INDUSTRIAL STRUCTURE, POPULATION STRUCTURE AND REGIONAL DEVELOPMENT IN BRITISH COLUMBIA

by

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Industrial Structure, Population Structure and Regional Development in British Columbia

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ABSTRACT

The purpose of this thesis is to analyze the effects of industrial structure on population structure and, further, on the stability of labor force and population in British Columbia census divisions. The study was done using data taken mostly from Statistics Canada publications, especially from the 1971 census.

The most important effects of dependence on primary extracting and processing industries are the cyclical and seasonal sensitivity of the economy, unbalanced population structure, and high labor turnover and migration, underutilization of the existing labor force and the concentration of service industries in Vancouver and goods-producing industries in the Interior. Associated with these are some external costs and development problems for both the Interior and Vancouver.

In the core of the empirical part of this study multi-equation models are used to determine the effects of industrial structure on population structure and on labor turnover and outmigration. The estimation was done by using ordinary and two-stage least square multiple linear regression.

Policy recommendations based on the results of the analysis are discussed in the concluding chapters. The solutions are not simple because the existing structure has some economic basis. It is argued, however, that while in the short

term we may have to keep the present industrial structure, in the longer term we could try to eliminate some external costs and other problems by giving more attention to developing secondary manufacturing and service industries in the interior regions.

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CHAPTER 1

INTRODUCTION

A. Statement of the Problem

The Canadian population is heavily concentrated around the three largest cities. Over half of the Canadian population lives within 150 miles of Toronto, Montreal and Vancouver.

Manufacturing activity is similarly concentrated. Over half of the total value of manufacturing shipments comes from Ontario. Another 25% comes from Quebec. Within these provinces, almost all manufacturing is concentrated in the Windsor-Quebec City corridor.

Contrary to the experiences of some other developed countries, and despite the very strong growth of the Canadian economy, regional disparities have widened. In 1955 Ontario produced 40.6% of the national manufacturing value added; in 1969, 42.4%. The share of national value added in manufacturing has slowly decreased in all regions other than Ontario.*

A similar situation exists in British Columbia. Presently, Greater Vancouver has 48.9% of the entire B. C. population, 49.9% of the female population, 52.2% of the B. C. manufacturing

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* Data from Springate (1973)

TABLE 1

REGIONAL DISTRIBUTION OF CANADIAN MANUFACTURING INDUSTRIES, 1971*

	% of Population	Total Employees	%	Total Salaries & Wages	Salaries & Wages Per Employee	Total Value Added	%	Value Added Per Employee
Newfoundland	2.4	12,580	0.8	72,757	5,784	135,496	0.6	10,770
P. E. I.	0.5	2,290	0.1	10,464	4,569	22,384	0.0	9,775
Nova Scotia	3.7	31,958	2.0	188,792	5,908	311,757	1.3	9,755
N. Brunswick	2.9	28,565	1.8	173,118	6,060	296,802	1.3	10,390
Quebec	28.0	508,591	31.2	3,459,043	6,801	6,406,236	27.7	12,596
Ontario	35.7	800,023	49.1	6,326,544	7,908	12,516,413	54.0	15,645
Manitoba	4.7	48,325	3.0	310,760	6,431	588,920	2.5	11,565
Saskatchewan	4.3	14,578	0.9	103,147	7,075	217,941	0.9	14,950
Alberta	7.5	51,941	3.2	384,480	7,402	758,347	3.3	15,119
B. C.	10.1	129,308	7.9	1,099,080	8,499	1,912,561	8.3	14,790
Yukon	0.1	77	0.0	514	6,675	1,074	0.0	13,948
N. W. T.	0.1	144	0.0	1,200	8,333	2,158	0.0	14,986
Canada	100.0	1,628,380	100.0	12,129,897	7,449	23,167,000	100.0	14,227

Source: Census of Manufacturing, 1971, No. 31201.

*The picture given by this table is understated in that manufacturing in Quebec and Ontario is not comparable with the type of manufacturing in other provinces, where manufacturing mostly consists of primary processing. The truly secondary manufacturing is mostly only in Quebec and Ontario.

labor force, 59.9% of B.C. transportation employment, 57.1% of B.C. trade employment, 67% of B.C. employment in finance, insurance and real estate and 55.4% of the B.C. employment in education, health, personal, accommodation and food services.

This thesis deals primarily with the industrial and population structures in B.C. regions with the aim of determining the connections between them, particularly the degree to which the industrial structure determines the population structure. We will discuss the industrial requirements for labor in different regions and whether the resulting labor force and population structure is "normal" and what its economic consequences are, especially in terms of turnover rates.

Such a study should be useful in a time of growing problems and questions about the further growth of Vancouver. Governments on all levels are confronted with fiscal problems which are aggravated by the instability of the labor force. We will suggest some policies to consider for the development of frontier areas and the easing of pressures on Vancouver. These problems are very complex and difficult to solve. All conclusions and recommendations should be considered with caution and should be further studied.

B. Human Resources and Development in Frontier Regions

It is not clear how much man's abilities and capacities are innate and how much they are the result of influences of environment. This conflict was briefly discussed by F. H. Knight (1951: p. 16) who stated:

> "It is in fact a matter of the greatest uncertainty and one of the most disputed questions in the whole field of knowledge, as to how far observed differences in kinds and degrees of capacity are innate and how far they are the result of 'nurture' and the subtle influences of environment and social suggestion. The tendency of scientific study at the present time is to place more and more emphasis on the environment and less upon congenital structure."

If environment is really important then the economy, a very important part of the total environment, influences and shapes man.* Whether man is influenced favorably or unfavorably has a very important back-influence on the economy itself.

It is generally recognized that capital and labor are the most important economic resources, but some writers have suggested that human resources are more important than any other resource. Friedrich List (1916: Ch. 12) stated that goods themselves are of less importance than the ability to produce them, and that goods can be destroyed or become obsolete, but the ability to produce and improve them is what is important and must be nourished. Health, education, skills and organizational abilities are important, but

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*R.A. Shearer (1971: p. 36). "Growth and size of population of the region are themselves to be explained in large part by factors relating to the location of economic activity."

motivation, expectations, satisfaction and moral attitudes will also have economic consequences.* Other writers have argued that the prime causes of economic development are not material conditions or the amount of resources, but a "protestant ethic", and that differences in the level of development are the result of differences in the quality of human resources. McClelland (1961: pp. 422-425) even goes so far as to say that certain economic policies will gradually foster certain kinds of personalities.

Keynes stressed business expectations as an important economic factor, but all people - not only businesses - have expectations, and not only material expectations, but also social and cultural. Isard (1975: p. 13) says: "In response to questioning, my students have invariably placed at the head of the list properties with reference to diverse social phenomena and at the bottom, physical properties." It was said a long time ago that man does not live by bread alone. It is probably not enough to give workers in northern resource communities good wages while their other expectations are not met.

The B.C. interior industries are primary extracting and processing industries which employ mostly men. Because of this, and no doubt other factors, there is a high labor turnover (even at a time of high unemployment), an unstable

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*D.R.E.E. - "Western Region" (1973: p. 24): " . . . social and economic forces interrelate . . .."

population and consequently lower productivity and higher production costs. This situation only discourages new industries from locating in such regions and hinders their development, perpetuating the original problem in a "vicious circle".

Well-established married men are usually not willing to go to the remote areas. Single men will go North, but only because they cannot find jobs in the Lower Mainland. In a study on resident perception of quality of life in Fort McMurray, Matthiasson (1971: p. 23) writes that 77.2% of those interviewed gave as the first reason for the decision to migrate to Fort McMurray employment and 8.7% gave employment as a second reason. According to Lucas (1971: p. 354) miners say that "Mining was the only thing available. There was only one thing facing us--the mines."

Single men have a higher labor turnover. As soon as they make some money, many return to Vancouver, collect unemployment benefits and, if they are not able to find jobs in the meantime in Vancouver, they return to the North. This pattern is created not only by the lack of cultural and social life in the North (caused mainly by poor population structure), but also because progressive income taxes make high-paid labor uninterested in working the whole year (especially single men not responsible for a family).

Cawsey and Richardson (1975: Summary) feel that " . . . the provision of tax incentives for residents of isolated communities would alleviate to some extent the problem of labor turnover." Additionally, high unemployment benefits for high-paid labor, which are heavily subsidized by the government, make such patterns attractive.*

The nature of industries and conditions in the North creates additional costs to society, but presently these industries are vital to the B.C. economy. If we want them, we have to accept the externalities they produce and be prepared to spend money solving their social problems**, or we should try to change the industrial structure and create different social and economic conditions in such areas. The question of which is cheaper (especially in the long run) is important. Every benefit-cost analysis of northern projects should take into consideration the external social costs.

An excellent book about economic, environmental, social and cultural conditions in a single industry town is "Minetown, Milltown, Railtown" by R. A. Lucas. Lucas (1971: pp. 10-11) estimates that 3,465,000 of the non-farm population in Canada

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*It was suggested (in Germany and Eastern Europe) that one of the factors helping to maintain the ability to work is the continuity of work itself.

**Part of the costs connected with turnover - unemployment, welfare and congestion in cities - could be classified as such externalities. In some exceptional cases and with many reservations, drugs, alcoholism and some health problems could also be placed into this category. Costs to cope with such problems decrease our living standard and slow economic growth as well as contribute to fiscal crises of the state.

lives in communities with less than 1,000 people. Further, 6,000,000 people live in communities with up to 30,000 population, which are not in the sphere of metropolitan areas, are single industry dependent, and do not have a fully urban character.

There are some economic incentives for living in such communities. The basic wages are not much different from those in metropolitan areas, however, there is usually more overtime work caused by labor shortages and turnover, which is usually paid one and one-half times higher. But the poor population structure caused by a single industrial orientation and remoteness results in insufficient social and cultural attractiveness (especially in the case of single men). As one of those interviewed by Lucas (1971: p. 59) states: "The position of the men in the bunkhouses is rather bad . . . they are just lonely people . . . ."

On the other side we have developed areas with large cities, with much different population structures and with social and cultural attractiveness, especially for singles who are thus induced to migrate to such areas. But this causes problems again, such as excessive growth, congestion, high unemployment, social tensions and high prices of land and housing (which enables an increasing number of landowners to live from non-productive activities). No matter how fast metropolitan areas are growing, there are not enough jobs to

employ all who would like to live there. Governments are again called upon to help, to finance and speed further development and improvement in these metropolitan areas, to finance infrastructure, housing, public transportation, police protection, unemployment, welfare, etc. This only further increases the attractiveness of metropolitan areas and induces further migration. As the Greater Vancouver Regional District's "Livable Region" report (1976: p. 13) put it: ". . . the more we succeed in keeping Greater Vancouver livable, the more it will continue to attract people to come to live here." Such a situation can go on forever - frontier regions will never develop and the B.C. population will continue to concentrate around the metropolis. Of course, this is on the condition that governments would be able to continue financing the growing needs of service-oriented cities and to cope with social problems if there were insufficient growth of the goods producing hinterland. But fiscal crises on all levels of government have become an increasing problem (see, for example, O'Connor, (1973).

C. Other Aspects of Dependence on Primary Industries - Seasonality, Cyclical Sensitivity, Underutilization of Labor Force, Labor Disputes

As we have seen previously, an industrial structure based on primary extracting and processing industries produces some externalities, in that it creates an unbalanced

population structure which contributes to voluntary turnover, which in turn increases private and social costs of production and hinders further development of the frontier areas.

In addition, however, a one-sided industrial structure increases the region's sensitivity to cyclical and seasonal fluctuations, which results in involuntary turnover and other problems. Pinfield and Hoyt (1974: p. 19) state:

> "There are other advantages to the multi-industry town. Recessions are less likely to occur at the same time for all industries - moreover, seasonal variations are likely to be diminished."

Similarly, Black (1970: p. 117) comments:

> ". . . The province as a whole is virtually in thrall to an export market that can be but little influenced through the actions of British Columbians. Extreme vulnerability to fluctuations in the price and demand for timber, forest products and mining adds the important elements of uncertainty and fear to the attitudes of people in the company towns and the resource dependent communities."

The same argument is used by Lucas (1971), Clegg (1958), the Department of Economic Development, and D.R.E.E. Because primary products are mostly exported, we are too dependent on changes in demand abroad. Our fiscal and monetary anticyclical policies support demand for imported goods, while our domestic production is influenced very little.

Another argument for diversification of the B.C. industrial structure is that in the present "belt-tightening" situation which exists all over the world, countries with

industries able to increase female employment might be in advantageous positions. By increasing female employment and attempting better economic utilization of their existing population, they may be able to preserve and enhance their living standard.*

As dependence on primary industries causes some hardships to workers - discharges (involuntary turnover) caused by cyclical and seasonal sensitivity of industries, not enough jobs for wives, frontier character of life (remoteness etc.) - some labour disputes in B.C. may be the result of the character of the B.C. economy. Workers simply want to be compensated for such problems by higher wages. (See Jamieson, S.N., pp. 405-416).

From the long run point of view, we may be required to change our priorities, and to support the development of interior and frontier regions and to improve the industrial structure in these regions. Pinfield and Hoyt, (1974: p. 20) argue in favor of expanding and decentralizing secondary processing to offset somewhat the overcrowding of our established urban centres. However, there may be some

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*The level of development is usually defined by income level. However, the question "Which is better - to have only one member of the family employed in primary industry with high income, or more members employed, each making less money?" may be asked. Because of possible positive external effects of employment, we believe that the second alternative is better. Further, we do not argue against primary industries; we want such industries to be complemented by some manufacturing industries so that workers making good money in primary industries can still earn it. Such improved economic utilization of population may result in higher savings and capital creation.

arguments against speeding up the development of frontier regions and diversification of industries. We deal with this in the next section.

