THE ECONOMIC BASE OF ROLETTE COUNTY, NORTH DAKOTA, AND POPULATION THRESHOLDS FOR POTENTIAL BUSINESSES IN BELCOURT AND THEIR RELEVANCE FOR THE COMMERCIAL DEVELOPMENT OF THE TURTLE MOUNTAIN INDIAN RESERVATION

By
James Murray
University of Wisconsin--Green Bay
and
James Harris
University of North Dakota

Bureau of Business and Economic Research
University of North Dakota

January 1979

North Dakota Economic Studies, Number 22

This study was made possible by the financial assistance of the Federal Reserve Bank of Minneapolis. The results of this study have also been published in Ninth District Economic Information Series, A Regional Economic Analysis of the Turtle Mountain Indian Reservation: Determining Potential for Commercial Development, 1978.

CHAPTER 1

INTRODUCTION

American Indian reservations are generally known to be areas with chronically high unemployment rates and relatively low per capita incomes. It seems unnecessary, especially for the sake of those who are close to the issue, to repeat the lengthy list of data which attest to the economic circumstances of Indian people who live on reservations, or to chronicle the wide variety of programs by numerous government and private agencies which have been aimed at improving this situation. It is sufficient for our purposes here to note that tribal governments today have a great deal more power and autonomy than was true ten or twenty years ago. Also most reservations are more viable economically than was true in the recent past. Much of the improvement, however, has been associated with transfer payments via federal and private grants. Grants are generally viewed as a means to an end, the end in this case being to develop the reservation economies to the point where the residents of these areas realize their full and rightful share in the prosperity of this nation.

The effort to promote economic development on reservations in the Upper Midwest has often been a source of frustration for those involved. This is, in part, because the reservations in the Upper Midwest are generally very small in population and thus lack the critical mass which is necessary to the development of a diversified and viable local economy. Relationships with neighboring communities are usually strained

by racial, cultural, and value differences and, thus, many Indian people would prefer to develop their economy independently rather than in co-operation with the surrounding non-Indian communities. This is often simply the source of further frustration as Indian people find it difficult to compete with well established and better capitalized non-Indian enterprises.

The approach in this study is to view a reservation and its residents as part of the larger community of Rolette County. The economy of the entire county is examined and the contributions to that economy by the reservation are identified. The question of the opportunities for development are viewed in the context of the entire county rather than of the reservation alone.

There has been much discussion about the question of Indian people's willingness to support Indian-owned businesses. Most of the evidence from Indian business people and Indian customers would suggest that this is true only when everything else is equal. It would appear that if the Indian-owned firm offers a quality product at a competitive price in a convenient location, Indian people will support the enterprise. However, prospective Indian entrepreneurs should not expect racial preferences to support a venture on the reservation in a market already saturated with off-reservation suppliers. It is in this spirit that this study focuses on the reservation as a part of the regional economy.

The purpose here, then, is not as much to further document the economic problems on the reservation, as to demonstrate how some of the tools of regional economics can be addressed to improving the situation. It is hoped that the findings will be of specific use to the tribe and

especially to tribal planners; to the government officials, especially those concerned with economic development; to the local business proprietors, especially the Indian people who operate or contemplate operating stores on the reservation; and to the bankers in the region who serve the credit needs of the reservation community.

This study focuses on the Turtle Mountain Indian Reservation in northern North Dakota. The reservation is totally contained within Rolette County which shares its northern border with Canada. The Turtle Mountain Reservation was chosen for several reasons: (1) It has one of the largest populations of any reservation in the Upper Midwest. (2) It was one of the first reservations to attract an industrial employer (William Langer Jewel Bearing Plant, 1954) and has since attracted two other significant industrial employers. (3) It has a larger number of Indian people as proprietors of retail establishments than any other reservation in the Upper Midwest. (4) It is in the process of constructing a small shopping mall which will almost double the number of Indian-owned and operated retail establishments on the reservation.

The two techniques used in this study are referred to as "economic base analysis" and "threshold analysis." These methods were chosen because, in spite of some obvious limitations, they are among the least expensive and most easily understood approaches available in regional economics. Neither technique can be considered complete in itself, but when combined they complement each other rather well.

Planners must realize that new ventures cannot be justified on the basis of either base studies or threshold studies, but only after very careful and detailed feasibiltiy studies which consider many specific

details excluded in these studies. Base and threshold studies are intended to provide a perspective and a point of departure. They should help suggest which ventures are potentially feasible and deserve further explanation.

CHAPTER 2

ROLETTE COUNTY'S ECONOMIC BASE

As is typical of North Dakota generally, agriculture supplies a large share of the employment and income in Rolette County. Farming and directly related agricultural activities provided 564 jobs in Rolette County in 1975 (see table 1) including farm owners who manage their own farms.

TABLE 1

MAJOR SOURCES OF BASIC EMPLOYMENT,
ROLETTE COUNTY, NORTH DAKOTA
(Annual Average 1975)

Industry Group	Total Employment	Basic Employment
Government (federal, state and local; includes Indian Health Service)	1281	673
Agriculture (includes farmers and farm laborers)	564	450
Jewelry Manufacturing (bearings)	(D)*	(D)
Civic and Social Organizations (Turtle Mountain Chippewa Tribe)	141	129
Hospitals (excludes Indian Health Service)	188	101
General Building Contractors	125	75
Electronic Component and Accessory Manufacturing	(D)	(D)

Source: North Dakota Job Service. Government and Agricultural Employment were estimated using state job service data and census data.

*(D) Withheld to avoid disclosure of single firm's operation.

Because it currently requires about three percent of the nation's employed persons to supply the United States population with its food and fiber, it may be assumed that it also requires about that percentage to satisfy these needs in each region of the country. This is not to suggest that people consume only farm products grown in their own region, but rather that it requires about three percent of the employed persons to either supply needs locally or to offset imports from elsewhere. Employment in excess of three percent in agriculture, then, is here assumed to be engaged in producing products for export to other regions. To the extent that a region's tastes differ from those nationally, this method may overstate or understate actual export employment. For example, if the people of Rolette County eat more per capita than the average for the nation, it may require more than three percent of their employment to satisfy their food requirements. Recognizing this limitation, the technique is, nevertheless, a useful approximation of net export employment. Using this method it is estimated that it requires approximately 114 persons to provide food for Rolette County's population. Therefore, about 450 of the county's farmers and farm workers in 1975 produced products for export to other regions. This same procedure is used to identify export employment in each industry group. The employment which produces goods for export is referred to as "basic employment" (see table 1) because it serves as a base on which to support the numerous products and services which citizens of the county must purchase from other areas of the state, the nation, and the world.

Rolette County's employment pattern is less typical of the state in its very high percentage of government employees. In 1975 well in

excess of one-third (37 percent) of all employed persons in Rollete County worked for a federal, state, or local government agency and another four percent were employed by the Turtle Mountain Chippewa tribal government in Belcourt. Using national averages, Rolette County would be expected to have about 608 persons employed in government based upon 1975 employment levels. Therefore, the excess of 673 persons beyond this is viewed as basic employment.* This "basic" employment in government is not as clearly associated with exports as is true in the agriculture industry. In some cases, such as the San Haven State Sanitorium, it is clear that services are being provided to clients from outside the county and this easily qualifies as an export activity. However, in other agencies the principal reason for identifying the activities as "basic" is that the funding originates outside the county. For example, the large contingent of federal employees associated with the Turtle Mountain Indian Reservation are supported by federal funds, only a minute fraction of which are supplied by citizens of Rolette County. The same is also true of the tribal government.

