (1994)

categories: everyday purchases such as low cost personal and household goods and services[2] and higher cost durables and vacations[3].

In order to estimate the total household expenditures in the FMF, it was necessary to calculate expenditures that reflected Alberta rural non-farm households as well as the level of household income and demographic structure. There were 19 demographic groups identified by family structure (listed in Appendix C) and nine different levels of household income in the *Family Expenditure in Canada 1992* study. The *Family Expenditure in Canada 1992* survey did not provide direct household expenditure estimates that incorporated all three of these characteristics. Therefore, the following equation is a modifier used to estimate the household expenditure for commodity group *i :*

MODIFIER SUP i = {(1-RNF SUP i OVER AB SUP i) + (1-INC SUP i OVER AB SUP i) + (1-DEM SUP i OVER AB SUP i)} OVER 3

(11)

where *RNF* is average rural non-farm expenditures for commodity *i*, *AB* is average Alberta expenditure for commodity *i*, *INC* is average expenditure on commodity *i* by income category, and *DEM* is average expenditures on commodity *i* by demographic group.

Average expenditure by commodity group *i,* and family structure *j* can be estimated by the following equation:

EXP SUB j SUP i = AB SUP i -(AB SUP i)(MODIFIER SUB j SUP i)

(12)

The results of the modification yield estimated household expenditures for each of the 17

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survey: Table 6 - Summary and Selective Detailed Household Expenditure by Size and Area of Residence, Canada, 10 Provinces, 1992, Table 7 - Summary and Selective Detailed Household Expenditure by Region and Province, Canada, 10 Provinces, 1992, Table 12 - Summary and Selective Detailed Household Expenditure by Household Income, Prairie Provinces, Canada, 1992, Table 20 - Summary and Selective Detailed Household Expenditure by Age and Sex, Canada, 10 Provinces, 1992, and Table 21 - Summary and Selective Detailed Household Expenditure by Age of Husband and Number of Children, Canada, 10 Provinces, 1992. Table 7 was used as the Base Case.

[2] Herein referred to as “Everyday household goods and services”.

[3] Herein referred to as “Durables”.

bundles of household goods and services, (including vacation expenditures) as specified according to household income, family structure and the rural nature of the economy (See Appendix A for an example).

IV Results of the Expenditure Survey

The three major background demographic features: sector employment, income level, and family structure are outlined. This is followed by a discussion of the reasons cited in the survey for the location of purchase for everyday and durable household goods and services. The level of leakage of household purchases from the FMF, by sector of employment and level of income is then discussed for each community. The final section compares the employment-based, income, and household expenditure dependency indices.

a) Background Results

In Figure 1, the most frequently mentioned sector identified as the primary source of household income in the FMF was forestry at 19.4%, followed by mining at 14.2%. The Canada Pension Plan (CPP) and/or private pensions was next at 12.1%. This was followed closely by the service industry (11.9%) and construction (10.4%). The third major natural resource industry in the FMF, oil and gas, was indicated by 8.9% of the respondents. Those who worked in the government sector represented 7.9% of the sample. Professionals and those in the transportation sector comprised 4.8% and 4.5% respectively. Other categories such as agriculture, financial, investment, and social assistance comprised the remaining 7.1% of the sample . Not surprisingly, the results support similar findings that the natural resource industry is the dominant source of income in the FMF (Beckley & Parkins 1998). There are nine categories of household income starting at $15,000 or less and increasing by $10,000 increments to household pre-tax earnings over $80,000. The most frequent household income range indicated was $50,001 to $60,000 followed by $40,001 to $50,000 at 13.6% and 12.9% respectively. These household incomes are higher than both the provincial and national averages. The high household incomes are largely explained by the higher than average percentage of natural resource related sector employment where wage rates tend to be higher than other sectors (reference) . Nearly ten percent (9.9%) of households reported incomes over $80,000 while conversely nearly the same percentage (11.2%) reported incomes less $20,000.

Each household can be categorized into one of 19 family structure types. The study found that 43.3% of the households were married couples with a husband under the age of 45 (both with or without children). The most prevalent family structure was a married couple with a husband under the age of 45 with two children; nearly one out of every six households or

15.6% fell into this category. Single male households accounted for 5.4%, while single female households represented 7.8% of the respondents. Households with one of the members over 65, and presumably retired,were 8.0%.

B) Leakages

Figures 2 and 3 reveal that there were different reasons for each type of purchase. Figure 1 indicates that location (68%) is a dominant reason for purchasing frequently needed, relatively low priced items such as groceries or household supplies. Most of these purchases are made in the FMF area. This is due to the both the convenience and the cost involved in travelling to another area to make a similar type of purchase. Also, 19% of the respondents indicated that they made local purchases to support local business.

