THE MAIN FACTORS INFLUENCING COUNTY PER CAPITA INCOME IN THE PROVINCE OF QUEBEC

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CURRICULUM STUDIORUM

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INTRODUCTION

The regional disparities in income which exist between various countries and also between regions within countries have been a source of concern not only to economists but also politicians and other persons concerned with economic and social problems. The creation of a new academic specialization, namely Regional Sciences, and the development and implementation of many governmental policies aimed at reducing disparities in income, are only two of the manifestations of the growing awareness and discontent arising from regional economic disparities.

The development of Regional Economics as a new field of specialization in economics stems from the observation that national aggregates hide many details of the universe they represent. It was hoped that a better understanding of the working of the economic system can be gained through the analysis of smaller aggregates. This gave rise to the development of regional accounts.

In studies dealing with income disparities, the unit of observation is usually a state or a province. In this thesis the areas to be studied are smaller, they are the counties of the Province of Québec. Per capita money income varies greatly among these areas.

Although per capita money income is not an exact measure of welfare, variations in this statistic indicate that differentials in welfare exist in the counties of the Province of Québec. These differentials are mainly due to variations in the average earnings of the residents of the different counties. It is assumed that the marginal theory of income distribution holds; consequently differentials in earnings can be related to productivity. The purpose of this thesis is to isolate the main factors affecting the average productivity of the residents of the different counties and to estimate the total and individual contributions of these factors to the observed variations in per capita earned income.

The earnings of economic resources are closely related to the existing spatial growth pattern of the Province. Although the purpose of the thesis is not to isolate the forces that created the existing pattern of growth of the Province, some of the factors that led to the actual situation will be discussed. For example, some barriers to the free flow of factors of production will be mentioned. Such barriers are responsible to a certain extent, for the differentials that exist in the counties of Québec in the combination of factors available for production. These differentials create variations in the earnings of the factors.

Chapter I contains a description of the problem to be studied and the hypothesis to be tested: per capita earned income disparities can be explained to a great extent by variations in the distribution of the labour force among the different sectors of the economy, in the educational attainment of the labour force and in the participation rates of total population in economic activities. In the three following chapters, each one of these factors is analysed and a statistical measurement for each is given. The relationships between each one of these factors and both income per capita and income per person employed are analysed.

In Chapter V, the total and individual contributions of the three above-mentioned factors to the observed differentials in per capita earned income are estimated through regression analysis. Empirical estimation confirms the hypothesis and indicates that all the factors embodied in it are significant.

In conclusion, the findings are summarized. Some avenues that future studies could take in order to provide further insight into the matter are mentioned. Finally the implications of the empirical results regarding the prospects for a reduction in per capita income differentials in the counties of the Province of Québec are examined.

CHAPTER I

THE PROBLEM, FRAMEWORK AND HYPOTHESIS

Per capita personal income[1] is the statistic most frequently used to measure the welfare of people. When income is used for that purpose, it is adjusted to reflect differentials in the buying power of money. Per capita personal income so adjusted, that is, personal real income per head, measures the average buying power of the residents of the areas under study. In comparisons involving nations, per capita personal real income is not only a measure of welfare, it is also an index of resident's productivity.[2] Because the redistribution of income through taxes and transfer payments are made within the national boundaries of each nation, it does not affect the total income to be distributed to the residents. It modifies the distribution of income but does not change the average income of the residents.

1. The Problem

Per capita personal real income is also used to compare the level of welfare of different areas or regions

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1 Personal income includes transfer payments and excludes certain income flows associated with corporate enterprise and government.

2 Due to the fact that certain income flows associated with corporate enterprise and government are excluded, from personal income, it cannot be considered as an exact measure of productivity.

within a country, state or province. However in comparisons involving regions or areas which are part of a nation, differentials in per capita personal real income do not arise only from differentials in the average productivity of residents of the different areas but also from governmental income redistribution activities. As a result one cannot say which portion of the observed differentials can be explained by variations in earnings.

Transfer payments are made for social and political reasons. They are not the cause of income disparities, on the contrary they aim at reducing such disparities.

If transfer payments are put aside one has earned income instead of personal income. Earned income is the income received by, or imputed to, residents of one area, however defined, for their participation in economic activities whether they are employers, employees, self-employed or investors. Except for certain income flows associated with corporate enterprise and government, earned income represents the final results of economic activities undertaken by the residents of the area whether or not the income was earned within the area or outside it.

When studying disparities in income among areas which are part of a political unit where redistribution of income takes place it is better to refer to earned income than to personal income. This is due to the fact that differentials

in the level of earned income among the areas can be related to differentials in the average productivity of the residents of the different areas. This can be done only if the marginal theory of income distribution holds. It is assumed that it does.

The marginal theory of income distribution says that the remuneration of each factor of production is equal to the value of its marginal product. The value of a factor's marginal product depends on that factor marginal physical product and on the value of the output produced which in turn is determined by its supply and demand conditions. This will be the case only if both factor and product markets are competitive. It is recognized that some markets are not in equilibrium, however it is assumed that most of these disequilibria offset each other and that the remaining ones, if any, are not so important as to invalidate the general proposition to the effect that each factor is remunerated according to the value of its marginal product.

Under these assumptions, differentials in the level of earned per capita real income in the counties of Québec can be explained by differentials in the average productivity or earning capacities[3] of the residents of the different counties.

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3 From now on, productivity will be used when talking about the labour force and earning capacities when referring to total population.

In this thesis money income rather than real income is used. This is due to the fact that the data that would be required to make the necessary adjustments are not available. Moreover, it is believed that the differences between real and money income would not be significant because this study is a cross-section analysis involving sub-areas of a relatively small area, namely the Province of Québec. The buying power of money within the area is not so great as to have a significant effect on the wage level from one county to another. In other words, it is assumed that other things being equal, persons having the same productivity receive almost, if not, the same income throughout the province.[4]

The interest of studying the differentials in per capita earned income of the counties of the Province of Québec stems from the fact that these differentials reflect variations in the average earning capacities of the residents which in turn are the basic cause of the observed differences in the levels of welfare of the people. Per capita earned income also measures what would be the actual welfare of people of each county in the absence of governmental redistribution activities.

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4 From now on, income will always mean money income unless otherwise specified.

The analysis is not restricted to earned income per person employed because by doing so an important factor influencing differentials in the earning capacities of the residents of the different counties, and consequently in the differentials in the levels of welfare would be omitted. This factor is the extent to which the total population participates in economic activities. The average earning capacities of a population, however defined, depends not only on the productivity of those working but also on the percentage of that population engaged in economic activities.

The extent to which total population participates in economic activity is influenced both by the age structure of the population and by the availability of employment for residents of each area. Although the age structure of a population is usually considered a demographic variable, it also has an economic dimension because it influences the average earning capacities of the members of this population by limiting the number of persons who can engage in economic activities. The impact of the age structure and of employment availability on the participation of the population in economic activities and consequently on the average earning capacity of the people will be discussed in greater detail later on.

A comparison of per capita earned income between areas which are part of a political unit where redistribution of income takes place is similar to a comparison of per capita income among nations. In the first case, per capita earned income and, in the second case, per capita income can be considered as an index of the average earning capacities of the total population residing in each area.

Per capita income of a nation is the national income of that nation in a given year divided by its population at the middle of that year. When studying areas which are part of a political unit within which redistribution of income takes place, for each part an aggregate is required which corresponds as closely as possible to the concept of national income. Such an aggregate has been estimated for each county of the Province of Québec and reported in Répartition régionale du revenu personnel au Québec (1961).[5] This aggregate is called total earned income.[6]

If each county's total earned income is divided by the number of residents engaged in economic activities, a rough estimate of the average productivity of those employed is obtained. If one takes the same aggregate for

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5 Gérard Vibien, Répartition régionale du revenu personnel au Québec (1961), Québec, Conseil d'orientation économique du Québec, 1967.

6 See Appendix I for a discussion of these income estimates.

each county and then divides it by the number of persons residing in the county at mid-year, one obtains an index of the average earning capacities of the residents, including those employed as well as those not employed whether because they are too young or too old or for any other reasons.

Table I-1 gives for each county per capita earned income both in absolute terms and as a percentage of the Province per capita earned income. The counties are ranked accordingly. Only five counties have a per capita earned income higher than that of the Province. Four of them are in the Metropolitan area of Montréal; the other is the county of Québec. Forty-one counties have a per capita earned income which is lower than eighty per cent of that of the Province.

Table I-1 also gives for each county earned income per person employed in dollars and as a percentage of that of the Province. The Table shows the ranking of each county according to earned income per person employed. It can be readily seen that the ranking of counties according to this criterion is substantially different from that reported when per capita earned income is used. For example, the county of Bonaventure which has the lowest per capita earned income ranks sixteenth when the counties are arranged in terms of their earned income per person employed.

TABLE I-1

PER CAPITA EARNED INCOME AND EARNED INCOME PER PERSON EMPLOYED IN THE COUNTIES OF QUEBEC, MAY 31, 1961.

Counties	Per Capita Earned Income			Earned Income per Person Employed		
	Dollars	Percentage *	Rank	Dollars	Percentage **	Rank
Bonaventure	422	36.44	1	2175	60.82	16
Gaspé	482	41.62	2	2110	59.00	11
Matane	483	41.70	3	2083	58.24	10
Kamouraska	487	42.05	4	1844	51.56	4
Bellechasse	496	42.83	5	1735	48.51	1
L'Islet	509	43.95	6	1909	53.38	6
Dorchester	418	44.73	7	1793	50.13	3
Témiscouata	533	46.02	8	2083	58.24	9
Frontenac	542	46.80	9	1953	54.61	8
Lotbinière	559	48.27	10	1948	54.47	7
Charlevoix	569	49.13	11	2288	63.98	19
Labelle	576	49.74	12	2421	67.70	20
Wolfe	592	51.12	13	2160	60.40	15
Montmagny	604	52.15	14	2138	59.78	13
Nicolet	604	52.15	15	1902	53.18	5
Yamaska	607	52.41	16	1767	49.41	2
Beauce	622	53.71	17	2119	59.25	12
Montcalm	640	55.26	18	2241	62.66	17
Rimouski	657	56.73	19	2429	67.92	21
Maskinongé	659	56.90	20	2249	62.89	18
Lac-St-Jean	665	57.42	21	2706	75.67	30
Bagot	698	60.27	22	2156	60.29	14
Berthier	709	61.22	23	2446	68.40	22
Abitibi	712	61.48	24	2810	78.57	33
Pontiac	737	63.63	25	2468	69.01	23
Napierville	742	64.07	26	2578	72.09	27
Brôme	748	64.59	27	2521	70.49	25
Compton	749	64.68	28	2734	76.45	31
Portneuf	753	65.02	29	2623	73.35	29
Montmorency	778	67.18	30	2573	71.95	26

* The Province per capita earned income equals 100%

** The Province earned income per person employed equals 100%

TABLE I-1 (continued)

Counties	Per Capita Earned Income			Earned Income per Person Employed		
Soulanges	797	68.82	31	2588	72.37	28
Arthabaska	815	70.37	32	2518	70.41	24
Papineau	826	71.37	33	2919	81.62	38
Drummond	854	73.74	34	2892	80.87	35
Joliette	873	75.38	35	2913	81.45	37
Mégantic	880	75.99	36	3075	85.98	39
Champlain	891	76.94	37	3149	88.05	44
Huntington	892	77.02	38	3105	86.82	41
Témiscamingue	893	77.11	39	3279	91.69	47
Richmond	900	77.72	40	3297	92.19	49
Chicoutimi	920	79.44	41	3648	102.01	61
Stanstead	930	80.31	42	2879	80.50	34
Richelieu	943	81.43	43	3200	89.48	48
Shefford	958	82.72	44	2895	80.95	36
Iberville	960	82.90	45	3188	89.14	45
Laprairie	982	83.07	46	3387	94.71	53
Ste-Hyacinthe	985	85.06	47	2773	77.54	32
Lévis	999	86.26	48	3119	87.22	43
Missisquoi	1007	86.96	49	3116	87.13	42
L'Assomption	1012	87.39	50	3541	99.02	58
Terrebonne	1021	88.16	51	3363	94.03	52
Rouville	1036	89.46	52	3300	92.28	48
Beauharnois	1041	89.89	53	3508	98.09	57
St-Maurice	1042	89.98	54	3438	96.14	55
St-Jean	1044	90.15	55	3086	86.29	40
Argenteuil	1055	91.10	56	3350	93.68	51
Verchères	1065	91.96	57	3603	100.75	60
Deux-Montagnes	1074	92.74	58	3435	96.06	54
Sherbrooke	1082	93.43	59	3304	92.39	50
Saguenay	1087	93.86	60	3792	106.04	63
Hull	1091	94.21	61	3500	97.87	56
Chateauguay	1164	100.51	62	3750	104.86	62
Québec	1235	106.64	63	3570	99.83	59
Vaudreuil	1251	108.03	64	3957	110.65	64
Chambly	1301	112.34	65	4152	116.10	65
Montréal	1637	141.36	66	4317	120.72	66
PROVINCE	1158	100.00	-	3576	100.00	-

More important is the reduction in the variations of the level of income when the total income earned by residents of a county is divided by persons employed rather than by total population. In the case of per capita earned income the ratio of the highest to the lowest is 3.88, whereas in the case of earned income per person employed, the corresponding ratio is only 2.48. The reduction in the ratio indicates that the variations in the participation of total population in economic activity tend to widen differentials in per capita earned income.

The observed differentials in the levels of per capita earned income in the 66 counties of the Province of Québec, indicate that the average earning capacities of the people residing in the different counties of the Province vary widely. In this thesis the variables associated with these variations will be explored.

2. The Framework

It is possible to use different approaches to analyse the income of an area, however this area may be defined. If one is interested in per capita income, one may consider the per capita income of the area as the weighted average of the income per head of some set of sub-areas. Then the per capita income of the area can be analysed in terms of the contribution of each sub-area to

the total. For this kind of analysis, it is necessary to have meaningful economic sub-areas rather than administrative units. In the present study, such an approach is impossible because the available statistics refer only to areas that are not economic units by definition. Thus, it is necessary to adopt another framework.

The Province of Québec is considered as a single economy operating within the framework of a single set of institutions. The differentials in the counties in income per head are looked upon as arising from the different combinations of the factors selected to explain these differentials.

Frank A. Hanna used this approach in studying interstate differentials in per capita income in the United States.[7] He stated that this approach "provides us with a framework for analysing any observed changes in terms of economic factors other than location."[8] For example,

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7 Frank A. Hanna, "Analysis of Interstate Income Differentials: Theory and Practice," Studies in Income and Wealth, No.21, New York, National Bureau of Economic Research, Princeton University Press, 1957, pp. 113-193.

8 Ibid., p. 118.

> A textile plant in one part of the nation may, because of its location, vary from a textile plant somewhere else. This variation may be reflected in the organization of the productive process, in the composition of the skills of the workmen employed, or in the types of markets served. But though these may be important sources of variation, for the purpose of the present paper they are treated as being of the same order as the variation between two textile plants located in the same community, that is, as independent of location.[9]

In this thesis, the fact that the counties of Québec are looked upon as a set of randomly selected areas means that the contribution of each factor to the observed differentials in per capita earned income is independent of location. In other words, the contribution of each factor would be the same if instead of taking the counties as a unit of observation another set of sub-areas chosen from the infinity of sets possible was used.

Regression analysis is used to measure the individual and total contributions of the selected factors to the observed differentials in per capita earned income. This type of analysis is based on the mathematical theory of statistics which enables inference to be made about a population on the basis of a sample.

In this case there are only 66 units and it is not possible to select a representative sample from such a small

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9 Ibid., p. 117.

population or universe. However the statistical data may be considered as resulting from "non experimental observations" as is done in all regression analysis studying a universe instead of a sample.

> We may look upon our universe as an infinite number of all possible economic decisions that could have been made on some subject and our sample as a particular set of such decisions that are actually made.[10]

In addition to this and due to the fact that the counties are considered as randomly selected sub-areas of a single economy, it may be assumed that the statistical data used in this thesis constitute a sample because they refer to only one set of sub-areas among the infinity of sets that could have been taken.

3. The Hypothesis

In Regional Economic Policies in Canada, T.N. Brewis, reviewed the most significant spatial characteristics of the Canadian economy and observed that income disparities were significant. He stated:

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10 L.R. Klein, An Introduction to Econometrics, Englewood Cliffs, Prentice-Hall, 1962, p. 4.

> In attempting to explain the disparities in income and employment opportunities across the country, it is possible to explore many different variables: among these, an investigation can be made of the significance of different age structures. A province with a relatively high proportion of children of school age and under will, other things being equal, have a lower labour force participation rate and per capita income. In some instances, lower income levels may be largely attributable to industrial mix; for example, a high proportion of the labour force may be in subsistence agriculture. In other cases unemployment may be higher. Such studies, by quantifying the component elements in the disparities between regions, can help to clarify the problem.[11]

This thesis is such an attempt. However, since it is concerned with income disparities, employment opportunities should be looked upon as a variable that can explain to a certain extent income disparities.

The main factors affecting the level of per capita income are embodied in an hypothesis to be tested by regression analysis. The hypothesis is that the observed differentials in per capita earned income in the counties of Québec can be explained by differentials in the productivity of those employed and also by differentials in the participation of the total population in economic activity. the hypothesis may be stated symbolically as:

$$Y_i = f(I_i, E_i, P_i)$$

where, Y denotes per capita income,

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11 T.N. Brewis, Regional Economic Policies in Canada, Macmillan, Toronto, 1969, p. 26.

I, the percentage of the labour force in the secondary sector,

E, the educational attainment of the labour force and

P, the extent to which total population participates in economic activities.

(the subscript i denotes the counties and varies from 1 to 66)

The first two variables relate to the productivity of labour. The percentage of the labour force in the secondary sector indicates the extent to which the shifts of human resources, from low productivity primary activities to high productivity secondary activities have taken place in each county. The second variable reflects the non-homogeneity of labour and measures differentials in the level of training, abilities and skills that enhance the productive capacities of members of the labour force. The third variable indicates the extent to which total population participates in economic activities.

For two reasons, account has not been taken of the counties' endowments in natural resources. The first is that it is very difficult to find a suitable measurement of natural resource endowments. The second reason is that natural resources do not have a significant impact on per capita income until they are developed.

An area may be very rich in natural resources but the income of the people living in it may be very low. Most countries of Latin America are examples of such situations. The inclusion of the industrial structure as a variable in the analysis, in fact measures the extent to which natural resources are developed and thus contribute to increasing total income and per capita income. As a consequence it can be said that a factor is not being omitted by the exclusion of natural resources from the analysis.

In the following chapters each variable embodied in the hypothesis will be discussed in detail. The causal relationship that exists between the dependent and the independent variables will also be investigated.

CHAPTER II

THE INDUSTRIAL MIX

The purpose of this Chapter is to show how the distribution of employment among the sectors of the economies of the counties of the Province of Québec is related to their level of per capita earned[1] income. The criteria used to allocate industries to the different sectors will also be discussed. Finally, the relationship that exists between the distribution of workers among the sectors and the level of both income per person employed and per capita income will be described.

The industrial mix as used here refers to the relative importance of the different sectors in the economies of the counties of the Province of Québec. The relative importance of each sector is measured by the percentage of total labour force engaged in each one. There are other bases that can be used. However, it is preferable here to use employment as the base because this thesis is concerned with income rather than with production. As it will be explained below, the income of an area can be related to the

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1 From now on, income will mean earned income unless otherwise specified.

industrial distribution of its labour force.

1. The Definition of Sectors

As it was said before the levels of earnings are related to the existing spatial pattern of economic growth. Economic growth as used in this thesis, means an increase in output and income whether it is achieved through either or both an augmentation of inputs or an increase in productivity.

Economic growth is more the result of new activities than the result of the growth of existing ones. According to Schumpeter, economic growth comes from the creative and destructive effects of technological innovations. They create new activities, new production processes and new products and render the old ones obsolete. It is the industries that take full advantage of technological innovations that are the most productive and that contribute the most to economic growth.

Gains in productivity in one industry have the effect of reducing the amount of resources necessary to produce a given output in that industry. Other things being equal, this enables some resources to leave the industry and be realllocated. Increased productivity also results in increased incomes for those remaining in the industry, and consequently creating a demand for new goods

and services. This demand can be met by the reallocation and subsequent production of the factors which left that industry which experienced productivity gains. In this way increased productivity paves the way to both the supply of, and demand for new goods and services.

The resulting structural changes may, and often do, create bottlenecks and structural unemployment. Some resources, especially human ones, do not leave industries or sectors as fast as increases in productivity dictate. As a result the output of the industry in which productivity has increased may rise more than the demand for it and the benefits of increased productivity go to the consumers but not to the producers. If the lack of mobility is very great, the income of certain resources may even be reduced following a gain in productivity.