D. Possible Counterarguments to Developing Frontier Regions: Comparative Advantage, Climate, Specialization, Pollution

There are economic reasons for the existing structure and spatial location of industries (but social costs and benefits external to private operations have been rarely considered). To develop frontier regions is a difficult task and they have to offer some economic advantage for their development. There are many problems involved with commencing production in remote areas, far from the markets, from suppliers and from an available labor force. A comparative cost advantage which enables location of the first industries is very important to start the development of the frontier. The usual economic advantages of the frontier regions are natural resources - minerals, land, fish, forests or climate. It was not by chance that many regions in B.C. grew dependent on mining. This is the only economic advantage they have, but if no other economic activities grow on the basis of such primary industries, these regions will have shaky futures. Once the non-renewable resources are depleted, there is nothing left but ghost towns. If we miss the opportunity to build up other industries while mines are in operation, frontier regions in B.C. can lose their opportunity to develop for a long time. At the present time,

there is no other economic advantage in many B.C. frontier areas. There is little agricultural land or attractive climate. In addition, if a mining community becomes a ghost town, there is considerable loss in roads, buildings and other infrastructure.* An excellent description of such an unfortunate occurrence in some B.C. frontier regions has been given by Clegg (1958). The survey of B.C. ghost towns in Chapter I especially gives ample evidence that great mines can be depleted.

The present development of mining in B.C. does not attract a permanent population, partially because there are no other industries in the region which would diversify employment opportunities and population structure and make living more attractive and secure in such regions. Neither does mining attract different industries, no doubt since there is no stable population in the region and, as a result, both operating costs and risks to locate in these areas are too high. Such a situation becomes a vicious circle. As Sinclair (1974: p. 24) has pointed out: "The amount of investment made in an area depends on the attractiveness of the region as a place to live, just as the attractiveness of the area as a place to reside, in turn, depends on investment."

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*Part of the infrastructure is financed or subsidized by governments and is not included in private costs.

Since many B.C. regions do not have a very attractive climate, this may be used as an argument against their development and permanent settlement. However, we consider climate as a part of living conditions which can be outweighed by other "amenities". There are enough examples which show that climate by itself is not so important. Big cities in Europe like Stockholm, Helsinki, Leningrad, Murmansk or Moscow have a very severe climate in comparison to most B.C. regions. But we do not have to go to Europe for examples. North American cities like Anchorage, Edmonton, Saskatoon or Winnipeg have harder winters than most B.C. regions.

An argument against diversification could be specialization. Specialization makes it possible to exploit the very important economies of scale. It may be argued that the B.C. economy specializes in primary industries and such specialization is beneficial.* Since specialization usually requires export (especially in Canada with a relatively small domestic market), in order to benefit from specialization, our economy has to be dependent on foreign trade.

However, we do not consider dependence on primary industries as specialization in a proper sense, but we term such "specialization" as "underdevelopment". As we discussed

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*Most of today's industrial powers were underdeveloped in the past and dependent on primary industries. They rejected such "specialization" and intervened into the free market in order to develop secondary manufacturing: pro-tariff policies after the revolution in the United States (Hamilton), pro-tariff and state intervention in Germany (List), industrialization policies in Russia (Lenin).

above, such "specialization" has serious disadvantages. Even such stout advocates of specialization as the Economic Council of Canada (1975: p. 72) have to admit that, in the case of completely free international trade, areas in which production tends to be resource-based were judged to have every prospect of continued prosperity where it already existed - i.e. in primary industries and little else. However, on p. 65 they say that there is as yet no precedent for evolution of a post-industrial economy without securing notable proficiency in the sphere of manufacturing production and "evidence today appears to suggest that post-industrial competence follows mostly from success in the more sophisticated areas of manufacturing activity. Thus we feel it is extremely important to stress the need of enhanced performance in this field . . .."*

We ourselves recognize the importance of economies of scale (Chapter 8) which can be achieved only by specialization and foreign trade.** The Economic Council of Canada (1975: p. 109) says that problems of the manufacturing sector are caused by the lack of specialization and scale and further, on p. 111, that capital/output ratios in Canadian manufacturing

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*According to the Economic Council of Canada (1975: pp. 23-24; 200) secondary manufacturing has a higher factor content of educated labor than primary industries. This may result in overqualification, underemployment and outmigration of educated labor if primary industry is emphasised.

**Some benefits of specialization could be achieved without increasing foreign trade - through rationalization, specialization and standardization of production producing for domestic markets. However, such a move would require cartelization of industries and reduction of benefits of competition.

are much higher than in the United States, primarily because of small scale. We would not like to create the impression that specialization and diversification are mutually exclusive concepts. We would like to see specialization and diversification go hand in hand - diversify in a sense of developing viable secondary manufacturing industries which have comparative advantages in B.C. and specialize in such activities.

The staple theory of economic growth gives a theoretical explanation for dependence on primary industries (for example, Watkins - 1963). However, it was also pointed out that a country or region can get used to such a pattern and end up in a "staple trap" and miss opportunities to develop secondary manufacturing. Policies of developed countries and regions (for which such a situation is advantageous) only help to perpetuate the dependence of underdeveloped regions on primary industries.* Examples of such policies are transportation rates, tariff structure and especially non-tariff barriers.

There may be some environmental concerns in connection with the development of secondary manufacturing. More manufacturing means more pollution, so why not leave

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*R.A. Shearer (1971: p. 36): "Foreign tariffs discriminate against manufactured products."

manufacturing to other countries? However, we have to have some industries, otherwise we could not exist. The only question environmentalists should be concerned with is which industries have the lowest negative environmental impact. There is some evidence that primary industries (especially primary processing industries) are much bigger pollutants per dollar of value added than most secondary manufacturing.

Considering economic underutilization of population, high social costs, depletibility of natural resources, high capital-output ratio and necessity to import and service huge amounts of capital*, primary industries alone may not be able to create a long term economic base for the province**.

E. Plan of Research

We will first (Chapter 2) examine the problem of labor turnover in Canadian frontier areas and primary industries; especially the size, effect, costs and causes. Since turnover data by census divisions and industries is inadequate, this will be mainly a survey of the literature.

Next, in Chapter 3, we will describe B.C. and Alberta census areas.

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* See for example article in The Vancouver Sun, October 25.1977 - p. A4, "Canada is the West's economic invalid" which states that Canada has accumulated foreign debts approaching $ 100 billion, while all under-developed nations of the world have foreign debts of around $ 175 bill.

** Canada has highest per capita imports and exports in the world. This implies very high existing specialization - unfortunately in primary industries only.

In Chapter 4 we will try to find out what the industrial structure is in each of 29 B.C. census areas and what the requirements are on the labor force by different industries. We will be especially interested in what the effect of industrial structure is on the female to male employment ratio in regions and how the different census areas utilize the possibility (opportunity) of employing females, given their industrial structure. We will compare B.C. with Alberta to provide a frame of reference.

Chapter 5 deals with population structure in B.C. census divisions. We will try to find out the rate of growth of the population, sex structure, marital status, age structure, degree of urbanization, labor force participation and some other characteristics of the population. We will attempt to determine whether these population structures are "normal" and what their economic consequences are.

In Chapter 6 we will try to reveal what the economic incentives are to locating and working in different census areas.

Chapter 7 is a synthesis of the study. We will run regressions to determine the effects of industrial structure on employment structure and further on population structure. We will also try to explain turnover rates in census

divisions by population structure and industrial structure.

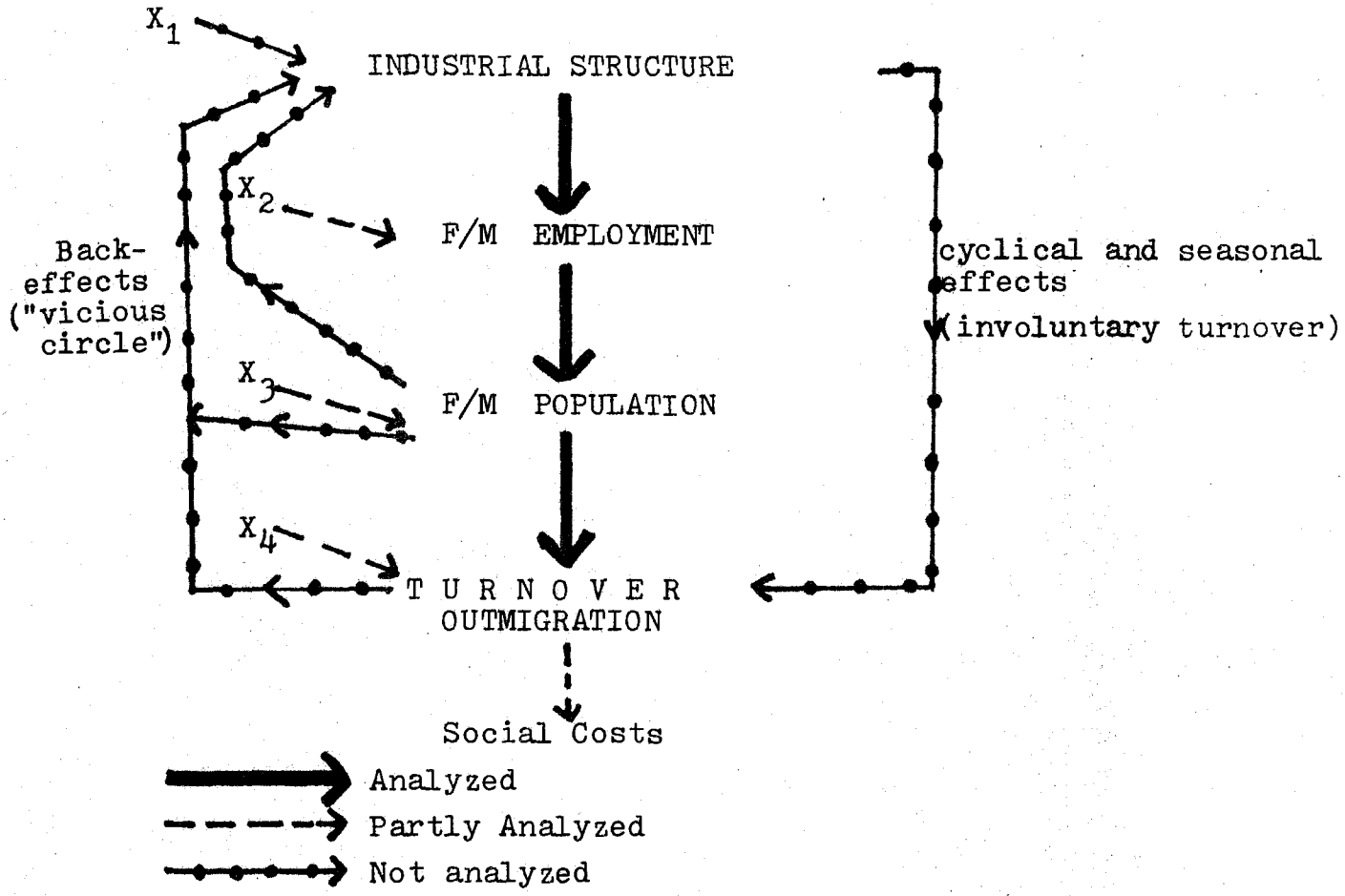
In many B.C. areas dependent on primary industries, labor force, closeness to markets and urban and other agglomeration economies are non-existent. Only special industries can locate in such regions. They are typically capital intensive with modern equipment (producing high value added per worker) and have some kind of natural resource advantage. In Chapter 8 we will briefly deal with the question of which industries are suitable for location in frontier regions as an extension of existing industries, and are also able to improve population structure and create a viable industrial complex. Such development could diminish both voluntary turnover caused by unbalanced population structure and involuntary turnover caused by cyclical and seasonal fluctuations in production.

Chapter 9 examines the problems connected with further growth of Greater Vancouver and the effect of such growth on the development of the B.C. Interior. The "Livable Region 1976/1986" is used as an example for a settlement plan for the whole of B.C.

In Chapter 10, the study concludes with the classification of B.C. census divisions into three groups and a recommendation for policy analysis.

The following diagram should make our research plan

easier to understand:



In this study we deal only with a part of this complex problem - namely the effects of Industrial Structure on female/male (hereafter F/M) employment and further on F/M population and turnover rates. In our diagram, this is depicted by heavy arrows between Industrial Structure and Turnover Rates. This is the main objective of our study. As side issues, we examine

some other effects on F/M employment, F/M population and Turnover rates. The other determinants of industrial structure (X_1) are only briefly commented upon in Chapter 1. The other determinants of employment (X_2), of population (X_3) and of turnover (X_4) are only briefly analyzed in Chapter 7.

The very important direct cyclical and seasonal effects of industrial structure on turnover are not examined, partly due to insufficient data, but we have included a few regressions in Chapter 7 where we connect outmigration directly to % LF in primary industries.

The "back-effects" of turnover and population structure on industrial structure are briefly commented upon in Chapter 1, where they are referred to as a "vicious circle". The "back-effects" of population structure on industrial structure are analyzed partly in Chapter 7 where population structure is included into some equations as one of the determinants of industrial structure.

Except for a section in Chapter 2 and some crude estimates in Chapter 7, we will not deal with effects of turnover on the social costs of production. With the available data, such effects are very difficult to measure.