The Rolla Jewel Bearing Plant is another major source of employment in the county and for all practical purposes its entire employment can be viewed as basic export activity. This plant was established at this location because of the available Indian work force and the majority of its employees are members of the Turtle Mountain Chippewa Tribe.

---

*Estimated from data supplied by the North Dakota Job Service and the U.S. Department of Commerce, Bureau of Census. Because of the unique nature of the Indian reservation infrastructure, there may be some confusion in the employment categories. For example, the tribal government employees are listed as employees of a civic organization rather than as government employees.

In addition to unusually high levels of government employment, Rolette County also has a very large number of people employed in the health services industry. In addition to the 188 persons shown as employed by hospitals in table 1, another 107 persons were employed by the Indian Health Service hospital in Belcourt in 1975.* Because this is a federally supported facility, these employees appear among the government employees rather than with other hospital employees. With hospitals in Rolla, Rolette, and Belcourt and the San Haven State Sanitoruim near Dunseith, Rolette County clearly exports medical care services to surrounding areas as well as to the entire state. Both the Rolla and Rolette hospitals provide long term care, and there are also nursing homes in both Dunseith and Belcourt which add to the medical employment in the county.

In recent years, contract construction has generated a sizable number of jobs in Rolette County. While large amounts of this activity are locally funded, some are associated with federally funded housing projects on the reservation and in that sense, may be viewed as export or basic activity.

The employment in electronics manufacturing at the Turtle Mountain Corporation has been rather sporadic in recent years, but in 1975 it contributed a rather sizable number of jobs to the county's economic base. In 1976 the employment dropped sharply in this activity, but current indications are that this industry will recover and continue to be an important source of export activity in Rolette County.

---

*Data supplied by North Dakota Job Service and Mr. Clarence Frederic (Administrator) Indian Health Service, Belcourt, North Dakota.

It is interesting to note here that easily half of the basic (export) employment in Rolette County in 1975 was directly attributable to activities associated with the Turtle Mountain Chippewa Indian Reservation. This would include a sizable percentage of the government employment, all of the jewel bearing manufacturing employment, all of the tribal employment, a sizable fraction of the construction employment and all of the electronics employment (see table 1; only seven large sources of basic employment are listed.)

CHAPTER 3

MEASURES OF ROLETTE COUNTY'S ECONOMIC HEALTH

Income

Rolette County enjoyed the dubious distinction of having the lowest per capita income in the state of North Dakota in 1974. While the county's position has improved relative to the national average, it declined relative to the state and comparison counties in recent years (see table 2). Rolette County held its own with respect to the state

TABLE 2

PER CAPITA MONEY INCOME FOR UNITED STATES, NORTH DAKOTA, ROLETTE COUNTY, AND SELECTED COUNTIES (1969, 1972, 1974)

			County			
Year	U.S.	N.D.	Rolette	Bottineau	McLean	Mountrail
1969	$3680	$2410	$1637	$2437	$2132	$2071
1972	4478	3356	2278	3258	3157	2492
1974	5434	6121	2941	5304	4130	3839
			Percent Change			
1969-72	21.7%	39.2%	39.2%	33.7%	48.1%	20.3%
1972-74	21.3	82.4	29.1	62.8	30.8	54.1

Source: U.S. Department of Commerce, Bureau of the Census, Population Estimates and Projections, Series P-25, No. 682, North Dakota.

Statistical Abstract of the United States, various issues.

Note: For a complete explanation of the criteria used in selecting counties for comparison, please refer to Appendix A.

and gained some ground on the national average per capita income from 1969 to 1972. However, from 1972 to 1974 it failed to participate in the great increase in income enjoyed by the state and many North Dakota counties and thus slipped from a per capita income which was 68 percent of the state average in 1969 to one which was 48 percent of the state average by 1974. Its position relative to the nation did improve, however, from having a per capita income which was 44 percent of the national average in 1969 to 54 percent by 1974.

A major factor in Rolette County's failure to share in the state's increased prosperity from 1972 to 1974 was the lower percentage of the county's employment, relative to the state, which is in agriculture. Farms employed 16 percent of Rolette County's employed persons in 1975 compared with 19 percent for the state of North Dakota, 34 percent for the neighboring county of Bottineau, and 38 and 32 percent respectively for the comparison counties of McLean and Mountrail.* Rapid price increases for grain in the mid 1970s contributed heavily to the increase in the state's income during that period. It can be said, then, that because its citizens are experiencing an increase in per capita income relative to the nation that Rolette County is making progress in relative per capita income in spite of its failure to share fully in the state's rather sharp increases in per capita income in the mid 1970s.

Nevertheless, the low absolute level of the county's per capita income remains a serious problem. Although its percentage of employment in agriculture is less than the state average, a large part of the

---

*Estimates based upon data supplied by the North Dakota Job Service and U.S. Department of Commerce, Bureau of the Census.

increases in per capita income in Rolette County during the 1970s must be attributed to farm income. If this element of the county's income was removed, it is not clear that the county would have gained relative to the nation.

The low absolute level of per capita income in Rolette County is associated primarily with two phenomena: (1) a high level of unemployment and a low level of labor force participation and (2) an economic base which is heavily dependent upon very labor intensive activities.

The unemployment rate in Rolette County has been consistently twice that for the state of North Dakota in recent years, typically being at or above 12 percent of the county's labor force. According to the latest figures available, the unemployment rate among the adult members of the Turtle Mountain Chippewa Tribe is about 33 percent of that labor force. However, when the definition is narrowed to those actively seeking employment, the unemployment within this group drops to 14 percent (March 1977, Form 5-2119, U.S. Department of Interior, Bureau of Indian Affairs). Members of the tribe are largely concentrated in a triangular area of the county bounded by the communities of Rolla, Dunseith and St. John, with its focal point in the community of Belcourt This is one of the most densely populated rural areas in the upper Midwest. While the Indian people represent over 60 percent of the county's population, they realize only about 20 percent of the county's income.*

*County population and income from U.S. Department of Commerce, Population Estimates and Projections, Series P-25, No. 682. Indian population and income estimates from Bureau of Indian Affairs.

It should be noted that most estimates of the income of Indian families fails to include appropriate adjustments in real income. The official estimates of income for the Turtle Mountain Chippewa Tribe are presented in table 3. Tribal members are all entitled to free medical care, including both out-patient and in-patient services, pharmaceuticals, optical care, and dental care. According to the Bureau of Labor Statistics, families with incomes below $10,000 per year in non-metropolitan areas of the North Central Region of the United States spend approximately 8 percent of their income on these medical services. Also, the large majority of tribal members live on trust land which makes them exempt from property taxes. Families with incomes below $10,000 per year would be expected to spend about 2 percent of their income on property taxes either directly or through rent payments. It would be appropriate, therefore, to adjust the Income of Indian Families in Rolette County upward by about 10 percent to better reflect their spendable income. However, while this is important to the Indian families, and to business enterprises for whom they are customers, such an adjustment would raise the county's per capita income by less than 2 percent.

Employment

An important indicator of a county's economic health is the extent to which it provides adequate employment opportunities for its population. Nationally, and in the state of North Dakota, the employed labor force typically represents about 40 percent of the population. In 1975 in Rolette County, employment was only 27.3 percent of the county's population (see table 4). The low ratio of employment to population in Rolette County

TABLE 3

ANNUAL INCOME PER FAMILY FOR TURTLE MOUNTAIN CHIPPEWA INDIAN PEOPLE
February 1975 to February 1976

	No. of Families	Percent
Under $1,500	0	0
$1,500 to $2,499	300	14
$2,500 to $3,499	435	31
$3,500 to $5,499	315	22
$5,500 to $9,999	400	28
$10,000 and over	70	5
Total	1,420	100

Source: Bureau of Indian Affairs, Turtle Mountain Agency, Belcourt, North Dakota.