The level of per capita income of an area can be related to its industrial mix if industries can be grouped into sectors and if each sector has some characteristics that have an impact on the earnings of its labour force. The characteristics should refer to the productivity of labour and to the demand and supply conditions for the output of each sector. The productivity of labour determines its physical marginal product, the value of which is determined by the value of the final product on the market place. The value of the final product depends on both its

demand and supply conditions.

If industries can be grouped into such sectors, income differentials in the counties of the Province of Québec can be related to differentials in their industrial mix. This can be done only if the marginal theory of distribution holds. It has been assumed that it does.

Although a detailed analysis of each industry would be needed to obtain exact results, a good approximation can be obtained by grouping industries into sectors. This approach is often used in economic literature dealing with structural changes and income.

The Seventh Annual Review of the Economic Council of Canada reported that the share of agriculture, forestry and fishing in the overall value of production "has fallen from 15 per cent to 5 per cent" since the end of the Second World War. It added:

> This is only one of the several important structural changes that have occurred in Canada as a result of shifting world and domestic demand patterns, and the influence of far-reaching and accelerated technological change. These forces and others have helped to transform Canada into an advanced industrial, highly urbanized and substantially service-oriented nation.[2]

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2 Economic Council of Canada, Seventh Annual Review, Patterns of Growth, Ottawa, Queen's Printer, 1970, p. 14.

Similar findings were reported by Simon Kuznets in National Income: A Summary of Findings.[3] He studied the relative importance of the different industries in the economy of the United States and estimated the contributions of the different factors that accounted for the $59 billion increase in the United States national income that took place during the period 1875-1925.

He found out that about 40 per cent of this increase was due to the augmentation in the number of gainfully occupied persons. The remaining rise in total income was associated with the increase in "income per gainfully occupied."

> Of the total rise in income per gainfully occupied, $822 (in 1929 prices), $486, or 59 per cent,was due to the intra-industry rise in income per gainfully occupied, and $336, or 41 per cent, to the shifts from industries with lower to industries with higher income per gainfully occupied.[4]

These estimates of Kuznets show the great importance of inter-industry shifts in increasing income.

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3 Simon Kuznets, National Income: A Summary of Findings, New York, National Bureau of Economics Research, 1946, pp. 31-49.

4 Ibid., p. 48.

The findings of the above-mentioned economic studies indicate that structural changes follow the application of technology to the production process. When these changes take place, income increases. Consequently in cross-section analysis, one would expect to observe higher per capita income in areas where the relative share of the total labour force employed in secondary and tertiary production is large, because it indicates that some or all of the necessary structural changes have taken place.

In Horizon 1980, Gilles Lebel studied income and the changes of the employment structure of the labour force in the Province of Québec. He grouped the industries in three sectors:

> Nous distinguons d'abord le primaire qui comprend l'agriculture et les industries extractives où les progrès techniques ont été lents pendant longtemps, mais accélérés depuis quelques années; ensuite, le secondaire où le progrès a été généralement rapide et continu, comprenant surtout l'industrie manufacturière; enfin le tertiaire qui comprend les services dont les progrès techniques sont faibles.[5]

He indicated the meaning that should be given to each of them:

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5 Gilles Lebel, Horizon 1980, une étude sur l'évolution de l'économie du Québec de 1946 à 1968 et sur ses perspectives d'avenir, Gouvernement du Québec, Ministère de l'industrie et du commerce, Québec, 1970, p. 142.

> ... les trois qualificatifs primaire, secondaire et tertiaire, ne sont pas uniquement destinés à classer les activités économiques en trois secteurs, mais plutôt à caracteriser trois types de comportement de la production à l'égard du progrès technique.[6]

Similar concepts can be found in the article of Martin Wolfe, "The Concepts of Economic Sectors."[7] Wolfe argued that industries should be grouped according to their "mode of production". He believed that sectors formed on this criterion are capable of showing meaningful relationships between employment in the different sectors of the economy of an area however defined, and the level of per capita income of the same area. He stated that this is due to the fact that each sector groups industries with similar production functions. As a result productivity is different from one sector to another and one may expect to observe differentials in earnings.

The primary sector is defined by Wolfe as that "group of industries in which an increase in productivity is limited by factors of natural growth."[8] Even in the largest and most modern farms, a crop takes a season to

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6 Ibid., p. 143.

7 Martin Wolfe, "The Concepts of Economic Sectors," The Quarterly Journal of Economics, Vol. LXIX, No. 3, Aug. 1955, pp. 402-420.

8 Ibid., p. 414.

grow. This is not to say that technical progress is impossible, but that it is limited by the "limiting effects of biological and climatic factors." In addition to this, productivity in the primary sector is also limited by seasonal unemployment and by the fact that a great amount of resources of this sector are under-employed. This is due to the fact that the application of technology to production has not been matched by the necessary structural changes in employment.

The economy of Canada in general and that of Québec in particular are not the only economies facing that problem.

> ... despite the steady exodus of farmers and farm workers, agriculture in most industrialized countries is marked by the existence of an unnecessary large, hence under-employed, farm population, in many cases working holdings that are structurally ill-adopted to the needs of a modern economy. In almost all the O.E.C.D. countries, a large proportion of total output is produced by a relatively small number of farmers. Excess farm population existing alongside labour shortage in certain other sectors of the economy constitutes in many cases an impediment to economic expansion.[9]

Increase in production in the secondary sector is limited by mechanical factors:

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9 Organisation for Economic Cooperation and Development, O.E.C.D. at Work, Paris, 1969, p. 59.

> This 'limitation' is of a totally different character than that of the primary sector, since it is constantly receding. It is the sum total of productivity-raising machines that human ingenuity have developed up to any one point in time. There is no foreseeable end to the process of mechanization until every mass-production activity is of the 'push-button' variety where, perhaps, even maintenance will be carried on with a minimum of human intervention.[10]

In allocating industries to sectors, "tool-using rather than machine-using industries" are excluded from the secondary sector and included in the tertiary or primary sectors.

According to Wolfe the tertiary sector experiences only a small amount of technical progress and it "includes the arts and crafts, personal and domestic service, amusement, education, and government - but not the utilities which, ... are highly mechanized ..."[11] Other industries includes in the tertiary are wholesale and retail trade, finance, insurance and medical services.

The secondary sector groups only the industries that make an extensive use of capital and of "the technological change embodied in it", and the percentage of the labour force engaged in this sector indicates the extent

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10 Martin Wolfe, op. cit., p. 416.

11 Ibid., p. 418.

to which the labour force of the counties shifts from low productivity primary industries to high productivity secondary industries.

Although the mode of production is used as a criterion to allocate industries to sectors this does not mean that the demand side is completely disregarded. On the contrary, the low demand for primary products must be taken into account in explaining the low income of persons working in primary industries as defined for the purposes of this thesis.

> Economists are generally in agreement about the manner in which poverty is being recreated in agriculture and other primary industries as an unwanted but persistent by-product of the very rise in productivity that is the foundation of the wealth of industrial societies. Demand for food tends to rise more slowly than the technical ability to produce it, and resources devoted to its production become redundant. The resulting 'price-cost squeeze' is a signal through the market mechanism that a reallocation in the use of labour, capital and land is necessary.[12]

It thus appears that the major problem in the primary industries is a resource problem. Because not enough resources left the primary sector to match the

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12 Helen Buckley and Eva Tihanyi, Canadian Policies for Rural Adjustments, A Study of the Economic Impact of ARDA, PFRA and MMRA, Economic Council of Canada, Special Study No. 7, Queen's Printer, Ottawa, 1967, p. 41.

increase in productivity, the output of this sector is much greater than the demand for its products. Consequently the prices of these products rise more slowly than that of other sectors and the remuneration of labour in this sector is kept lower than that of others.

While the demand for primary products decreases when economic growth takes place, the demand for the goods and services of the secondary and tertiary sectors increases. The demand for services tend to increase faster than the demand for products of the secondary sectors after a certain level of economic growth has been attained.

The increase in demand for the goods and services of the secondary and tertiary sectors can be illustrated by the change in the industrial distribution of the labour force that occurred between 1946 to 1966 in the Province of Québec.

> Ce qui apparaît le plus évident est le glissement dramatique et probablement irréversible de la balance de l'emploi en faveur des industries de services. Les effectifs des services s'étant accru de 44 à 58 pour cent entre 1946 et 1966 ont augmenté de 637,000, comparativement à un accroissement de seulement 210,108 dans le secondaire, et à une baisse de 199,000 dans le primaire.[13]

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13 Gilles Lebel, op. cit., p. 146.

Although employment increased much faster in the tertiary than in the secondary sector, the demand for products of the latter sector is still strong. Because productivity is lower in the tertiary sector than in the secondary sector, an equal increase in the demand for products and services of both sectors results in a greater increase in employment in the former than in the latter.

2. Kuznets' Study

Before analysing the relationship that exists between the relative importance of the sectors in the counties of the Province of Québec and per capita income, it is worthwhile to review briefly a study made by Simon Kuznets.[14] This study is interesting because it provides further insight into the cause of the association or relationship between the relative importance of the sectors and the level of per capita income.

In this cross-section analysis Simon Kuznets discussed the associations between the level of per capita

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14 Simon Kuznets, "Quantitative Aspects of the Economic Growth of Nations, III. Industrial Distribution of Income and Labor Force by States, United States, 1919-1921 to 1955," Economic Development and Cultural Change, Supplement to Vol. 6, No. 4, July, 1957, pp. 1-128.

income of the states in the United States and the proportions of the participation income originating from the different sectors.[15] Although he did not elaborate at length on the definition of his sectors, it is clear that the mode of production was the determining factor in allocating industries to sectors.

Kuznets carried out his cross-section analysis for five time periods. He ranked the forty-eight states in descending order of per capita personal income. He then divided them into six groups of eight. For each of the six groups, he took the arithmetic mean of per capita income and also of the employment shares of the three sectors. He also calculated for each group the arithmetic mean of the shares of participation income originating from the three sectors. He found that:

> The association between per capita income and the share of the A sector is decidedly negative. In each of the five years the share rises fairly consistently as we move from group I to group VI,

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15 Kuznets also discussed the association between per capita incomes and the shares of total labour force engaged in the different sectors. The associations are basically the same as that between per capita income and the proportions of the participation income originating from the different sectors.

> ... By contrast, there is definitive positive association between per capita income and the share of the M sector: It is usually highest in group I and then drops to group VI.[16]

Kuznets observed that a given relative differential in per capita income is associated with a larger difference in the shares of the A and M sectors among the states than among the countries[17] which he had studied before. The range of variations from the highest to the lowest nation was more than 15 to 1 whereas the range of variations from the highest to the lowest group of states was only of 2 to 1 in 1941.

Kuznets explained that this is due to the fact that the demand for agricultural products is relatively limited in areas which have a high per capita income. He added that it may be argued that per capita income is the independent variable or the cause and the low share of the A sector or the high share of the M sector the dependent variable or the effect.

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16 Ibid., p. 12.

17 Simon Kuznets, "Quantitative Aspects of the Economic Growth of Nations, II. Industrial Distribution of National Products and Labor Force," Economic Development and Cultural Change, Supplement to Vol. 5, No. 4, July 1957, p. 1-111.

> However plausible such an interpretation may be for self-contained areas and nations, it can hardly be relevant to states in this country, with its high mobility of resources and goods. Specifically, such an approach would not explain the finding just stated, since small income differentials - particularly at the high level of income prevailing in the United States - should not cause major relative changes in the proportions of demand for agricultural and industrial products. The explanation must lie, therefore, in the alternative approach with the industrial structure of the area the independent variable.[18]

Kuznets went on to explain that due to the fact that the United States has a rapidly growing economy and that intersectoral shifts in demand are rapid, the supply side of the economy is continually lagging behind. He added that "shifts may be so rapid that the slower moving internal migration processes (particularly from the A to the other sectors) lag behind them."[19]

In this connection it is worthwhile to report one more finding of Kuznets. He discovered that, when he excluded from the forty-eight states those with a high proportion of Negroes, the range of variations of per capita income in the remaining states was reduced. He explained:

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18 Ibid., p. 14.

19 Ibid., p. 92.

> This suggests that much of the internal inequality in income per worker in this country is due to the situation of the Negro minority which even today faces social and legal barriers to free mobility and equal opportunity for economic growth.[20]

Discrimination is a good example of the many factors which limit the mobility of resources. This lack of mobility is responsible for the fact that so many resources are misplaced and earning less than what they would if they were in the growing sectors of the economy.

3. The Economic Sectors in the Counties of Québec

In the following pages the relationship between income and the industrial distribution of the labour force in the counties of the Province of Québec is analysed. The sixty-six counties of the Province are listed in increasing order of per capita earned income. For each one of them the proportions of the labour force which is engaged in the primary and in the secondary sectors of the economy are given.

The industries are grouped into sectors according to the criterion of Wolfe, that is the "mode of production". The industries of the primary sectors are griculture, forestry and fishing. The secondary sector comprises

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20 Ibid., p. 92.

manufacturing, mining, construction and transportation, communication and other utilities. All other industries are included in the tertiary sector.

In economic literature, mining is often classified as a primary industry. However for the purpose of this thesis it must be included in the secondary sector because this industry makes an extensive use of capital. Despite the fact that the mining industry is a rather heterogeneous group, as a whole it has experienced in the recent decades an increase in the use of capital.

> Gross capital stock per employee in mining in 1967 dollars increased from less than $25,000 in the early post war years to more than $100,000 in recent years.[21]

For this reason mining is included in the secondary sector which groups highly capitalized industries.

In Table I and Charts I and II, it can be seen that per capita income is associated with the share of the labour force engaged in primary sector and also with the share of the labour force engaged in the secondary sector. As one moves from counties with low per capita income to counties with high per capita income the share of the

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21 Economic Council of Canada, Seventh Annual Review, Patterns of Growth, op. cit., p. 21.

Per Capita Income, Income per Person Employed and Employment in the Primary and Secondary Sectors in the Counties of the Province of Québec, 1961

Counties	Income per capita	Income per person employed	Percentage of the labour force in the primary sector	Percentage of the labour force in the secondary sector
1. Bonaventure	422	2175	32.99	26.30
2. Gaspé	482	2110	25.20	35.28
3. Matane	483	2083	39.86	15.19
4. Kamouraska	487	1844	40.04	23.57
5. Bellechasse	496	1735	47.52	20.58
6. L'Islet	509	1909	40.52	28.40
7. Dorchester	518	1793	54.44	18.37
8. Témiscouata	533	2083	38.30	23.61
9. Frontenac	542	1953	39.61	31.23
10. Lotbinière	559	1948	41.82	26.90
11. Charlevoix	569	2288	25.61	31.05
12. Labelle	576	2421	28.97	27.70
13. Wolfe	592	2160	38.69	34.52
14. Montmagny	604	2138	29.39	36.87
15. Nicolet	604	1902	40.19	23.66
16. Yamaska	607	1767	50.81	25.49
17. Beauce	622	2119	33.29	32.41
18. Montcalm	640	2241	29.17	33.83
19. Rimouski	657	2429	28.25	26.78
20. Maskinongé	659	2249	30.48	36.50
21. Lac-St-Jean	665	2706	28.38	28.97
22. Bagot	698	2156	36.54	39.44
23. Berthier	709	2446	27.47	40.48
24. Abitibi	712	2810	20.64	41.78
25. Pontiac	737	2468	35.69	31.48
26. Napierville	742	2578	36.08	35.56
27. Brôme	748	2521	30.33	35.99
28. Compton	749	2734	34.18	37.58
29. Portneuf	753	2623	22.93	40.28
30. Montmorency	778	2573	22.45	34.49
31. Soulanges	797	2588	27.55	40.70
32. Arthabaska	815	2518	21.21	44.19
33. Papineau	826	2919	21.66	38.04
34. Drummond	854	2892	12.75	51.88
35. Joliette	873	2913	16.76	39.57
36. Mégantic	880	3075	18.82	46.39

TABLE II-1 (continued)

Counties	Income per capita	Income per person employed	Percentage of the labour force in th primary sector	secondary sector
37. Champlain	891	3149	15.11	49.78
38. Huntington	892	3105	30.29	33.82
39. Témiscamingue	893	3279	15.15	42.76
40. Richmond	900	3297	12.21	57.53
41. Chicoutimi	920	3648	11.33	43.34
42. Stanstead	930	2879	12.54	52.81
43. Richelieu	943	3200	10.20	55.07
44. Shefford	958	2895	14.36	53.18
45. Iberville	960	3188	18.59	44.56
46. Laprairie	962	3387	9.98	54.31
47. Ste-Hyacinthe	985	2773	14.06	43.31
48. Lévis	999	3119	8.57	43.56
49. Missisquoi	1007	3116	17.69	49.57
50. L'Assomption	1012	3541	14.69	47.15
51. Terrebonne	1021	3363	4.92	47.81
52. Rouville	1036	3300	22.48	42.09
53. Beauharnois	1041	3508	4.77	58.33
54. St- Maurice	1042	3438	5.39	49.53
55. St- Jean	1044	3086	6.23	46.16
56. Argenteuil	1055	3350	8.45	56.05
57. Verchères	1065	3603	15.07	47.23
58. Deux Montagnes	1074	3435	20.25	39.88
59. Sherbrooke	1082	3304	2.70	43.02
60. Saguenay	1087	3792	14.51	48.46
61. Hull	1091	3500	6.79	35.90
62. Chateauguay	1164	3750	15.47	48.09
63. Québec	1235	3570	1.62	33.47
64. Vaudreuil	1251	3957	10.64	42.86
65. Chambly	1301	4152	1.00	52.01
66. Montréal	1637	4317	0.47	47.69

CHART II-1

PER CAPITA INCOME AND THE PERCENTAGE OF THE LABOUR FORCE IN THE PRIMARY SECTOR IN THE COUNTIES OF THE PROVINCE OF QUEBEC, 1961