CHAPTER 2

LABOR TURNOVER PROBLEMS IN FRONTIER AREAS

A. The Size of Labor Turnover

Estimates of the magnitude of labor turnover in remote areas differ widely, depending on the industry, company and region, but it is generally recognized that turnover rates in primary industries and in frontier areas are high. For example, MacMillan and Tulloch (1974: pg. 1) examining turnover problems in the Canadian mining industry, found that ". . . the average turnover rate for all responding companies (67 mining companies in 1972) weighted by employment size was 80 per cent." "The highest gross turnover rate was 2,200 per cent."

Similarly, Pinfield and Hoyt, (1974: pg. 3) studying labor problems in Kitimat, came to the conclusion that " . . . current high levels of aggregate turnover of over 60 per cent have a significant impact on the efficiency and costs of plant operation as well as on the community."

In the report on manpower problems in the B. C. logging and sawmill industries, P.S. Ross and Partners (1973: pp.51, 81, 90) found that the three northern Vancouver Island logging operations experienced weighted average labor turnover of

155%. "In the Fort St. James area the large company turnover rates averaged approximately 75% per annum, while the small contractor rates were 230% and 550%." "In the Vanderhoof area turnover rates varied from as low as 18% to approximately 600%." According to the report, similar variations were seen in the sawmill industry where turnover ranged between 0% and 500%.

A report on the development possibilities in the North East region of B. C., prepared by the Department of Economic Development (D.E.D.) (1975: pg. 97) states that one of the biggest problems in developing the North East is that "persistent bottlenecks occur as a result of labor shortages and high labor turnover. Increasingly, people migrate and settle in response to urban amenities rather than employment opportunities."

Similarly, D.R.E.E. in "Western Northlands" (1973: pg. 9) states that " . . . a majority move into the northern areas to make a stake and get out. Labor turnover is high, for some industries running to one hundred per cent or more a year. This not only results in an insecure social situation but also adds to the already high costs of operation for industries in remote areas."

As to the problem of labor turnover in single industry towns, one of the interviewed by Lucas (1971: p. 47) notices

that a company had to hire 1,800 men each year to maintain a work force of 800 - " . . . all of the people consider themselves to be living here temporarily."

Sinclair (1974: p. 7) examined the problems of single industry communities in the Terrace-Kitimat area. He wrote that " . . . labor turnover in logging camps in the northern areas of B. C. is running well over 100%." He also notices that " . . . high labor turnover rates are at the time when there is idle labor in other parts of the province."*

Until 1966, Statistics Canada published separation rates by industries and regions. In 1966, this publication was discontinued. Table 2 thus uses the last data published to show how turnover differs between industries. We have summed monthly separation rates for the year September, 1965 to August, 1966. Such rates are of course affected by cyclical sensitivity and seasonal character of industries. We can clearly see that Construction, Forestry-Logging and Mining had the highest separation rates. These same industries are the major employers in frontier areas.

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*On the other hand, if there were not idle labor in other parts of B. C., industries with high labor force turnover in remote areas would not be able to replace quitting labor. Surplus labor might be necessary for high turnover areas and industries.

TABLE 2

SEPARATION RATES - PACIFIC REGION (B.C. AND YUKON)

Industry	Sept. '65 to August '66
All industries	89.8
Forestry-logging	202.4
Mining	130.9
Manufacturing	83.4
Construction	257.3
Transportation	48.7
Trade	66.1
Finance, Insurance, Real Estate	59.0
Services	69.9

Source: Dominion Bureau of Statistics, #72-006.

According to Pinfield and Hoyt (1974: pg. 7), Ross and Partners (1973) and other reports, turnover rates in frontier regions have, in the last few years, increased substantially. This may be the result of both easier access to U. I. C. benefits and an increasing proportion of single workers in resource industries.*

Lists of the studies which mention turnover as a serious problem for primary industries in frontier areas could go on. We have included only a few to illustrate the point.

B. Effects of Turnover

We can argue that a reduction of high rates of turnover

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*This problem is further discussed in the section entitled "Reasons for Turnover".

would result in benefits to the economy, the local community, the company and probably also to the individual.

i) Private Costs to the Company and Industry

Replacement costs basically include advertising, interviewing, travel, medical examinations, indoctrination and training. There are also increased production costs of paying overtime and the loss of production resulting from the lower productivity of new employees. But such direct costs are only part of the problem for the firm. It has been suggested that wastage, accident frequencies and absenteeism are related to turnover.

Siemens (1973: pg. 21) writing on single enterprise communities in Canada quotes D. L. Makale (1973: unpublished data) that the " . . . average cost of replacement for a married worker is up to $10,000."

Pinfield and Hoyt (1974: pg. 4) say that the recent changes in turnover (in Alcan-Kitimat) and their repercussions throughout the plant have been estimated to "have increased the cost of operation approximately $3 million to $4 million a year."

Referring to the problem of turnover in logging and sawmill industries, Ross and Partners (1973: pg. 25) state that the cost of putting a man on the payroll in a Northern

Vancouver Island operation has been estimated at $600. Further, they say that " . . . while this cost sounds high, it is relatively small compared to the cost of lost production and lower productivity from a work force which is less experienced that it would be if greater stabilization could be accomplished. The potential profit improvement from even a small reduction in labor force turnover is staggering, as are the less tangible benefits of a more highly skilled, better motivated and more productive labor force." " . . . it seems likely that with a sufficient reduction in turnover and relief of skill shortages, an improvement in labor productivity of 5 to 10 per cent or perhaps 15 per cent could be achieved."

The study on labor turnover in the mining industry done by the Mining Association of Canada (1974) found that the turnover could have cost the industry $350 million in 1974. The largest costs appeared to be associated with lost production due to labor shortage and inexperienced workers. According to the Mining Association, companies in B. C. experienced higher turnover than those in other provinces.

Quite different estimates of turnover costs in the mining industry are given by MacMillan and Tulloch (1974: pg. 1). From the survey of one-third of all Canadian

mining companies, they estimated turnover costs for the whole industry for 1972 as being $36 million. However, these are only separation and hiring costs; loss of production is not included. The estimated average cost per employee for responding companies was $584 for separation and $428 for hiring.

Turnover costs are mentioned in numerous other studies. For example, executives in a Flin Flon mine are quoted by Cawsey and Richardson (1975: pg. 1.1) as saying that " . . . production is being hurt because the constant turnover means that we cannot properly train workers. Ten years ago, 100 men could produce 1,100 tons a day, but now they can only produce 600 tons."

G. Shramm (1968: p. 228) discussed the viability of locating aluminum smelters in the Canadian north. He says that lower Canadian wage levels may offer cost advantages of $15. to $20. per ton (as compared with the U.S.). He concludes that these advantages will be largely offset by higher labor turnover rates in Canada.

ii) Indirect Costs to Society

Unemployment and welfare costs per capita are higher in Canada than in any other developed country (Maki and Spindler (1976)). There might be many reasons for this, but one is probably the high labor turnover partly caused

by a frontier economy with cyclical sensitivity. Orientation in primary industries is also causing unbalanced employment and population structure, which increases turnover and consequently unemployment rates. MacMillan and Tulloch (1974: pg. 2) say that transfer payments are a positive function of turnover. Sinclair (1974: pg. 10) states that " . . . both public and private costs are associated with the movement of population." Similarly, Ross and Partners (1973: pg. 68) argue that " . . . there would be a corresponding reduction in governmental social oriented expenditure and increased governmental revenue resulting from increased average length of employment per worker."

iii) Impact on Development of Frontier Communities and Frontier Regions

High labor turnover has negative effects on frontier regions and communities. If workers think they are only temporary, they will not buy many durable goods, i.e. spending in the area will be low. If the workers consider frontier areas only as a temporary place in which to make money, they will leave as soon as they are out of work; unemployment insurance, welfare and strike payments will not be spent in the remote area. This makes some businesses too risky and hinders development of the remote areas.

D.R.E.E. in "Western Northlands" (1973: pg. 17) states that " . . . in the extreme remote community . . . there is no income multiplier - all the money going in goes out . . . after one transaction."

Interdependence between population stability and development of frontier regions is emphasized by Sinclair (1974: pp. 24-27) who writes: "The amount of investment made in an area depends on the attractiveness of the region as a place to live just as the attractiveness of the area as a place to reside depends on investment. It is in fact a vicious circle." "The base industry or outside injections to the local economy may increase the size of local payroll, however, the effect of such injections is weak when expenditures on local goods and services are small."

Another problem is that temporary residents are disinterested in community affairs. Sinclair (1974: pg. 26) says: " . . . there is little incentive for individuals to support money bylaws which will not bring about visible and immediate benefits to themselves . . . large expenditures intended for the long range good of a community would not necessarily receive support from those people who do not intend to permanently reside in the area." Lucas (1971: pg. 47) confirms: "You cannot build a town if everyone thinks they are temporary."

Horsfall and Bradbury (1974: pg. 4; 45) analyzing community problems in Port Alice comment: "To achieve and maintain a healthy and interactive community, a stable core population of some size and tenure is needed. Without such a group, sustained and organized community effort is a virtual impossibility, as there is little opportunity to develop shared values, norms and goals." "In Port Alice the population turnover wreaks havoc with attempts at community development." "It was also suggested, that transience begets transience. The substantial yearly turnover in population makes self-help efforts less viable, while bringing in a population which increases the need for those efforts."

We conclude with a quotation from I. Robinson (1962: pg. 6): "If settlement and developing of the Canadian Northlands depends ultimately on attracting and holding workers, it may well be that the greatest single challenge in the future will be that of creating acceptable and viable communities."

C. Reasons for Turnover

There are many reasons discussed in the literature such as poor recruitment practices, wages, poor management, not enough advancement opportunities, remoteness, lack of services, poor housing, climate, social and cultural conditions, lack of females, etc. Sinclair (1974: pp. 10-11) says that

the " . . . explanation is difficult, particularly since an appeal to the commonly accepted concepts found in standard economic theory do not appear to provide satisfactory answers." "Relative wages do not capture adequately the economic attraction of various regions within the country." "Thus, it would appear that the failure to attract permanent residents to the area can be explained neither in terms of wage variations nor in terms of alternative employment opportunities." Price (1975: pg. 51; 65) cautions against assigning too much importance to pay as a determinant of turnover. He proposes a theory which includes both economic and non-economic determinants. Similarly, Cawsey and Richardson (1975) say that " . . . turnover has no single cause and there is no single cure."

Some writers argue that the inadequacy of shopping and service facilities is one of the main reasons for high turnover, but the results of other studies are contrary to this opinion. Barclay and Baxter (1974: pp. 20; 38; 50), surveying homemakers in Thompson, Manitoba found that " . . . the general opinion on the variety or amount of choice and the quality of food were unexpectedly favorable." "Problems related to cheque cashing and general banking services seemed to be minimal." "The selection and availability of appliances did not appear to be a problem. Variety,

desired features, available models, condition when received and the number of retail outlets stocking appliances all were considered satisfactory by the majority of respondents." "Over 97 per cent of all homemakers expressed no difficulty in obtaining any item necessary for household operation." According to Barclay and Baxter, the lack of any specific item being a problem is trivial. It can be seen that the overall ratings received by retail outlets were high. Matthiasson (1971: pp. 12-14), who conducted research on resident's conception of needs in the typical resource community of Fort McMurray (260 miles north of Edmonton) comes to similar conclusions. Residents gave the highest priority to improvement of entertainment and recreational facilities. The high priority items being in need of drastic improvement also are access to southern cities and communication services. All other factors including accommodation, education and retail facilities have low priority.

Are entertainment, recreation and contacts with the South really so important? Why do communities and companies operating in frontier areas not supply recreation and entertainment if turnover is so costly to them? But many companies are trying to supply entertainment and recreation for their workers.* Some company towns probably have better recreational facilities per capita than many southern

*Ormsby (1958: p. 410) says that however many amenities a company supplied, nothing could compensate for the isolation of the town, which is not exactly our opinion.

communities,* but even in such towns, turnover is a very serious problem.

Ross and Partners (1973: pp. 57-62) argue that nearness to home (south) has to be regarded as the single most important motivation among those measured. They say that " . . . remoteness and isolation as a reason for voluntary turnover was ranked first in two logging operations and third in the other." Why is it so important to be close to southern communities? Cram (1969: pp. 144-145) says that " . . . it is time to pay some deliberate attention to the psychological as well as the physical climate in the Arctic." Ross and Partners (1973: pp. 52-64) state that turnover in bunkhouses (single accomodation) is 290%, while turnover in married accomodation is 39%. There is obviously a remarkable difference in the turnover rate between bunkhouses and married accomodations. Whereas the bunkhouse residents leave their jobs approximately every three months, the residents in married accommodations change jobs only approximately every three years. Ross and Partners (1973) continue: "Particularly in the more isolated operations there appeared to be a general atmosphere in the single quarters of constrained social and leisure activity relating both to the general absence of members of the opposite sex as well as the absence of the opportunity for a broader variety of

*For example, the Cassiar Asbestos mine in Clinton Creek has a club, indoor ice hockey and curling rink, ski lift, beer parlor, library, movies 3 times a week - all for less than 1000 residents. Of course, not all people live in company towns and in some places recreational facilities could be insufficient.

social diversion. The feeling of being "bushed" appeared to grow readily in the abnormal social environment. Under these circumstances it is no wonder that single workers in particular frequently feel the need to "go to town" and to "cut loose".