TABLE 4

EMPLOYMENT AS A PERCENTAGE OF POPULATION FOR NORTH DAKOTA, ROLETTE COUNTY, AND SELECTED COUNTIES (1975)

County	Employment	Population	Employment/Population
State of North Dakota	259,757	642,888	40.4%
Rolette	3,489	12,769	27.3
Bottineau	3,139	9,841	31.9
McLean	3,631	11,662	31.1
Mountrail	2,711	8,569	31.6

Source: North Dakota Job Service and U.S. Department of Commerce, Bureau of Census, Population Estimates and Projections, Series P-25, No. 682, North Dakota.

is, in part, the result of an unusually large percentage of young people in its population. According to the Bureau of Census, 43.2 percent of Rolette County's population in 1970 was under the age of 16. This percentage was strongly influenced by the Indian families in which just over 50 percent of the persons are under the age of 16, according to estimates by the Bureau of Indian Affairs. In the state of North Dakota, by comparison, 32.5 percent of the population was under the age of 16 according to the 1970 census.*

In addition to the age distribution, however, the discouraged worker effect also appears to be at work. Rolette County has had a chronically high unemployment rate (12 percent of the labor force in 1970; see table 5). This unemployment rate is strongly influenced by the high rate of unemployment among the Indian people as memtioned earlier. According to the Bureau of Indian Affairs estimate, about 50 percent of the unemployed adult Indian males (245) who would be expected to be in the labor force were not actively seeking employment in 1975. The labor force participation rate of Indian women, at 45 percent of those over 16 years of age, was at the national average. This reflects the fact that the industrial firms which have been attracted to the reservation have created more jobs for female workers than for male workers.

In addition to the high unemployment and low participation rates, Rolette County also suffers from large seasonal variations in the level of employment. It is commonly understood that agriculture is a very seasonal industry. However, other elements of Rolette County's economic

---

*U.S. Department of Commerce, Bureau of Census, General and Social Economic Characteristics, North Dakota, 1970.

base, especially government and health care employment, should contribute to a less seasonally sensitive economy. By comparing an index of non-agricultural employment in Rolette County to that for the state of North Dakota, the county had an employment pattern which is more subject to seasonal fluctuations than was true for the state in 1975 (see figure 1).* This phenomenon is, in part, the result of the fact that sizable numbers of the federal government and tribal employees in Belcourt are associated with construction activities, especially highway and street construction and maintenance and, therefore, experience seasonal employment patterns more typical of construction workers than of government employees.

TABLE 5

LABOR FORCE, EMPLOYMENT AND UNEMPLOYMENT
BY SEX, SELECTED NORTH DAKOTA COUNTIES
(1970)

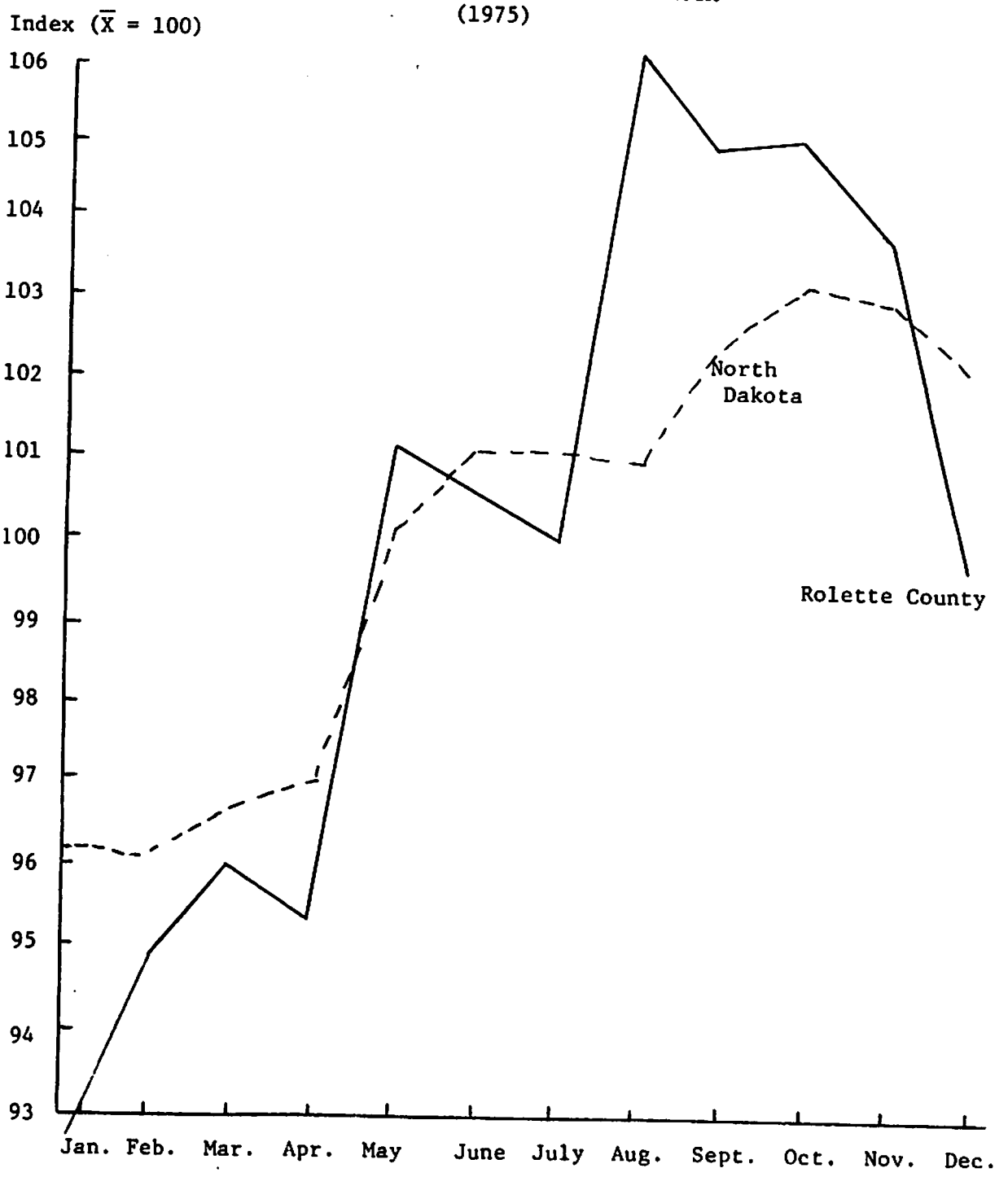
	County			
	Rolette	Bottineau	McLean	Mountrail
Labor Force	3240	3076	3749	2743
Total Employed (16 and over)	2852	2922	3514	2570
% Male	57	69	71	72
% Female	43	30	28	28
% Unemployed	12	5	6	6

Source: U.S. Department of Commerce, Bureau of Census, General and Social Economic Characteristics, North Dakota, 1970.

With a high unemployment rate, a low percentage of employment to population, and a more seasonal employment pattern than is true for the state, Rolette County's employment data suggest the need for continued and greater efforts to improve the county's employment situation.

FIGURE 1

INDEX OF NON-AGRICULTURAL WAGE AND SALARY EMPLOYMENT
IN ROLETTE COUNTY AND NORTH DAKOTA
(1975)



Source: North Dakota Job Service, Bismarck, North Dakota.