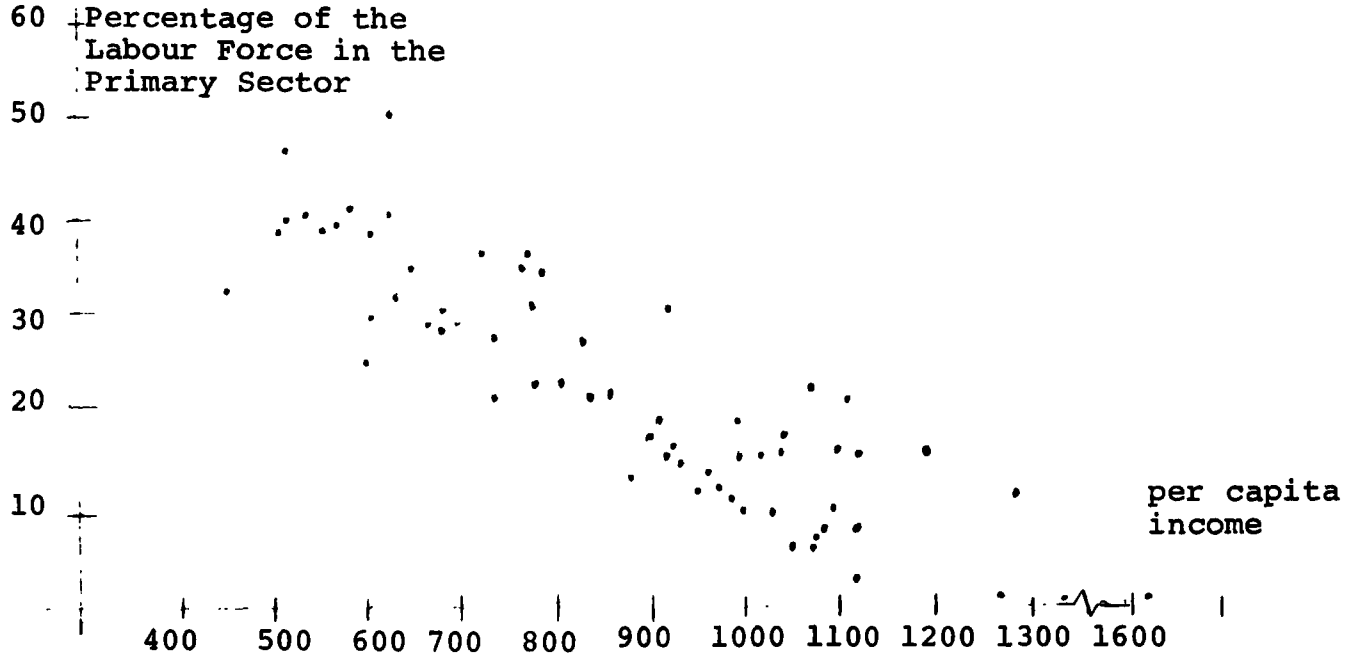
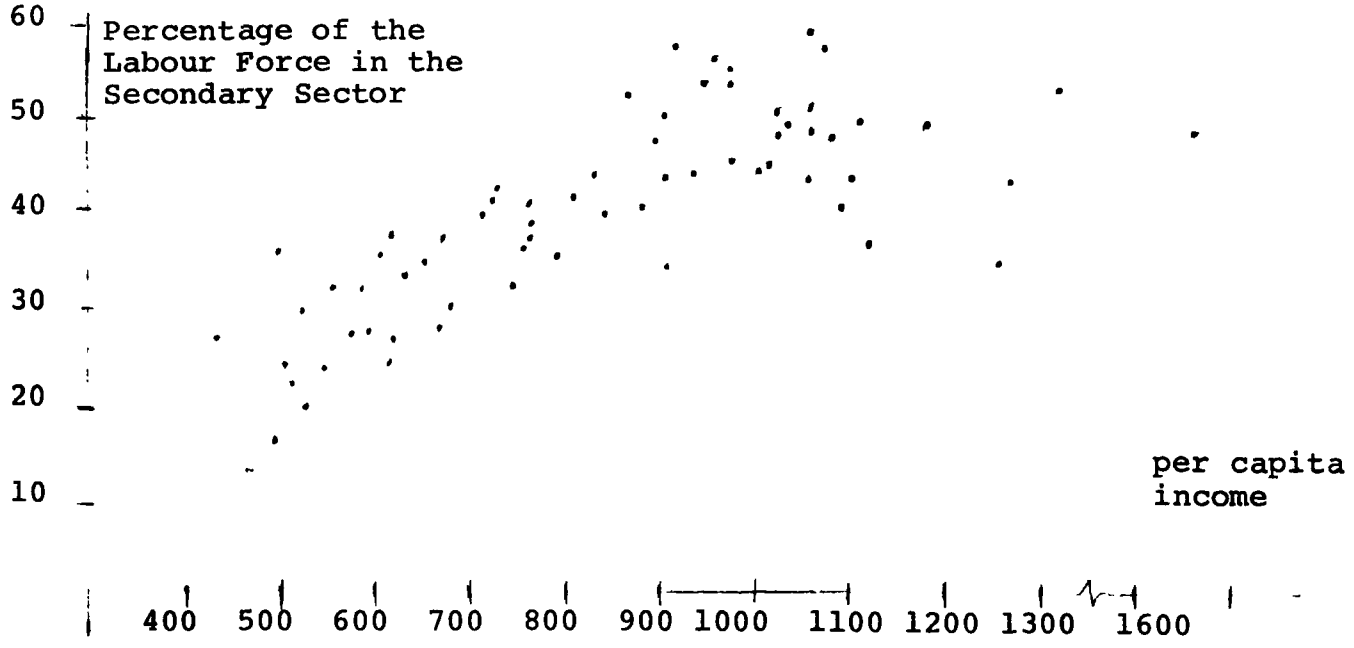


CHART II-2

PER CAPITA INCOME AND THE PERCENTAGE OF THE LABOUR FORCE IN THE SECONDARY SECTOR IN THE COUNTIES OF THE PROVINCE OF QUEBEC, 1961



labour force in the primary sector decreases whereas that of the secondary sector increases. The coefficient of correlation between per capita income and the share of the labour force in the primary sector is -0.85, whereas that of per capita income andthe share of the labour force in the secondary sector is+0.73. If one takes income per person employed instead of per capita income, the correlation coefficients are -0.88 and +0.75 respectively.[22]

The correlation between per capita income or income per person employed and the share of the labour force which is engaged in the primary sector, is very strong because of the reasons mentioned above and especially because of the low mobility of labour.

To explain the low mobility of labour engaged in primary activities, one must not overlook the human factor. Movement out of agriculture would have necessitated governmental organization and encouragement. In the past, outmigration has been retarded by the level of unemployment in the industrialized sector of the economy, by a lack of information about job opportunities and by the cost of moving to urban areas. As a consequence, unemployed or

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22 The four correlation coefficients are significant at the 1% level.

underemployed people in rural areas had to take the risk of moving to urban areas without being sure of gaining employment. The Economic Council of Canada described in the following terms the employment decline in agriculture:

> Our analysis of agriculture suggests that the continuing reduction of the farm labour force is one of passive out-movement rather than active out-migration. Many farmers whose experience and investment is in agriculture are reluctant or unable to leave farming even if returns to labour and capital are low. Adjustment takes place primarily by reduction in entries of younger people rather than shifts out of agriculture on the part of older persons[23]

As a result,

> ... the proportion of male farm operators, 45 years of age and over, increased from 51 per cent in 1951 to 59 per cent in 1961, and in 1961 the average age in agriculture was 48 compared with 39 for all occupations.[24]

As it was said earlier in this section, the farm problem, and that of the primary sector, is a resource problem. Because of the delay in human resources engaged in primary activities leaving the sector, the surplus of resources has impeded the development of the whole sector by reducing the replacement of labour by capital and the

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23 Economic Council of Canada, Fourth Annual Review, The Canadian Economy from the 1960's to the 1970's, Ottawa, Queen's Printer, 1967, p. 244.

24 Ibid., p. 237.

vast enhancement of the production of land, physical capital and labour through the application of technical production patterns.

Due to these reasons, the percentage of the labour force engaged in primary activities can also be taken as a rough approximation of the extent to which the economy is still dependent on an elementary form of economic organization.

The high correlation coefficient between per capita income and income per person employed and the relative importance of the secondary sector in the economy can be explained, as it was said before, by the fact that this sector is much more capitalized than the primary sector. In addition to this, the major autonomous industries[25] of the economy are comprised in the secondary sector. Most of the industries included in the tertiary sectors are satellite industries. The activities in these industries depend to a great extent on that of autonomous industries such as agriculture, forestry, mining and manufacturing. As a rule it can be said that, if the autonomous industries

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25 Autonomous industries are those industries which activities are not dependent on that of other local industries or which products are mainly exported outside the area concerned.

in a county provide little employment or employment with low earnings, non-autonomous industries would be less developed.

Forestry and agriculture yield only low income and do not generate much activity in tertiary industries. The other two major autonomous industries, namely mining and manufacturing,[26] are included in the secondary sector and constitute in the great majority of cases the economic base of the counties.

In the counties where these two industries are greatly developed they have a direct and indirect effect on the level of per capita income. The direct effect stems from the high earnings of workers engaged in these industries compared to other sectors. The indirect effect on per capita income is due to the fact that the high earning of the labour force stimulates other industries and also due to the fact that for their operation mining and manufacturing require a great quantity of producer goods and services that are provided by other industries. Some of

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26 We say the two major autonomous industries, because at the county level some other industries are partly autonomous. For example, certain cities are distribution centres for other smaller cities or towns located in other counties.

these goods and services can be produced within the boundaries of the county. The following quotation from Kuznets can also be applied to mining.

> The development of manufacturing generally means a concentration of population in urban communities - if only because of the minimum or optimum scale of manufacturing plants. The emergence of manufacturing then calls for complementary activities - transportation trade, etc. - and thus produced urban agglomerates.[27]

In turn agglomerates provide a market for other enterprises producing consumer goods and services. The establishment of such enterprises in these agglomerates increases the demand for labour and makes it possible for some workers to leave the primary sector where they have become redundant.

The relationship between per capita income and the percentage of the labour force engaged in the tertiary sector is not as firm as that of the two other sectors. The correlation coefficient between the two series is only 0.50. This loose association may be due to many reasons. Due to the heterogeneity of the sector, some of its industries may have a negative effect on the level of income

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27 Simon Kuznets, "Quantitative Aspects of the Economic Growth of Nations, III. Industrial Distribution of Income and Labor Force by States, United States, 1919-1921 to 1955," op. cit., p. 20.

whereas others have positive effects. Furthermore, most service industries are located where the services are dispensed and consequently a region cannot specialize in the service industries to the same extent as it can in the primary and secondary sectors.

In addition to this, many consumer services are provided to the public by the provincial and federal governments and they are independent of the level and kind of economic activities taking place in the counties in which they are dispensed. Finally some services are directly related to production activities, and as a result, enterprises providing these services are located in areas where there is a demand for such services, that is, mainly where manufacturing and mining are developed to the highest degree.

As a result more disaggregation would be needed before one can draw any conclusion from the loose relationship that exists between employment in the tertiary sector and the level of per capita earned income.

In conclusion, it can be said that in the counties of Québec, the more developed the secondary sector, the higher is the per capita income of that county. This is what can be expected from the theory reviewed above and from the empirical findings of studies concerned with

regional income disparities.

The percentage of the labour force engaged in the secondary sector indicates the extent to which resources have been shifted from the low-earning primary sector to the high-earning secondary sector. In the latter sector capital has replaced labour to a great extent and more technological innovations have been applied to production processes than in the other two sectors. In addition to this, the products of the secondary sector are in greater demand than those of the primary sector. For these reasons, it is possible to relate the observed differentials in income per person employed and per capita income, to the differentials in the counties' industrial mixes.

CHAPTER III

THE EDUCATIONAL ATTAINMENT OF THE LABOUR FORCE

This Chapter deals with the economic dimension of education and its impact on income. In the first part, a brief review of the relevant economic literature is presented. This Chapter also contains some estimates of the contribution of education in raising the productivity of the labour force and the earnings of individuals. Finally, the relationship that exists in the counties of Québec between the educational level of the members of the labour force and income per person employed and per capita income is discussed.

1. The Economic Dimension of Education

Since the earliest development of economic theory, it has been recognized that education has an economic dimension. Adam Smith discussed the role of education and stated "that education had to be regarded as investment in human capital in the same way as the purchase of a machine is regarded as an investment in physical capital."[1] He

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1 Jenny Podoluk, Incomes of Canadians, 1961 Census Monograph, Ottawa, Queen's Printer, 1968, p. 95.

believed that by increasing the educational level of the poor, earning differentials would be reduced.

Although investment in education and in the acquisition of skills has long been recognized as an important source of economic growth, it is only recently that the relationship between education and income has been analysed.

The assumption that investment can be made in human beings

> ... implies that not all the economic capabilities of people are given at birth, or at age fourteen when some of them enter upon work, or at some later age when some complete their schooling; but that many of these capabilities are developed through activities that have the attributes of an investment.[2]

The principal forms of investment in human beings are formal education, on-the-job training, migration, health services, information about job opportunities and knowledge of the economic system. All these enhance the capabilities of people as consumers as well as producers.

In this thesis, only formal education and its "by-products" will be studied. It is the most important form of human investment and also that to which most attention had been given.

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2 Theodore W. Schultz, "Reflections on Investment in Man", The Journal of Political Economy, Vol. LXX, No.5, Part 2 (supplement October 1962), p. 1.

The effects of education on the capacities of people to consume have not been analyzed to a great extent in economic literature. Most of the authors who have written on the subject have indicated that education affects the attitudes of consumers. For example, it is believed that education widens the horizons of consumers: an educated consumer prefers more sophisticated goods than one without education. He is not resistant to innovations and initiates changes in the consumption pattern of society.[3] By so doing he creates a demand for new products and thus encourages producers to innovate.

It has also been said that formal education promotes a better functioning of the market because it "results in greater selectivity and critical assessment of the quality, serviceability and price of consumer goods and services coming on the market.[4]

Speaking of literacy, an output of primary school, Burton A. Weisbrod stated:

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3 O.J. Firestone, Industry and Education, A Century of Canadian Development, University of Ottawa Press, 1969, p. 154.

4 Ibid., p. 156.

> Literacy is not only a value to the individual possessing it and to employers but also is of value to others. Without widespread literacy the significance of books, newspapers, and similar media for the transmission of information would dwindle; and it seems fair to say that the communication of information is of vital importance to the maintenance of a market economy, as well as to the maintenance of political democracy.[5]

These statements are rather general; they indicate some of the avenues that can be explored in order to achieve a better understanding of the effects of education on the capacities of people to consume. The most important impact of education on consumption results from the fact that education increases the income of people and consequently their consumption. Increases in income are due to the acquisition through formal education of knowledge, skills and abilities which enhance the productive capacities of the labour force.

Schultz, a pioneer in this field, was puzzled as were many other economists, by the fact that the United States national income had been increasing much faster than the amount of all kinds of resources used in its production

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5 Burton A. Weisbrod, "Education and Investment in Human Capital," The Journal of Political Economy, Vol. LXX, No. 5, Part 2, Supplement: October 1962, p. 119.

He observed that there existed a great discrepancy between resources and income and that if this discrepancy could not be resolved, economic theory of production becomes a "try not a tool for studying economic growth."

He questioned the validity of the assumption that human capital is homogeneous and that it is equal to the total number of persons in the labour force. According to this, labour has also a qualitative aspect. He argued that any attributes of labour that enhance human capacities to do productive works should be considered as investment. With reference to the puzzle mentioned above he stated:

> It is now clear that this puzzle is largely of our own making because we (the economists) have been using estimates of capital and labour which had been refined and narrowed in ways that excluded many of the improvements that have been made in the quality of these resources.[6]

The exclusion of investment in human capital from estimates of capital also accounts for the observed apparent decline in the capital-income ratio.[7] In the same way, Schultz explained that the great increases in the real

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6 Theodore W. Schultz, "Reflection on Investment in Man," op.cit., p. 3.

7 Theodore W. Schultz, "Investment in Human Capital", American Economic Review, Vol. LI, No. 1, March 1961, pp. 5-6.

earnings of the workers in the United States were not due to quasi-rents accruing to them pending on adjustment of supply to demand. Increase in earnings represent returns to the investment that has been made in the labour force.

Investment in human beings is a relatively new field of study in Economics and the present understanding of the contribution of formal education to the productivity of the labour force is limited. However, it has been established that some improvements in the quality of the labour force are due to formal education. The most important of these improvements are listed below.

In his book, Industry and Education, A Century of Canadian Development, Dr. Firestone emphasized the contribution of education in promoting technological innovations and their applications to production processes. Formal education "provides a basis in the everlasting search for scientific advancement, technological achievements and innovational accomplishments."[8] He also pointed out that formal education "raises managerial competence and entrepreneurial leadership, so essential to continuing economic progress."[9]

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8 O.J. Firestone, op. cit., p. 158.

9 Ibid., p. 158.

Education is not only necessary to promote technological innovations, it also facilitates the structural adjustments that follow their applications to production processes.

> New technology often requires new skills and knowledge; and those persons having more education are likely to be in a position to adjust more easily than those with less education, and to reap the returns from education which the new technology has made possible.[10]

Workers with higher education are capable not only of performing jobs requiring high levels of skill and knowledge but they are also more flexible. Jacob Mincer has shown that the greater the level of an individual's formal education attainment, the greater are his capacities to benefit from additional on-the-job training and therefore, the more on-the-job training he obtains.[11]

Not only occupational mobility is important in a developing economy, but also geographical mobility. Economic growth requires much internal migration of workers in order to meet the changing employment opportunities.

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10 Burton A. Weisbrod, op. cit., p. 113.

11 Jacob Mincer, "On the Job Training: Costs, Returns and Implications," The Journal of Political Economy, pp. 55 and 57.

Without migration there are risks that resources would not be properly combined and "analytically a misplaced resource is equivalent to a less productive resource properly located."[12] Persons with higher education are more inclined to migrate than persons with less education because the former are more informed about employment opportunities. Furthermore, because the earnings of the former are higher than that of the latter, the costs of migrating represent a smaller percentage of total earnings.

Education also improves the health of people. Schools, especially primary schools, provide some health care to the children. However, more important is the acquisition of hygiene practices and of a general knowledge about illnesses.

> Educational levels determine to a large extent the seeking out of health services and the selection of appropriate kinds of services. A large body of information exists pointing to a high correlation between use of health services and educational status. And one of the major health problems that confronts public health officers is education of groups in the community to use available public services, for example, Salk vaccine. Delays in seeking care, due to ignorance, intensify disease problems and convert cases that could be prevented or controlled into serious disabilities or premature deaths.[13]

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12 Theodore M Schultz, "Reflections on Investment in Man," op. cit., p. 2.

13 Selma J. Mushkin, "Health as an Investment," Journal of Political Economy, Vol. LXX, No. 5, Part 2, Supplement: October 1962, p. 131.

Better health results in a reduction of the death rate of children of school age and therefore the costs of education per effective labour force member are reduced. Better health services also lengthens life expectancy and, as a result, less workers die before retirement age. Proper health care reduces illnesses and thus less working days are lost for this reason.

2. Estimates of the Gains in Productivity due to Education

It has been shown that formal education raises the quality of the labour force; this input represents about 75% of national income in industrialized countries.

The macro theory of production when applied to a nation relates the aggregate inputs of that nation to its national income or product. It makes it possible to measure the impact of a change in the quantity or quality of an input on the size of national income. In the present case, it enables one to measure the changes in national income that are due to changes in the quality of the labour force achieved through formal education. Such a measure indicates the gains in productivity resulting from investment in human beings through formal education.

T.W. Schultz estimates[14] that the stock of education in the labour force in the United States rose about eight and a half times between 1900 and 1956 whereas the stock of non-human capital rose four and a half times. He related these estimates of capital to the increases in the United States' National Income, especially to the unexplained increases.

> On one set of assumptions, the unexplained parts amount to nearly three-fifths of the total increase between 1929 and 1956. How much of this unexplained increase in income represents a return to education in the labour force? A lower limit suggests about three-tenths of it, and an upper limit does not rule out that more than one half of it came from this source. These estimates also imply that between 36 and 70 percent of the hitherto unexplained rise in the earnings in labour is explained by returns to the additional education of workers.[15]

By recognizing the non-homogeneity of labour and by considering as investment, costs incurred to acquire skills and knowledge that can be applied to production, Schultz reduced the discrepancy between inputs and outputs. It can be further reduced by taking into account

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14 T.W. Schultz, "Investment in Human Capital," op. cit, pp. 5-6. Schultz said that his estimates of human capital were preliminary and incomplete. He mentioned for example that no adjustment had been made for improvements of education over time.

15 Ibid., p. 13.

other forms of investment in the labour force. This approach has the merits of reconciling economic theory of production as applied to inputs and outputs, with observed facts.

In the Sources of Economic Growth,[16] Denison attempted to measure the contribution of the different factors affecting economic growth in the United States. Although this Chapter is concerned with education only, it is necessary to explain the general model underlying Denison's work. The framework used involved the Cobb-Douglas aggregate production function and the marginal theory of income distribution. Both of these concepts are closely linked together. In fact, the Cobb-Douglas[17] production function can be used only if the marginal theory of income distribution holds. This will become apparent later on.

The Cobb-Douglas production function can be used only if average income per unit and marginal income per

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16 Edward F. Denison, The Sources of Economic Growth in the United States and the Alternatives before Us, New York, Committee for Economic Development, 1962.

17 The Cobb-Douglas Production function takes the form $0 = AL^a K^{1-a}$ where 0 is output, L and K are respectively Labour and Capital, A is an index of total factor productivity and a and 1 -a are the elasticities of output with respect to labour and capital. Under competitive conditions and equilibrium, any given factor of production of similar quality will receive the same income and this income will be equal to the factor marginal product.

unit are the same and equal to the value of the marginal product of the unit of the factor. Denison stated:

> The basic assumption of my approach is that the economy of the United States is not so different from this description as to invalidate the use of average return per unit of each factor as a measure of its marginal value product ... The chief requirement for its validity is that firms tend to employ each factor up to the point where its marginal value product equals the price of its services (however that price may be established) and that departures from this practice tend to be offsetting.[18]

The aggregate Cobb-Douglas production function serves to compare the increases in inputs used in production, with the resulting increases in total outputs. It implies that if all inputs increase by 1 per cent, outputs also rise by 1 per cent. If only one input is increased by 1 per cent, and the other is held constant, the percentage increase in output would be equal to the elasticity of output with respect to the input augmented. The elasticity of output with respect to one input, say, labour, is equal to the share of that input, in this case labour, in national income.

For such a theory to be useful, the economy has to be in equilibrium, or alternatively the disequilibrium must

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18 Edward F. Denison, op. cit., p. 13.

off-set each other. Denison recognized that equilibrium is constantly shifting and is never attained in a dynamic economy. However he assumed that the economy tends towards an equilibrium and that this was sufficient for his study. He also believed that disequilibria off-set each other.

The Cobb-Douglas production function implies constant returns to scale. Denison proceeded as if there were no returns to scale but subsequently included them in the residual.