Reasons for purchasing high priced consumer durables such as automobiles or furniture in locations within and outside of the FMF (see Figure 3) were quite different than the reasons given for purchasing frequently needed, low cost items. A large proportion of high priced goods or consumer durables were purchased outside of the FMF. The primary reason for travelling to locations such as Edmonton to purchase consumer goods such as home entertainment equipment and recreational vehicles was the perceived advantage in price (Figure 3). Selection was also a criterion that a large proportion (19%) of respondents who travelled outside of the FMF based their high end consumption decisions on. For purchases of high priced consumer goods and services within the FMF location (26%) and supporting local businesses (11%) were given as the main reasons.

The household expenditure leakages for each community were measured according to the major source of household employment and level of household income. If a significant proportion of income earned from a sector is being spent outside of the community, the level of dependence that the community has on the sector will be diminished. Leakages for the sample population were extrapolated to the FMF using demographic information from Statistics Canada 1991 Census data and the *Family Expenditure in Canada 1992* survey. An accurate reflection of total expenditures for the FMF was calculated by estimating the total expenditures for all 18 categories of goods and services for each of the nine income groups combined with the 19 household structures (Table 1). The total 1997 household discretionary expenditures for the sample was $15,959,544. Thus the estimated total household discretionary expenditures for all 9,925 households in the FMF was $160,712,608 ($15,959,544 x 10.07).[1] The average leakage

[1] The total number of households in the FMF (including Edson) was 9,925. 10.07 is calculated when the number of households is divided by the sample size, 1002 households. Therefore the total household expenditures for the sample was multiplied by 10.07 to reflect the total household expenditures for the FMF.

for all sectors combined is 24.40%. Therefore, the total annual leakage for the entire population of the FMF is $39,209,126. When adjusted for inflation (CPI[2]), the 1996 total household discretionary expenditure is $166,712,903 and the total leakage is an estimated $40,655,942.

There are a number of noteworthy household expenditure leakage results. First, the data suggests that income spent outside of the regional economy on personal and household goods and services is a small proportion of the total expenditures made on these. For example, some goods such as groceries, fuel, pharmacy, and tobacco and alcohol had leakages of less than 3%. This contrasts with durables and vacations which had leakages of greater than 35%.

Figure 3 and Table 2 provide a summary of the percentage of leakages from the FMF by the sector of employment. Several sectors had samples that were too small (less than 50) to analyze.[3] From those employment sectors with large samples (N>50), forestry with a leakage of 32.21% was the only sector that had significantly greater leakages than the overall leakage of 22.88%. The leakages from the CPP/or private pension sector was the smallest (14.88%). However, those employed in the mining sector also had a below average expenditure leakage (20.88%). It would be expected that the mining industry with its higher than average provincial and FMF incomes would be less dependent on the area for its household expenditures. In Table 2 there were no major trends in terms of the specific leakages of goods and services.

There is a weak, albeit noticeable, trend of greater leakages out of the FMF as the income level increases (Figure 5). Table 3 indicates that the highest income category, those households with incomes over $80,000, had an overall leakage of 29.42%. Also there is a higher than average percentage of leakages from the $30,001- $40,000 income bracket. This category showed the highest leakage values of all income categories in the following high end consumer good categories; home entertainment equipment, recreational vehicles, all terrain vehicles, motor homes, and new and used cars. This may be a result of a high proportion of multiple person families under the age of 45 who fall into this income category. This type of household structure may be characterized as demanding more durable goods and vacations.

Table 3 summarizes the percent leakage by each of the 18 specific goods and services by income level. The leakages for everyday household goods and services, except clothing and reading material, are below the total sectoral average. Similar to Table 2, all of the leakages for durables are above the total sectoral average. Clothing is the lower priced consumer good that stands out from both of the tables with a leakage of approximately 37%. Again, the three highest

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[2]Consumer price index

[3] The sectors were agriculture, financial, professional, transportation, investment, and UIC/or Social Assistance.

leakage categories are vacations, home entertainment, and furniture and major appliances. The only noticeable trend of increased leakages corresponding to an increased income level were spectator entertainment and computer-toys-games categories.

Leakages from Edson, Hinton, Jasper and the FMF region were examined and compared (Table 4). For example, from the first line we read that 2.6% of all grocery expenditures leaked from Hinton. That money was spent either in another community within the FMF or outside the FMF. The total percent leakage from the FMF from each of the towns was calculated for each of the goods and services. In the same example, 1.5% of Hinton's total grocery expenditures were spent outside the FMF. This was followed by the percentage of that town's total leakages out of the FMF. In this case, 57.69% (1.5/2.6) of those respondents who bought their groceries outside of Hinton also bought them outside of the FMF area.