The Employment Multiplier

The word "Multiplier" when used in economic analysis, takes on a rather specific meaning. It is a measure of the total overall change in either income (in the case of an income multiplier) or employment (in the case of an employment multiplier) which results from a basic change in either of these economic variables. For example, if a new employer locates in a region or place, added employment and income are generated. Initially the added income and employment are those created directly by the new firm. However, this new economic activity results in new customers and demands for other goods and services. The total change when adding the original firm's employment or income to that which is induced in other firms, is reflected in the "multiplier." The reverse is also true, of course, when a region loses an employer.

A large multiplier usually reflects a situation in which more of the income which originates in a region or community is re-spent locally. Thus, larger cities typically have higher multipliers than small cities. Other circumstances which can influence the size of the multiplier would include (but not be restricted to) distance between cities or the presence of tourism. Greater distance between centers tends to cause people to spend more in their home community, thus raising the multiplier.

The employment multipliers for Rolette County and comparison counties are listed on table 6. While Rolette County's multiplier is significantly below that for Bottineau County, it is clearly in line with those of McLean and Mountrail Counties. This figure of 1.78 suggests that for every ten new jobs created in a basic activity in Rolette County, about eight jobs are generated in support activities. Or to put it another way,

the 140 people employed at the William Langer Jewel Bearing Plant in 1975 supported approximately 110 persons in grocery stores, gas stations, and other similar activities within Rolette County.

TABLE 6

EMPLOYMENT MULTIPLIERS FOR ROLETTE COUNTY AND SELECTED NORTH DAKOTA COUNTIES (1975)

County			
Rolette	Bottineau	McLean	Mountrail
1.78	1.98	1.82	1.85

Source: Calculated from data provided by the North Dakota Job Service, Bismarck, North Dakota, and the U.S. Department of Commerce.

Note: The method used in obtaining these multipliers is described in Appendix B.

Improving the county's retail trade and service activity support system, of course, will tend to raise this multiplier and cause each of the basic jobs to generate more employment in support activities.

As was suggested in the section on the economic base of Rolette County above, about half of the basic employment (about 800 persons) identified in table 1 is attributable to the presence of the Turtle Mountain Chippewa Tribe. The employment multiplier suggests that an additional 640 persons are employed in support activities as a result of reservation related basic employment. Thus, the direct and indirect employment attributable to the Turtle Mountain Chippewa Tribe including the federal government service activities, the industrial development projects, and direct tribal employment, was approximately 1,440 persons in 1975 or over 40 percent of the total employment in Rolette County.

CHAPTER 4

RETAIL TRADE AND SERVICE SECTOR OF ROLETTE COUNTY

Introduction

Because the communities in Rolette County are largely agricultural service centers, and because of the current interest in expanding the retail services available in Belcourt, the retail trade sector of Rolette County's economy will be analyzed in greater detail here. In this process a concept called a "Location Quotient" will be used extensively. The basis for this concept is rather simple, but it is important for the reader to grasp it clearly for a proper understanding of the analysis to follow.

In calculating a location quotient, the percentage of employed persons in a local economy is compared to that of the nation in the following manner:

$$\text{Location Quotient} = \frac{\%\ \text{Employed in Industry Locally}}{\%\ \text{Employed in Industry Nationally}}$$

If the result of this calculation is a number close to one, it is assumed that the local economy is satisfying its own needs for the products in question. If the result is greater than one, the area in question would be providing more than enough for its local citizens and may be exporting the product or service to persons from other regions. If the number is less than one, the local employment may not be sufficient to satisfy local needs and some of the product or service is probably being purchased outside the immediate communities.

To illustrate this concept further the location quotient for Funeral Parlors in Rolette County is exactly equal to one, calculated as follows:

$$\text{Location Quotient for Funeral Parlors} = \frac{\text{\% Employed in Funeral Parlors, Rolette Co., .09\%}}{\text{\% Employed in Funeral Parlors, Nationally, .09\%}} = 1$$

This suggests that Rolette County is self-sufficient in Funeral Parlor services (which is a favorable albeit unusual situation for rural areas in the Upper Midwest).

Another example would be General Merchandise Stores:

$$\text{Location Quotient for Gen. Mds. Stores} = \frac{\text{\% Employed, Rolette Co., .63}}{\text{\% Employed, Nationally, 3.00}} = .21$$

The location quotient for General Merchandise Stores in Rolette County of .21 reflects the fact that people are traveling to larger urban centers such as Minot, Devils Lake, or Grand Forks to shop in large department stores and, thus, the county is an importer of products from these cities.

One more example should serve to complete the illustration; for automobile dealers, new and used, the location quotient is as follows:

$$\text{Location Quotient for Auto Dealers} = \frac{\text{\% Employed, Rolette Co., 1.35}}{\text{\% Employed, Nationally, .99}} = 1.36$$

The procedure in establishing location quotients is much the same as that used in the earlier section to establish Rolette County's economic base. As suggested there, when a county has the same percentage of its employment in an industry as is true nationally (L.Q. = 1) it is not assumed that firms in that industry group are selling all of their output locally. Instead the sales of such firms to other regions are just offsetting the purchases of similar products from outside the region by local consumers.

It also should be noted here that location quotients can vary because of differences in tastes or circumstances between regions. For example, northern communities will use more fuel per capita in almost every form than the national average. Therefore, the location quotient of greater than one in gasoline service stations, for example, might reflect the higher gasoline consumption associated with rural northern communities which are more dependent upon the automobile and with colder climates than is true for the nation generally, rather than reflecting exports of these products and services to other regions.

The use of location quotients here is restricted to the retail trade and service sector of Rolette County's economy. Having already identified the county's economic base, the purpose now is to determine which elements of the retail trade and service sector are developed to their full potential, which are underdeveloped, and which may be over-extended. Because of regional differences as well as differences in community size, location quotients based upon national employment percentages are, by themselves, inadequate for this purpose. It is necessary, therefore, to make comparisons of location quotients in similar counties to determine whether or not the location quotients in Rolette County are at appropriate levels.

The usual method of inter-county comparisons of location quotients is supplemented here by inter-county comparison of the population per employee in retail trade and service activities. The value of this technique is that it avoids the concern over using national averages which may not be appropriate for certain activities in some regions. Also, because it relates to population rather than employment, it

establishes a specific population support base for each employee. When using location quotients, a community may have a high percentage of its employment in one activity because it has very little in other activities. By observing the population per employee it is possible to judge whether or not the employment level in such an activity is, indeed, unusually high or is in fact typical of that for other communities.

A final advantage in observing the number of persons per employee is that it can provide a basis for estimating the amount by which employment is above or below some established regional norm. The norm could be established by simply using the average number of persons per employee in one activity for a group of comparable counties. However, because it is difficult to find specifically comparable counties, they will be limited in number, and a simple average is probably a more specific standard than can be justified. By assuming that the comparison counties are in fact a sample of all such counties in the region, it is possible to use a statistical technique known as a "confidence interval" to establish what might be called a "typical range" of persons per employee in each activity.

In using this method, the selection of a good set of comparison counties (as mentioned earlier) is obviously quite important. Therefore, that process is described here and is also covered in detail in Appendix A.

The Selection of Comparison Counties

It is clear that there are no counties in the nation exactly like Rolette County, North Dakota. However, it is important for the purpose of establishing appropriate levels for retail trade and service activity

to select counties which are relatively similar in appropriate ways. For the purposes of inter-county comparisons the counties of Bottineau, McLean, and Mountrail in North Dakota have been selected. This selection was based upon the similar rankings of these counties in the categories of median family income, ratio of poor to rich families, median female-male earnings ratio, population-employment ratio, the percentage employed in primary vs. service sector activities, and the median school years completed; all as reported in North Dakota Economy: Some Basic Data by Fikret Ceyhun, Department of Economics, University of North Dakota, 1977, table 37.