The marginal theory of income distribution provides the necessary link between the inputs and the outputs. The productivity of the different factors is measured by their income. The income represents the real contribution of inputs only if the marginal theory of income distribution holds, that is if the remuneration of each factor of production is equal to the value of its marginal product.

Denison considered a "change in the average quality of labor in exactly the same way as an increase in its quantity."[19] The differentials in earnings between males of similar age classified by education are considered to

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19 E.F. Denison, "Education, Economic Growth, and Gaps in Information," The Journal of Political Economy, Vol. LXX, No. 5, Part 2, Supplement: October 1962, p. 124.

represent differences in their contribution to production. To estimate the changes in the average quality of the labour force due to education, Denison made the following assumption:

> Of the total earnings differentials, three-fifths are assumed to result from differences in education and associated off-setting differences in work experience, as distinguished from natural ability, energy, and other factors.[20]

The average annual rate of measurable growth of the United States from 1929 to 1957 was 2.93% According to Denison 2.00% of it was due to increases in inputs and 0.93% was due to increased productivity. As mentioned above, Denison considered that investment in the labour force through education should be looked upon as an increase in inputs. He estimated that, of the annual 2.00% growth of national income due to increases in inputs, education contributed 0.67 percentage points.

Denison also estimated that advancement in knowledge accounted for 0.58 points of the 0.93% average rate of growth due to increase in productivity. This estimate was obtained as a residual and included the advancement of managerial techniques, the measureable part of technical progress and reductions in the lags in the application of

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20 Ibid., p. 124.

knowledge to production.

Increases in over-all income resulting from advancement in knowledge did not necessarily accrue to workers having higher education although it was made possible by more educated persons. The resulting increases in productivity must be credited to education in the same way as direct increases in income.

Bertram used Denison's approach in his study of The Contribution of Education to Economic Growth.[21] In estimating the educational level of the Canadian labour force for the period 1911-1961, he took into account the fact that the number of days of school attended per year of school completed had increased. He assumed, as Denison did, that:

> increasing the number of days spent in school per year raises a man's contribution to production just as much as will an equal percentage increase in the number of years spent in school.[22]

He estimated that in Canada the average income per worker was 29.50 per cent higher in 1961 than it would have been if there had been no improvements in the educational

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21 G.W. Bertram, The Contribution of Education to Economic Growth, Economic Council of Canada, Staff Study No. 12, Queen's Printer, Ottawa, 1966.

22 Ibid., p. 52.

level of the labour force. As a result, labour productivity increased by 0.52 per cent per year due to the fact that more educated workers entered the labour force during that period.

Bertram calculated that the labour share in net national output had been fairly stable during the period 1911-61 and that it amounted to some 76 per cent of national revenue. With the above figures he estimated that "total productivity per man rose by 0.40 per cent per annum as a result of improved education."[23]

Total output per person employed rose at a compound rate of 1.67 per cent per annum in the same period. "Educational improvements thus accounted for almost one quarter of the rise in productivity per employed person from 1911-1961".[24]

3. Education and the Income of Individuals

The previous pages were concerned with the importance of education in increasing the productivity of the labour force. This refers to the macro effects of education. In this section we consider the micro effects of education, that is, the contribution of education in increasing the

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23 Ibid., pp. 41-56

24 Ibid., p. 55.

earnings of the individuals.

In her book, Incomes of Canadians,[25] Jenny Podoluk studied the relationship between the income of individuals and their level of education. The following table[26] reproduced from her book presents average earnings of the male non-farm labour force classified by age and level of schooling.

TABLE III-1

Average Income from Employment of Males in the Non-Farm Labour Force, by Age and level of Schooling, Year Ended May 31,1961

Age	Elementary Only	High School 1-3 yrs.	High School 4-5 yrs.	Some Univ.	University Degree
	$	$	$	$	$
15-24	1,912	2,206	2,496	1,868	3,078
25-34	3,311	4,147	4,760	5,108	6,909
35-44	3,653	4,629	5,779	6,608	9,966
45-54	3,648	4,756	6,130	6,882	10,821
55-64	3,480	4,588	5,944	6,731	10,609

Two conclusions can be derived from the preceding table. First, the differentials in education in the age group 15-24, clearly suggests that when entering the labour force persons with higher education contribute more to

25 Jenny Podoluk, op. cit., pp.81-94.

26 Ibid., p. 87.

production than persons with no schooling or only elementary schooling. The second conclusion comes from the fact that the higher the level of schooling, the greater is the rate of increase of earnings of workers. Thus, it can be said that persons entering the labour force with higher education can learn more through experience than others and that their productivity increases at a faster rate than that of persons with less schooling.

> It suggests that training is not simply a matter of the formal training acquired before entry into an occupation but also on-the-job training or experience derived from working ... However, the likelihood that experience or training acquired while working may influence earnings is greater, the greater the amount of the initial formal training acquired.[27]

Chart III-1 gives for the Canadian labour force the ratio of average income from employment by age groups to average income from employment for age group 25-34, by level of schooling for the year ended May 31, 1961.[28]

This chart is based on the figures of Table III-1. The earnings of Canadians reported in this Table are net of investment in education. This steepen the age-earnings profiles and increase their concavity as investment in human capital increases.

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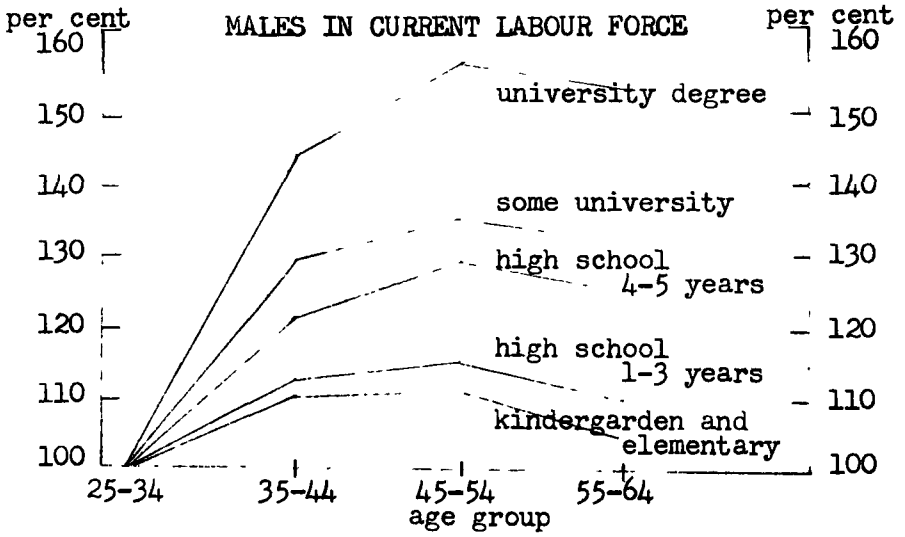
27 Ibid., p. 86.

28 Ibid., p. 87.

CHART III-1

RATIO OF AVERAGE INCOME FROM EMPLOYMENT BY AGE GROUPS TO AVERAGE INCOME FROM EMPLOYMENT FOR AGE GROUP 25-34, BY LEVEL OF SCHOOLING, YEAR ENDED MAY 31, 1961



As explained before, the differentials in earnings revealed by Table III-1 cannot be attributed solely to education. Gary Becker investigated the problem and analysed the relationship between education and natural ability. He stated:

> General observation indicates that college graduates tend to be more 'able' than high-school graduates, apart from the effect of college education. This is indicated also by information gathered on I.Q., rank in class, father's education or income, physical health, ability to communicate, and several other distinguishing characteristics.[29]

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29 G.S. Becker, Human Capital, New York, National Bureau of Economic Research, 1964, p. 154.
For an interesting discussion on the subject refer to pp.61-66 and 79-88. Becker claims that abler persons invest more in human capital because their marginal rate of return is greater than that of other persons.

Thus the earning differentials between persons having university education and others, do not measure the effect of more education alone since university graduates are abler and would earn more even without university education. In studying the earnings of high school and college graduates in the United States, Gary Becker observed a large differential between the average earnings of the two groups and consequently a larger return to education for college graduates. However, he asked himself what percentage of the differentials should be attributed to education. He stated that "Neither general observation nor theoretical analysis has much to suggest about this."[30]

The problem of allocating parts of the observed differentials in earnings between natural ability and education and other forms of investments in human capital, is important when calculating the rates of return to education. However, for the present study it is sufficient to know that education increases both the productivity of the labour force and the incomes of individuals. For the same reason it is not necessary to allocate the cost of education between consumption and investment because it does not alter the total returns but the rates of return, the analysis of which is beyond the scope of this study.

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30 Ibid., p. 80.

4. The Educational Attainment of the Labour Force in the Counties of Québec

The economic dimension of formal education has been discussed in the preceeding pages. The relationship between the level of education of the working force in the counties of Québec and the level of per capita earned income will be analysed below. The educational level of the working population is taken as a measurement of its knowledge, abilities and skills that enhance its production capacities.

The only source of information regarding the formal education of the population at the county level is the 1961 Census of Canada. For each county, the Census gives the highest grade attended for the population 5 years of age and over. Data are given by sex for two groups: for persons attending school and for those not attending school.

The educational level of the working population is often measured by the average number of years spent at school by members of the labour force.[31] However, the available statistics do not enable such a measure to be

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31 It is very common in economic literature to use the number of years spent acquiring formal education as a measure of the labour force knowledge and skills. The following is an example: "Changes in the level of knowledge and skills in an industry are roughly estimated from information on the years of formal schooling among employed persons", Economic Council of Canada, Seventh Annual Review, Patterns of Growth, Ottawa, Queen's Printer, 1970, p. 10.

derived. Due to the limitations of the available data, the educational attainment of the labour force will be estimated by the following ratio (or percentage if multiplied by one hundred): the ratio of the number of males of 5 years of age and over not attending school who have completed at least 3 years of high school to the total number of males of 5 years of age and over not attending school in 1961.

For the purpose of this thesis it is not necessary to have an exact measurement of the stock of formal education in the labour force. What is needed is an estimate of education, the values of which vary from one county to another as would the values of an exact measurement. Such an estimate is satisfactory because it is the relationship between the level of per capita income in the counties and the level of formal education of the labour force which is analysed in this Chapter.

The values of the proposed estimates will vary as would the values of an exact measurement, if the two following assumptions are considered realistic. First, it is assumed that the educational levels of the male population 5 years of age and over not attending school vary from county to county exactly as do the educational levels of the total labour force. The second assumption is that the female labour force educational levels vary from one county

to another along the same lines as do the male labour force's educational levels.

With regard to the first assumption,two different groups of males are considered separetely; males over 5 years of age but less than 65 years old and those aged 65 or over. It seems realistic to assume that within the first group the males who were 16 years old or younger attended school in 1961. Although some males of that group might not have attended school during that year their number should not have been great enough to invalidate the above mentioned assumption.

It cannot be assumed that the labour force participation rate of the male population aged 16 or over was the same in all counties. Due to the fact that the participation rate of those having completed at least 3 years of high school was most likely greater than that of those who have less schooling, the effects of these variations in the participation rate would be reflected more in the denominator of the ratio than in the numerator. As a consequence, it cannot be assumed that the variations of the proposed estimates would be exactly the same as those of an exact measurment.

However, it is believed that the bias is not as

important as to invalidate the estimates.

In addition to this, there are variations in the percentage of total male population which comprises persons aged 65 and over. This percentage is rather small and consequently its effect on the estimates are not significant and can be overlooked.

The second assumption is rendered necessary because there are no statistics pertaining to the educational level of the female labour force. In 1961, the total labour force contained only a relatively small percentage of the female population 5 years of age and over not attending school. Consequently it is not realistic to assume that the educational level of that latter group is similar, or almost similar, to that of the female labour force.

The factors affecting education are the same for both sexes and consequently the educational level of the female labour force should vary along the same lines as that of the educational level of male labour force.

For the above-mentioned reasons it thus seems reasonable to assume that the percentage of total male population 5 years of age and over not attending school which have completed at least 3 years of high school is a suitable estimate of the educational level of the labour force.

It is believed that persons, who have completed at least 3 years of high school, have studied the relevant subjects sufficiently to enhance their productive capacities. After primary school a person has acquired elementary mathematical and grammatical skills, but he does not have any special abilities or skills that would enhance significantly his productive capacities. The same applies to a person who has completed only the first years of high school. This is shown on Table III-1 on page 61, and on Chart III-1 on page 63. It can be seen that both the starting salary and the earning profile of a person having completed only the first years of high school are not significantly different from those of a person having only elementary schooling.

In Table III-2, counties are listed in increasing order of per capita earned income. The table also gives the income per person employed and the percentage of the male population 5 years of age and over not attending school which has completed at least three years of high school.

Table III-2 and Chart III-2 show that as one moves from counties with low per capita income to counties with high per capita income, the percentage of the male population 5 years of age and over not attending school but having completed at least 3 years of high school is always increasing. The coefficient of correlation between the two

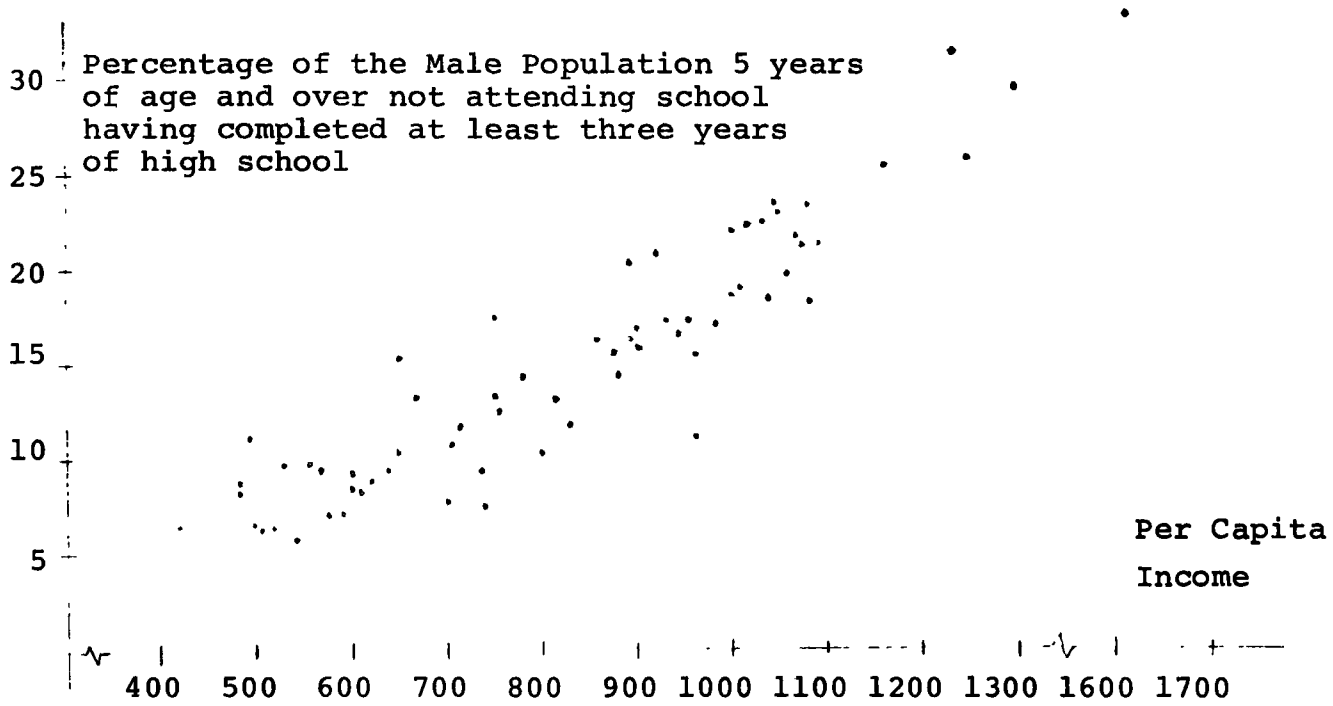
Per Capita Income, Income per Person Employed and the Estimated Educational Level of the Labour Force in the Counties of the Province of Quebec 1961

Counties	Per Capita Income	Income per person employed	Estimated Educational level of the labour force
1. Bonaventure	422	2175	6.57
2. Gaspé	482	2110	8.96
3. Matane	483	2083	8.39
4. Kamouraska	487	1844	11.06
5. Bellechasse	496	1735	6.70
6. L'Islet	509	1909	6.11
7. Dorchester	518	1793	6.53
8. Temiscouata	533	2083	9.91
9. Frontenac	542	1953	5.85
10. Lotbinière	559	1948	9.79
11. Charlevoix	569	2288	9.18
12. Labelle	576	2421	7.07
13. Wolfe	592	2160	7.14
14. Montmagny	604	2138	9.42
15. Nicolet	604	1902	8.71
16. Yamaska	607	1767	8.39
17. Beauce	622	2119	9.02
18. Montcalm	640	2241	9.91
19. Rimouski	657	2429	15.49
20. Maskinongé	659	2249	10.58
21. Lac-St-Jean	665	2706	13.58
22. Bagot	698	2156	7.84
23. Berthier	709	2446	10.97
24. Abitibi	712	2810	11.74
25. Pontiac	737	2468	9.61
26. Napierville	742	2578	7.33
27. Brôme	748	2521	17.80
28. Compton	749	2734	13.25
29. Portneuf	753	2623	12.37
30. Montmorency	778	2573	14.40
31. Soulanges	797	2588	11.07
32. Arthabaska	815	2518	13.21
33. Papineau	826	2919	11.74
34. Drummond	854	2892	16.20
35. Joliette	873	2913	15.51
36. Mégantic	880	3075	14.40
37. Champlain	891	3149	20.37
38. Huntington	892	3105	16.43
39. Témiscamingue	893	3279	16.85

Counties	Per Capita Income	Income per Person Employed	Estimated Educational Level of the Labour Force
40. Richmond	900	3297	15.87
41. Chicoutimi	920	3648	20.95
42. Stanstead	930	2879	17.38
43. Richelieu	943	3200	16.95
44. Shefford	958	2895	17.55
45. Iberville	960	3188	11.10
46. Laprairie	962	3387	15.43
47. Ste-Hyacinthe	985	2773	17.54
48. Lévis	999	3119	22.21
49. Missisquoi	1007	3116	18.66
50. L'Assomption	1012	3541	18.71
51. Terrebonne	1021	3363	22.46
52. Bouville	1036	3300	22.45
53. Beauharnois	1041	3508	18.54
54. St-Maurice	1042	3438	23.90
55. St-Jean	1044	3086	23.72
56. Argenteuil	1055	3350	19.76
57. Verchères	1065	3603	21.99
58. Deux Montagnes	1074	3435	21.24
59. Sherbrooke	1082	3304	23.39
60. Saguenay	1087	3792	18.63
61. Hull	1091	3500	21.18
62. Chateauguay	1164	3750	25.54
63. Québec	1235	3570	31.35
64. Vaudreuil	1251	3957	25.91
65. Chambly	1301	4152	29.63
66. Montréal	1637	4317	32.58

CHART III-2

EDUCATION AND PER CAPITA INCOME IN THE COUNTIES OF THE PROVINCE OF QUEBEC, 1961



series is +0.93. The correlation coefficient between income per person employed and the same percentage is +0.89.[32]

Although the educational level of the labour force is strongly correlated to the level of per capita income it does not mean that education is the only factor associated with differentials in earnings. This can be illustrated by the fact that in the different provinces of Canada persons with the same education have different incomes.

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32 Both correlation coefficients are significant at the 1% level.

> ...to take the extremes, the average income of male graduates in 1961 was $6,823 in Prince Edward Island and $9,370 in Ontario. For all levels of education, income in the Atlantic Provinces are lower than the national average.[33]

Most likely the same differentials would be observed in the counties of Québec from more developed to less developed counties. However the statistics necessary for such comparisons are not available at the county level.

These statistics tend to confirm that the educational level of the population is closely related to their level of income. This is due, as it was explained before, to the fact that formal education enhances the knowledge, abilities and skills of workers and also their capacity to learn from experience. Furthermore more on-the-job training is available for those with more education; they have more information about employment opportunities and receive better health services.

These are some of the factors that explain the higher productivity of educated workers compared to those with less education. The effects of formal education on the productivity of the labour force are numerous and have

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33 T.N. Brewis, Regional Economic Policies in Canada, Macmillan, Toronto, 1968, p. 69.

not been exhausted by the discussion in this thesis.

> The universal association between education and earnings across industries, sectors, and occupational categories in all advanced economies suggests that educated workers are more productive in ways that we have hardly begun to analyse: they are more flexible, adapt themselves easily to changing circumstances, act with initiative in problem-solving situations, are quick to guide others, easily assume supervisory responsibilities, and so forth.[34]

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34 M. Blaug, "An Economic Interpretation of the Private Demand for Education", Economica, Vol. XXXIII, No. 130, May 1966, p. 181.