The estimates of leakages from the towns reveal that on average the leakages from Jasper were absorbed by the other communities in the FMF. And conversely, on average, the leakages from Edson to outside the FMF were the higher than leakages Hinton and Jasper. In all cases, the leakages from Hinton were lower than for the entire FMF area.

Sector dependency indices

Sector dependence indices were calculated using base employment, income, and expenditure based data. The level of dependency decreases as the index approaches 0 and increases as it approaches 1. A sector with an index score of 1 would indicate a 100% dependency by a community or region on that particular sector whereas 0 would indicate that there was no dependency. Expenditure-based estimates will be greater than employment indices for sectors which spend an above average proportion of their income within the local community. Sectors spending below average proportions of income within the local community would have a lower index than in the employment case. With respect to income based analysis, sectors which observe above (lower) average income will have higher (lower) sector dependence indices than those based on employment data. This occurs because the income and expenditure indices are weighted by incomes and expenditures respectively. Weighted sector dependence indices were calculated for the communities within the FMF (Table 5). For example, in the first line of Table 5, the base employment index is 0.14. This means that 14% of employment in Edson's economic base is employed in forestry. From the second column we learn that 17% of the income received by employees in sectors that make up Edson's economic base comes from the forestry sector. Since 17 is greater than 14, we know that income in the forest sector is greater than average income in Edson. Finally, the third column shows that 15% of expenditures on household goods and services made by employees in Edson's economic base industries comes

from the forestry sector. Because 15 is greater than 14 but less than 17, we know that a portion but not all of the higher than average income received by forest sector employees remains in Edson. This also means that Edson is more dependent on the forest sector than the employment method reveals but less dependent than the income method shows. The remainder of the table can be read in the same way.

V Summary and Suggestions for Future Research

The purpose of this study was to quantify the level of community dependence for a regionally based natural resource economy. As expected the higher incomes paid in the resource sectors (forestry in particular) show communities in the FMF to be more dependent on the resource sectors when the income index is compared to a base employment index. However, the expenditure index reveals that the higher incomes do not translate into equally higher local spending for household goods and services. Indeed, in every case a portion of the the additional income received by these sectors leaves the local economy.

The household expenditure study estimated the levels of leakages from the community. This was measured by income group, occupation, and by town. However, when the household expenditure and employment methods were compared to income based methods there were notable differences. As a result, the level of community dependence a region has on particular sectors was significantly altered. Communities in the FMF are more dependent on higher income sectors than the employment based method reveals but the expenditure based method shows that relying on income based method would overstate the level of dependency. The study also found that lower income sectors spend a greater pportion of their incomes locally than higher income sectors.

Suggestions for future research include the application of the expenditure method presented in this paper to other resource based communities and regions. As expenditure based analysis is relatively new, and empirical examples lacking, more work is needed to determine if accounting for expenditures in community dependence estimations is a valid methodological practice. Also, the areas that have no metropolitan areas nearby may yield different household expenditure leakages and different dependency indices. In addition, gathering local expenditure data for the purpose of regional comparative economic impact models would be of significant value (See Alavalapati, et. al., 1998).

Figure 1: Main Source of Household Income

Figure 2: Reasons Cited for Everyday Household Purchases Made Within the FMF

Figure 3: Reason Cited for Purchasing High End Consumer Durables in Select Locations

Table 1: Estimated Household Expenditures and Leakages from the major good and service groups

	Expenditure ($)	**Leakage(%)**	**Leakage ($)**
Food-Grocery	$36,683,812	2.73%	$2,677,918
Food-Restaurant	12,032,109	9.74	1,171,927
Household Supplies	8,000,172	11.87	949,620
Clothing	19,252,984	37.11	7,144,782
Fuel	11996582	1.58	126,403
Dental/Optical	2,626,467	10.48	275,254
Pharmacy	1,841,682	2.08	38307
Spectator Entertainment	2,421,946	40.50	980,888
Computers/Toys/Games	2,531,145	38.89	984,362
Tobacco/Alcohol	12,485,149	2.33	290,904
Reading Material	2,114,015	24.23	512,226
Small Gifts/Accessories	3,718,811	15.00	557,822
Furniture/Appliances	12,318,188	56.72	6,986,876
Home Entertainment	4,513,636	56.21	2537115
Sport/Recreation	1,218,047	42.27	514,868
RVs-ATVs/Motor Homes	4,126,485	38.25	1,578,380
New Cars/Used Cars	19269851	45.6	8798614
Vacations	3,561,527	86.56	3,082,858
Total	**160712608**	**24.4**	**39209126**