Bancroft (1975: pg. 31) describes the situation in B. C. Mining communities as follows: "For the single employees - most complaints spring from the absence of suitable leisure and recreation activities. This is usually centered around the lack of women for single men to take out. The shortage is indeed acute in the smaller communities where, apart from a few single female mine employees, there are virtually no unmarried women. This situation turns dances, clubs and movies into dull affairs with little to do but put up with male camaraderie in sports, drinking sessions, or fishing and hunting."

There are many examples in the literature of unbalanced employment and population structures in resource industry towns. Horsfall and Bradbury (1974: pg. 134) argue that resource communities need more sources of jobs, especially for women. Pinfield and Hoyt (1974: pp. 5-18) are discussing the same problem in Kitimat: "Places for social gatherings, 'cruising' and meeting young women are highly desired by the younger worker."

Pinfield and Hoyt include in their study a table of historical and current turnover rates by marital status in Kitimat:

Marital Status	Historical Turnover Rate (69/72)	Current Turnover Rate (74)
Married	20.8	33.7
Single	46.9	125.6

They say that over three-quarters of turnover increase is because there are many more singles. In periods of a tight labor market the labor segment most readily available is one having high mobility. Both quits and non-quits expressed greatest dissatisfaction with opportunity for entertainment and recreation. The authors note that entertainment and isolation are likely to be more sensitive issues for younger, single workers than their older married counterparts. Younger, mostly single workers, who work in poorer conditions have little influence on the job and in the community. There are few unattached women. As a solution, the authors propose multiple industry towns: "Instead of the single industry town we believe multiple industry towns should be used as a more

viable model for the industrial development of the north. As such, it has a population base capable of supporting a wider variety of community activities such as entertainment and recreation facilities. These in turn will support a more heterogenous population, one containing more single females than the single industry towns."

Similarly, Cawsey and Richardson,(1975: pp. 8, 10, 13, 44) speaking about turnover in mining,come to the conclusion that increasing age and marriage makes employees more stable, that the workers with turnover characteristics are young and single, that the proportion of female workers should be increased substantially and that simple aging of the community will not in itself decrease turnover.

Lucas (1971: pp. 50-51) quotes one member of a resource frontier community as saying that several thousand single men - and there were about fifty single women - live in company dorms under rather poor conditions. Lucas continues: "Most of the discussions centered around women and plans for big parties and the problem of finding enough women to half go round the guests of the party . . . isolation, leaves, women and housing conditions were the major topics." "The sex ratio is crucial to young graduates . . ."

Robinson (1961: p. 82) showed that the ratio of number of males to 100 females in four new single industry towns in

Canada ranged from 143 to 1,119. Drayton Valley in Alberta had the closest ratio. This town differs from others in that it was not built from scratch, but existed before as a rural service center for surrounding agriculture. The town continues to hold this function along with its role as a residential business service center for the oil industry. It is not actually a single industry town.

On the same topic, Sinclair (1974: pg. 14) says that " . . . another factor is the apparent shortage of females in the region. This is both a cause and effect of the comparatively low rate of permanent settlement."

That the sex ratio may have rather subtle but profound effects upon psychological traits and general behavioural patterns is also stressed by Landis (1948: pg. 78) who, writing on population problems generally, states: "The abnormal proportion of males is usually conceded to be a factor in behaviour as, for example, in the frontier mining and cattle raising towns, which ordinarily draw mainly male settlers." "Carelessness with life is characteristic in absence of women . . ." "A high rate of violent deaths and high suicide rates are to be expected." Siemens (1973: pp. 23, 27) wonders about a startling and unexplained change in major causes of death in the Canadian North: "The North now has a new champion killer, labelled "Injuries - Accidents -

Violence." "The stress symptoms of isolated northern Canadian community residents most frequently referred to in the literature include: a) mental health problems, especially depression; b) alcoholism and drunkenness; c) extreme loneliness; d) feeling of insecurity and uncertainty; e) "cabin fever" and "crowding"; f) promiscuity; and g) suicide-accident-injury-violence." In the same study, Seimens (1973: p. 22) says that the strong economic incentive for maximum stability of the labor force also implies a preference for a maximum number of married employees.

Sociologist E. A. Ross (1933: pp. 3-11) explains population instability in the North this way: ". . . population is in a continual flux, for the men tire of womenless life . . ."

To conclude, we again quote Landis (1948: p. 79): "In a male community . . . there is little interest in civic beautification or the development of permanent social institutions. A male town is, so long as it remains a male town, a transient town that lacks homes and all of the permanent improvements that go with a home-making locality."*

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* Landis (1948: p. 81) also states that "It is probable that in many areas where the sex ratio is predominantly female one finds extreme expression of various patterns of feminism ---."

It is argued that resource industries in Canada are highly productive. But the underutilization of labor force resulting from dependence on primary industries may result in over all per capita productivities not being very high. The Economic Council of Canada (1975b, p. 44) says that:

". . . resource industries must try to hold and even increase their labor force under conditions considerably different than those in the urban-centered, service industries. Highly volatile demand conditions, instability in capital investment, sharp seasonal variation in employment and remote area and rural living conditions cause high rates of labor turnover and conditions of work in which steady, long term gains in productivity are difficult to achieve."*

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*The sex imbalance as a problem of development of the B. C. frontier regions is mentioned in some very recent studies, for example Farstad (1976), East Coal Manpower Subcommittee of the B. C. Government (1976) and the Department of Economic Development reports (1975-76). Farstad gives sex imbalances considerable importance. He supports MacMillan's (1974: p. 107) conclusion that a one per cent increase in the proportion of male workers in mining is associated with a 7.84% increase in labor turnover. Farstad states that the major obstacle to increased female employment is social conventions, not physical differences between sexes. (This is not exactly our opinion). He also argues for greater decision-making authority to employees. By improving industrial democracy the alienation of workers, and consequently turnover, can be diminished. Farstad uses metropolis-hinterland model in his study and argues for greater equality between the two. To improve health services throughout the B. C. frontier, Farstad is in favour of directly allocating immigrants and university graduates if all other methods fail.

CHAPTER 3

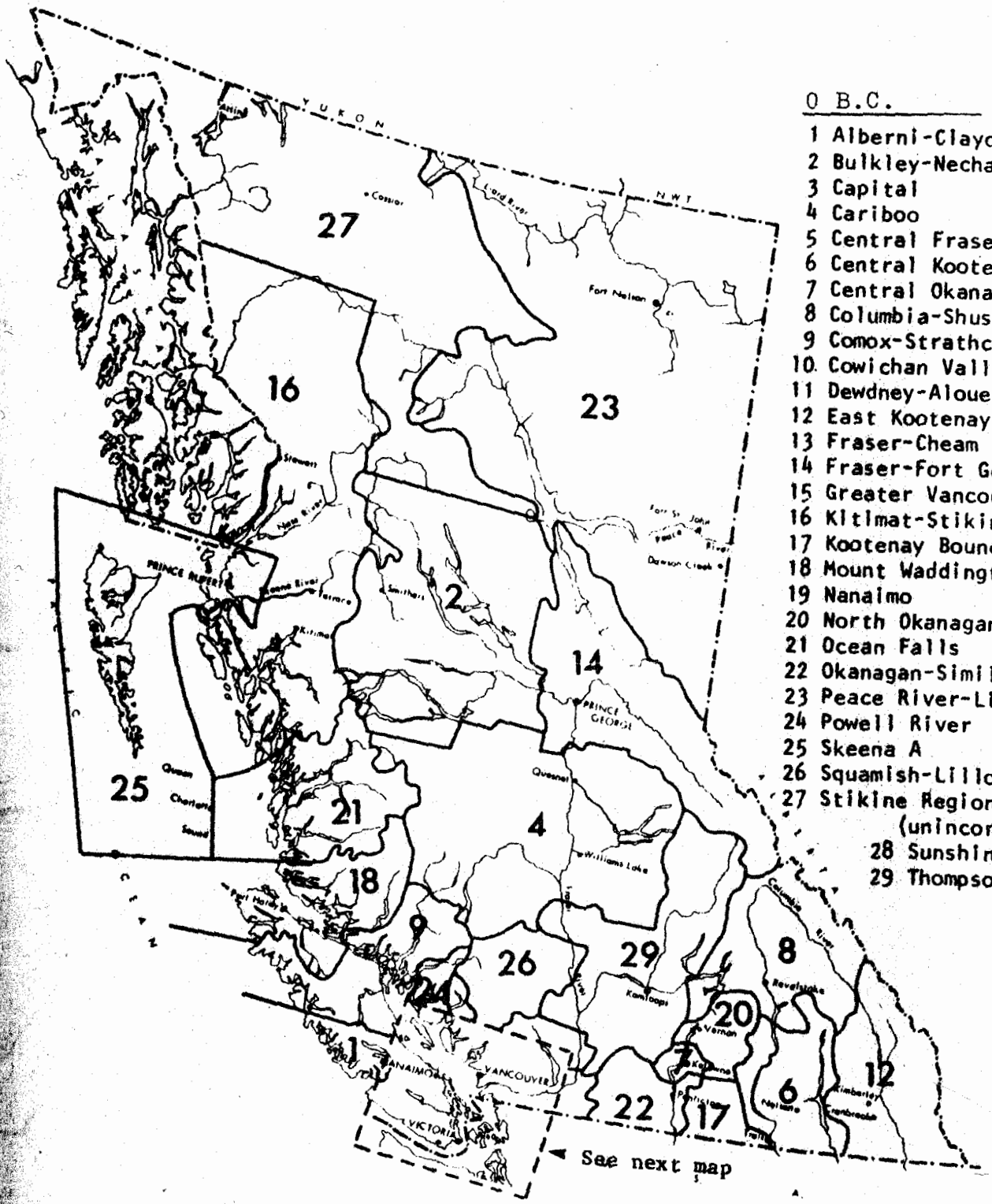
DESCRIPTION OF B. C. CENSUS DIVISIONS AND REGIONS

There are 29 census divisions in B. C., some of which are huge in area with a small population, some with the opposite characteristics, some more developed and some less. Each area is assigned a number (the same number as in the 1971 census) and is hereafter usually identified by this number alone. The total of B. C. is identified by "0" and in all tables occupies the first row.

The British Columbia Department of Economic Development divides B. C. into 9 or 10 economic regions. The nine region system is as follows:

Region	Current Census Divisions
1 - East Kootenay	12
2 - West Kootenay	6 + 8
3 - Okanagan	7 + 17 + 20 + 22
4 - Kamloops	26 + 29
5 - Lower Mainland	5 + 11 + 13 + 15 + 24 + 28
6 - Lower Coast-Vancouver Island	1 + 3 + 9 + 10 + 18 + 19
7 - Central Interior	2 + 4 + 14
8 - North East	23
9 - North West	16 + 21 + 25 + 27

FIGURE 1 **CENSUS DIVISIONS** OF BRITISH COLUMBIA, 1971



0 B.C.

1 Alberni-Clayoquot
2 Bulkley-Nechako
3 Capital
4 Cariboo
5 Central Fraser Valley
6 Central Kootenay
7 Central Okanagan
8 Columbia-Shuswap
9 Comox-Strathcona
10 Cowichan Valley
11 Dewdney-Alouette
12 East Kootenay
13 Fraser-Cheam
14 Fraser-Fort George
15 Greater Vancouver
16 Kitimat-Stikine
17 Kootenay Boundary
18 Mount Waddington
19 Nanaimo
20 North Okanagan
21 Ocean Falls
22 Okanagan-Similkameen
23 Peace River-Liard
24 Powell River
25 Skeena A
26 Squamish-Lillooet
27 Stikine Region (unincorporated)
28 Sunshine Coast
29 Thompson-Nicola

FIGURE 1 (Continued)