In addition to these criteria, the comparison counties are smaller in that each of them contains a sizable Indian population, although not as large absolutely or relatively as that in Rolette County. Also, all of these counties relate to Minot, North Dakota, as a wholesale-retail trade center and their major trade centers are all more than 50 miles from Minot. It might be expected, therefore, that while Rolette County is more distant from Minot than the other three counties, all are far enough from that center that Minot's influence will be similar on shoppin or comparison goods trade for the three counties.

A further point of similarity is that the major trade centers in each of these counties have populations of between 1,000 and 3,000 perso and the spheres of influence for these centers include most of the area within each county. This is important when using employment data on a county basis and when making judgements about the adequacy or inadequacy of employment levels in each county. A county may have low levels of employment in a certain activity because of the influence of a large tra

center in a neighboring county. The location and relative size of trade centers in the counties used here suggests that this is generally not the case in these counties.

Retail Trade Activities with Relatively High Employment Levels in Rolette County

Having selected the counties, it is appropriate to proceed with inter-county comparisons. By comparing location quotients it is possible to identify those activities in which employment levels are either relatively high or low. Table 7 reflects trade and service activities in which the location quotients for Rolette County are above those for each of the other three counties. This observation suggests that employment in these activities is a larger percentage of Rolette County's employment than is typical of the other counties.

TABLE 7

LOCATION QUOTIENTS FOR RETAIL TRADE AND SERVICE ACTIVITIES WITH RELATIVELY HIGH EMPLOYMENT LEVELS IN ROLETTE COUNTY WHEN COMPARED WITH SELECTED NORTH DAKOTA COUNTIES (1975)

	County			
Activity	Rolette	Bottineau	McLean	Mountrail
Lumber and Bldg. Materials	4.47	.94	1.25	.94
Food Stores	1.27	1.03	.68	1.13
Liquor Stores	.85	.46	---	.31
Real Estate Agents & Brokers	.71	.22	.14	.16
Funeral Parlows	1.00	.33	.56	---
Auto Repair Shops	1.25	.31	.44	.22

Source: Calculated from data supplied by the North Dakota Job Service, Bismarck, North Dakota, and the U.S. Department of Commerce.

It is possible to consider a wide variety of explanations for a high location quotient. For example, a local merchant could be an aggressive merchandiser and be capturing business from others in surrounding counties. Or, one or more employers may be inefficient and employ too many people. Also, a firm which has more than a single activity could be classified in one rather than several activities by the North Dakota Job Service thus distorting the data. Local people may also have different tastes or be engaged in unusual activities in a given year which could exaggerate the inter-county differences. However, it is also possible that these high location quotients reflect the overextension of certain activities in the county. The fact that a lumber store and a grocery store have been closed in the county since 1975 suggests that there may be some validity to this possible interpretation of these statistics.

Additional data from another perspective may help shed light on this matter. Recognizing that it requires a certain number of consumers to support an employee in a given activity, it is also useful to make inter-county comparisons of population-employment ratios. Table 8 identifies those retail trade and service activities in which the number of persons per employee is below the average for the four counties. When this population-employment ratio is low this also suggests the possibility of excessive employment in a particular sector. An additional statistical step is taken here, however. With only four counties as a basis for comparison, and some rather wide inter-county variations in population-employment ratios in some activities, a simple average may be a rather arbitrary standard. It is possible to simply note how much the

county's ratio differs from the average, but this too can be quite subjective. A technique used by statisticians in such cases is known as the confidence interval. It involves using the variation in the sample means as well as the number of observations to estimate a range of possible averages. The confidence interval may be interpreted as suggesting that there is a 95 percent chance that the true average (mean) for the data in question is within the range described.

TABLE 8

RETAIL TRADE AND SERVICE ACTIVITIES WITH BELOW AVERAGE POPULATION-EMPLOYMENT RATIOS IN ROLETTE COUNTY, NORTH DAKOTA (1975)

Activity	No. of Persons Per Employee			
	Rolette County	4-County Average	4-County 95% Confidence Interval*	Outside Confidence Internal
Food Stores	125	146	103-189	
Motor Vehicles, new and used	272	281	197-365	
Apparel & Acces. Stores	638	645	449-841	
Lumber & Bldg. Material	255	772	268-1276	x
Real Estate Agnts. & Brokers	440	1332	416-2248	
Motion Picture Theaters	2128	2173	124-4222	
Ins. Agents & Brokers	2554	2621	390-4852	
Auto Repair Shops	912	3752	1165-6339	x
Laundries	3192	3611	1450-5771	
Liquor Stores	3192	5560	1442-9678	
Fuel Dealers	4256	5915	2429-9401	
Funeral Parlors	4256	6642	2322-10962	

Source: Calculated from data provided by North Dakota Job Service and U.S. Department of Commerce.

*Based upon "t" distribution with 3 degrees of freedom.

employment ratios for all retail trade and service activities in which the population-employment ratio is above the four-county average. However, the statistics on table 10 give greater support to the observations of table 9 than was true of table 8 relative to table 7. This suggests that even when allowing for the small sample of counties and the wide variations in the data,

TABLE 9

LOCATION QUOTIENTS FOR RETAIL TRADE AND SERVICE ACTIVITIES WITH RELATIVELY LOW EMPLOYMENT LEVELS IN ROLETTE COUNTY WHEN COMPARED WITH SELECTED COUNTIES IN NORTH DAKOTA (1975)

	County			
Activity	Rolette	Bottineau	McLean	Mountrail
General Merchandise Stores	.21	.37	.40	.28
Furniture Stores	.18	.61	.25	.17
Eating and Drinking Places	.54	1.16	.80	.91
Drug and Prop. Stores	.60	.70	1.05	1.40
Commercial Banks	.89	1.04	1.04	1.04
Hotels, Motels & Lodging Pl.	.25	.60	.42	1.29
Beauty Studios	.31	1.11	.56	.83

Source: Calculated from data supplied by the North Dakota Job Service and U.S. Department of Commerce.

TABLE 10

RETAIL TRADE AND SERVICE ACTIVITIES WITH ABOVE AVERAGE POPULATION-EMPLOYMENT RATIOS IN ROLETTE COUNTY (1975)

Activity	No. of Persons Per Employee			
	Rolette County	4-County Average	4-County 95% Confidence Interval*	Outside Confidence Internal
Health Services	50	49	40-58	
Eating & Drinking Pl.	182	113	47-179	*
Hardware & Farm Equip.	170	163	93-233	
Gasoline Service Sta.	177	165	140-190	
Commercial Banks	304	244	181-488	
General Mds. Stores	580	399	219-579	*
Hotels, Motels, & Lodging Pl.	1277	639	2-1276	*
Drug and Prop. Stores	1064	701	286-1116	
Beauty Studios	3192	1706	167-3145	*
Furniture Stores	3192	2009	635-3384	
Legal Services	3192	2619	1073-4165	

Source: Calculated from data supplied by North Dakota Job Service and U.S. Department of Commerce.

*Based upon "t" distribution with 3 degrees of freedom.

The opening of two new restaurants and a savings and loan institution in Rolette County since 1975 (as mentioned above) has already filled some of the gaps suggested by these figures. The low employment level in Drug Stores can probably be explained by the availability of pharmacy services to Indian families through the Indian Health Service, thus suggesting that added employment may not be called for in this activity.