Table 2: Percent Leakage by Major Sector of Employment

%Leakage	Agric-ulture	Const-ruction	Forestry	Financial	Oil and Gas	Govern-ment	Profes-sional	Mining	Service	Transpor-tation	CPP/or Private Pension	Investment	UIC/or Social Assistance	Other	Total All Sectors
Food -Grocery	0.00	3.23	2.06	8.33	1.12	1.27	6.25	3.52	3.36	2.22	2.48	6.25	0.00	7.69	2.79
Food - Restaurant	18.18	8.60	7.73	8.33	8.99	11.39	22.92	9.15	3.36	15.55	5.79	12.50	8.33	0.00	8.78
Household Supplies	27.27	13.98	10.31	50.00	8.99	11.39	27.03	9.86	9.24	11.11	4.96	6.25	0.00	7.69	10.78
Clothing	45.45	37.63	40.21	58.33	47.19	40.51	45.83	25.35	35.29	42.22	23.97	43.75	16.67	46.15	36.33
Fuel	9.09	10.80	0.00	8.33	2.25	2.53	2.08	1.41	0.84	0.00	1.65	0.00	16.67	0.00	1.50
Dental/Optical	0.00	13.98	7.73	8.33	12.36	16.46	8.33	5.63	15.97	11.11	11.57	18.75	0.00	7.69	10.68
Pharmacy	0.00	4.30	1.03	8.33	0.00	3.80	0.00	1.41	2.52	4.44	3.31	6.25	0.00	0.00	2.20
Spectator Entertainment	27.27	40.86	49.48	50.00	46.07	32.91	52.08	38.73	37.82	35.56	18.18	31.25	41.67	30.77	38.62
Computer/Toys/Games	36.36	40.86	38.66	83.33	51.69	53.16	43.75	33.10	40.34	44.44	7.44	31.25	16.67	30.77	37.13
Tobacco/Alcohol	0.00	3.23	1.55	8.33	1.12	1.27	2.08	2.82	0.84	4.44	0.00	0.00	0	0	1.80
Reading Material	54.55	16.13	26.80	50.00	23.60	32.91	18.75	21.13	19.33	22.22	22.31	25.00	8.33	30.77	23.45
Small Gifts/Accesso-ries	18.18	21.51	17.01	8.33	20.22	18.99	18.75	9.86	11.76	11.11	9.92	25.00	8.33	23.08	15.07
Furniture/App-liances	54.55	64.52	55.15	66.67	70.79	60.76	52.08	49.30	63.03	60.00	42.98	50.00	50.00	46.15	56.19
Home Entertainment	45.45	67.74	56.19	75.00	67.42	67.09	54.17	45.07	64.71	73.33	25.62	50.00	41.67	46.15	54.99
Sport/Recreation	45.45	47.31	48.97	58.33	41.57	56.96	43.75	45.07	42.86	28.89	19.01	31.25	33.33	23.08	41.52
RV's-ATV's/Motor-homes	4.50	42.00	42.00	46.00	42.00	34.00	36.00	38.00	44.00	43.00	18	34.00	29.00	27.00	37.00
New and Used Cars	41.00	47.00	47.00	33.00	43.00	57.00	48.00	44.00	53.00	67.00	24.00	25.00	17.00	38.00	45
Vacation	63.64	80.65	89.69	91.67	87.64	81.01	87.50	90.85	78.99	95.56	87.60	93.75	75.00	69.23	86.03
Percentage Leakage by Sector	23.11	25.50	32.21	31.79	25.70	26.00	27.21	20.88	23.70	20.13	14.88	42.21	17.20	21.35	22.88

Table 3: Percent Leakage by Income Level

%Leakage	Less than 15,000	15,001-20,000	20,001-30,000	30,001-40,000	40,001-50,000	50,001-60,000	60,000-80,000	More than 80,000	Total
1. Food -Grocery	6.89	1.85	0.90	3.50	2.32	2.20	3.04	2.73	2.66
2. Food - Restaurant	8.62	5.55	5.50	8.77	7.75	8.82	10.36	25.23	10.70
3. Household Supplies	13.79	7.40	6.36	14.03	7.75	11.76	12.19	27.27	12.95
4. Clothing	25.86	31.48	30.9	40.35	33.33	33.82	41.46	51.51	37.88
5. Fuel	1.72	3.70	2.72	3.50	0.75	0.73	1.21	1.01	1.66
6. Dental/Optical	20.68	12.96	14.54	13.15	7.75	5.88	11.58	5.05	10.28
7. Pharmacy	3.44	3.76	2.72	1.75	0.00	1.47	1.21	4.04	1.97
8. Spectator Entertainment	24.13	24.07	36.36	44.73	41.86	40.44	48.78	50.50	42.37
9. Computer/Toys/Games	18.96	29.62	29.09	34.21	37.98	47.05	42.68	52.52	40.66
10. Tobacco/Alcohol	17.20	0.00	1.81	3.50	2.32	2.20	1.82	2.02	2.85
11. Reading Material	22.41	27.77	18.18	24.56	26.36	29.50	23.17	28.28	25.00
12. Small Gifts/Accessories	10.34	14.81	14.54	21.92	12.40	14.70	12.19	18.18	14.92
13. Furniture/Appliances	62.06	53.7	56.36	60.52	63.56	55.14	54.26	54.45	57.24
14. Home Entertainment	46.55	57.40	50.00	65.78	58.91	58.08	55.48	59.59	57.43
15. Sport/Recreation	36.20	37.03	30.90	43.85	53.48	47.79	39.63	42.42	43.01
16. RV's-ATV's/Motor homes	29.31	34.25	31.36	47.80	39.14	44.11	36.58	40.90	39.5
17. New and Used Cars	42.24	38.88	39.54	54.38	46.12	46.63	44.81	51.01	46.32
18. Vacation	72.41	74.07	82.72	84.21	86.04	86.76	94.51	91.91	87.11
Percentage Leakage by Sector	21.99	19.33	19.73	25.97	23.19	22.99	24.30	29.42	23.89