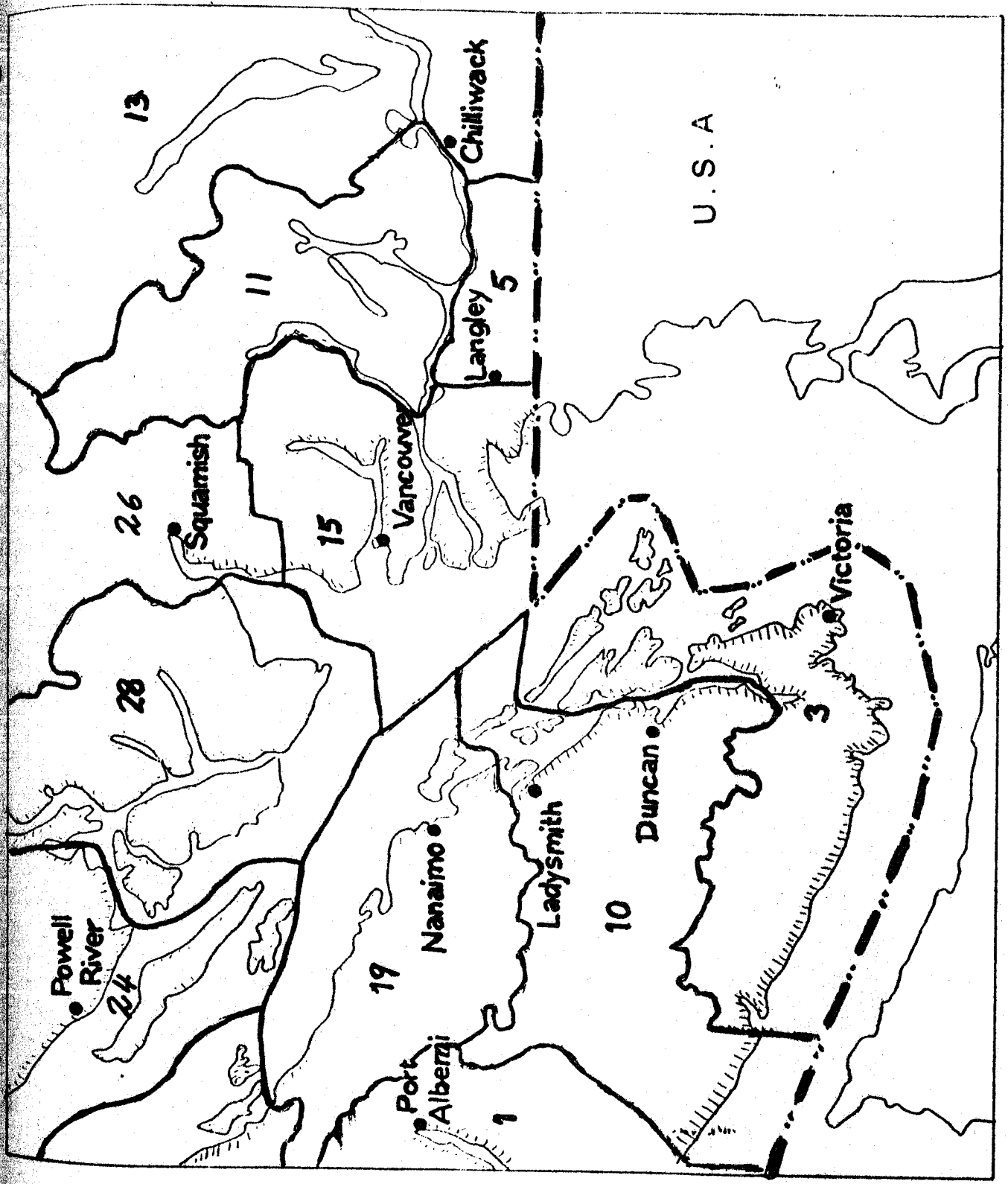
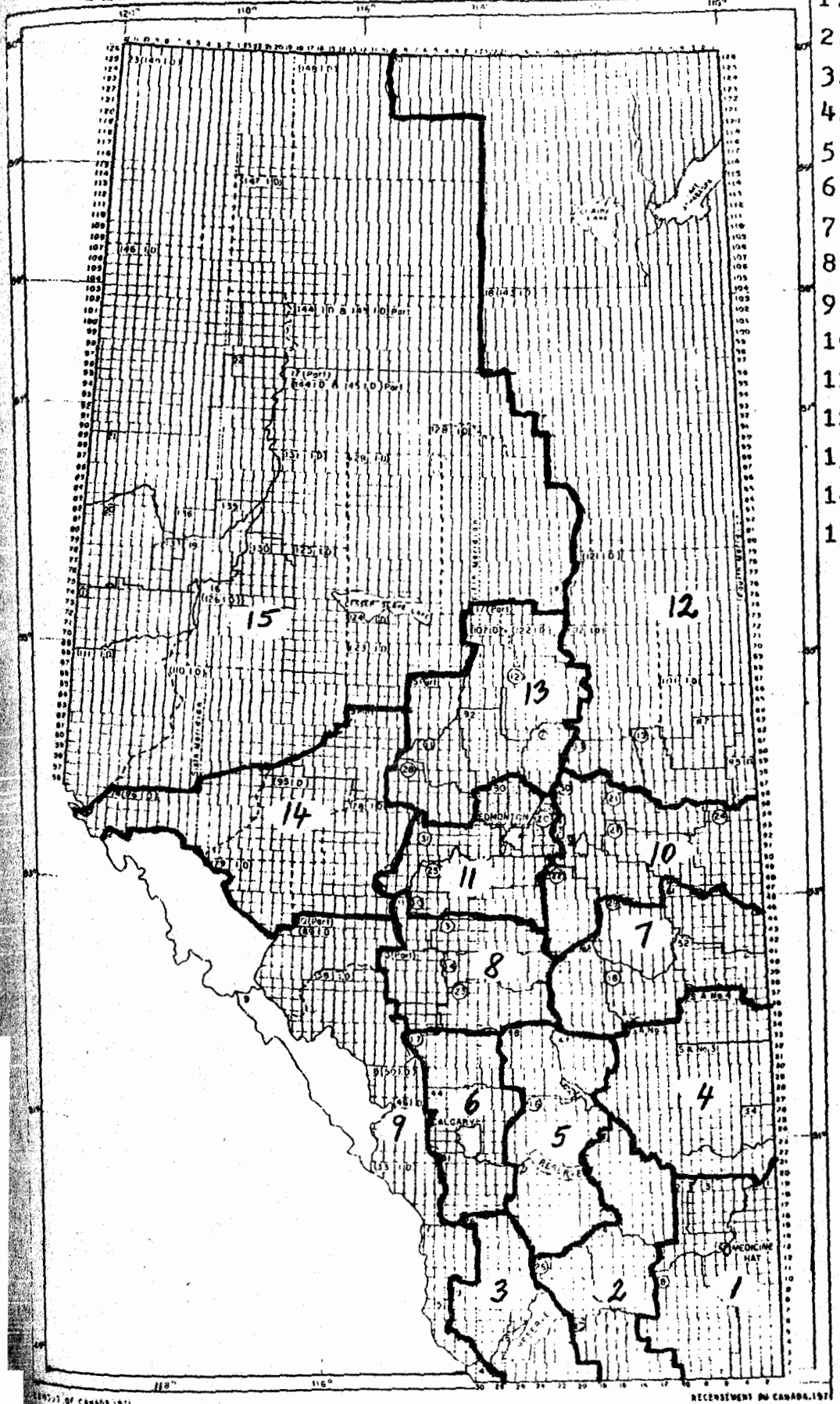


FIGURE 2 - CENSUS DIVISIONS OF ALBERTA, 1971



1. Medicine Hat
2. Taber
3. Lethbridge
4. Hanna-Youngst.
5. Drumheller
6. Calgary
7. Wainwright
8. Red Deer
9. Lake Louise
10. Vermillion
11. Edmonton
12. Fort McMurray
13. Athabasca
14. Edson
15. Peace River

We often use the terms "developed" and "underdeveloped" ("frontier") to describe particular census areas. By the term "developed" we refer to regions which have diversified industries, high female employment and a balanced population structure (high Female to Male ratio). "Underdeveloped" or "frontier" areas are perceived to have a one-sided industrial structure oriented towards primary industries with low employment in light manufacturing and services. They also have low female employment and an unbalanced population structure. The population is unstable and the labor turnover is high. A more accurate description and classification of B. C. regions is given in the concluding section of this study.

CHAPTER 4

INDUSTRIAL STRUCTURE AND ITS EFFECTS ON FEMALE TO MALE EMPLOYMENT RATIO

We will try to find out what the industrial structure is in B. C. and Alberta census areas. We use labor force data as we do not have other data showing industrial structure in census areas. Since we have argued that female to male ratio affects turnover rates, we will try to find out what the abilities of different industries to employ females are, and if such abilities are exploited in different areas.

A. British Columbia

From Table 3 - Female/Male Ratio in B. C. Industries - we can see at what rate different industries employ females in different areas. The first row "0" represents the B. C. Total.) The highest relative female employment is in "Personal Service Industries", the lowest in "Primary Industries". Generally, non-goods producing industries have a higher F/M employment ratio than goods producing. The lowest relative female employment is in the construction, mining, forestry and fishing industries. Considering the large differences in F/M ratio between industries, we can look on the F/M ratio as a technological coefficient, an input parameter, or as an industry requirement for structure of the labor force. Such coefficients

should not be considered as absolutely rigid, but subject to some change - i.e., some employment substitution between females and males is probably possible in each industry. We suspect that the more the industry is male dominated, i.e. the lower the F/M employment ratio is, the more difficult substitution will be. Therefore, in primary industries, substitution will be more difficult than in service industries.

The differences in F/M ratios between industries are much higher than the differences between regions within the same industry. This supports the theory of the F/M ratios as an input coefficient.

In the same industry, some regions have higher F/M employment, some lower. We speculate that possibilities for substitution in a particular industry can be shown by differences in F/M employment between regions. Assuming homogeneity of industry, the higher such differences are, the greater the opportunity to substitute. We also speculate that to substitute females for males is a much greater problem than the reverse.

A problem is that, in our low industrial disaggregation, our industries are not homogenous. A particular industry in one region might not be exactly the same industry in another region, which of course means F/M input require-

ments would not be the same. A striking example is the relatively high F/M employment ratio in the mining industry in regions 5, 14 and 15. Under "Mining" are included head offices and supply offices of mining companies which are predominantly located in those regions. Another example is "Manufacturing". There are many different kinds of manufacturing activities aggregated under the same heading, from food processing and clothing to metal fabricating, machinery, pulp and paper and different kinds of mills. Of course, each of these industries needs a different type of labor force. The level of disaggregation in manufacturing particularly is very unsatisfactory. Our manufacturing is very unhomogenous, but available census data does not allow us a higher degree of disaggregation. This is unfortunate, for manufacturing will probably play a big role in the further development of B. C. and it would be useful to know exactly what kind of manufacturing has a positive influence on population structure. However, we do not have data for the Food and Beverage part of manufacturing which produces, by itself, 71% of the value added of all manufacturing with high F/M ratios (Food and Beverage, Leather, Textiles, Clothing, Pringing and Publishing). Therefore, our subdivision into Food and Beverage and Other Manufacturing

roughly means a division between high F/M ratio and low F/M ratio manufacturing, i.e. between light and heavy manufacturing. Even this low disaggregation will give us clarification if we consider that Food and Beverage has relatively high female employment while Other Manufacturing has low female employment.*

There is probably much more room for the substitution of females for males in the services than in the goods producing industries. In the goods producing group, the best chances for substitution probably are in Food and Beverages (and other light manufacturing), because work in these industries is not as physically demanding as in the heavy industries. In any case, we must not consider F/M ratios in any industry as an absolute limit to female employment. Also, changes in technology and automation will be an important factor for increasing female employment. With such changes, work is less physically demanding and health hazards are diminished.

We should also keep in mind the nature of the female labor force in B. C. and not to attempt to imitate some other countries and substitute to too great an extent. Other countries may have different kinds of female labor forces with different characteristics which were developed

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*Discussion of manufacturing industry with higher disaggregation can be found in Chapter 8, where we use other than Census data.

historically by different social attitudes. Such characteristics, however desirable, are probably not possible to develop overnight. Some countries are using methods not acceptable here to force people to work in more difficult conditions and areas.

Looking at the F/M employment ratio in regions, we can see that the fairly well developed southern regions have the highest F/M ratio: 3 (Victoria), 5 (Central Fraser), 7 (Central Okanagan), 11 (Dewdney-Alouette), 15 (Greater Vancouver), 19 (Nanaimo), 20 (North Okanagan) and 22 (Okanagan-Similkameen). This is caused primarily by better industrial structures favorable to female employment, especially the higher portion of labor force employed in service industries.

Table 4 shows the distribution of the labor force in industries (i.e. industrial structure) for every census division in B.C. The first row - "0" (B.C.) - shows the average distribution for the province. If we include transportation in goods-producing industries, then 43.22% of the labor force in B.C. is employed in goods-producing industries. Without transportation, only 32.95% are so employed. Is this present percentage high enough? Trade alone employs more people than the total manufacturing. Forestry and Mining together employ less people than Finance, Insurance, and Real Estate.