CHAPTER IV

THE PARTICIPATION OF TOTAL POPULATION IN ECONOMIC ACTIVITIES

County per capita earned income is obtained by dividing total income earned by the residents of a county during a year by its total population at mid-year. Assuming that every person engaged in economic activity had the same earnings throughout the Province in 1961, per capita income would have varied from one county to another because the percentage of the total population of the different counties participating in economic activity was not identical.

In this Chapter, the extent to which total populations of the counties participate in economic activities will be discussed. The first part concerns itself with the age structure of the populations of the counties and also with the factors which create variations from one county to another in the population age structure. Then follows a discussion relating to the factors affecting the participation rates of the working age population.[1] Finally, the age structure of the populations and the participation rates of the working age groups of the counties are given and analysed.

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1 The working age population is defined as the population age 15 to 64 years inclusive.

1. The Age Structure

The age structure of a population at a given point in time is the result of both past migration and past natural increase of population. The latter is dependent on the interaction of fertility and mortality rates. This section studies the magnitude and effects of each of the above-mentioned factors on the age structure of the counties.

Nowadays, the birth rate is the major determinant of the natural increase of population. There was a time when in the now industrialized countries, the death rate was also important. However, with the development of medicine, the infantile mortality rate has been reduced and infectious diseases almost eliminated. In Québec elementary medical services are provided throughout the province and the death rates of counties are roughly equal. This cannot explain the observed variations in the age structure of the population of counties. This is to say that the rate of natural increase of population is almost exclusively determined by the fertility rate.

In their study of economic and demographic models of fertility, Phillips, Votey and Maxwell[2] applied the

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2 Llad Phillips, Harold Votey, Darold Maxwell, "A Synthesis of the Economic and Demographic Models of Fertility: An Econometric Test," Review of Economics and Statistics, Vol. LI, No. 3, August 1969, pp. 298-308.

cost-benefit technique to the analysis of fertility rates. They considered that the benefits of having children are derived from the utility received from:

1) enjoying children as a consumption good;
2) from the income received from children working in a productive capacity for the family; and,
3) the potential security of receiving support and assistance from progeny in old age.[3]

They said that there was a time when children were desired for their production and security contributions. However industrialization has reduced to practically nothing these kinds of benefits. In industrialised countries, laws have been enacted to make school attendance compulsory until the children are advanced teen-agers. In addition to this, people have come to realize that education is very important for the future well-being of their children and they accept to support them for a few years while they pursue their studies and thus improve their prospects for a better life. Industrialization has also changed the situation of parents. Most of them are now employed by others and consequently do not have opportunities to employ their children.

Similarly, industrialization and urbanization have reduced, if not eliminated, the benefits that can be derived from potential security for elderly persons or misfortunate

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3 Ibid., p. 299.

members of the family. In the recent past, the creation of a effective social security system has replaced the family as the major source of security. The author describes the attitude of people in this respect by the following quotation from a report of a Joint Committee of the United States Congress.

> Workers have shown growing interest in securing income protection for the time when they will have to retire .... For the aged who do not have jobs, dependence on children as a method of support is no longer completely acceptable .... Today, when parents live with children, typically more rent is required and more food and clothing bought .... By and large the pattern of living today is such that most older people prefer not to live with their children and be supported by them (only a few can afford to support parents in separate households).[4]

In summary, the economic and social environment has changed so much that children are not to be desired for their security and productivity contribution to the family. This is to say that children are no more considered as investment goods but as consumer goods.

Phillips, Votey and Maxwell made the hypothesis that "Within each relatively homogeneous residence group, birth rates should vary directly with income provided children

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4 Ibid., p. 300, quoted from:
U.S. Congress Joint Committee Report, 82nd Congress, 2nd Session Pensions in the United States. A study prepared for the Joint Committee on the Economic Report by the National Planning Association, Government Printing Office (1952).

are a normal good.[5]

The place of residence is important because the costs of bringing up children vary with it. In the rural areas, space is less limited and the general price level is usually lower than in urban communities.

The higher participation rate of female to the labour force in urban areas is also another factor explaining the observed lower fertility rate in urban areas. The cost of bearing children for a female in the labour force implies the opportunity cost of the foregone earnings. The average opportunity cost of having children is higher for urban than for rural women because less rural women have to leave the labour force for this purpose.

Both direct and opportunity costs of having children are higher in urban than in rural areas whereas there are no reasons why the derived benefits should be different assuming that children are a "normal good".

In order to test their hypothesis the authors classified total population by type of community residence. They found that in rural, as well as in urban areas the birth rates and the level of living index were positively correlated to each other. They concluded that:

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5 Ibid., p. 301.

> This pattern is consistent with the evidence reported by demographers and demonstrates that the rural-urban fertility differential is not due to some mysterious difference in social attitudes and values between people in the city and the country but can be rationally explained by the effects of costs and benefits upon the decisions of families in different economic environments.[6]

The conclusion of this study confirms that children are normal consumer goods and that the application of cost-benefits analysis to fertility rates can yield meaningful results. The same is used in this thesis to explain the variations that existed in 1961 among the counties of Québec in the percentages of total population which are in the working age group.

The benefits of having children were not the same for both urban and rural populations. Past fertility rates had a great impact on the age structure of the population of the counties of Québec and it is necessary to study the costs and benefits of having children during the years preceding 1961 in order to explain the population age composition existing in 1961.

Although this period was characterized by fast industrialization in Québec, as in all Canada, not all counties in Québec participated in it to the same extent. Also due to the fact that new industries located mainly

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6 Ibid., p. 300.

in urban areas, counties which were still dependent to a great extent on primary industries in 1961, were even more dependent on these industries in the preceding years.

In the primary industries there are many self-employed people operating small family production units. Consequently it is in areas in which industrialization was less advanced in 1961 and during the preceding years that the benefits of having children derived from their productivity was greater.

Similarly, the benefits derived from children as potential sources of security for old age people was eliminated later in rural areas than in urban areas. This was due to the fact that private income security plans were introduced later in the latter areas than in the former.

For these reasons, the fertility rates of the population of the counties should vary greatly and, ceteris paribus, the age structure of the population of each county. Before describing the age structure of the populations of the counties, another of its determinants, will be discussed.

Three types of movements of people have to be studied when analysing the contribution of migration to the age composition of a county. Gain of population of one county is the sum of the following components:

a) net international migration

b) net interprovincial migration

c) net inter-county migration

In his Analysis of Population Growth Trends in Ontario, R. Kogler noted that "Usually immigration increases when economic conditions are favourable in Canada and relatively depressed in Europe."[7] The economic conditions of the originating places of the migrants is as important as that of the places where they want to settle. This can be explained by the fact that there are certain costs involved in the process of migration and persons would not be prepared to incur these costs if the economic opportunities of their place of residence were satisfactory or comparable to that of the region where they intent to settle. They are incited to migrate when the economic situation of their place of residence and consequently their earnings are depressed.

It has been shown that "since the end of the war Ontario has received the largest share of immigrants arriving in Canada."[8] This is certainly not independent

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7 R. Kogler, "An Analysis of Population Growth Trends in Ontario," Ontario Economic Review, Vol. 7, No.6, Nov.-Dec. 1969, p. 9.

8 Ibid., p. 9.

of the fact that Ontario had in the recent years one of the highest rates of economic growth in Canada.

Although economic factors are the most important, other factors must also be taken into account in explaining international migration. The political situation of countries other than Canada may incide the people to leave. The unrest in Central Europe in 1956 and 1957 is a striking example of political events increasing entry of people into Canada.

There are no statistics that make it possible to list the counties which received people entering Canada. However, it is well known that migrants settle in areas where economic opportunities are good. Consequently it can be expected that the counties which gained more from international migration were those in which the largest cities are located, namely the county of Montréal and the surrounding areas. The counties of Québec and Sherbrooke probably also benefitted from these international migration flows.

Although international net migration had a significant impact on patterns of settlement in Canada at large and in Québec, internal flows of people within Canada were more important. From 1921 to 1961, "internal net migration was more than twice as large as the net movement into Canada."[9] Internal flow of people can be divided into two

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9 Isabel Anderson, Internal Migration in Canada, 1921-1961, Economic Coucil of Canada, Staff Study No. 13, Ottawa, Queen's Printer, 1966, p. 15.

groups. One is the migration from one province to another one. The other is the movement from rural areas to urban centres within the same province. In fact both of these two movements are closely interrelated and it is difficult to study them separately.

> Although some rural migrants simply moved to rural areas of other provinces, the high rates of urban growth indicate that a significant portion of the migration took place not merely from rural to urban areas within regional boundaries,[10] particularly within Québec and the Prairies, but also from rural areas in one province to urban centres in another.[11]

As for international migration, economic considerations are very important in explaining interprovincial and intra-provincial movements of people. "People tend to move from areas of low economic opportunity to areas of high economic opportunity."[12] This is not to say that economic factors are the only factors influencing migration, but that they are the major determinants of net gains of population of an area.

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10 Region in the context refers to five economic regions of Canada.

11 Canada, Economic Council of Canada, Second Annual Review, Towards Sustained and Balanced Economic Growth, Ottawa, Queen's Printer, p. 110.

12 R. Kogler, op. cit., p. 12.

> Migration in Canada, during the forty-year period from 1921 to 1961, was related to differences in economic opportunity. Population movements between farm and nonfarm areas and between rural and urban areas have included intraprovincial migration in response to more economic opportunities in nonfarm and urban than in farm and rural areas in each province, and they have included interprovincial migration in response to more economic opportunities in nonfarms and urban areas in some provinces than in others.[13]

Internal migration is closely associated with industrialization. Industrialization had in the past decades reduced the percentage of the total labour force engaged in primary production and increased the percentage engaged in secondary and tertiary production. These shifts in the production patterns of the economy accelerated the urbanization of the country because of the importance of growth centers in an economy where secondary industries are very important:

> Modern industry is itself a complex process requiring a wide range of management services, other business services, a labour market with a wide variety of skills, technical services, repair and maintenance services, transportation services, merchandising services, market services, and so on. By and large this range of services can only be found in a community of some considerable size. Both management and labour demand a wide range of cultural, social and recreational services which are to a large extent only available in larger communities.[14]

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13 Isabel Anderson, op. cit., p. 32.

14 Atlantic Provinces Economic Council, Second Annual Review, The Atlantic Economy, Halifax, Sept. 1968, p. 65.

This is without any doubt the main reason why industry especially secondary manufacturing, have clustered in relatively few centres in Canada. The location of these agglomerations have often been determined by historical factors which are at present of no importance. Myrdal described in the following way the beginning of to-day's big cities:

> But within broad limits the power of attraction today of a center has its origin in the historical accident that something was one started there, and not in a number of other places where it could equally well or better have started, and that the start meet with success.[15]

Myrdal goes on to say that:

> Thereafter the ever-increasing internal and external economies - interpreted in the widest sense of the word to include, for instance, a working population trained in various crafts, easy communications, the feeling of growth and elbow room and the spirit of new entreprise - fortified and sustained their continuous growth at the expense of other localities and regions where instead relative stagnation or regression became the pattern.[16]

People residing in small communities are consequently inclined to migrate to large agglomerations where economic opportunities are better. This explains the out-migration that took place in the more rural counties of the Province. For example in the county of Bonaventure,

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15 Gunnar Myrdal, Economic and Underdeveloped Regions, University Paperbacks, London, 1964, p. 26.

16 Ibid., p. 27.

21.5% of the 1951 population left the county during the decade ending in 1961; in the county of Témiscouata the corresponding figure is 26.3%; in Dorchester, 21.7%; in Frontenac, 26.0%; in Labelle, 21.9%; in Pontiac, 21.4%; in Témiscamingue, 22.0% and in Huntington, 6.4%. In addition to this, in Bonaventure, Matane, Bellechasse, Kamouraska, Compton, Frontenac, Wolfe, Nicolet, Yamaska and Brôme, the natural increase in population that took place between 1956 and 1961, was completely offset by out-migration.[17]

In opposition to these counties are those which gain population. They include, or are located near, major urban centres.

> Les zones dites d'accueil coincident toutes avec la présence d'une agglomération urbaine importante, gravitant autour d'une concentration d'activités industrielles et de services: Hull, Montréal et ses comtés limitrophes, Sherbrooke, Trois-Rivières et Québec .... En dehors de la Côte-Nord, région dont la population n'a pus se constituer qu'à partir d'éléments presque exclusivement étrangers au territoire, aucune autre agglomération n'exerce un attrait aussi fort que Montréal sur les migrants, au point d'accélérer l'urbanisation de certains comtés périphériques.[18]

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17 Robert D. Hirsch, Les origines et la nature des déséquilibres régionaux du Québec, Québec, Conseil d'Orientation économique du Québec, 1967, p. 79.

18 Ibid., p. 77.

In 1961, in conjunction with the Census, statistics on internal migration were gathered through a 20 per cent sample of private households. "The Population Sample was designed to represent persons five years old and over on June 1, 1961, who were at that time residing in private households."[19] The term internal migrants was defined to include those who move across municipal boundaries. Persons coming from abroad were excluded.

From these statistics, five-year internal migration ratios[20] were calculated. Migration is very selective with respect to certain characteristics of individuals. As regards with age the following conclusions were reached.

> Typically, the 1956-61 five year migration ratios drops from age 5-14 to age 15-19. Then it rises to a peak at 20-24 (mostly for females) or in age group 25-29 (mostly for males). From this peak the migration ratio tends to fall gradually as one goes toward the higher ages.... In general there is a strong concentration of migrants in the peak ages for labour force entry, for family formation and child-bearing, and in the early years of working life.[21]

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19 Dominion Bureau of Statistics, 1961 Census of Canada, General Review, Internal Migration, (Cat. No.99-513) Ottawa, Queen's Printer, 1968, p. 1.

20 The five year migration ratio is defined as the ratio of those who migrate to the reporting population. The statistics on migration gathered at the Census reflect the differences between the place of residence, of a particular individual at June 1, 1956 and at June 1, 1961. "the statistics do not provide an adequate measure of the total number of migration (.....) taking place from June 1, 1956 to June 1, 1961. Thus the data are said to refer to five-year migration". Ibid. p. 33.

21 Ibid., p. 11.

From these findings regarding internal migration it can be expected that counties which gained population through internal migration would have a greater proportion of their total population in the working age group. Thus, other things being equal, net migration has a tendency to increase per capita income of a county by reducing the dependency ratio.[22]

2. The Supply of Labour

For the economists, the supply of labour is the number of standard or normal man-hours of labour that will be forthcoming on the market at various real wage rates per normal man-hours. The supply schedule of labour has a positive slope reflecting the fact that usually the willingness of the suppliers to offer a commodity or a resource for sale increases when the price per unit rises.

The economist's concept of the supply of labour is a very useful theoretical concept. However it is very difficult to use it in empirical studies due to the fact that it requires a great deal of statistics. More useful for the purpose of this thesis is the statistician's concept.

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22 The dependency ratio is defined as the percentage of total population which is not in the working age group, that is, persons who are either younger than 15 years old or older than 65.

> the statistician concept of 'labour supply' is the labour force. The labour force is a measurable concept of labour supply .... the supply of labour or the labour force consists, at any given time of all adult persons in the population who are either employed or unemployed. Everyone else in the population is outside the labour force: children, housewives at home, students, retired people and others who are 'voluntarily idle."[23]

This concept is not as refined as that of the economist, but it has the advantage of being easier to use. It is the concept used in this thesis. In the following pages the factors influencing the labour force participation rate of the population aged 15-64 are discussed.

Economists have long been concerned by the many factors influencing the decision to enter or to leave the labour force. One of these factors is income or earnings. Alfred Marshall stated:

> An increase in the earnings that are to be got by labour increases its rate of growth; or, in other words, a rise in its demand price increases the supply of it.[24]

This is most likely what happens in the short run. However, the precise nature of the long-run relationship between the price of labour and the amount supplies is not known. The reaction of the labour force when the wage rates change is the sum of the income and substitution

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23 H.D. Woods, Sylvia Ostry, Labour Policy and Labour Economics in Canada, Toronto, Macmillan, 1962, p.280.

24 Quoted in Ibid., p. 313.

effects.

The income effect is the worker's reaction with respect to the purchase of leisure when his income rises under the assumption that the prices of leisure remains constant. The substitution effect shows the rate at which he will substitute leisure for income when the price of leisure changes.

If the prices of other goods remain the same, a change in the wage rates modifies the real income of workers and changes the price of leisure because leisure can be bought only by sacrificing income. Thus wages have both an income and substitution effect. Unfortunately, economic theory does not show which one is the greater. One has to refer to empirical studies to find out, if possible, the relationship between income and the supply of labour.

In Labour Policy and Labour Economics, Sylvia Ostry related aggregate participation rates of the Canadian population for the years 1946 to 1959 to an index of annual real income for the same years. She came to the conclusion that "The Canadian experience suggests that no simple explanation of either an inverse or positive relationship between income and participation is appropriate."[25]

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25 Ibid., p. 315.

The same author also made a cross-section analysis of participation rates in 1951 and noticed that the picture was "no clearer" than in the preceding time-series analysis.

In order to be able to isolate the effects of rising wages on participation rates, the influences of other factors would have to be isolated and removed. To do such a study a tremendous amount of statistics would be needed. It is clearly beyond the scope of this study.

The decision to enter or to leave the labour force is made by human beings and consequently there are numerous factors that have to be taken into account. The following discussion is limited to a few considerations which are considered the most critical in taking the decision to enter or to leave the labour force.

Sylvia Ostry has studied the changes in employment in the three sectors of the Canadian economy that took place between 1946 and 1960. She noted that

> .... employment in agriculture shrank by one half a million persons, four-fifths of whom were men. Employment in the secondary industries swelled by 450,000, the majority of this increase (almost 90 per cent) being male. Far greater was the increased demand for labour provided by the tertiary sector: well over 800,000 more workers were employed in these industries and about 60 per cent were women. Thus, in the most rapidly expanding sector of the economy the demand for female labour has been rising more quickly than has the demand for males ...[26]

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26 Ibid., p. 322.

These findings are interesting because they show that the tertiary industries provide the major source of demand for female labour. As it was mentioned in Chapter III there are more tertiary industries located in urban areas than in rural areas and consequently women have more employment opportunities in the former than in the latter areas.

This is reflected in the participation rates of urban and non-urban women. In 1961, 33.0% of the urban female population was in the labour force whereas the corresponding percentage for the rural population was only 20.6%.[27]

Women in rural areas have very few employment opportunities because primary industries employ very few female workers. In addition to this "working women are often viewed with disapproval in the more conservative rural communities."[28]

As it was said before, employment in primary industries is declining and a great amount of resources engaged in those industries are redundant. Consequently,

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27 Dominion Bureau of Statistics, Census of Canada, General Review, The Canadian Labour Force, (Cat. No.99-522), Ottawa, Queen's Printer, 1967, p. 36.

28 H.D. Woods, Sylvia Ostry, op. cit., p. 287.

in counties which are dependent on these industries the demand for labour is very weak. Due to the fact that the ease of finding employment also influence the decision to enter the labour force, one would expect participation rates to be low in areas in which employment is difficult to find.

> the costs of search for employment, both monetary costs and time lost for non-remunerative activities, are inversely related to the level of job vacancies.[29]

For these reasons, it can be expected that in rural counties the participation in economic activities of the working-age population would be lower than in urban counties in which both the secondary and tertiary sectors are more developed than in the rural counties.

The urban counties have also another advantage compared to rural ones because they received proportionally more immigrants than rural counties. International immigration does not only affect the dependency ratio of the population of a given area, it also has an impact on the participation rate of the 15 to 64 age group.

From statistics published by the Department of Labour it appears that from 1951 to 1961 the proportion of

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29 Arthur Kruger, "Micro-Economic Theory, Labour Allocation and Manpower Policy," in The Canadian Labour Market, Readings in Manpower Economics, edited by Arthur Kruger and Noah M. Meltz, Toronto, University of Toronto, 1968, p. 41.

migrants destined for the labour force was relatively stable. In each year this proportion was approximately over half of the total arrivals, whereas only about one third of the Canadian population is in the labour force.[30] This indicates that within the 15 to 64 age group, participation of immigrants is higher than for the group of native born.

This high participation rate can be explained by the fact that a great proportion of immigrant arrivals were single and also by the fact that about 80% of them were over 15 years of age. In addition to this

> ... because of a very strong need to establish themselves, immigrants of all ages and both sexes tend to have a higher 'participation rate' in the labour force (...) than do native-born Canadians."[31]

As it was said before urban counties also gain population through internal migration. Internal migration increases the participation rate of the 15 to 64 age group because it is selective. "Almost invariably it is the younger members of the labour force who move."[32] It is well known that the participation rate of young males and

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30 Department of Labour, Immigration, Ottawa, Queen's Printer, 1951 to 1961.