The opportunity for added employment in Hotels, Motels and Lodging Places has been verified by travelers who find it frequently impossible to find accommodations on short notice during the summer months in Rolette County. Each of the activities must be examined in detail before making specific recommendations and there is no substitute for a thorough knowledge of local affairs in this process. However, in evaluating proposals or in identifying opportunities, these tables should serve as a useful first step.

Applying the Observations to the Proposed Mini-Mall

The newly constructed mini-mall at Belcourt in Rolette County is expected to house the following activities: a grocery store, a clothing store, a variety store, a hardware store, a restaurant, a music store, a barber and beauty shop, and a bank pay station. The location quotient for food stores was above that for other comparable counties in 1975 (see table 7) and the population-employment ratio was well below the average for the four counties. However, as mentioned earlier, a grocery store in Rolla (which is only seven miles from Belcourt) closed in 1977, which would tend to lower the location quotient and raise the population-employment ratio. Also, while the population-employment ratio was below average, it was not outside the confidence interval which suggests that there is a good possibility that this sector of Rolette County's economy may not be overextended.

The clothing store falls into the Apparel category on table 8 which also has a population-employment ratio which is slightly below average. If the new establishment employs four persons or less, the

population-employment ratio would remain within the confidence interval. On the basis of these data, and given the nature of clothing as a shopping goods item, this establishment will need to be prepared to compete aggressively for the Rolette County market around the community of Belcourt.

All of the other proposed establishments fall into groups which have below average location quotients and above average population-employment ratios in Rolette County. In fact, three of them are in categories where the population-employment ratio was above the confidence interval in 1975 which strengthens the possibility that these sectors may be underdeveloped. As mentioned earlier, the establishment of two new restaurants and one savings and loan institution since 1975 will change the picture for these activities, but these ventures together with the proposed ventures are not likely to push population-employment ratios below the 1975 four-county average.

In all cases it should be noted that Rolette County's population grew by 10.6 percent from 1970 to 1975, which is the fourth highest increase among North Dakota's 53 counties. This will also influence the population support base for new firms in the county.

Generally, therefore, the data in this economic base study are supportive of the prospects for the tribally built mini-mall in Belcourt. It would appear that there is room in the county's market for the added employment by these establishments without seriously jeopardizing existing firms.

CHAPTER 5

POTENTIAL BUSINESS OPPORTUNITIES FOR BELCOURT

Having set out a number of retail trade and service activities which are underdeveloped in Rolette County, the study turns to examining the conditions necessary to support these kinds of business establishments. A method called threshold analysis was used to achieve this end.

The Concept of Threshold

+ what other variables are there? →

The concept of threshold was first proposed by Walter Christaller in conjunction with his work in what has come to be called Central Location Theory. Christaller reasoned that each type of retail or service establishment had a specific volume of business which it needed for on-going operation. The lower limit or the threshold of operation was viewed as varying across different kinds of businesses as well as varying over different scales of businesses of the same kind. Since the volume of business is largely determined by the frequency of consumer purchases, a grocery store, for example, can thrive in a locality where a large supermarket would languish. In other words, it almost sounds trite, the number of people influences the diversity as well as the size of business establishments in a given area.

With this in mind, it is a short step to develop a precise definition of threshold, which is: the minimum level of demand required to support one establishment of a given kind at a certain level of

profitability. In order to determine thresholds, then, the average level of demand and the average level of profits, or average profit rate, of a certain kind of business of a specific size must be known or empirically estimated. This can be done where ample funds are available and sufficient time is allowed. One way of measuring actual demand would be to obtain annual sales figures for a large number of specific kinds and sizes of businesses located in comparable areas and then calculate the average volume of sales for that kind of business. The average level of profits could be obtained in the same way. Optimally, this should be done by random sampling. However, the success of this approach hinges on the cooperation of businesses in the sample which too often refuse to provide the relevant information, in whole or in part, especially with respect to profits. Another way would be to select firms on the basis of the survival principle, businesses that have been in existence during some specified time, and then determine the number of people in the trade area of the towns in which these firms are located. This would be an improvement from the standpoint of determining the viability of businesses but a marginal one from the standpoint of measuring demand. The reason is that populations of trade areas are not readily available and would have to be estimated in each case once the respective market area was defined. Fortunately it is usually unnecessary to determine market populations for there is considerable evidence that town populations are good proportional estimates of trade-area populations. This makes the task much easier because community population figures for intracensal years are published annually by the Bureau of Census.

Threshold Procedure for Belcourt

In identifying possible business ventures for Belcourt, threshold is defined as the minimum number of people in a community required to support one establishment of a particular kind of business.

Although threshold populations are the objective, the number of businesses of a specific type in a community is influenced by a number of factors other than population. One of these factors is the amount of income people in the trade area have to spend. Changes in population and income levels are also important. Another is the existence of competing trade centers. Consequently the determination of threshold values for Belcourt are estimated from data on these variables as well as data on population.

Data

All towns in North Dakota having a population between 1000 and 3000 people were included in the threshold analysis. There were 49 such towns in North Dakota in 1975 according to the 1977 Current Population Reports of the Bureau of Census. Population and per capita income data for the 49 towns were obtained from this report. The number of businesses in each 2-digit SIC category in mid-1975 was obtained from Dun & Bradstreet's business report for North Dakota. Again the businesses selected for each community were those existing for a number of years. A map search in conjunction with the population report was used to identify the nearest largest town and its distance from the town of origin.

Establishment data were collected on forty-five 2-digit SIC categories but the number of categories was later reduced to 13 because of

either the lack of sufficient number of observations or for reasons of statistical insignificance.

Business Opportunities for Belcourt

Regression analysis was employed to estimate population thresholds* for 10 two-digit SIC categories based on Belcourt data for the relevant variables. The threshold values calculated for up to three establishments in each type of business are given in table 11.

TABLE 11

POPULATIONS REQUIRED TO SUPPORT ADDITIONAL ESTABLISHMENTS OF SELECTED FUNCTIONS IN NORTH DAKOTA

Functions	Number of Establishments		
	1	2	3
Building Materials, Hardware and Garden Supplies	424	1,080	1,869
General Merchandise	1,417	4,497	-----
Food Stores	611	1,189	1,757
Auto Dealers and Gasoline Service Stations	189	478	824
Apparel and Accessory	1,209	2,167	3,052
Furniture and Home Furnishings	1,094	1,970	2,782
Eating and Drinking	379	701	1,007
Misc. Retail (Drug Stores)	759	1,167	1,503
Banking	647	6,271	-----
Auto Repair	1,049	-----	-----

*The regression technique and the manner of calculating threshold values are discussed in Appendix C.

The threshold values indicate that one business in each SIC category listed could be supported by the Belcourt trade area. In the majority of cases the Belcourt trade area could support two or three establishments in each type of business. These conclusions, however, need to be tempered by considering the economic base of Rolette County.