TABLE 3: FEMALE TO MALE EMPLOYMENT RATIO IN B.C. INDUSTRIES 1971

Census Area	All Indust.	Agric.	Forest.	** Fish. & Trap.	Mines & Quarries & Oil	Total* Primary	Manufact. Total	Manufact. Food & Bev'ge	Const.	Transport. Communicat. Utilities Total	Transp. & Stge.	Trade Total	Trade Retail	Finance Insur. Real Estate	Personal Service Industries Total	Educ.	Health & Welfare	Pers. Serv.	Accom. & Food	Public Admin. & Defence	Unspec.
0	50.1	45.5	6.9	8.3	6.7	6.9	18.7	47.2	5.5	22.9	14.0	65.8	84.7	112.6	136.8	113.8	346.5	231.5	151.0	34.2	67.4
1	29.9	60.0	2.0	3.3	-	2.1	6.1	80.0	3.2	20.8	10.0	80.5	91.0	241.7	166.7	129.1	337.5	371.4	300.0	45.3	81.8
2	34.5	42.9	9.5	100.0	1.8	6.1	6.0	100.0	3.6	9.4	3.7	61.6	71.6	123.5	176.1	142.9	536.4	212.5	205.0	39.1	69.2
3	59.0	67.2	9.8	3.1	-	7.9	18.5	47.8	5.9	24.0	16.5	82.9	101.3	99.7	146.1	109.0	328.2	205.7	154.5	29.1	65.5
4	33.7	40.6	3.1	-	2.9	3.0	6.1	50.0	3.8	21.7	7.7	50.8	60.3	97.4	145.2	112.7	477.8	157.1	167.1	49.2	76.5
5	50.3	51.5	40.0	40.0	18.8	26.9	25.1	46.5	3.7	37.9	13.5	46.8	59.3	100.0	148.9	100.9	475.0	335.3	163.3	33.6	70.4
6	41.8	55.1	3.5	-	1.5	2.6	8.5	26.3	3.2	17.5	6.4	55.7	69.3	151.5	161.3	87.4	422.6	247.1	238.3	41.3	75.0
7	48.0	33.2	2.8	-	3.6	3.4	21.9	35.2	5.1	27.6	20.2	56.5	65.4	94.4	140.7	91.7	438.9	310.0	142.7	45.6	42.9
8	34.0	46.8	4.6	-	2.4	4.1	7.9	44.4	2.9	9.6	5.4	60.6	71.5	104.3	143.8	110.2	420.0	186.7	204.2	32.9	33.3
9	35.3	56.1	4.1	8.8	2.4	4.2	6.2	54.5	5.1	37.7	14.8	75.7	93.8	127.0	155.5	113.1	443.5	306.3	176.1	9.7	93.3
10	35.0	47.1	4.5	-	-	4.3	4.9	25.0	5.8	11.3	4.2	58.8	68.4	157.1	170.2	152.5	485.0	250.0	224.3	51.2	87.5
11	52.0	49.6	5.7	11.1	-	6.1	25.9	160.0	5.8	9.4	6.2	65.8	72.8	114.3	166.5	103.8	452.2	323.1	250.0	27.8	52.9
12	35.9	28.6	5.6	-	3.1	3.6	7.7	52.9	4.3	22.8	5.9	54.9	74.1	140.5	174.5	116.4	517.4	200.0	203.7	31.2	75.0
13	47.6	38.8	4.5	66.6	4.8	5.4	48.7	80.0	5.4	17.7	11.5	59.5	73.6	107.5	166.7	121.2	487.0	213.0	198.9	14.6	47.4
14	40.3	71.4	16.6	-	20.0	16.6	7.4	23.7	5.9	19.5	7.4	57.8	81.2	104.8	163.3	158.4	452.9	322.7	181.3	34.7	100.0
15	57.3	65.4	23.7	8.0	24.3	20.3	26.0	44.1	6.4	24.8	17.1	66.9	89.9	114.8	122.8	112.4	315.5	221.9	119.0	43.5	75.8
16	34.4	27.3	5.5	-	6.7	5.9	6.6	17.6	7.7	27.0	16.2	69.7	90.7	146.4	182.1	132.3	495.7	209.1	202.8	39.7	35.7
17	37.1	37.8	-	-	6.2	5.1	5.6	66.6	10.0	18.8	10.7	81.8	96.2	139.1	199.4	111.5	434.5	309.1	332.0	43.5	36.4
18	19.1	50.0	4.2	5.0	4.1	4.2	7.4	18.8	3.8	24.4	13.3	85.3	100.0	120.0	155.3	173.3	433.3	1000.0	123.5	17.8	16.7
19	48.7	69.4	5.7	24.4	-	10.2	8.3	16.1	7.4	22.8	13.3	63.4	75.0	109.2	134.8	87.0	327.5	266.7	150.0	36.9	100.0
20	48.4	38.4	2.3	-	-	2.1	19.7	42.1	4.8	23.3	5.6	45.0	55.6	116.2	158.8	85.5	355.9	243.8	275.8	30.6	76.5
21	28.5	37.5	2.1	6.7	-	3.2	9.1	21.4	-	27.3	22.2	66.7	100.0	200.0	171.4	100.0	600.0	100.0	300.0	33.3	-
22	54.4	37.1	10.9	-	1.6	1.8	24.7	102.7	4.6	20.5	7.2	62.2	62.5	108.0	150.8	105.0	371.1	255.6	205.8	40.7	47.8
23	40.6	30.6	6.3	-	2.9	4.0	10.2	44.4	4.3	21.7	9.4	44.3	57.1	112.5	172.5	135.7	523.8	393.8	804.1	34.1	32.0
24	32.8	100.0	6.7	20.0	3.6	5.9	5.5	20.0	7.3	21.7	13.8	83.3	96.7	107.1	204.9	184.0	516.7	380.0	157.9	52.6	50.0
25	40.8	33.3	5.3	100.0	5.0	5.5	25.9	48.5	5.6	21.2	13.3	85.2	107.2	100.0	186.2	179.3	508.3	285.7	165.0	27.3	30.8
26	26.8	20.0	6.9	-	6.5	6.7	5.1	50.0	8.7	9.1	6.0	83.3	122.2	100.0	140.2	120.7	400.0	150.0	233.3	40.0	11.4
27	21.5	-	-	-	12.8	12.4	-	-	11.1	31.3	28.6	50.0	100.0	100.0	114.3	100.0	-	50.0	150.0	-	100.0
28	34.3	57.1	1.1	7.7	-	1.8	7.2	1000.0	-	30.9	25.5	67.3	72.5	81.8	116.7	117.6	233.3	175.0	138.9	72.7	75.0
29	42.7	26.7	8.3	8.3	2.6	5.1	10.6	22.9	2.2	14.4	4.9	58.7	76.9	84.9	163.9	122.9	364.6	214.3	189.4	37.8	35.3

Source: Census 1971 - #94-741

*Under "Total Primary" we include Forestry, Fishing and Mining.

**High deviations from F/M average are in regions where there are only a few people employed in industry and wives of fishermen are probably included into L.F.

Table 4: Percentage of Labor Force in Industries for Census Areas in B.C. 1971*

Census Area	Agri.	Primary				Manufacturing			Constru.	Goods Prod. Ind. Total	Transportation &Commnication			Trade			Fin. Ins. Real Est.	Service Industries						Public Admin.	Unspec. Ind.
		Forest.	Fish. & Trap.	Mines Quar. & Oil	Total Prim.	Total Mfg.	Food & Bev.	Other Mfg.			Total Trans.	Trans & Stge.	Other Tran. & Comm.	Total Trade	Retail	Other Trade		Total Serv.	Educ.	H'lth & Welf.	Pers. Serv.	Accom. & Food	Other Serv.		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	2.67	3.21	0.38	1.74	5.33	17.47	2.41	15.06	7.48	32.95	10.27	6.79	3.48	17.61	12.49	5.12	4.99	26.82	6.27	6.31	2.24	5.55	6.45	6.48	0.88
1	0.65	15.57	2.67	0.43	18.67	33.91	0.82	33.09	4.23	40.67	6.56	4.79	1.77	12.47	11.00	1.47	1.77	17.56	5.44	3.02	1.42	4.92	2.76	3.28	0.86
2	6.53	11.21	0.11	9.30	20.62	17.46	0.27	17.19	6.26	50.87	9.52	7.62	1.90	12.08	10.23	1.85	2.07	20.73	6.53	3.75	1.31	6.64	2.50	3.48	1.14
3	1.30	1.70	0.45	0.13	2.88	9.32	1.58	7.74	6.78	19.68	7.37	4.43	2.94	17.06	13.93	3.11	5.21	30.50	6.97	8.77	2.88	5.81	6.07	19.22	0.97
4	6.46	8.32	0.07	2.57	10.96	23.79	0.32	23.47	8.68	49.89	8.86	6.00	2.86	13.36	10.54	2.82	2.64	20.96	6.00	3.75	1.29	6.96	2.96	3.36	1.00
5	19.22	0.19	0.22	0.59	1.00	14.45	5.79	8.66	11.30	45.97	6.01	3.18	2.83	15.73	11.46	4.27	3.36	21.89	6.70	5.05	2.30	3.52	4.32	5.57	1.40
6	4.35	6.47	-	4.78	11.25	18.41	0.86	17.55	5.72	29.73	12.01	7.23	4.78	13.27	10.10	3.17	2.95	25.24	8.56	5.83	2.12	5.68	3.05	5.54	1.22
7	8.15	1.10	-	2.49	2.59	14.18	3.45	10.73	12.59	37.51	7.08	3.97	3.11	20.13	13.43	6.70	5.10	24.68	6.00	5.66	2.78	5.74	4.90	3.34	1.10
8	4.80	7.78	-	1.87	9.65	16.23	0.55	15.68	13.39	44.07	13.05	10.71	2.34	12.32	10.50	1.82	2.00	23.42	5.23	3.31	1.83	9.14	3.97	4.12	1.02
9	1.87	15.64	1.05	1.23	17.92	16.55	0.96	15.59	4.80	41.14	7.05	3.89	3.26	13.33	10.91	2.42	2.46	20.99	6.14	3.68	1.87	5.76	3.54	14.21	0.82
10	2.92	13.70	0.32	0.28	14.30	28.11	0.79	27.32	4.97	50.30	7.82	5.84	1.98	12.75	10.26	2.49	2.21	23.21	7.97	4.62	1.93	4.70	3.99	2.57	1.18
11	8.81	4.90	0.52	0.10	5.52	18.77	4.74	14.03	7.51	40.61	5.47	3.65	1.82	15.90	13.66	2.24	3.13	25.65	8.29	6.67	2.87	3.28	4.54	7.72	1.36
12	2.28	4.21	0.03	16.02	20.26	14.60	0.82	13.78	9.09	46.23	10.23	6.30	3.93	14.06	10.89	3.77	2.82	22.13	5.03	4.50	1.52	7.76	3.32	3.86	0.70
13	9.24	5.74	0.16	1.37	7.27	11.05	6.77	4.28	8.55	36.11	5.37	3.59	1.78	15.41	12.26	3.15	2.59	24.21	5.83	4.21	2.22	8.58	3.37	15.48	0.84
14	1.47	7.70	-	0.12	7.82	21.98	0.98	21.00	8.55	39.82	13.07	8.74	4.33	16.39	11.62	4.77	3.53	21.73	6.06	3.92	1.93	5.29	4.53	4.86	0.58
15	0.80	0.45	0.86	0.53	1.24	18.00	2.80	15.20	6.97	27.01	11.60	7.80	3.80	19.85	13.03	6.80	6.60	29.36	6.26	7.02	2.41	5.03	8.64	4.78	0.80
16	0.54	11.73	0.12	5.54	17.39	29.38	0.77	28.61	5.92	53.23	8.08	4.92	3.16	12.69	10.27	2.42	2.69	19.42	5.77	5.31	1.31	4.19	2.84	3.15	0.73
17	2.64	1.64	-	7.92	9.56	35.77	0.63	35.44	4.61	52.58	6.67	3.90	2.77	12.96	10.82	2.14	2.35	21.09	5.37	6.50	1.84	4.57	2.81	3.73	0.63
18	0.29	36.23	2.05	7.52	45.80	12.70	1.86	10.84	8.01	66.80	5.37	3.42	1.95	6.15	5.18	0.97	1.07	11.62	4.00	1.56	0.78	3.81	1.47	8.40	0.68
19	1.94	4.16	1.65	0.13	5.94	14.35	1.13	13.22	8.42	30.65	10.29	6.10	4.19	18.87	14.84	4.03	4.42	27.42	6.94	5.52	2.52	7.26	6.18	6.65	1.32
20	9.55	3.95	-	0.26	4.21	15.54	2.34	13.20	7.56	36.86	8.55	3.30	5.25	19.32	13.98	5.34	3.52	25.58	6.17	6.77	2.39	5.38	4.87	4.82	1.30
21	3.77	16.78	5.14	-	21.92	36.64	11.64	25.00	2.74	65.07	4.79	3.42	1.37	5.14	4.45	0.69	1.03	19.18	7.53	4.79	1.03	3.77	2.06	4.45	0.34
22	12.02	1.53	0.10	2.06	3.69	11.52	2.46	9.06	7.51	34.74	6.81	3.99	2.82	20.09	12.99	7.10	3.43	27.20	5.41	5.98	2.09	8.73	4.99	6.51	1.10
23	10.40	2.70	0.10	5.62	8.42	6.61	0.83	5.78	12.48	37.91	15.37	10.82	4.55	15.98	11.65	4.33	2.76	23.17	6.35	4.17	2.02	7.12	3.51	3.79	1.06
24	0.32	6.31	0.48	4.71	11.50	44.01	0.48	43.53	3.43	59.26	4.39	2.72	1.67	11.34	9.58	1.76	2.24	19.89	5.67	5.99	1.84	3.91	2.48	2.32	0.48
25	0.16	7.40	4.53	2.24	14.17	25.40	13.21	12.19	6.02	45.75	12.51	9.05	3.46	11.40	9.16	2.24	1.92	18.74	4.26	3.89	1.38	5.64	3.57	8.68	0.91
26	1.60	13.73	-	10.25	23.98	20.14	0.36	19.78	4.46	50.18	18.09	12.66	5.43	6.77	5.35	1.42	1.52	19.61	5.79	2.67	0.80	7.04	3.31	2.58	1.07
27	0.63	0.63	0.63	61.01	62.27	2.52	0.63	1.89	6.29	71.71	12.58	11.32	1.26	1.89	1.89	-	0.63	9.43	2.52	0.63	1.26	2.52	2.50	1.26	1.89
28	1.74	14.58	2.22	0.95	17.75	19.02	0.32	18.70	7.45	45.96	11.57	9.19	2.38	12.84	11.09	11.75	3.17	22.66	5.86	3.17	1.74	6.66	5.23	3.01	1.11
29	4.48	3.45	0.06	5.12	8.63	10.98	0.81	10.17	12.32	36.41	10.58	7.19	3.39	17.27	13.39	3.88	3.22	26.29	6.05	6.91	1.66	7.70	3.97	5.42	0.81

Source: Census 1971 - 94-741

* Sum of all industries in census area equals 100

Service industries are concentrated in developed areas, primary industries in frontier regions. Regions 3, 7, 5, 11, 15, 19, 20 and 22 (all in the south-west corner of the province) have the lowest employment in primary industries. Because these industries have low F/M employment ratios, we deduce that these regions have a good industrial structure to employ and retain females.

Census divisions 3, 6, 7, 11, 15, 19, 20, 22 and 29, (most of them in the south-west corner of B.C.) have a higher proportion of the labor force employed in Personal Services and Finance, Insurance and Real Estate. These industries have high F/M employment ratios, which indicates that these regions have an industrial structure favorable to female employment.