Figure 5: Percent Leakage by Household Income Level

Table 4: Leakages by Town and Region

	% Leakage from Hinton	% leakage out of FMF from Hinton	% Hinton Leakage out of FMF		% Leakage out of Edson	% leakage out of FMF from Edson	% Edson Leakage out of FMF		% Leakage from Jasper	% leakage out of FMF from Jasper	% Jasper Leakage out of FMF		All FMF
Food-Grocery	2.6	1.5	*57.69*		4.1	3	*73.17*		23.7	2.6	*10.97*		2.73
Food-Restaurant	6.6	5.4	*57.45*		13.6	8.5	*62.50*		11.6	9.9	*58.62*		9.74
Household Supplies	10.36	24.2	*84.62*		13.2	2.4	*82.13*		40.7	12.5	*57.27*		11.87
Clothing	10.4	7.1	*68.27*		44.2	4.9	*66.67*		79.6	44.1	*30.64*		37.11
Fuel	0.6	0	*0.00*		2.3	0.9	*39.13*		4.2	1.4	*33.33*		1.58
Dental/Optical	9.2	5	*54.35*		14.7	10.3	*70.07*		34	14.2	*41.76*		10.48
Pharmacy	2.2	1.1	*50.00*		1.9	0.8	*42.11*		12.1	2.7	*22.31*		2.08
Spectator Entertainment	46.7	41.9	*89.72*		66.2	44.9	*67.82*		45.5	38.8	*85.27*		40.5
Computer/Toys/Games	38.1	35.4	*92.91*		52.8	47.23	*89.45*		86.11	62.03	*72.04*		38.89
Tobacco/Alcohol	1.6	1.1	*68.75*		2.3	2	*86.96*		7.8	2.3	*29.49*		2.33
Reading Material	20.5	11.7	*57.07*		30.7	19.6	*63.84*		30.7	13.3	*43.32*		24.23
Small Gifts/Accessories	19.9	6.2	*31.16*		32.3	14.1	*43.65*		38.7	14.5	*37.47*		15
Furniture/Appliances	42.17	38.9	*92.25*		86.7	68.4	*78.89*		93.6	61.1	*65.28*		56.72
Home Entertainment	59.7	40.3	*67.50*		74.4	64.7	*86.96*		89.2	64.2	*71.97*		56.21
Sport/Recreation	47.7	39.4	*82.60*		47.5	40.8	*85.89*		60.6	35.21	*58.10*		42.27
RV's/ATV's/Motor homes	62.9	48.9	*77.74*		52.8	44.8	*84.85*		94.5	91.41	*96.73*		38.25
New/Used Cars	55	29.4	*53.45*		55	38.7	*70.36*		91.3	73.4	*80.39*		45.66

Table 5: Sector Dependence Indices (Not including transfer payments and private pensions), Comparative

SECTOR	BASE EMPLOYMENT INDEX	INCOME INDEX	EXPENDITURE INDEX
Edson			
Forestry	0.18	0.21	0.19
Mining, Oil and Gas	0.33	0.37	0.32
Government	0.06	0.06	0.06
Service	0.12	0.12	0.16
Transportation	0.11	0.11	0.12
Other	0.2	0.15	0.15
Hinton			
Forestry	0.45	0.5	0.44
Mining, Oil and Gas	0.33	0.32	0.3
Government	0.01	0.01	0.01
Service	0.12	0.07	0.11
Transportation	0.02	0.08	0.1
Other	0.07	0.03	0.04
Jasper (ID 12)			
Government	0.07	0.06	0.07
Service	0.52	0.45	0.53
Transportation	0.27	0.46	0.31
Financial Services	0.03	0.04	0.03
Other	0.11	N/A**	0.06
FMF			
Agriculture	0.08	0.07	0.08
Forestry	0.23	0.35	0.24
Mining, Oil and Gas	0.23	0.34	0.24
Financial Services	<0.01	<0.01	<0.01
Government	0.03	0.03	0.03
Services	0.17	0.19	0.18