31 H.D. Woods, Sylvia Ostry, op. cit., p. 291.

32 T.N. Brewis, Regional Economic Policies in Canada, Toronto, Macmillan, 1968, p. 88.

females is higher than that of older people.

3. Participation in Economic Activities in the Counties of Québec

Table IV-1 gives for each county per capita income, income per persons in the age group 15 to 64 and income per person in the labour force. Also given for each county is the percentage of total population in the age group 15 to 64 and the participation rates of that group in the labour force.

It is impossible due to a lack of statistics to measure separately the effects of the fertility rates and migration flows on the age structure of the populations of the different counties. The counties with low per capita income have a relatively small percentage of their population in the working age group. The dependency ratios of these counties are high. For example, the county of Bonaventure has one of 50.05. This county has also the lowest per capita income. Montréal has the lowest dependency ratio and the highest per capita income.

The variations in the dependency ratios are those that were expected. A county like Bonaventure and others with similar dependency ratios are the counties where the benefits of having children were higher in the early post war period because of the high dependence of the economy

TABLE IV-1

Per Capita Income, Income per Person Age 15 to 64, Income per Person in the Labour Force, Percentage of the Population aged 15 to 64, and Participation Rates in the Counties of Québec. 1961.

Counties	Income per Capita	Income per person aged 15 to 64	Income per person in the labour force	Percentage of the population aged 15 to 64	Participation rates of persons aged 15 to 64
1. Bonaventure	422	845	1922	49.95	43.95
2. Gaspé	482	952	1930	50.70	49.31
3. Matane	483	940	1905	51.36	49.32
4. Kamouraska	487	888	1728	54.85	51.38
5. Bellechasse	496	927	1683	53.45	55.10
6. L'Islet	509	944	1843	53.90	51.23
7. Dorchester	518	984	1740	52.65	56.54
8. Témiscouata	533	1021	1971	52.22	51.81
9. Frontenac	542	1044	1886	51.96	55.34
10. Lotbinière	559	1070	1901	52.26	56.29
11. Charlevoix	569	1007	2133	56.50	47.22
12. Labelle	576	1111	2288	51.85	48.57
13. Wolfe	592	1135	2098	52.18	54.11
14. Montmagny	604	1098	2058	55.02	53.44
15. Nicolet	604	1122	1862	53.86	60.25
16. Yamaska	607	1109	1736	54.70	63.85
17. Beauce	622	1152	2047	53.99	56.30
18. Montcalm	640	1174	2179	54.55	53.87
19. Rimouski	657	1228	2297	53.48	53.47
20. Maskinongé	659	1169	2173	56.36	53.77
21. Lac-St-Jean	665	1261	2524	52.72	49.97
22. Bagot	698	1301	2120	53.66	61.34
23. Berthier	709	1263	2348	56.13	53.81
24. Abitibi	712	1344	2570	52.99	52.28
25. Pontiac	737	1395	2374	52.87	58.77
26. Napierville	742	1335	2534	55.53	52.70
27. Brôme	748	1380	2467	54.23	55.95
28. Compton	749	1430	2688	52.41	53.19
29. Portneuf	753	1348	2553	55.89	52.79
30. Montmorency	778	1368	2470	56.91	55.39
31. Soulanges	797	1447	2537	55.06	57.06
32. Arthabaska	815	1474	2472	55.31	59.63
33. Papineau	826	1503	2789	54.96	53.88
34. Drummond	854	1563	2772	54.66	56.39
35. Joliette	873	1520	2843	57.46	53.47
36. Mégantic	880	1597	2998	55.12	53.26
37. Champlain	891	1514	2997	58.83	50.52
38. Huntington	892	1644	3017	54.27	54.51

TABLE IV-1 (continued)

39. Témiscamingue	893	1643	3055	54.35	53.78
40. Richmond	900	1687	3200	53.35	52.72
41. Chicoutimi	920	1697	3381	54.24	50.19
42. Stanstead	930	1647	2809	56.48	58.64
43. Richelieu	943	1632	3073	57.77	53.11
44. Shefford	958	1690	2799	56.70	60.39
45. Iberville	960	1756	3074	54.71	57.10
46. Laprairie	962	1747	3280	55.03	53.27
47. Ste-Hyacinthe	985	1671	2720	58.97	61.42
48. Lévis	999	1716	3030	58.24	56.64
49. Missisquoi	1007	1783	3020	56.50	59.05
50. L'Assomption	1012	1859	3419	54.44	54.36
51. Terrebonne	1021	1797	3247	56.84	55.35
52. Rouville	1036	1858	3252	55.75	57.14
53. Beauharnois	1041	1787	3271	58.27	54.64
54. St-Maurice	1042	1743	3267	59.79	53.33
55. St-Jean	1044	1749	2971	59.68	58.88
56. Argenteuil	1055	1843	3282	57.22	56.15
57. Verchères	1065	1901	3517	56.03	54.06
58. Deux-Montagnes	1074	1922	3373	55.87	56.99
59. Sherbrooke	1082	1855	3200	58.32	57.98
60. Saguenay	1087	1951	3541	55.70	55.09
61. Hull	1091	1966	3347	55.50	58.73
62. Chateauguay	1164	2118	3630	54.96	58.34
63. Québec	1235	1978	3479	62.42	56.85
64. Vaudreuil	1251	2183	3887	57.30	56.16
65. Chambly	1301	2292	4023	56.74	56.98
66. Montréal	1637	2560	4189	63.92	61.12

of these counties on primary industries. It was also in these counties that economic opportunities were the less capable of attracting migrants and in which out-migration took place during the years preceding 1961.

On the contrary the county of Montréal and the surrounding ones were more appealing to migrants. They were also the counties in which natural increase in population was lower because, in these areas, the productivity and security benefits that could be expected from having children were low or completely non-existent in the years preceding 1961. Furthermore, as it was explained before, the costs of having children were higher in these areas than in rural areas.

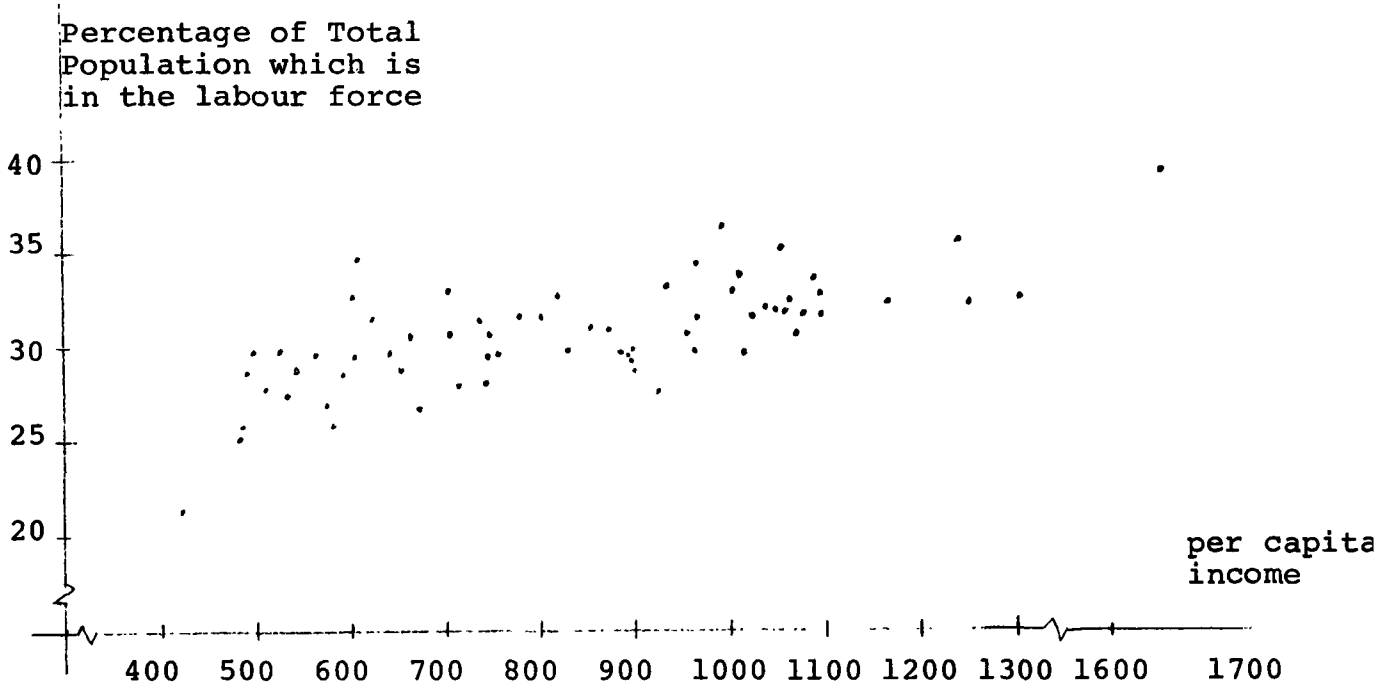
Differentials in the age structure of the populations of the counties and in the participation rates of the age group 15 to 64 tend to widen the variations in per capita income. Chart IV-1 indicates that as one moves from counties with low per capita income to counties with high per capita income, the percentage of total population which is in the labour force tends to increase.

In this connection, it is worthwile to note that the range of variations in per capita income from the highest to the lowest is 3.88. The corresponding ratio for income per person in the 15 to 64 age group is only 3.02. This reduction in the ratio, from 3.88 to 3.02, indicates that the variations in the age structure contribute to the observed variations in per capita income. However the reduction cannot be considered as a measure of the relative or absolute importance of that factor to the observed per capita income differentials in the counties of the Province of Québec.

The county of Bonaventure has the lowest income per person aged 15 to 64 years of age ($845); the county of Montréal has the highest ($2,560). The ratio of the highest to the lowest is 3.02. The corresponding ratio for income per person in the labour force is 2.49. As in the preceding case, it can be said that this reduction in

CHART IV-1

PARTICIPATION OF TOTAL POPULATION IN ECONOMIC ACTIVITY AND PER CAPITA INCOME IN THE COUNTIES OF QUEBEC, 1961



the ratio, from 3.02 to 2.49, indicates that the variations in participation rates within the working age group also serve to widen differentials in per capita income.

The range of variations in income per person employed is 2.48. This represents a very minor reduction compared to the corresponding ratio for income per person in the labour force. Nevertheless this small difference in the value of the ratio seems to indicate that unemployment rates tend to widen differentials in per capita income.

However unemployment rates as reported in the 1961 Census of Canada do not take into account underemployment or hidden unemployment which also reduce earnings of people. Robert Swidinsky reported:

> that in June 1961, when the unemployment rate reached 7.5 per cent, hidden unemployment amounted to 131,000 males and 140,00 females, a total of 271,000. Thus the adjusted rate of unemployment (hidden plus countable) would have been 11.2 per cent.[33]

Furthermore the unemployment rates as of June 1, 1961, do not reflect annual unemployment rates because unemployment rates vary throughout the year and they are usually lower at mid-summer than during other periods of the year.

Variations among the counties in unemployment rates contribute to widen differentials in per capita income. However due to the shortcomings of the available statistics it would be misleading to use them to estimate the contribution of unemployment rates to the observed differentials in per capita income.

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33 Robert Swidinsky, "A Note on Labour-Force Participation and Unemployment," The Canadian Journal of Economics, Vol. III, No. 1, February 1970, p. 148.

CHAPTER V

EMPIRICAL ESTIMATION

The problem to be studied was defined in Chapter I. In the following chapters the three main factors influencing per capita earned income differentials in the counties of Québec were discussed. In this Chapter, the individual and total contribution of these factors are estimated through regression analysis.

1. The Form of the Function and the Method of Estimation

The hypothesis to be tested was written symbolically as follows:

$$(I) \qquad Y_i = f(I_i, E_i, P_i)$$

where Y denotes per capita income

I, the percentage of the labour force in the secondary sector;

E, the educational attainment of the labour force, and

P, the extent to which total population participates in economic activities.

(the subscript i denotes the counties and varies from 1 to 66.)

It has been shown that each one of the three independent variables affect the level of per capita income in the counties. The individual and total contributions of these variables to the observed differentials in per capita income in the counties of Québec must now be estimated, and the form of the functions must be specified.

> ... economic theory, at the most suggests the variables to be taken into account in explaining a given situation but not the form in which they enter.[1]

Empirical studies are not of great help either. Since there are no theoretical or empirical grounds for assuming that the relationship between each independent variable and per capita income is curvilinear, a simple and straightforward linear function has been chosen. A graphic analysis of each factor against per capita income strongly supports the assumption.

The parameters of the hypothesis embodied in (I) will be estimated by the single equation least-squares method of estimation that is:

$$(II) \qquad Y_i = a + b\,I_i + eE_i + dP_i + u$$

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1 S.J. Prais, and Houthakker H.S., The Analysis of Family Budgets, Cambridge, at the University Press, 1955, p. 47.

where Y, I, E and P have the same meaning as in (I); a, b, c and d are the parameters to be estimated and u is a random error term.

This method of estimation is used because there is only one endogeneous variable. It is believed that the simultaneous nature of economic relations do not invalidate the single-equation procedure adopted here. In other words it is assumed that, at a given point in time, the value of the independent variables cannot be explained by the value of the dependent variable.

The regression yields the following parameters:

$$(I) \quad Y = 6.7115 + 5.1781\ I + 26.4349\ E + 7.5284\ P$$

$$(1.1038) \quad (1.7519) \quad (1.3083)$$

$$4.6911 \quad 15.0892 \quad 5.7543$$

The numbers in parenthesis are the standard errors of estimate. On the line below, are their t values. R^2 is equal to 0.9129 and the analysis of variance gives a F value of 217.36. The Durbin Watson statistic is equal to 1.81 and is significant at the 5 per cent level.

2. Multicollinearity

The discussion in Chapter IV relating to migration flows in the Province of Québec leads one to suspect the presence of multicollinearity. In their article

"Multicollinearity in Regression Analysis: The Problem Revisited",[2] Donald E. Farrar and Robert R. Glauber proposed a test that can be used to detect the presence of multicollinearity in regression analysis. They obtained a transformation of the determinant of the matrix of simple zero-order correlation coefficients, $/X^tX/$, "that is distributed approximately as Chi Square with - $v = \frac{1}{2}\, n(n - 1)$ degrees[3] of freedom".[4] Thus "a meaningful scale is provided against which departures from orthogonality, and hence the gradient between singularity and orthogonality, can be calibrated."[5] The transformation is the following:[6]

$$X^2_{|X^tX|}{}^{(v)} = -\left[N - 1 - 1/6\ (2n - 5)\right] \log |X^tX|$$

The correlation matrix is

	I	E	P
I	1.0000	0.6126	0.4240
E	0.6126	1.0000	0.6014
P	0.4240	0.6014	1.0000

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2 D.E. Farrar, R.R. Glauber, "Multicollinearity in Regression Analysis: The Problem Revisited," The Review of Economics and Statistics, Vol. XLIX, No. 1, February 1967, pp. 92-107.

3 n is equal to the number of independent variable plus 1.

4 Ibid., p. 101.

5 Ibid., p. 101.

6 Where N is equal to the number of observations and n is equal to the number of independent variables.

Its determinant is equal to 0.3956. When this determinant is transformed as proposed by Farrar and Glauber, it yields a Chi Square equal to 25.8399. According to the Chi Square table, the value at the 5 per cent level, with 3 degrees of freedom, should not be over 7.815. Thus the test reveals the presence of multicollinearity in the set of independent variables.

Farrar and Glauber found "localization measures" which make it possible to identify the variables most severely undermined by interdependence. They proposed constructing from the inverse of the matrix $|X^tX|$ a matrix of (n - 1) by (n - 1) that contains partial correlation coefficients below its diagonal, multiple correlation coefficents in its diagonal and the partial t values above the diagonal.

The multiple correlation coefficient (R) between one independent variable and the rest of the independent variables provides the basis for the traditional analysis of variance, the following quantity has the F distribution:[7]

$$F = \frac{R^2/(k - 1)}{(1 - R^2)/(N - k)}$$

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7 Ibid., p. 103.

If the set of independent variables is jointly normal the right hand side of the above equation is distributed exactly as F, and its magnitude provides a cardinal measure of the extent to which individual variables are affected by multicollinearity. If normality cannot be assumed, it provides an ordinal measure.

Further insight into the pattern of interdependence in the set of independent variables can be gained by looking at off-diagonal elements of the inverse correlation matrix $|X^tX|^{-1}$, "by a change of sign, normalized off-diagonal elements of the inverse correlation matrix $|X^tX|^{-1}$ yield partial correlations among members of the independent variable set."[8] These partial correlation coefficients are kept in the matrix as below-diagonal elements. Farrar and Glauber proposed transforming the partial correlation coefficients lying above the diagonal of the inverse correlation matrix in the followingway;

> In a manner exactly analoguous to the simple (zero order) correlation coefficient, the statistics

$$t_{ij}^{(v)} = \frac{r_{ij} \quad N - n}{1 - r_{ij}^2}$$

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8 k is equal to n - 1

may be shown to be distributed as Student's t[9] with $v = N - n$ degrees of freedom.

Farrar and Glauber added that this statistic provides a useful ordinal measure of collinearity even in the absence of exact satisfaction of multivariate normal distributional properties.

The matrix that makes it possible to localize the variable most affected by multicollinearity is the following:

	I	E	P
I	0.6167	4.0758	0.7011
E	0.4942	0.7194	4.3114
P	0.0880	0.4773	0.6056

The diagonal elements are the multiple correlation coefficients, which can be transformed in order to obtain F statistics:

$$F = \frac{R^2/(k - 1)}{(1 - R^2)/(N - k)}$$

An appropriate critical region can be selected from the F distribution with (k - 1) and (N - k) degrees of freedom

$$F = \frac{R^2 1.23/(k - 1)}{(1 - R^2 1.23)\ (N - k)} = 19.40$$

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9 Ibid., p. 104, r_{ij} are the partial correlation coefficients.

$$F = \frac{R^2 2.13/(k - 1)}{(1 - R^2 2.13)/(N - k)} = 34.04$$

$$F = \frac{R^2 3.12/(k - 1)}{(1 - R^2 2.13)/(N - k)} = 18.33$$

These F statistics show that a significant part of the variance of each independent variable is due to the influence of other variables of the set. In other words, the independent variables are interdependent. The high value of F associated with $R_{2.13}$, off-diagonal partial correlations and the corresponding partial t value show that the dependence between education and participation rate, and education and the industrial mix, are the strongest.

Multicollinearity can be explained by the fact that the demand for labour is not uniform throughout the Province of Québec. Some areas which are not urbanized nor industrialized experienced heavy out-migration during the decade preceding June 1, 1961. In many counties, more than 10 per cent of the 1951 population left the area during that decade.

As it was said before, migration is selective and it was the younger and more educated workers that left the rural counties and settled in urbanized and industrialized

centres where there is a demand for skilled and educated workers.

As a rule workers who migrate are younger and have less dependents than the average worker. As a consequence the dependency ratios of out-migration counties increase and those of in-migration counties decrease. As migration is also selective with regard to education it reduces the educational level of the labour force of out-migration counties and increases that of in-migration counties.

As a consequence the three variables, the industrial mix, the educational level of the labour force, and the availability of labour for work, are not completely independent of each other when the 66 counties are taken together.

Migration flows indicate that employment opportunities vary greatly from one county to another. The differences in the demand for labour in the counties of Québec can be related to their locational advantages.

In the past, many factors have been associated with the choice of a location for particular firms. This had led to the classification of industries as "market-oriented", "transport-oriented", "power-oriented" and so on, depending on which factor was considered to be the most important one for each industry. The importance of

some factors was reduced while that of others was increased through time.

> Le fait est que les entreprises nouvelles, innovatrices et dynamiques, sont mobiles et non plus liées aux ressources naturelles, à la source d'énergie ou aux moyens de transport.[10]

> La baisse des coûts enregistrés dans le secteur des transports ou de l'énergie a avantagé les zones les plus dynamiques, tandis qu'une certaine substitution s'opérait au détriment d'un facteur jusque là prédominant: la main-d'oeuvre. Si la première phase d'industrialisation nécessitait une main-d'oeuvre banale, mais nombreuse, l'accent mis progressivement sur la mécanisation et la qualification professionnelle a enlevé aux zones rurales (sous-équipées intellectuellement) une de leurs forces d'attraction .... essentielles. De même l'égalisation des taux de salaires risque de favoriser incontestablement les zones dans lesquelles les autres facteurs sont plus favorables.[11]

These factors include the proximity to markets, a diversified pool of workers, the availability of public and personal services, favorable conditions for social and cultural activities and, most important, the existence of the economies associated with close inter-industry relationships. Due to linkages between firms of the same industry or of different industries, economies can be obtained when firms congregate in one area.