If we consider other industries with high F/M employment ratios; Administration, Agriculture, Food and Beverage and Trade; we see that all these industries are disproportionately concentrated in southern developed regions.

Considering all industries together, we can conclude that regions 3-Victoria, 5-Central Fraser Valley, 7-Central Okanagan, 11-Dewdney-Alouette, 15-Greater Vancouver, 19-Nanaimo, 20-North Okanagan and 22-Okanagan-Similkameen have the best industrial structure conducive to female employment.

The percentage of the labor force employed in construction is an indication of the relative growth and investment in regions. The highest relative employment in construction is in regions 5, 7, 8, 23 and 29, but above-average relative employment can be found in regions 4, 12, 13, 14, 18 and 19. These are mostly less developed regions, which is a good sign, for they will probably grow more rapidly. But this conclusion depends on what type of industries are growing. The growth of primary industries (without some growth of secondary and tertiary industries) will not help to stabilize the population and permanently settle and develop these regions.* Furthermore, construction by itself has a very high labor force turnover and a low F/M employment ratio which does not help stabilize population in these regions.

B. Alberta

Comparing the F/M ratios in B.C. and Alberta (Tables 3 and 5), Alberta has slightly higher female employment in "All Industries". Industries with higher F/M employment ratios in Alberta are the following: Mining, Manufacturing, but more importantly, Services and Public Administration. Industries with lower F/M employment ratios in

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*The recent studies done by D.E.D. (The North East Report 75; The Central Report 76) indicate that B.C. interior regions will further develop primary industries only.

Alberta are Agriculture, Trade and Food and Beverage.

These differences may be caused by a different industrial mix. For example, "Mines, Quarries & Oil" might be quite a different industry in Alberta than in B. C. A closer look at the mining industry (Census #94-749 and #94-747) indicates that the F/M ratio in coal mining is very similar across Canada.

B. C.	F/M = 40/1215	= 3.29/100 = 0.0329
B. C. Singles	F/M = 15/310	= 4.84/100 = 0.0484
Alberta	F/M = 80/2125	= 3.76/100 = 0.0376
Alberta Singles	F/M = 30/535	= 5.61/100 = 0.0561
Nova Scotia	F/M = 65/4575	= 1.42/100 = 0.0142
Canada	F/M = 195/8605	= 2.27/100 = 0.0227
Canada Singles	F/M = 70/1395	= 5.00/100 = 0.0500

The difference between B. C. and Alberta F/M ratios in "Mines, Quarries & Oil" can be explained principally by Alberta's much higher proportion of employment in oil, where female employment is higher.

A similar explanation can be offered for Agriculture and Manufacturing. A large portion of B. C. agriculture is in smaller-scale vegetable and fruit growing, dairy farming, etc., whereas Alberta's agriculture is primarily large-scale grain and cattle production. The result is that the F/M ratio in B. C.'s agriculture is higher. As was previously

noted, B.C. manufacturing and food and beverage industries are very heterogeneous. The differences in the F/M ratio in manufacturing can probably be explained by a different industrial mix.

However, differences in Trade, Services and Public Administration cannot be attributed to a different industrial mix. Trade is a relatively homogenous industry, and Personal Services are as well broken down to homogeneous sub-industries.

This indicates that there is some possibility of improving the F/M ratio within the existing industrial structure, especially in B.C.'s service industries. But a more significant improvement is probably possible by changing the industrial structure. Oc course, the industrial structure is not easy to alter, especially in the short run.

To look at the problem differently, we have included Table 7, the F/M ratios in occupations in B.C., the G.V.R.D. and Alberta. Analysing the table, we again come to similar conclusions. In most occupations the F/M ratios across the regions are not very different, which illustrates how deeply rooted occupational patterns are with respect to female employment. Again it is noticeable that more significant differences are apparent in service occupations, where the F/M ratios in Alberta are higher (teaching, health, personal services).

Table 5: F/M Ratio in Industries Alberta 1971

Census Area	All Indust.	Agric.	Forest.	Fish & Trap.	Mines & Quarries & Oil	Total Primary	Manufact. Total	Manufact. Food & Bev'ge	Const.	Transport. Communicat. Utilities Total	Transport. Communicat. Utilities Trans. & Stge.	Trade Total	Trade Retail	Finance Insur. Real Estate	Personal Service Industries Total	Personal Service Industries Educ.	Personal Service Industries Health & Welfare	Personal Service Industries Pers. Serv.	Personal Service Industries Accom. & Food	Public Admin. & Defence	Unspec.
0	52.67	31.79	7.62	2.94	19.22	18.26	24.59	29.35	5.37	21.94	11.06	58.92	77.83	117.56	146.04	126.14	371.31	243.20	161.11	32.64	74.87
1	48.63	30.05	-	-	8.00	7.14	20.79	16.88	4.80	12.96	3.75	54.81	66.67	96.88	185.59	115.66	696.00	190.00	270.97	27.68	81.82
2	49.02	23.80	-	-	1.82	1.72	27.52	29.06	5.80	22.81	11.86	54.53	73.89	124.47	167.19	114.15	524.19	239.47	185.44	17.61	77.78
3	49.86	33.40	-	-	3.33	5.00	22.88	46.15	3.05	22.54	11.32	44.85	55.07	161.11	198.68	160.71	370.97	255.56	257.89	55.88	50.00
4	81.05	24.76	-	-	-	-	37.50	-	2.86	20.31	3.77	42.11	50.00	112.50	184.75	124.14	975.00	240.00	237.50	39.12	166.67
5	43.19	24.70	-	-	2.63	2.56	31.43	22.22	4.82	20.15	3.85	41.71	56.00	214.29	184.52	148.78	600.00	260.00	204.17	26.87	126.67
6	55.17	30.96	-	100.0	33.07	32.91	25.94	33.03	5.93	21.86	14.01	65.74	86.65	108.93	132.53	128.66	391.74	243.30	134.71	29.22	75.35
7	45.11	27.42	-	-	1.37	1.35	32.73	48.00	6.02	15.38	2.97	39.03	53.55	173.68	221.64	159.15	740.00	283.33	252.00	32.35	104.76
8	53.26	29.47	-	-	2.81	2.65	29.10	26.42	5.52	22.91	8.25	52.93	68.18	118.18	170.32	135.00	264.58	266.67	179.41	31.06	68.18
9	54.01	29.41	-	-	1.35	1.16	16.36	27.27	1.92	19.50	17.16	72.97	76.77	200.00	143.55	182.05	366.67	158.33	139.55	24.18	41.67
10	50.81	36.63	-	-	11.76	11.76	18.78	31.82	4.97	18.73	5.71	44.89	62.41	175.00	180.83	122.54	445.76	177.27	253.66	41.32	94.74
11	56.69	37.66	9.52	-	15.18	14.86	25.37	26.22	6.06	23.74	11.58	61.44	83.48	118.69	136.61	118.56	309.45	248.73	150.54	49.42	68.24
12	42.37	39.75	8.57	-	6.53	6.56	20.90	61.54	3.20	22.76	7.14	54.68	66.24	159.09	169.23	128.07	654.55	214.29	205.41	17.11	55.56
13	48.20	40.27	-	-	2.50	1.54	10.37	50.00	2.45	13.49	6.93	43.81	56.96	150.00	189.94	154.55	600.00	222.22	244.44	44.29	115.38
14	39.56	48.55	2.44	-	4.32	3.87	10.63	62.50	4.55	16.67	6.86	49.25	61.00	127.27	183.19	143.90	850.00	320.00	296.55	43.14	54.55
15	41.30	28.01	11.48	-	3.84	5.57	13.27	45.95	3.14	20.14	5.99	44.36	60.37	115.15	176.03	134.63	636.17	285.71	195.10	36.87	57.45

Source: Census 1971 - #94-741

Table 6: Percentage of Labor Force in Industries for Census Areas in Alberta 1971*

Census Ar.	Agri.	Primary				Manufacturing			Construct	Goods Prod. Ind. Total	Utilities, Transportation & Communication			Trade			Fin. Ins. Real Est.	Service Industries						Public Admin.	Un-Spec. Ind.
		Forest.	Fish. & Trap.	Mines Quar. & Oil	Total Prim.	Total Mfg.	Food & Bev.	Other Mfg.			Total Trans.	Trans & Stge.	Other Tran. & Comm.	Total Trade	Retail	Other Trade		Total Serv.	Educ.	H'lth & Welf.	Pers. Serv.	Accom. & Food	Other Serv.		
0	13.22	0.27	0.03	3.90	4.20	9.81	2.52	7.29	7.95	35.18	8.47	5.25	3.22	16.48	11.71	4.77	4.01	26.69	7.77	6.76	1.97	4.35	5.84	8.05	1.12
1	20.43	0.07	0.04	0.97	1.08	14.23	3.24	10.99	4.72	40.46	9.12	5.98	3.14	15.06	11.89	3.17	2.27	23.57	6.45	7.17	2.09	4.14	3.72	8.17	1.38
2	21.30	0.03	0.02	0.86	0.91	12.23	6.95	5.28	6.72	41.16	7.52	4.05	3.47	17.25	12.56	4.69	3.24	23.48	6.96	5.94	1.98	4.51	4.09	6.38	0.97
3	33.03	0.05	-	3.00	3.05	7.01	0.92	6.09	8.17	51.26	4.21	2.85	1.36	13.59	10.35	3.24	2.27	21.81	7.06	7.06	1.55	3.29	2.85	5.13	1.73
4	50.00	-	-	2.10	2.10	1.05	0.19	0.86	3.44	56.59	7.35	5.25	2.10	12.88	9.16	3.72	1.62	16.03	6.20	4.10	1.62	2.58	1.53	3.05	2.48
5	45.51	-	0.04	1.60	1.64	1.89	0.45	1.44	3.58	52.62	6.63	4.44	2.19	10.91	8.02	2.89	1.81	19.67	8.40	4.32	1.48	3.00	2.47	7.00	1.36
6	3.64	0.03	0.01	6.74	6.78	11.41	2.47	8.94	9.03	30.86	9.06	5.77	3.29	18.03	12.32	5.71	5.62	29.07	7.46	6.39	2.17	4.49	8.56	6.30	1.06
7	42.50	0.03	-	2.57	2.60	2.54	1.29	1.25	4.90	52.54	5.74	3.62	2.12	13.00	9.77	3.23	1.81	19.12	6.40	5.84	1.60	3.06	2.22	6.26	1.53
8	26.16	0.18	-	2.99	3.17	5.66	2.19	4.72	6.25	41.24	5.53	3.44	2.09	14.94	11.50	6.67	2.75	27.42	6.15	11.45	1.80	4.66	3.36	6.90	1.22
9	1.26	1.32	0.06	8.58	9.96	7.32	0.80	6.52	6.06	24.60	0.87	8.98	1.89	10.98	10.01	0.97	1.72	39.99	6.29	3.20	1.77	24.25	4.48	10.87	0.97
10	44.16	-	-	1.20	1.20	4.52	1.22	3.30	4.00	53.88	6.27	3.89	2.38	12.83	9.36	3.47	1.85	20.02	6.65	6.77	1.28	3.06	2.27	3.60	1.55
11	4.31	0.11	0.01	2.26	2.38	11.77	3.03	8.74	8.40	26.86	9.79	5.67	4.12	18.39	12.78	5.61	4.53	28.94	8.94	7.50	2.21	3.76	6.53	10.32	1.17
12	24.22	1.16	0.31	6.49	7.96	2.48	0.64	1.84	6.92	41.58	4.63	3.21	1.42	9.61	7.99	1.62	1.75	20.36	7.96	5.08	1.35	3.46	2.51	20.33	1.74
13	46.45	0.82	0.03	1.40	2.25	5.08	0.51	4.57	5.70	59.48	4.88	3.68	1.20	11.08	8.46	2.62	1.53	17.70	6.68	4.77	0.99	3.17	2.09	3.44	1.89
14	13.39	2.74	0.07	9.47	12.28	11.56	0.85	10.71	12.02	46.78	9.14	7.12	2.02	13.06	10.52	2.54	1.63	20.90	6.53	2.48	1.37	7.51	3.01	4.77	3.72
15	24.19	2.10	0.25	5.85	8.20	5.94	0.84	5.10	9.16	45.62	7.85	5.20	2.65	12.49	9.33	3.16	2.20	21.75	7.44	5.36	1.25	4.66	3.04	7.17	2.91

Source: Census 1971 - 94-741

* Sum of all industries in census area equals 100

TABLE 7 : F/M RATIOS IN OCCUPATIONS IN B.C. AND ALBERTA

Occupation Group	F/M Ratio B.C.	F/M Ratio GVRD	F/M Ratio Alberta
Managerial, administrative	17.4	17.1	17.8
Natural sciences, engineering, mathematics	8.0	9.6	9.1
Social Services	61.4	60.3	56.2
Teaching Total	136.9	130.3	156.6
Elementary and secondary school teaching	176.0	196.0	205.0
Medicine, health Total	273.2	260.7	306.2
Nursing, therapy, assisting	685.4	642.1	747.5
Artistic, literary, recreational	41.7	40.1	46.3
Stenographing, typing	4014.7	4233.3	4149.2
Bookkeeping, accounting, recording	415.6	412.1	343.2
Material recording, scheduling, distributing	18.7	24.3	20.4
Library, file and correspondence clerks	612.0	609.2	782.9
Reception, information, mail	245.1	216.3	227.5
Sales occupation Total	46.3	41.6	44.7
Service occupation Total	94.1	96.7	102.5
Protective service occupation	3.8	5.9	4.4
Food and beverage preparation services	176.4	136.7	244.1
Lodging, accomodation services	189.3	182.5	204.1
Personal services	347.6	331.3	431.0
Farming Total	31.9	27.9	29.2
Fishing, hunting, trapping	4.2	1.8	4.5
Forestry, logging	2.3	2.2	2.1
Mine, quarrying, oil, gas	0.5	2.0	0.8
Processing occupations Total	12.8	18.6	16.2
Food and beverage processing	51.6	45.6	25.6
Machining and related occupations	2.7	3.4	2.5
Product fabricating, assembling, repairing Total	12.7	20.0	13.6
Fabricating, repairing, textiles, fur, leather	214.8	227.1	229.4
Mechanics and repairs except electrical	0.5	0.6	0.8
Construction trades	0.7	0.8	1.0
Transport equipment operating Total	2.6	2.2	3.6
Motor transport operating	3.3	2.8	4.1
Material handling and related	12.5	16.5	12.5
Other crafts and equipment operating	13.7	18.3	11.6

C. Utilization of Existing Industrial Structure With Respect to Female Employment

In this section we will try to find out how different census areas utilize female employment given the existing industrial structure. To be able to measure the degree of utilization, we construct the (F/M) expected ratio, which is equal to the F/M employment ratio in the region under the assumption that each industry in that region had employed females on the provincial average. In other words, the F/M expected ratio is a proxy for the industrial structure only; it should be cleared from all other influences. Of course we are assuming that every industry is homogeneous throughout the province - that it has the same opportunities to employ females in every region. This is, in our small disaggregation, quite a major and not very realistic assumption.