Other	0.15	N/A	0.08

*ID 14 sample size was too small (23) to develop indices. However, the sample was used in estimating the overall FMF indices

** figures are rounded and may not add up to 1.00

Table 6: Final Sector Dependence Indices - Comparative Analysis of Three Methods of Dependency Estimation*

SECTOR	BASE EMPLOYMENT INDEX**	INCOME INDEX**	EXPENDITURE INDEX**
Edson			
Forestry	0.14	0.17	0.15
Mining, Oil and Gas	0.26	0.32	0.26
Government	0.04	0.05	0.05
Service	0.14	0.1	0.13
Transportation	0.09	0.09	0.09
Government Transfers	0.19	0.11	0.15
Other	0.14	0.16	0.15
Hinton			
Forestry	0.36	0.47	0.39
Mining, Oil and Gas	0.26	0.29	0.26
Government	0.01	0.01	0.01
Service	0.11	0.06	0.1
Transportation	0.08	0.07	0.09
Government Transfers	0.15	0.07	0.12
Other	0.04	0.03	0.04
Jasper (ID 12)			
Government	0.06	0.05	0.06
Service	0.52	0.41	0.5
Transportation	0.26	0.42	0.29
Government Tansfers	0.08	0.04	0.07
Financial Services	0.03	0.04	0.03
Other	0.05	0.05	0.06
FMF			
Forestry	0.21	0.27	0.23
Mining, Oil and Gas	0.21	0.25	0.21

Financial Services	<0.01	<0.01	<0.01
Government	0.03	0.02	0.02
Services	0.19	0.17	0.18
Transportation	0.12	0.14	0.13
Other	0.08	0.08	0.08

*ID 14 sample size was too small (23) to develop indices. However, the sample was used in estimating the overall FMF indices
** BASE EMPLOYMENT is the employment based sector dependence index, EXPENDITURE is the expenditure based sector dependence index, and INCOME is the income based sector dependence index.

Table 7 - Differences between the Three Methods of Dependency Estimation

SECTOR	BASE EMPLOYMENT INDEX minus INCOME INDEX	BASE EMPLOYMENT INDEX minus EXPENDITURE INDEX	EXPENDITURE INDEX minus INCOME INDEX
Edson			
Forestry	-0.03	-0.01	-0.02
Mining, Oil and Gas	-0.06	0	-0.06
Government	-0.01	-0.01	0
Service	0.04	0.01	0.03
Transportation	0	0	0
Government Transfers	0.08	0.04	0.04
Other	-0.02	-0.01	-0.01
Hinton			
Forestry	-0.11	-0.03	-0.08
Mining,Oil and Gas	-0.03	0	-0.03
Government	0	0	0
Service	0.05	0.01	0.04
Transportation	0.01	-0.01	0.02
Government Transfers & Private Pensions	0.08	0.03	0.05
Other	0.01	0	0.01
Jasper (ID 12)			
Government	0.01	0	0.01
Service	0.11	0.02	0.09

Government Transfer	0.04	0.01	0.03
Financial Services	-0.01	0	-0.01
Other	0	-0.01	0.01
FMF			
Forestry	-0.06	-0.02	-0.04
Mining, Oil and Gas	-0.04	0	-0.04
Transfer Payments	0.04	0	0.04
Financial Services	0	0	0
Government	0.01	0.01	0
Services	0.02	0.01	0.01
Transportation	-0.02	-0.01	-0.01
Other	0	0	0

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Example of a Calculation of a Household Expense for a Commodity using the Modifier Calculation

We have modified the data in the *Family Expenditure in Canada 1992* survey to allign it as closely as possible with actual expenditures in the FMF region. This is done by taking the expenditure level reported in the survey for a given good for an average Alberta family and modifying it for the rural nature, and the various incomes and family structures of the survey respondents. Each of these three components was given equal weight in the calculating the modifier. An example for clothing expenses is provided below.