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10 Benjamin Higgins, Fernand Martin, and André Raynaud, Les orientations du développement économique régional dans la province de Québec, Ottawa, Ministère de l'Expansion économique régionale, 1970, p. 144.

11 Robert D. Hirsch, Les origines et la nature des déséquilibres régionaux au Québec, Québec, Conseil d'Orientation économique de Québec, 1967, p. 52.

> Vertical, horizontal, and diagonal linkages can make possible very substantial savings in operating costs, or firms engaged in the same or related activities may contribute to and share services to their mutual benefit. Isolated firms can be at a great disadvantage in this respect. It is harder for them to keep in touch with developments and they are apt to lack quick access to the specialized services more readily available to others.[12]

This quotation indicates some of the financial advantages which accrue to firms by locating in areas where other firms are already operating. Although it does not list all the economies that are derived from spatial-juxtaposition of firms,[13] it shows that the locational advantages of urban centers are greater than those of small rural communities.

It thus seems reasonable to divide the counties in two groups on the basis of their degree of urbanization. The rationale is that, because of the locational advantages of urban centers, the counties in which they are located have a greater demand for labour than rural ones. Counties with no important agglomerates do not have any locational

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12 T.N. Brewis, Regional Economic Policies in Canada, Toronto, Macmillan, 1969, p. 36.

13 An interesting discussion of the subject can be found in: Isard, Walter, et. al., Methods of Regional Analysis: An Introduction to Regional Science, Cambridge, the M.I.T. Press, Fifth Printing, May 1967, pp. 404-409.

advantages to attract industries and consequently the demand for labour in these areas is very weak. By grouping the counties according to this criterion, two rather homogeneous groups are formed and it is hoped that multicollinearity will not be encountered when applying regression analysis to each group.

The urban group of counties includes the counties of the metropolitan region of Montréal: Montréal, Chambly, Chateauguay, Deux-Montagnes, Laprairie, L'Assomption, Terrebonne and Vaudreuil. The counties of the metropolitan region of Québec are also included: Québec and Levis. in the area between Montréal, Québec City and Sherbrooke, there are many large cities. In all the following counties there was at least one city of 10,000 people or more: Mégantic, Arthabaska, Drummond, Richmond, Champlain, Sherbrooke, Stanstead, Shefford, St-Jean, Ste-Hyacinthe, Richelieu, Beauharnois, Joliette and St-Maurice. It is considered that the following counties are located in the "zone d'influence" of the cities located in the above-mentionned counties: Missisquoi, Verchères, Argenteuil, Rouville, and Iberville.

In addition to these counties there are a few counties in which there are one or more important manufacturing or mining centers. These counties are Abitibi,

Chicoutimi, Hull, Lac-St-Jean, Rimouski, Témiscamingue and Saguenay. In addition to their manufacturing and mining functions, the cities located in these counties have financial, administrative and educational regional functions.

The remaining 30 counties are areas where the demand for labour is very low. These counties have a very low population density and are located outside the "zone d'influence" of any large urban center.[14]

3. The Parameters and their Reliability

The three variables that entered the first regression are now used to explain per capita earned income differentials that exist within the two groups of counties. Least square regressions of the same form as the first one are used. They yield the following results:

URBAN

(2) $Y = 1.74 + 3.87I + 26.02E + 9.83P$

$(1.74) \quad (3.13) \quad (3.52)$

$2.22 \quad 8.31 \quad 2.79$

$R^2 = 0.82$, $F = 36.61$, and Durbin-Watson $= 1.46$

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14 Appendix II contains a map of the counties of the Province of Québec.

RURAL

(3) $Y = 1.70 + 7.18I + 17.85E + 8.04P$

$(1.88) \quad (4.44) \quad (2.01)$

$3.83 \quad 4.02 \quad 4.01$

$R^2 = 0.75$, $F = 19.76$ and Durbin-Watson = 1.46

The figures in parenthesis are the standard errors of estimate and the figures below are the t values of the estimates. In both regressions, all the t and F values are significant at the 5 per cent level. The Durbin-Watson statistics are significant at the 1 per cent level. The transformations of the zero-order simple correlation coefficients matrices according to the formula

$$X^2_{|X^tX|}{}^{(v)} = - [N - 1 - 1/6 (2n - 5)] \quad \log. \ |X^tX|$$

give a Chi Square equal to 6.5060 in equation (2) and equal to 3.5833 in equation (3). Both values indicate that multicollinearity is absent from the regressions (at the 5 per cent level).

The t values indicate that each one of the factors included in the analysis is significant. Furthermore, the R^2's and the corresponding F statistic indicate that a significant proportion of the total variations is explained (in a statistical sense) by them. These different tests show that the parameters are reliable.

The conclusions of an empirical cross-section analysis like this one are limited by the nature of the statistical methods used. They only show what are, at a given point in time, the main factors responsible for the observed variations in per capita earned income within each group.

The limitation of such an approach can be illustrated in the following way. If, for example, there were in all the rural counties, exactly the same percentage of the labour force in the secondary sector, the analysis would show that within this group of counties, the industrial mix, as defined in this paper, would not be a factor associated with variations in per capita income within that group. However, it can be this variable which is the most important in explaining the difference in the levels of per capita income between that group and the other.

Consequently by themselves the results of this study cannot be used to prepare a development plan or strategy. They cannot be used either to develop economic policies aiming at a more equitable distribution of earned income because the analysis did not take into account dynamic factors. Furthermore the analysis as such does not show how the rural counties can attain a level of per capita earned income equal to that of urban counties.

The fact that the absolute and relative contributions of education in explaining differentials in per capita income, are smaller in rural than in urban counties, does not necessarily mean that education is less important a factor of economic growth in one area than in the other one. It simply means that during the calendar year 1961, in the rural counties as compared to urban counties, a smaller proportion of the differentials in per capita income was due to variations in the education attainment of the labour force.

The changes in the relative importance of one particular variable from urban to rural counties may be due to changes in the relative importance of the other two variables and/or to changes in the absolute individual contribution of that variable to observed variations in per capita earned income.

The regression coefficients and the beta coefficients are listed below, together with the t values of each regression coefficient. The figures are given for both rural and urban counties.

Regression coefficients	Urban	Rural
Industrial mix	3.87	7.18
Education	26.02	17.85
Participation	9.83	8.04

Beta coefficients	Urban	Rural
Industrial mix	0.1560	0.4095
Education	0.7363	0.4320
Participation	0.1424	0.1728
Student t values		
Industrial mix	2.22	3.83
Education	8.31	4.02
Participation	2.79	4.01

The absolute contribution of education is greater in urban than in rural counties. A change of 10 percentage points in the education variable would be accompanied by a change of 260 dollars in per capita income in urban counties, whereas a similar change in the education variable in the rural counties would bring about a change of only 178 dollars in per capita income.

It may seem surprising that the absolute contribution of the education variable is greater in urban than in rural counties. This is due to the fact that the reward for higher education is expected to be greater in rural than in urban areas, because human resources with higher education are relatively more scarce in rural areas. This would be the case if the demand for highly educated workers were as strong in rural as in urban counties. However, as it has been said before, industries requiring highly

qualified personnel have a tendency to locate in urban areas and consequently, in these areas the demand for highly qualified workers is much stronger than in rural areas.

Another factor also affects the absolute and relative contribution of education. This relates to the earnings of workers engaged in "standardized and integrated production processes." In his article, dealing with interstate wage differentials in manufacturing industries, Gerald Scully explained the situation in the following way:

> ... in the standardized and integrated production processes which characterize manufacturing industries, the return to the human capital possessed by production workers is undoubtedly a function of the average level of endowment, and thus does not vary greatly from individual to individual.[15]

There is no doubt that in rural areas the average educational level of the labour force is lower than in urban counties. The average value of the education variable is only 9.71 in the first group whereas its value is 19.77 in the latter.

As explained above, in the rural areas, the demand for skilled workers is not as strong as in urban areas. Thus the creation of a demand for labour is more important than in urban areas. This is reflected in the greater absolute

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15 Gerald W. Scully, "Interstate Wage Differentials: A Cross Section Analysis," The American Economic Review, Vol. LIX, No. 5, December 1969, p. 770.

contribution of the industrial mix variable in the former group than in the latter.

In rural counties an increase of 10 percentage points in the industrial mix variable brings about a 72 dollars increase in per capita income whereas an equal change in the same variable in urban counties causes an increase of only 39 dollars.

This finding can be expected. In its Second Annual Review, the Atlantic Provinces Economic Council investigated the role of education in economic growth:

> Careful analysis is very likely to show that the importance of education to economic development differs between a society which generally tends to virtually full employment and one where the tendency is to relatively high unemployment. In the former case the demand for labour is in large measure given and the problem is, through education, to provide a supply of labour of the type required by the economy. In the latter case the demand for labour is inadequate in relation to the supply and the problem becomes one of both building up an adequate demand and of providing a supply of the type required by that demand.[16]

The demand for highly educated workers is much greater in the secondary and tertiary sectors than in the primary sector. This explains partially why the absolute and relative contributions of the industrial mix variable

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16 The Atlantic Provinces Economic Council, Second Annual Review, The Atlantic Economy, Halifax, 1968, p. 69.

are greater in rural than in urban counties.

The absolute contribution of the participation variable is not very different from one group to the other. A 10 percentage points change in this variable brings about a 98 dollars change in the per capita revenue of rural counties whereas it changes per capita income by 80 dollars in urban counties.

The relative importance of the different factors is given by the beta coefficient which "measures the proportion of the standard deviation of the dependent which a change of one standard deviation in the independents produces."[17] The beta coefficients[18] of the two regressions show that the relative importance of the education variable is the most important in both groups of counties; the industrial mix variable is second and the participation variable, last.

Although the ranking of the variables is the same in both groups of counties when they are arranged according to their relative importance in explaining differentials in counties per capita income, the relative importance of the

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17 John L. Fulmer, "Factors Influencing State per Capita Income Differentials," The Southern Economic Journal, Vol. XVI, No. 3, January 1950, p. 264.

18 The beta coefficient is equal to the regression coefficient multiplied by the ratio of the standard deviation of the dependent variable to that of the independent variable.

variables is not the same in both groups. For example, the relative importance of the education variable is smaller in rural counties than in urban ones. Furthermore the difference between the relative importance of the industrial mix variable and that of the education variable is much smaller in rural than in urban counties. This supports the explanation given above relating to the absolute contributions of the same variables.

The small values of the beta coefficients of the participation variable in both regressions indicate that this variable was responsible for only a small proportion of county per capita income differentials existing in 1961.

4. Urbanization and the Tertiary Sector

As it was said before, the analysis does not show directly the factors influencing the differences in per capita income that exist between the two groups of counties. However insight into this matter may be gained by looking at the differentials in urbanization and in the percentage of the labour force engaged in the tertiary sector. It would have been interesting to estimate the individual contribution of these two factors. However, their inclusion in the set of independent variables would have created multicollinearity.

In addition to this, the economic aspect of urbanization is difficult to measure. The definition used in the 1961 Census of Canada, is not suitable for the purpose of this thesis because all persons living in agglomerates of 1000 people or more are classified as urban. Conclusions based on the correlation coefficient between urbanization (measured in this way) and any other economic variables would be misleading. This is due to the fact that 100 small villages of 1000 people do not have the same economic functions as one city of 100,000 people. By taking communities of 10,000 people as a threshold one implies that 10 cities of 10,000 are equivalent to one city of 100,000; this would also be misleading.

However it is observed that the percentage of the labour force engaged in the secondary sector, the education level and the level of the participation rates are greater in urban than in rural counties. It was also shown that the contribution of education to variations in per capita income is not independent of the place of residence.

In this connection it is worthwhile to notice that the R^2's and the corresponding F values of both regressions (2) and (3) are smaller than that of regression (1) in which all the counties were included. Although it is impossible to estimate the correlation between any one of the three variables included in the hypothesis and the size of cities

located in the counties, one knows that they are not completely independent for the reasons given above.

So the differences in the R^2's between equation (1) and equation (2) may be due in part to the fact that the values of the variables that were chosen to measure the three economic factors embodied in the hypothesis were influenced by the degree of urbanization. This implies that the estimated contribution of the factors to the observed variations of per capita income is overestimated to the extent to which urbanization influenced the values of the variables.

Within the group of urban counties there are cities of different sizes and the values of the three variables increase as one moves from counties with small agglomerations to those with large cities. Although this association is not strong enough to create multicollinearity, it may well increase a little the individual contribution of the variables, especially that of education. This would explain the reduction in the R^2 in equation (3) as compared to equation (2). Equation (3) refers to counties having no large cities.

This explanation of variations in the absolute sizes of the R^2's of the different equations is consistent with the explanations given above relating to the individual contribution of each variable. Both explanations relate

directly to the demand for labour.

By looking at another factor closely related to urbanization, further insight in the same matter may be gained. This factor is the percentage of the labour force engaged in the tertiary sector. The correlation coefficient between the percentage of the labour force in the tertiary sector and the education variable is 0.64 when all the counties are taken together. The correlation coefficients with the other variables are low.

However when the counties are separated between rural and urban counties, the values of the coefficients change significantly. In urban counties the correlation coefficients between, on one hand, the percentage of the labour force in the tertiary sector and, on the other hand, each one of the three independent variables are 0.56 (industrial mix variable), 0.63 (the education variable) and 0.39 (the participation variable). The corresponding coefficients for rural counties are 0.18 (industrial mix variable), 0.20 (the education variable) and 0.56 (the participation variable).[19]

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19 All the correlation coefficients are significant at the 5% level except the correlation coefficients between, on one hand, the percentage of the labour force in the tertiary sector and, on the other hand, the industrial mix variable and the education variable in the rural counties.

These results are interesting in many respects. In rural counties the low correlation between, on one hand industrial mix and education and on the other hand, the percentage of the labour force in the tertiary sector, indicates that there is a very loose association between these variables. This means that within this group of counties the percentage of persons engaged in the tertiary sector is not determined by the percentage of the labour force in the secondary sector. This is probably due to the fact that the cities located in these counties are not large enough to attract tertiary industries that provide services to counties other than the one in which they are located.

However, the situation is different in the case of urban counties where the corresponding correlation coefficients are relatively high. This is due to the fact that, the larger the urban centers, the stronger are their locational advantages for both secondary and tertiary industries which require highly qualified personnel.

Furthermore, in the cities there is a greater variety of services offered to the residents because the market is greater. This can be illustrated by the greater variety of educational and recreational services offered in big cities compared with small towns. Also located in these agglomerations are the head offices of national and

international firms, federal, provincial and regional administrative offices and distributing enterprises servicing counties other than that in which they are located.

Due to these reasons it would have been better to include the percentage of the labour force engaged in the tertiary sector in the regressions especially in that pertaining to urban counties. This was impossible because its inclusion would have created multicollinearity. Because this "absent" variable influences the industrial mix and the education variable, the individual contribution of these factors in the urban counties as estimated above have been overestimated to a certain extent.

It is interesting to see the sensitivity of participation rates in rural counties to variations in the percentages of the labour force engaged in tertiary activities. This is probably due to the fact that tertiary activities offer job opportunities to female workers and thus increase the participation rate of this group in economic activities.

The relatively high correlation coefficient between these two variables may to a certain extent, explain the higher relative contribution of the participation variable to differentials in per capita income in rural counties as compared to the contribution of the same variable in urban

ones. In fact, the estimated parameter relating to that variable may, in the rural group of counties contain a proportion of the contribution of the percentage of the labour force engaged in the tertiary sector.

SUMMARY AND CONCLUSIONS

The first part of this thesis contains a theoretical discussion of the factors influencing the level of per capita earned income in the counties of the Province of Québec. Economic theory and empirical studies relating to similar problems suggest the hypothesis to be tested, namely, that the three most important factors explaining the observed differentials in per capita income, are the variations in the industrial mix of the economies of the counties, the educational level of the labour force and the extent to which total population participate in economic activities.

Next, an attempt is made to find variables that measure these and only these economic factors; then the individual and total contributions of these factors to observed variations in per capita earned income are estimated through regression analysis.

The test of Farrar and Glauber is used and the presence of multicollinearity is detected. The test indicates that multicollinearity is due to the migration that had taken place during the years preceding 1961. Migration has affected the three variables included in the analysis. The division of the counties into two groups eliminates this problem. Counties in which there is an urban center

of at least 10,000 people are included in one group together with the counties located in their "zone d'influence". These counties are called urban counties in contrast to the remaining ones, the rural counties.

The two groups of counties are rather homogeneous because the demand for labour in urban counties is significantly stronger than in rural counties as reflected by migration flows.

The individual and total contributions of the variables mentioned above are estimated through regression analysis for both groups of counties. The empirical results tend to confirm the hypothesis and indicate that in each group, each variable is significant.

The educational attainment of the labour force is the factor contributing the most to the observed differentials in per capita earned money income. However, both the absolute and relative contributions of the educational variable are more important in urban than in rural counties.

This can be explained by the fact that the demand for labour in general and for highly qualified labour in particular, is stronger in the former group than in the latter. Furthermore, due to the highly "standardized and integrated production processes which characterized manufacturing industries" the income of workers of these

industries is more influenced by their average than by their individual level of education.

In rural counties, the absolute and relative contributions of the industrial mix variable are more important than that of the same variable in urban counties. These results indicate that in rural counties, it is very important to create a demand for labour by replacing primary industries by those producing goods and services for which there is a strong demand.

The differences in the individual and total contributions of the three economic factors as estimated from the variables used to measure them are mainly due to the fact that the demand for labour is higher in one group than in the other. In turn the differences in the demand for labour are attributed to the greater location advantages of large urban centers compared to small communities, especially with regard to highly specialized and highly capitalized industries.

If urbanization and the relative importance of the tertiary sector could be included in the regression analysis, the empirical results would be closer to reality than they are at present. However, their inclusion within this study framework would create multicollinearity and thus reduce the reliability of the estimated parameters.

Their exclusion is a limitation on the analysis and further studies would add to the understanding of per capita income differentials if these two related factors could be included and analysed.

The present thesis is a static analysis of county per capita earned income differentials. The influence of dynamic factors are not analysed. Further insight into the matter could be gained by studying the effects of economic growth and of changes in business conditions. In this connection, it would be interesting to compare the effects of business cycles on the different counties and to see whether or not income distribution in the counties becomes more equitable as economic growth takes place.

One of the interesting by-products of the empirical results is the implications that they have for the prospects of obtaining more equitable income distribution in the counties of the Province of Québec. The results are interesting especially with regard to the industrial mix of the counties and the educational level of the labour force.

Economic theory predicts that in a competitive free entreprise economy movements of labour and capital would take place in order to equalize regional factor endowments in such a way as to lead to an equalization of factor prices. It is most likely that such migration would not take place

in the Province of Québec. Because of the economies that can be obtained by most industries by locating and operating in a large agglomerate, it can be expected that the demand for labour in rural areas will continue to decline as it did in the years preceding 1961.

Similarly, the migration of people from rural areas to urban centers will not be sufficient to equalize the relative scarcity of human capital in both areas. In addition to social and cultural barriers, workers from rural areas are as a rule less skilled than their urban counterparts and would hesitate to move into urban areas where they would have to compete with more educated workers.

Educated people from urban areas are not induced to move to rural areas because the demand for qualified labour is very low and also because,in the "standardized and integrated production processes", the return to education is a function of the average level of endowments rather than of the individual educational attainment. As a result, more educated workers are not induced to migrate to rural areas.

Similarly, it is unlikely that participation rates of the working population will increase in rural areas to a level equal to that of urban areas. One of the main factors influencing participation rates is the demand for female workers. This demand originates mainly from the tertiary

sector and, as it was said before, there are indications that this sector would develop more in urban areas than in rural ones.

BIBLIOGRAPHY

Anderson, Isabel B., Internal Migration in Canada, 1921-1961, Economic Council of Canada, Staff Study No. 13, Ottawa, Queen's Printer, 1966.

Atlantic Provinces Economic Council, Second Annual Review, the Atlantic Economy, Halifax, 1968.

Becker, G.S., Human Capital, New York, National Bureau of Economic Research, 1964.

Bertram, G.W., The Contribution of Education to Economic Growth, Economic Council of Canada, Staff Study No. 12, Ottawa, Queen's Printer, 1966.

Blaug, M., "An Economic Interpretation of the Private Demand for Education", Economics, New Series, Vol. XXXIII, No. 130, May 1966, pp. 166-182.

Brewis, T.N., Regional Economic Policies in Canada, Toronto, Macmillan, 1968.