On the basis of inter-county comparisons more than the average number of people are employed in hardware stores, food stores, gas stations, and auto repair shops suggesting additional activity in these areas could cause financial problems for new or existing stores in the county. In other words the degree of competition will be increased and only the most efficiently-managed, favorably-located stores are likely to survive. On the other hand, there are activities in the county where the employment percentage is below the national average. Specifically, comparison of inter-county location quotients indicates that business opportunities exist in general merchandise, furniture, restaurants, lounges, banking, and lodging. Operations in each of these activities could be established in Belcourt as the threshold values indicate. Specific kinds of establishments suitable for Belcourt are:

Variety Stores
Grocery Stores
Miscellaneous General Merchandise Stores
Retail Bakeries
Men's and Boy's Clothing Stores
Women's Ready-to-Wear Stores
Shoe Stores
Furniture Stores
Household Appliance Stores
Radio, Television, and Music Stores
Eating and Drinking Places
Liquor Stores
Saddle Shop
Commercial Bank

APPENDIX A

SELECTION OF COUNTIES FOR ECONOMIC BASE STUDY

The counties used in the economic base study were selected because of the closeness of their socioeconomic structures. The selection was made on the basis of a modification of the socioeconomic rankings of the counties as presented in North Dakota Economy: Some Basic Data, Fikret Ceyhun, Department of Economics, University of North Dakota, 1977. The original rankings were based on a number of variables considered to be inappropriate for this study, thus the rankings were recalculated for a subset of the variables used in the cited work. The modified, unordered rankings are presented in table A-1. Table A-2 gives the sum of the rankings and the aggregate rank of the 53 counties in North Dakota. The mean, median and their associated standard deviations are shown below table A-2.

Since Rolette County is the median county, one standard deviation around the median was used to identify counties similar to Rolette. This technique isolated 34 counties out of which in turn a judgmental sample of counties was selected. Counties either containing or near other counties containing a sizable Indian population was the criterion used to select the following three counties: Bottineau, McLean, and Mountrail.

TABLE A-1

RANKING OF COUNTIES BY SOCIO-ECONOMIC VARIABLES, 1970

County	Median Family Income As % of State Average	Ratio of Poor to Rich Families	Non-Worker to Worker Ratio	% Employed In				Skilled Labor Ratio	Median Sch. Yrs. Completed for Persons Over 24 Yrs. of Age	Per Capita Bank Deposits as % of State Average	Sum of Rankings
				Agriculture	Primary Sector	Service Sector	White Collar Worker				
Adams	13	13	4	25	9	32	18	36	9	18	177
Barnes	19.5	17	6	13	18.5	13	13	41	5	19	165
Benson	47.5	49	36	39	47	36.5	25	32	19	36	367
Billings	53	53	24	53	52	53	42	2	29	48	409
Bottineau	21.5	22	30	25	20	22.5	27	30	12	37	247
Bowman	19.5	23	5	19	40	17	24	40	4	2	193.5
Burke	40	38	26	23	13	26.5	33	14	21	38	272.5
Burleigh	2	4	1	1	4	4	45	17	3	1	82
Cass	1	1	2	2	14	1	1	28	1	10	61
Cavalier	46	29	35	42	36.5	40	30	11	13	20	302.5
Dickey	45	39	5	30	23	31	26	31	14	42	286
Divide	36.5	48	7	35	34	33	31	8	12	30	274.5
Dunn	41	37	14	50	49	49	39	16	29	45	369
Eddy	39	46	21	29	28	28	29	19	15	24	278
Emmons	18	11	40	37	48	35	33	12	31	21	286
Foster	9	8	19	17	18.5	16	9	9	10	7	122.5
Golden Valley	21.5	20	15	27	51	15	19	21	8	8	205.5
Grand Forks	4	3	2	3	12	3	2	30	2	41	102
Grant	50	47	21	51	53	48	35	31	30	43	409
Griggs	28	31	31	28	6	36.5	22	19	23	4	228.5
Hettinger	36.5	33	37	35	43	29	21	26	26	23	309.5

TABLE A-1—Continued

County	Median Family Income as % of State Average	Ratio of Poor to Rich Families	Non-Worker to Worker Ratio	% Employed In				Skilled Labor Ratio	Median Sch. Yrs. Completed for Persons Over 24 Yrs. of Age	Per Capita Bank Deposits as % of State Average	Sum of Rankings
				Agriculture	Primary Sector	Service Sector	White Collar Workers				
Kidder	51	45	29	48	50	46	40	24	30	22	403
LaMoure	35	19	29	44	42	42	35	5	23	34	266
Logan	7	5	34	45	32.5	44	41	7	33	14	262.5
McHenry	34	42	22	38	26	38	31	18	18	46	313
McIntosh	31	7	21	33	45	24	23	15	34	32	265
McKenzie	15	30	18	42	7	45	34	13	13	44	261
McLean	27	40	22	43	24	25	20	29	17	39	286
Mercer	38	43	12	26	10	34	37	33	32	33	265
Morton	17	33	20	9	3	12	15	42	28	29	208
Mountrail	44	44	27	18	8	26.5	17	10	12	28	234.5
Nelson	47.5	50	16	36	44	30	36	30	20	3	312.5
Oliver	43	41	23	52	36.5	52	44	6	30	48	375.5
Pembina	14	21	32	12	5	18	14	38	11	25	190
Pierce	25.5	34	28	11	17	9	4	22	26	9	185.5
Ramsey	8	10	13	10	40	5	5	36	4	21	152
Ransom	30	27	18	20	16	22.5	28	35	8	6	210.5
Renville	12	13	30	40	29	39	23	5	4	47	242
Richland	32	27	17	16	26	14	12	37	12	27	220
Rolette	42	51	39	7	21.5	6	10	1	27	46	250.5
Sargent	33	36	11	31	1	43	34	20	16	40	265
Sheridan	49	35	10	46	32.5	47	38	17	31	31	336.5
Sioux	52	52	38	22	30	20	21	43	17	48	343
Slope	10	9	33	49	36.5	50	43	31	6	48	315.5

TABLE A-1--Continued

County	Median Family Income as % of State Average	Ratio of Poor to Rich Families	Non-Worker to Worker Ratio	% Employed In				Skilled Labor Ratio	Median Sch. Yrs. Completed for Persons Over 24 Yrs. of Age	Per Capita Bank Deposits as % of State Average	Sum of Rankings
				Agriculture	Primary Sector	Service Sector	White Collar Worker				
Stark	23	28	10	6	11	8	6	39	22	13	166
Steele	6	22	28	47	36.5	41	32	4	4	11	231.5
Stutsman	11	15	8	8	21.5	7	8	34	14	26	152.5
Towner	29	19	33	21	40	19	11	11	7	15	205
Traill	25.5	16	17	15	31	11	15	23	4	17	174.5
Walsh	16	24	22	14	26	10	16	3	28	5	164
Ward	5	6	3	4	15	2	3	30	2	35	105
Wells	24	25	25	32	46	21	24	27	18	16	258
Williams	3	14	9	5	2	51	7	25	4	12	132

Source: Fikret Ceyhun, North Dakota: Some Basic Data, Department of Economics, University of North Dakota, 1977. A modification of table 37.