From the *Family Expenditure in Canada 1992* survey we learn that the average Alberta family spends $2459 on clothing. For a household included in the FMF expenditure survey with an income of $50,000 to 59,999, composed of a couple with the male being between 45 and 64 years of age with two or more children living in the home we would make the following modifications. First, we determined the difference between expenditures of rural non-farm inhabitants (as residents of the FMF are classed) and the average Alberta expenses for clothing as reported in the *Family Expenditure in Canada 1992* survey. The average Alberta rural non-farm expenditure was $1890 leaving a difference of $569 or about 23% less than the overall Alberta average. The average expenditure for clothing by all Alberta households with incomes $50,000-59,999 was $2690 or a difference of $141 or 8.5% more. Finally, we compared the average overall Alberta expenditure for clothing with to this household structure type. In this case an Albertan married couple with a husband between 45-64 years of age with two or more children had an average clothing expenditures of $4114 or $1655 (40%) more than the Alberta average. As we are weighting these modifications equally, we sum the three modifications and divide by three to obtain the overall modifier for this case. This is shown below.

Rural Non-farm (-.231)+ Income (+0.085)+ Family Structure(0.402)/3=+0.0846. The modifier used for this particular commodity for the above household type was +0.083 or an increase of 8.46% over the Alberta average expenditure of $2,459. In this example the family would have spent $2,669 on clothing. This was repeated for all the commodities and all of the household types for all survey respondents.

Appendix B

Technical Compendium

This study also argues that the location and amount of consumer household expenditures provides another measurement of community sector dependence along with the more commonly used measures of community dependence based on the allocation of employment or income. Household expenditure analysis has been ignored in the community dependence literature because it requires detailed information pertaining to the geographic location of expenditures, as well as the amount of expenditure occurring within and outside of the region. Such analysis is both time consuming and expensive. However, if reliable data are gathered, then the benefits of the expenditure model in measuring community dependence are worthwhile.

Expenditure analysis provides detailed information regarding spending leakages from a local or regional economy. It potentially offers an account of the impacts of increased or decreased investment in particular sectors of the economy (Davis, 1990). The expenditure model's primary assumption is that some portion of the income earned within a regional economy will leak from the regional economy in the form of goods and service expenditures primarily to a surrounding metropolitan area. If significant leakage occurs, the level of community dependence a region has on a particular sector may not be accurately expressed with employment or income as the unit of measurement.

The method used in this study to calculate the employment-based, income, and household expenditure dependency indices is based on Fletcher *et al.* (1991) and Korber (1997). The location quotient method (LQ) is employed to estimate the economic base for various sectors in the economy. This study utilizes Korber's calculation of the LQs. Community *j's* location quotient for industry *i* is:

LQ SUB j SUP i~=~ {(E SUB j SUP i/ E SUB j SUP T)}over
{(E SUB P SUP i / E SUB P SUP T)}

(1)

Where *E* is employment, *T* is the total employment for all sectors, *P* is the provincial employment.

Base employment is considered to be employment in a given sector above the provincial average. The provincial average is assumed to be sector employment required to serve local needs. Equation 1 assumes no net exports or imports, or inventories. When a province is a net exporter, the location quotient overestimates the level of employment necessary to provide local consumption at the community level and consequently underestimates the level of community basic employment. Conversely, when the province is a net importer, community basic employment is assumed to be overestimated (Schwartz 1982, Korber 1997). Therefore, provincial benchmarks utilized in the calculation of the LQ must be adjusted to reflect only that output which is required to meet local or regional consumption. The adjusted benchmark employment for use in the LQ equation is:

E SUB P SUP i * = [(T SUB n SUP i - X SUB n SUP i + M SUB n SUP i)/T SUB n SUP i]E SUB P SUP i

(2)

Where

T sub n sup i is the total national output from industry *i,*

X sub n sup i is the national exports from industry *i,*

M sub n sup i is the national imports from industry *i,* and

E sub p sup i is the provincial employment in industry *i.*

The location quotient can be rewritten with the modifications presented above as:

LQ SUB j SUP i ~ = ~ {(E SUB j SUP i/ E SUB j SUP T)} over {(E SUB P SUP i * / E SUB P SUP T)}

(3)

The proportion of sector employment that is estimated to be basic is:

X SUB j SUP i ~ = ~ {(LQ SUB j SUP i-1)} over {LQ SUB j SUP i} ~ { E SUB j SUP i}

Fletcher *et al.* (1991), and Korber (1997) utilize equations (3) and (4) to estimate a Forest Dependence Index using census data. The most recent economic base data relevant to the FMF can be obtained from Korber's (1997) analysis of major sectors of employment. From this calculation, an employment based sector dependence index (SDI) can be derived where
X sub j sup i is basic sector employment and

X SUB j SUP T = SUM from { i=1} X SUB j SUP i

X sub j sup T is the total of all basic employment:

(5)

and:

SDI ~ = ~ {X SUB j SUP i} over {X SUB j SUP T}

(6)

The SDI approach can also incorporate household expenditure data:

AE SUB j SUP i=TE SUB j SUP i over {N SUB j SUP i}

(7)