Buckley, Helen and Tihanyi, Eva, Canadian Policies for Rural Adjustments, A Study of the Economic Impact of ARDA, PFRA and MMRA, Economic Council of Canada, Special Study No. 7, Ottawa, Queen's Printer, 1967, Chapter 2.

Canada, Department of Labour, Immigration, Ottawa, Queen's Printer, 1951 to 1961.

--------, Dominion Bureau of Statistics, 1961 Census of Canada, General Review, Internal Migration, (Catalogue 99-518, Vol. VII, Part 1), Ottawa, Queen's Printer, 1968.

--------, Dominion Bureau of Statistics, 1961 Census of Canada, General Review, The Canadian Labour, (Catalogue 99-522, Vol. VII, Part 1), Ottawa, Queen's Printer, 1967.

--------, Dominion Bureau of Statistics, 1961 Census of Canada, Labour Force, Employment Status by Sex, (Catalogue 94-533, Vol. III, Part 3) Ottawa, Queen's Printer, 1964.

--------, Dominion Bureau of Statistics, 1961 Census of Canada, Population Age Groups, (Catalogue 92-542, Vol. I, Part 2) Ottawa, Queen's Printer, 1962.

--------, Dominion Bureau of Statistics, 1961 Census of Canada, Population School Attendance and Schooling,(Catalogue 92-550, Vol. I, Part 2) Ottawa, Queen's Printer, 1963.

Canada, Economic Council of Canada, Second Annual Review, Towards Sustained and Balanced Economic Growth, Ottawa Queen's Printer, 1965.

--------, Economic Council of Canada, Fourth Annual Review, the Canadian Economy from the 1960's to the 1970's, Ottawa, Queen's Printer, 1967.

--------, Economic Council of Canada, Seventh Annual Review, Patterns of Growth, Ottawa, Queen's Printer, 1970.

Denison, Edward F., "Education, Economic Growth, and Gaps in Information", The Journal of Political Economy, Vol. LXX, No. 5, Part 2, Supplement: October 1962, pp. 124-128.

--------, The Sources of Economic Growth in the United States and the Alternatives Before Us, New York, Committee for Economic Development, 1962.

Farrar, Donald E. and Glauber, Robert R., "Multicollinearity in Regression Analysis: The Problem Revisited", The Review of Economics and Statistics, Vol. XLIX, No. 1, February 1967, pp. 92-107.

Firestone, O.J., Industry and Education, A Century of Canadian Development, Ottawa, University of Ottawa Press, 1969.

Fulmer, John L., "Factor Influencing State per Capita Income Differentials", The Southern Economic Journal, Vol. XVI, No. 3, January 1950, pp. 259-278.

Hanna, Frank A., "Analysis of Interstate Income Differentials: Theory and Practice", Studies in Income and Wealth, No. 21, New York, National Bureau of Economic Research, 1957.

--------, "Age, Labour Force, and State per Capita Incomes, 1930, 1940 and 1950", The Review of Economics and Statistics, Vol. XXXVII, No. 1, February 1955, pp. 63-69.

Higgins, Benjamin, Martin, Fernard, and Raynaud, André, Les orientations du développement économique régional dans la province de Québec, Ottawa, Ministère de l'expansion économique régionale, 1970.

Hirsch, Robert-D., Les origines et la nature des déséquilibres régionaux au Québec, Conseil d'orientation économique de Québec, 1967.

Isard, Walter et al., Methods of Regional Analysis: An Introduction to Regional Science, Cambridge, M.I.T. Press, 1960.

Klein, L.R., An Introduction to Econometrics, Englewood Cliffs, Prentice-Hall, 1962.

Kogler, R., "An Analysis of Population Growth Trends in Ontario", The Ontario Economic Review, Vol. 7, No. 6, Nov.-Dec. 1969, pp. 4-17.

Kruger, Arthur, "Micro-economic Theory Labour Allocation and Manpower Policy" in the Canadian Labour Market, Readings in Manpower Economics, edited by Arthur Kruger and Noah M. Meltz, Toronto, Centre for Industrial Relation, University of Toronto, 1968, pp. 1-54.

Kuznets, Simon, "Quantitative Aspects of the Economic Growth of Nations, II. Industrial Distribution of National Product and Labor Force", Economic Development and Cultural Change, Supplement to Vol. V, No. 4, July 1957, pp. 1-111.

--------, National Income: A Summary of Findings, New York, National Bureau of Economics Research, 1946, pp. 31-49.

Lebel, Gilles, Horizon 1980, une étude sur l'évolution de l'économie du Québec de 1946 à 1968 et sur ses perspectives d'avenir, Québec, Gouvernement du Québec, Ministère de l'industrie et du commerce, 1970, Chapter VII and VIII.

Mincer, Jacob, "On the Job Training: Costs, Returns and Implications", The Journal of Political Economy, Vol. LXX, No. 5, Part 2, Supplement: October 1962, pp. 50-79.

Mushkin, Selma J., "Health as an Investment", The Journal of Political Economy, Vol. LXX, No. 5, Part 2, Supplement: October 1962, pp. 129-157.

Myrdal, Gunnar, Economic Theory and Underdeveloped Regions, London, University Paperbacks, 1964.

Organisation for Economic Co-operation and Development, O.E.C.D. at Work, Paris, 1969.

Perloff, Harvey S., "Interrelations of State Income and Industrial Structure", The Review of Economics and Statistics, Vol. XXXIX, No. 2, May 1957, pp. 162-171.

Phillips, Llad, Votey, Harold L., and Maxwell, Darold E., "A Synthesis of the Economic and Demographic Models of Fertility: An Econometric Test", The Review of Economics and Statistics, Vol. LI, No.3, August 1969, pp. 298-308.

Podoluk, Jenny, Incomes of Canadians, 1961 Census Monograph, Ottawa, Queen's Printer, 1968.

Prais, S.J. and Houthakker, H.S., The Analysis of Family Budgets, Cambridge, University Press, 1955, Chapter 5.

Québec, Bureau de la Statistique du Québec, Migration nette 1931-1961, Ministère de l'industrie et du commerce, 1962.

Scully, Gerald W., "Interstate Wage Differentials: A Cross Section Analysis", The American Economic Review, Vol. LIX, No. 5, December 1969, pp. 757-773.

Schultz, T.W., "Investment in Human Capital", The Journal of Political Economy, Vol. LXX, No. 5, Part 2, Supplement: October 1962, pp. 1-8.

Swidinsky, Robert, "A Note on Labour-Force Participation and Unemployment", The Canadian Journal of Economics, Vol. III, No. 1, February 1970, pp. 147-150.

Vibien, Gérard, Répartition régionale du revenu personnel au Québec (1961), Québec, Conseil d'orientation économique du Québec, 1967.

Weisbrod, Burton A., "Education and Investment in Human Capital", The Journal of Political Economy, Vol. LXX, No. 5, Part 2, Supplement: October 1962, pp. 106-123.

Wolfe, Martin, "The Concepts of Economic Sectors", The Quarterly Journal of Economics, Vol. LXIX, No. 3, August 1955, pp. 402-420.

Woods, H.D. and Ostry Sylvia, Labour Policy and Labour Economics in Canada, Toronto, Macmillan, 1962.

APPENDIX I

THE ESTIMATES OF EARNED MONEY INCOME

The estimates of money earned income of the counties used in this thesis are taken from Gérard Vibien's report entitled: Répartition régionale du revenu personnel au Québec (1961).[1] Vibien estimated the major components of personal income either from data which were collected at the county level or from provincial aggregates which he distributed among the counties according to different criteria.

To arrive at earned income as defined in Chapter I, the first three components of personal income as given by Gérard Vibien were added. As the concept "regional personal income" implies, it was income received by individuals residing in each county that was estimated regardless of the place where such income was earned. The estimates presented by Vibien are for the twelve-month period preceding May 31, 1961. It is assumed that the differentials in total

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1 Gérard Vibien, Répartition régionale du revenu personnel au Québec, (1961), Québec, Conseil d'orientation économique du Québec, 1967.

income earned during the calendar year 1961, would be if estimated, equal or almost equal to that earned during the twelve-month period preceding May 31, 1961.[2]

Many sources were used to arrive at the estimates. The most important are the National Accounts, many bulletins of the 1961 Census of Canada and Taxation Statistics. However some components of personal income as they appear in the National Accounts were grouped in one component by Vibien.

When some components of personal income were estimated from sources other than the National Accounts, they were compared and adjusted to National Accounts afterwards.

> Ce principe est justifié car, quelle que soit la source de renseignements utilisée, la couverture de l'une ou l'autre des composantes du revenu personnel demeure incomplète par rapport aux évaluations des comptes nationaux.[3]

Vibien grouped under income from employment (revenu d'un emploi) wages, salaries and supplementary labour income plus net income of non-farm unincorporated business as defined in the National Accounts.

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2 There are no indications that the distribution of total earned income for calendar year 1961, if estimated, would have been different from that estimated for the twelve-months preceding May 31, 1961.

3 Ibid., p. 59.

This component accounts at the Provincial level for 77% of personal income of individuals and 85.52% of earned income of individuals. Statistics pertaining to income from employment as defined above were collected at the 1961 Census of Canada. This means that the estimates of the most important component of personal income are based on statistics which are reliable. The relatively small difference between total income from employment according to the Census and the National Accounts was allocated among counties according to their relative shares of the provincial income from employment.

The second component of income comprises rent, interest and miscellaneous investment income. Vibien distinguished between fixed assets and other assets. Provincial aggregates were derived from a publication of the Bureau de la statistique du Québec[4] and adjusted to the National Accounts.

> Une fois connus tous les éléments constitutifs des revenus de placements totaux de la province, la ventilation par comté s'est effectuée de la manière suivante: en ce qui concerne les revenus de placement mobilier ajustés aux comptes nationaux, (....) au prorata de la distribution par comté des déclarations fiscales relatives à

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4 Bureau de la Statistique du Québec, Bulletin Trimestriel de Statistique, Vol. IV, No. 3.

> ce type de revenu; en ce qui a trait aux revenus de placement immobilier ajustés aux comptes nationaux, (.....) il a été distingué entre les loyers nets des locataires, ventilés aux prorata du nombre de locataires dénombrés par comté, et les loyers nets des propriétaires, ventilés au prorata du nombre de propriétaires recensés par comté.[5]

The allocation of the provincial income from fixed assets among the counties in proportion to the number of owners or tenants reported by the Census implies that paid or imputed rents are the same in all counties of the Province. The author recognized the weakness of these estimates. However, due to the lack of information, he came to the conclusion that it was impossible to improve the allocation procedure.

The third component of personal income is Accrued net income of farm operators from farm production. As in the National Accounts, imputed rents of farm operators and income for work done outside the farm are included in one or the other of the two first components of personal income.

The basic sources of data for the estimation of farm income was Farm Net Income, 1961 published by the Agricultural Division of the Dominion Bureau of Statistics.

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5 Gérard Vibien, op. cit., p. 72.

The provincial aggregates were allocated to counties according to physical criteria taken from the Census.

To arrive at Accrued net income of farm operators from farm production, it was necessary to allocate many provincial aggregates among counties, such as monetary income from sales of farm products, imputed consumption of farm products, and different types of expenditures. As a result this component of personal income comprises all the errors present in the above mentioned series. Due to this drawback Gérard Vibien warns the reader that the estimates of the income of farm operators are not reliable enough to be used in all kinds of research studies. These estimates were presented for the following reason:

> Les évaluations relatives aux revenus tirés de l'agriculture constituent une étape intermédiaire nécessaire à l'obtention d'un revenu personnel global régionalisé; c'est dans cette optique qu'elles ont été présentées.[6]

Personal income includes also transfer payments. However, as this thesis is concerned only with earned income, transfer payments are not discussed. It is sufficient to know that the amount of transfer payments received by residents of each county were estimated and added to other

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6 Ibid., p. 82.

components to give total personal income for each county. In a similar way, Gérard Vibien estimated the taxes paid by the residents of each county, and he was able to present estimates of personal disposable income at the county level.

Table A-1 shows the relative importance of each income component. The relative importance of each income component among the counties reflects the variations in the structure of the economies of the counties.

Income from employment is by far the most important component of income. Because this aggregate comprises income originating from many sources, no firm conclusion can be drawn. However, it can be seen that as one moves from low to high per capita income counties, the relative importance of income from employment tends to increase. On the contrary the relative part of total earned income derived from agriculture tends to decrease. However there are certain exceptions and some very poor counties, as Gaspé, have a very little share of their total earned income originating from agriculture. At the other extreme some counties with above average earned income per capita have a relatively high portion of their income originating from agriculture. These counties are in the Eastern Townships region or in the south of the Metropolitan region of Montréal.

TABLE A-1

THE PERCENTAGE COMPONENTS OF EARNED INCOME IN THE COUNTIES OF THE PROVINCE OF QUEBEC, MAY 31, 1961

Counties	Income from employment	Rent, Interest and Investment Income	Farm Income
1. Bonaventure	76.74	19.21	4.05
2. Gaspé	83.65	16.25	0.10
3. Matane	77.94	15.92	6.14
4. Kamouraska	64.95	18.80	16.25
5. Bellechasse	54.42	17.86	27.72
6. L'Islet	65.30	17.53	17.16
7. Dorchester	54.45	17.57	27.98
8. Témiscouata	72.01	14.72	13.27
9. Frontenac	64.80	16.02	19.09
10. Lotbinière	56.30	16.06	27.63
11. Charlevoix	78.38	13.30	8.32
12. Labelle	76.13	16.70	7.15
13. Wolfe	62.41	15.02	22.57
14. Montmagny	74.97	15.84	9.19
15. Nicolet	52.28	14.95	32.77
16. Yamaska	47.34	15.72	36.94
17. Beauce	72.77	14.43	12.80
18. Montcalm	61.12	16.54	22.34
19. Rimouski	80.80	12.65	6.55
20. Maskinongé	67.41	14.19	18.40
21. Lac-St-Jean	82.16	10.93	6.91
22. Bagot	55.92	15.18	28.90

TABLE A-1 (continued)

Counties	Income from employment	Rent, Interest and Investment Income	Farm Income
23. Berthier	69.41	14.24	16.35
24. Abitibi	85.93	11.84	2.23
25. Pontiac	73.14	13.72	13.14
26. Napierville	57.76	12.76	29.48
27. Brôme	59.33	21.63	19.04
28. Compton	64.22	14.73	21.04
29. Portneuf	77.55	12.98	9.47
30. Montmorency	79.10	11.33	9.57
31. Soulanges	69.31	16.19	14.50
32. Arthabaska	73.58	12.07	14.35
33. Papineau	70.02	14.09	6.89
34. Drummond	81.05	10.88	8.06
35. Joliette	74.96	11.64	13.40
36. Mégantic	80.33	10.89	8.79
37. Champlain	86.25	9.95	3.80
38. Huntington	63.33	15.59	21.08
39. Témiscamingue	86.21	10.56	3.23
40. Richmond	81.59	11.06	7.35
41. Chicoutimi	90.21	8.53	1.26
42. Stanstead	78.65	13.84	7.52
43. Richelieu	84.22	11.45	4.33
44. Shefford	79.96	11.51	8.53

TABLE A-1 (continued)

Counties	Income from employment	Rent, Interest and Investment Income	Farm Income
45. Iberville	75.31	10.77	13.92
46. Laprairie	85.40	10.66	3.94
47. Ste-Hyacinthe	77.74	11.93	10.34
48. Lévis	86.17	10.48	3.55
49. Missisquoi	75.09	12.70	12.22
50. L'Assomption	81.03	10.18	8.79
51. Terrebonne	87.53	11.14	1.34
52. Rouville	73.08	12.35	14.57
53. Beauharnois	86.94	10.26	2.80
54. St-Maurice	87.69	10.12	2.19
55. St-Jean	86.17	10.27	3.57
56. Argenteuil	84.01	12.42	3.57
57. Verchères	78.69	11.58	9.74
58. Deux-Montagnes	77.73	12.83	9.44
59. Sherbrooke	86.46	12.31	1.23
60. Saguenay	93.22	6.66	0.12
61. Hull	89.29	9.58	1.13
62. Chateauguay	79.59	10.48	9.94
63. Québec	88.90	10.63	0.47
64. Vaudreuil	85.65	11.30	3.04
65. Chambly	90.96	8.62	0.38
66. Montréal	88.25	11.67	0.08
PROVINCE	85.52	11.54	2.94

The share of total earned income consisting of proprietor income is relatively stable among the counties. It is due to the estimation procedure that was adopted by Vibien. He stated:

> L'invariance observée est néanmoins imputable en grande partie à la méthode de ventilation utilisée dans la répartition des loyers nets; celle-ci opère indûment une certaine égalisation des revenus de ce type qui ne correspond sans doute pas à la réalité.[7]

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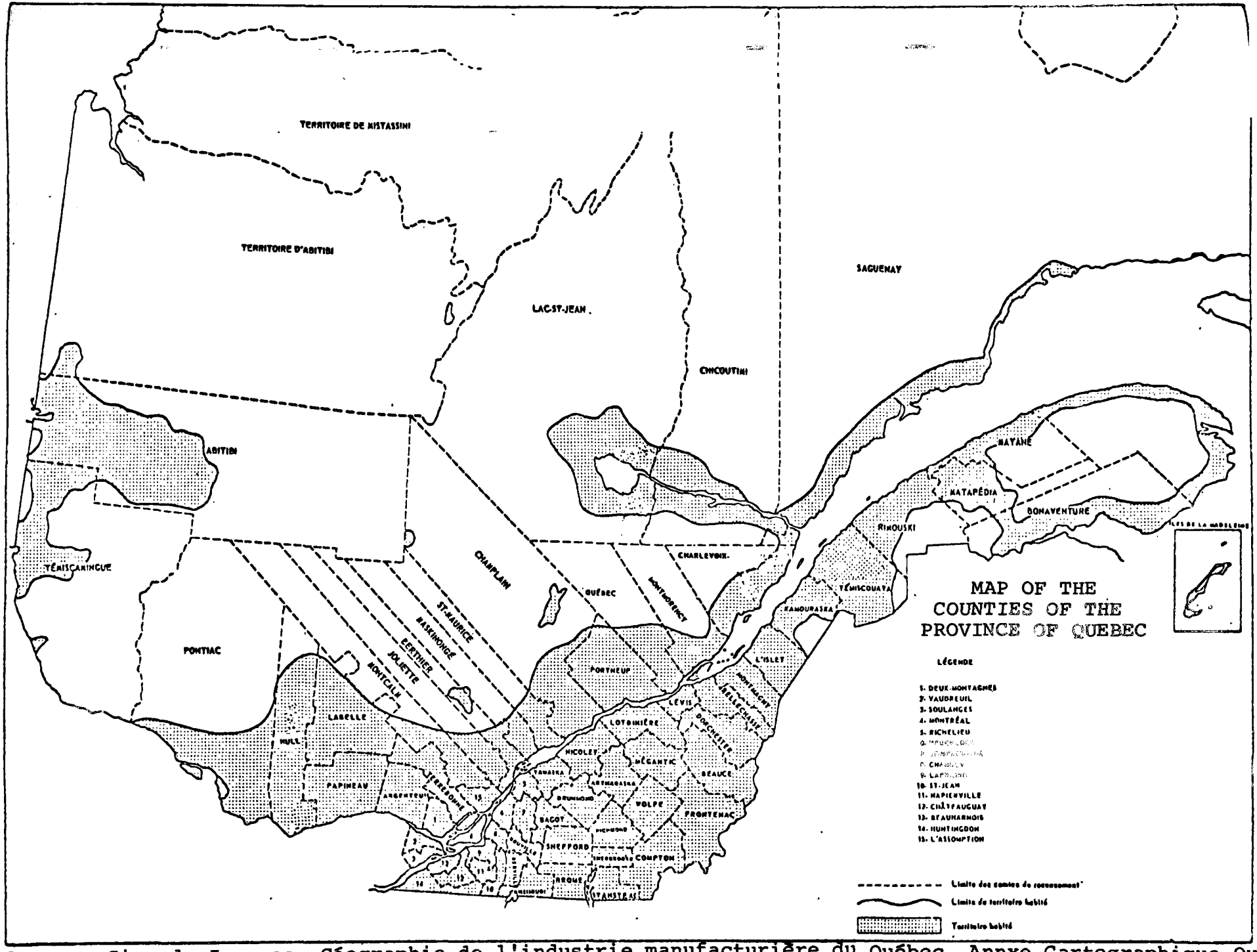
7 Ibid., p. 11.



Source: Girard, Jacques, Géographie de l'industrie manufacturière du Québec, Annxe Cartographique, Québec Ministère de l'industrie et du Commerce, 1970, Appendice I. The Map has been slightly modified.