**Ranking: 1 = Most Desirable
53 = Least Desirable

TABLE A-2

SOCIO-ECONOMIC RANK OF NORTH DAKOTA COUNTIES

Sum	Rank	County
61.0	1	Cass
82.0	2	Burleigh
102.0	3	Grand Forks
105.0	4	Ward
122.0	5	Foster
132.0	6	Williams
152.0	7	Ramsey
152.5	8	Stutsman
164.0	9	Walsh
165.0	10	Barnes
166.0	11	Stark
174.5	12	Trail
177.0	13	Adams
185.5	14	Pierce
190.0	15	Pembina
193.5	16	Bowman
205.0	17	Towner
205.5	18	Golden Valley
208.0	19	Morton
210.5	20	Ransom
220.0	21	Richland
228.5	22	Griggs
231.5	23	Steele
234.5	24	Mountrail
242.0	25	Renville
247.0	26	Bottineau
250.5	27	Rolette
258.0	28	Wells
261.0	29	McKenzie
262.5	30	Logan
265.0	31	McIntosh
265.0	31	Mercer
265.0	31	Sargent
266.0	32	LaMoure
272.5	33	Burke
274.5	34	Divide
278.0	35	Eddy
286.0	36	Dickey
286.0	36	Emmons
286.0	36	McLean
302.5	37	Cavalier
309.5	38	Hettinger
312.5	39	Nelson
313.0	40	McHenry
315.5	41	Slope
336.5	42	Sheridan
343.0	43	Sioux
367.0	44	Benson
369.0	45	Dunn
375.0	46	Oliver
403.0	47	Kidder
409.0	48	Billings
409.0	48	Grant

Mean = 243.34
Standard Deviation = 77.81

Median = 250.5
Standard Deviation = 83.41

APPENDIX B

EMPLOYMENT MULTIPLIER

The employment multiplier is determined as follows:

1. The percentage of employment in each industry nationally is compared with that in the county (or city or region as appropriate)
2. In each industry in which the county's employment percentage exceeds the national percentage, the difference in these percentages is multiplied by the county's total employment. The resulting total is basic employment
3. Total employment is divided by basic employment to arrive at the multiplier. This multiplier is related to the more widely understood income multiplier in the following manner:

$$\text{Income multiplier} = k = \frac{1}{1\text{-MPC}}$$

If we assume MPC = APC then:

$$k = \frac{1}{1\text{-MPC}} = \frac{1}{1\text{-APC}}$$

For a regional model this may be described as:

$$k = \frac{1}{1 - \frac{\text{Local Consumption Spending}}{\text{Total Local Income}}}$$

Using employment as a proxy for income and non-basic employment as that which produces for local consumption while basic employment is producing for export, we then can substitute:

$$k = \frac{1}{1 - \frac{\text{Non-Basic Employment}}{\text{Total Employment}}}$$

$$= \frac{1}{\frac{\text{Basic Employment}}{\text{Total Employment}}}$$

$$= \frac{\text{Total Employment}}{\text{Basic Employment}}$$

APPENDIX C

THRESHOLD ANALYSIS

Y is defined as the number of establishments of a specific kind of business in a community. Six determinants (X_i) of Y are defined as follows:

X_1 = Population of the town

X_2 = Population of closest larger town

X_3 = Distance to the closest larger town

X_4 = Income per capita of the towns

X_5 = Change in town population in the most recent five year period

X_6 = Change in town per capita income in the most recent five year period

The relationship is expressed functionally as

$$Y = f(X_i) \quad (i = 1,--6)$$

The specific functional form used is the exponential-multiplicativ function

$$Y = AX_i^{bi} \quad (i = 1,--6)$$

which was estimated in the logarithmic form of

$$\ln Y = a + b_i \ln X_i \quad (i - 1,--6)$$

by stepwise-forward regression.

Twenty-one regression equations were estimated but only thirteen were significant by the F-test at the .01 or .05 level. The statistically significant regression equations along with their pertinent statistics are listed in table C-1.

ESTIMATED THRESHOLD EQUATIONS

Construction, Special Contractors	$\ln Y = -1.410 + .921 \ln X_1 - 1.209 \ln X_5 + .247 \ln X_6$ $(.288)^*$ $(.660)$ $(.187)$	$F = 4.140$ $r^2 = .216$
Wholesale Trade-Durable Goods	$\ln Y = -4.858 + 1.482 \ln X_1 - 1.355 \ln X_5 + .304 \ln X_6$ $(.267)$ $(.613)$ $(.173)$	$F = 11.364$ $r^2 = .431$
Wholesale Trade-Nondurable Goods	$\ln Y = -5.191 + .770 \ln X_1 + .357 \ln X_6 - .225 \ln X_3$ $(.295)$ $(.198)$ $(.162)$	$F = 3.748$ $r^2 = .20$
Building Materials, Hardware and Garden Supply	$\ln Y = -2.314 + .441 \ln X_6 + .742 \ln X_1 - .872 \ln X_5$ $(.158)$ $(.244)$ $(.559)$	$F = 5.754$ $r^2 = .277$
General Merchandise Stores	$\ln Y = -4.769 + .600 \ln X_1 + .213 \ln X_3 - .074 \ln X_2$ $(.200)$ $(.125)$ $(.055)$	$F = 6.095$ $r^2 = .289$
Food Stores	$\ln Y = -6.685 + 1.042 \ln X_1$ $(.255)$	$F = 16.685$ $r^2 = .262$
Automotive Dealers and Gasoline Service Stations	$\ln Y = -4.329 + .747 \ln X_1 - .159 \ln X_2 + .212 \ln X_3$ $(.239)$ $(.066)$ $(.148)$	$F = 7.243$ $r^2 = .326$
Apparel and Accessory Stores	$\ln Y = -9.218 + 1.188 \ln X_1 + .403 \ln X_3 - .133 \ln X_2$ $(.225)$ $(.14)$ $(.062)$	$F = 18.325$ $r^2 = .549$

TABLE C-1--Continued

Furniture, Home Furnishings, and Equipment Stores	$\ln Y = -5.733 + 1.179 \ln X_1 + .478 \ln X_6 - .979 \ln X_5$ $(.259)^*$ $(.168)$ $(.593)$	$F = 9.761$ $r^2 = .394$
Eating and Drinking Places	$\ln Y = -.0853 + 1.125 \ln X_1 - 1.4 \ln X_5 - .0735 \ln X_2$ $(.221)$ $(.506)$ $(.052)$	$F = 9.644$ $r^2 = .391$
Misc. Retail (Drug Stores)	$\ln Y = -10.677 + 1.61 \ln X_1$ $(.242)$	$F = 44.095$ $r^2 = .484$
Banking	$\ln Y = -1.656 + .305 \ln X_1 - .163 \ln X_3 + .0464 \ln X_2$ $(.091)$ $(.056)$ $(.025)$	$F = 4.924$ $r^2 = .247$
Automotive Repair	$\ln Y = -1.412 + .203 \ln X_1$ $(.101)$	$F = 4.025$ $r^2 = .079$

*Values in parentheses are standard errors of the regression coefficients.

Every regression coefficient is statistically significant by the t-test at the .01 or .05 level. Population is the most significant explanatory variable (X_1) and appears in every equation. The per capita income variable (X_4) is absent in every equation; however, the change in per capita income variable (X_6) is significant in five equations and its coefficient has the expected sign in each. Population change (X_5) is significant in five equations but in each it has a coefficient with an unexpected sign. A possible reason for this could be intercorrelation, for the population variable (X_1) and the population change variable (X_5) are moderately correlated ($r = .3747$). The distance variable (X_3) is significant in five equations and of the expected sign in three. The nearest-larger town variable (X_2) is significant in five equations and of the expected sign in four. Overall the equations have lower r-squares than other regression threshold studies but are not unusually low for a cross-section study.

Threshold Values

The manner of calculating threshold values with the above equations is as follows. First let Y = 1 and insert the appropriate community values for the X_1. This converts the equation to one unknown (population) which then can be solved algebraically. For example:

$$\ln Y = -1.41 + .921 \ln X_1 - 1.209 \ln X_6 + .247 \ln X_5$$

$$\ln(1) = -1.41 + .921 \ln X_1 - 1.209 \ln(110.0) + .247 \ln(95.0)$$

$$0 = -1.41 + .921 \ln X_1 - 5.683 + 1.125$$

$$-.921 \ln X_1 = -5.968$$

$$\ln X_1 = 6.48$$

$$X_1 = e^{6.48}$$

$$X_1 = 652$$

Following the above procedure, population thresholds were calculated for 10 two-digit SIC categories using Belcourt data for the relevant variables and appear in table 11 in the text.