Where
AE sub j sup i is the average annual expenditure per household in each sector,
TE sub j sup i is the total expenditure for the sample by sector and town, and *N* is the number of basic sector jobs. As in previous equations, *i* and *j* refer to sector and community respectively. Average expenditures for all sectors weighted for the proportion which the sector contributes to

(8)

HHEXP SUB j SUP i ~ = ~ {{L SUP B} E SUB j SUP i }OVER {TLEB SUB j SUP T}

where $HHEXP_j^i$ is household expenditures by sector i in community j,

TLBE sub j sup T represents total basic sector expenditures for all sectors, and $L^BE_j^i$ is the number of base jobs in each sector. A new sector dependence index can be derived from the following formula:

(9)

HHEXP sub j sup i ~ = AE SUB j SUP i over {SUM AEXP SUB J SUP T }

where $AEXP^T_j$ is total consumer expenditures on household goods and services. Equation (9) therefore, represents the new sector dependence index which accounts for expenditures that have leaked from the local economy.

Sector dependence indices were estimated using average household income per sector. This analysis follows from Horne and Penner (1992) who estimated community employment dependencies for each of the basic sectors.[1] Income in each of the basic sectors is divided by the total income in all of the basic sectors. Sector dependence indices based on average income by sector are calculated from equation (10):

INCOME ={(AI SUB j SUP i)(X SUB j SUP i)} OVER {SUM from {i=1} AI SUB j SUP i}

(10)

where

AI SUB j SUP iis average income by sector of employment *i* in community *j*.

X SUB j SUP i is the number of basic sector jobs in sector *i* in community *j*.

The final results were compared and presented in Table 5 by calculating the differences between each of the estimates. The first observation was that the differences between the base employment index and the household expenditure index calculations for each sector were the

[1]Horne and Penner (1992) based estimations on total income, whereas this analysis employed average income. Average incomes where chosen to facilitate the comparison of expenditure

transfers and pensions (+0.04) in Edson. That means that the total base employment of the town is more dependent on those receiving government transfers than on their household expenditures.

However, when the base employment index and the household expenditure index estimates were compared to the income based index there were some significant variations (greater than 4%). When the base employment index was subtracted from the income index significant variations were found in Edson's mining, oil and gas, service, and government transfers and private pension sectors; Hinton's forestry and service sectors; Jasper's service, government transfers and private pensions, and transportation sectors and the FMF's forestry, mining, oil and gas, and transfer payments and private pensions. The same variations in the base employment index minus income index were also found for when the income based index was subtracted from the expenditure based index. In Table 6 some of the results were positive (i.e. Edson's service sector, base employment index minus income index = +0.04) while in other cases the result was negative (i.e. Hinton's forestry sector, expenditure based index minus income based index = -0.08). A positive result (for example in the case of Edson's service sector above) indicates that the base employment index has a higher degree of dependence. On the other hand, a negative result (for example in the case of Hinton's forestry sector above) indicates that the income based index illustrates a higher degree of dependence than the expenditure based index. Or conversely, using the same example, those employed in the forestry sector are less likely to make their household expenditures in Hinton.

There were some notable results. For Hinton's and FMF's forest sector and Edson's oil and gas sector, the income based estimates were 11%, 6%, and 6% greater than the base employment index estimates respectively. However, Edson's forestry sector as well as Hinton's mining and, oil and gas sectors showed little variation. This result was was unexpected. It was anticipated that these natural resource sectors would behave in similar manner as Hinton's forestry sector because of the higher than average incomes earned within the mining and oil and gas sectors.

The transportation sector also yielded mixed results. When all three indices were compared for Edson and Hinton, there were very small variations in the differences. However, when the base employment or expenditures indices were compared to the income based indices there were significant decreases in Jasper (-16% and -13% respectively).

We have noted that expenditure based measures do alter the traditional LQ employment based

economies of the FMF. Generally the changes in magnitude between the traditional employment method and household expenditure method were small (i.e. seldom over 3%).

Appendix C

Family Structures used in calculation of the modifiers

Family Structure Type	Percent of the Sample
Single Male under 45 years	3.8
Single Male between 45-64 years	1.2
Single Male 65 years or older	0.4
Single Female under 45 years	1.9
Single Female between 45-64 years	2.7
Single Female 65 years or older	3.2
Married couple with husband under 45 years and no children	12
Married couple with husband under 45 years and one child	8
Married couple with husband under 45 years and two children	15.6
Married couple with husband under 45 years and three or more children	7.7
Married couple with husband 45-64 years and no children	12.9
Married couple with husband 45-64 years and one child	1.3
Married couple with husband 45-64 years and two or more children	2.8
Married couple with husband over 65 years and no children	4.4
Lone Parent household, variable number of children	3
Three adult household	6.8
Three adults with a variable number of children	7.1
Four adults	2.6
Four adults with a variable number of children	2.6