If "i" is the industry and "j" is the census area, then

$$\text{the \% of female employment expected in the region} = \sum_i \left[\frac{(Eij)}{(\sum_i Eij)} Ii \right]$$

where $\frac{Eij}{\sum_i Eij}$ is the percentage of employment in "i" industry in region "j" from the total employment in all industries in

region "j". "Ii" is the percentage of female employment in industry "i" from total employment in industry "i" on the B. C. average, which should tell us how suitable industry "i" is to the employment of females. We call this ratio "F/M expected".

Our F/M employment ratio is actually the number of females employed per 100 men employed, therefore we can easily calculate the percentage of females employed by dividing F/M by (100 + F/M) and multiplying by 100.*

Subtracting actual F/M employment from F/M expected we should get some idea as to how much "potential" there is in every region to change the present F/M employment without changing the industrial structure. In other words, how industries in every region presently utilize their "abilities" to employ females. If we get a negative result, it means that the region actually employs females at a higher rate than its industrial structure predicts. If we have a

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*% Fem. Employ. $= \frac{F \times 100}{F + M} = \frac{F/M}{F/M+1} \times 100 = \frac{F/M \times 100}{F/M \times 100+100} \times 100$;

because our F/M = F/M x 100, % Fem. employ. $= \frac{F/M}{F/M+100} \times 100$

positive result, then industries within the region do not fully use their "ability" to employ females, i.e. there is room to increase female employment in the region without changing the industrial structure.

There are two main assumptions in this strategy:

1. That on the B. C. average, female employment in each industry is at the maximum and we cannot increase it.
2. That industries are homogeneous throughout all regions - the same industry in every region has the same opportunity to employ females. In our case of low disaggregation this is quite a large assumption, but even if we had detailed disaggregation, the possibilities for female employment in the industry would be affected by different technology, production processes, scale and degree of automation and mechanization. (Two plants producing exactly the same product might have different potentials for female employment.) In our case we used the maximum disaggregation the census data allows. Industries used in the calculation of the F/M expected ratio are listed in Table 8.

If our assumptions are reasonably realistic, then Table 9 shows how the regions in B. C. and Alberta are utilizing their present industrial structure toward female employment. B. C. regions 11, 15, 25 and 27 employ more

TABLE 8: DISAGGREGATION OF INDUSTRIES AND WEIGHTS OF INDUSTRIES USED FOR CALCULATION (F/M) EXPECTED

Used for (F/M) Expec. Calculation	Industry	% Females Employed In Industry		
		B.C.	Alta.	Can.
X	Agriculture	31.21	24.12	23.2
X	Forestry	6.45	7.08	4.5
X	Fishing and Trapping	7.66	2.86	3.5
X	Mining, Quarries, Oil	6.28	16.12	6.7
	Total Primary*	6.45	15.44	
	Manufacturing Total	15.75	19.74	23.7
X	Food and Beverages	32.06	22.69	26.6
X	Other Manufacturing	13.12	18.71	23.2
X	Construction	5.21	5.10	4.9
	Transport. & Commun. Total	18.63	17.99	17.0
X	Transport & Storage	12.28	9.96	9.5
X	Utilities & Communication	31.02	31.06	29.4
	Trade Total	39.69	37.08	36.7
X	Retail Trade	45.86	43.77	42.0
X	Wholesale Trade	24.60	20.64	22.8
X	Finance, Insurance, Real Estate	52.96	54.04	51.5
	Personal Services Total	57.77	59.36	57.6
X	Education	53.23	55.78	55.5
X	Health & Welfare	77.60	78.78	75.1
X	Personal Services	69.83	70.86	69.1
X	Food & Accomodation	60.16	61.69	57.3
X	Other Services	36.53	36.07	36.0
X	Public Administration	25.48	27.35	25.5
X	Unspecified	40.26	42.81	44.2
	ALL INDUSTRIES	33.78	34.50	34.3

*Total Primary is Forestry + Fishing + Mining.

TABLE 9: (F/M) EXPECTED AND (F/M) EXPECTED MINUS (F/M) ACTUAL (BUILD BY MAXIMUM INDUSTRIAL DIVISION = 19 INDUSTRIES)

	British Columbia			Alberta		
Census Area 0	F/M Exp.	(F/M) Expect. Minus (F/M) Employ. Actual	% of F/M Actual	F/M Exp.	(F/M) Expect. Minus (F/M) Employ. Actual	% of F/M Actual
1	33.55	3.66	12	52.10	3.46	7
2	37.64	3.14	9	52.13	3.10	6
3	59.59	0.59	1	49.73	-0.13	0
4	39.74	6.04	18	45.78	4.73	12
5	51.01	0.71	1	47.92	4.72	11
6	45.55	3.75	9	53.02	-2.15	- 4
7	50.81	2.81	6	48.64	3.54	8
8	39.77	5.77	17	60.30	7.04	13
9	40.62	5.32	15	60.62	6.61	12
10	39.56	4.56	13	50.06	-0.75	- 1
11	51.73	-0.27	- 1	54.58	-2.11	- 4
12	39.51	3.61	10	47.36	4.99	12
13	51.27	3.67	8	46.13	-2.10	- 4
14	41.23	0.93	2	40.82	1.26	3
15	53.99	-3.31	- 6	44.79	3.49	8
16	36.36	1.96	6			
17	40.29	3.19	9			
18	23.19	4.09	21			
19	51.41	2.71	6			
20	53.21	4.81	10			
21	35.40	6.90	24			
22	54.83	0.43	1			
23	45.04	4.44	11			
24	36.50	3.70	11			
25	40.14	-0.66	- 2			
26	31.69	4.89	18			
27	16.41	-5.09	-24			
28	38.21	3.91	11			
29	48.04	5.34	13			

females than their industrial structure would apparently permit them. Regions 11 and 15 are developed southern regions, while 25-Skeena and 27-Stikine are frontier areas. Stikine especially is surprising since this is the region which has the worst industrial and population structure (62% of L.F. in mining; F/M population 15+ = 55/100; F/M singles 15+ is 22/100). Actually, the industrial structure is so strongly oriented toward primary industries that to employ these few women who are employed in the area, the mining industry has to employ females far above the provincial average. (See Table 3). This suggests that if there is good will, even provincial F/M employment averages are not limits to female employment.* The problem is that we have in this group both developed and underdeveloped regions; (developed, 15-Vancouver and 11-Dewdney-Alouette; underdeveloped, 27-Stikine and 25-Skeena A). Considering that region 15 has by far the highest weight in B.C., and many other developed regions have a much better utilized industrial structure (with respect to female employment) than underdeveloped regions (i.e. F/M expected minus F/M actual is closer to zero in developed regions - especially in regions 3, 5 and 22), we conclude that developed regions utilize their capacity

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*Cassiar Asbestos is the biggest employer in this region and Cassiar is a company town. It could be that females employed in services are actually included into mining industry, so that we get a high F/M ratio in mining.

to employ females better than underdeveloped regions. This means that there is room in frontier regions to increase female employment without changing the industrial structure. Notably in regions 1, 2, 4, 6, 8, 9, 10, 12, 13, 17, 18, 20, 21, 23, 24, 26, 28 and 29 there exists a possibility to increase the F/M employment ratio by 3 to 7 points which is about 7 to 24% of the present female employment.

The situation is more clear-cut in Alberta, where the best utilization of the industrial structure for female employment is in regions 6-Calgary and 11-Edmonton, two of the most advanced regions in the province.* Generally, our conclusion for B.C., that underdeveloped regions utilize their potential to employ females (this potential being given by their industrial structure) less than developed regions, appears to be supported by the results we obtained for Alberta.

To identify the industries contributing negatively or positively to the utilization of the industrial structure to employ females, we look at Table 3 and compare the industry F/M employment ratio for the region with the ratio for the province. Because (F/M) expected is actually industrial structure expressed in terms of (F/M) employment by a single number, we intend to use it as one of the proxies for industrial structure in regression analysis in Chapter 7.

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*Two other Alberta census areas with above expected female employment are 10 and 13. Both are neighbours of Edmonton.

CHAPTER 5

POPULATION STRUCTURE IN B. C. CENSUS AREAS

In this chapter we examine the population structure of B. C. census areas with special attention given to the Female/Male ratio. We also look at population growth, age structure, marital status, urbanization, labor force participation rates (LFPR), and briefly, at some other characteristics such as unemployment rates, education, percentage of native population and incidence of poverty.

A. Population Growth (Table 10)

By far the fastest relative population growth was in region 5, Central Fraser Valley and 7, Central Okanagan. Vancouver and Victoria both had slightly below average population growth. This would appear to be a good sign, but in the case of Vancouver, the growth shifts to the immediately adjoining areas - especially region 5 - Central Fraser Valley. Also, census areas 11 and 19 are Vancouver neighbours with above average growth. Such growth is, in all practical terms, the expansion of Vancouver.

The above average growth of region 7 - Central Okanagan is a positive sign. It appears that areas around Kelowna (including Vernon and Salmon Arm, which are not in census area 7) are developing into a new centre

TABLE 10

POPULATION GROWTH 1960-1971 IN B.C. CENSUS AREAS

Census Division	Population 1966	Population 1971	Index 1966 = 100
0	1,873,674	2,184,621	116.1
1	28,700	31,747	110.6
2	21,323	27,145	127.3
3	182,189	204,803	112.4
4	32,796	39,357	120.0
5	41,311	58,085	140.6
6	45,080	44,791	99.4
7	33,929	50,177	147.9
8	25,762	30,641	118.9
9	39,633	47,345	119.5
10	34,247	38,988	113.8
11	32,616	40,096	122.9
12	30,749	39,720	129.2
13	40,589	46,097	113.6
14	51,537	64,364	124.9
15	892,853	1,028,334	115.2
16	29,357	37,326	127.1
17	32,112	31,396	97.8
18	9,856	10,408	105.6
19	39,468	48,006	121.6
20	27,673	34,039	123.0
21	6,161	4,215	68.4
22	36,119	42,752	118.4
23	41,441	43,996	106.2
24	16,504	18,536	112.3
25	21,390	22,299	104.2
26	11,800	13,081	110.9
27	2,003	1,470	73.4
28	8,274	9,655	116.7
29	58,202	75,752	130.2

Source: Census, 1971

in the Province. The other Thompson-Okanagan census divisions - 20, 22 and 29 - also have above agerage growth.

The remainder of the regions with above average growth are regions 2, 4, 12, 14 and 16. All are, (with the exception of 16 - East Kootenay) central regions of B. C. (4 - Cariboo, 14 - Prince George*, 2 - Nechako, 16 - Kitimat Stikine). Above average relative growth of these regions is encouraging. However, their absolute growth is still very slight compared with the absolute growth of the Greater Vancouver Regional District and surrounding areas. There is a high possibility that above average relative growth of these areas was in large part created by the strong growth of the primary extracting and processing industries.**

Four census divisions - 6, 17, 21 and 27 exhibited decrease in population in the 1966-71 period. Areas 6 - Central Kootenay and 17 - Kootenay Boundary had a negligible decrease. The population decrease in areas 21 - Ocean Falls and 27 - Stikine was substantial (around 30%). Both are remote areas with only a few primary industries. (Both areas also have a high percentage of native population).

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*D.E.D. "The Central Report (1976: pg. 131): "The cities of Kamloops and Prince George have been identified as potential major growth centres . . ."

**Future development of central regions of B.C. is discussed in D.E.D. "The Central Report" (1976). The profile is still heavily based on resource development, which is traditionally male oriented.

Significantly below average growth was also exhibited in regions 1, 3, 18, 24 and 26. All are regions located close to Vancouver, mostly in north, north-western direction. The greater part of Vancouver Island is included here. An explanation may be the transportation problem between the mainland and Vancouver Island. The mainland regions 24 and 26 have relatively bad road connections with Vancouver and a relatively high percentage of native population. If a Pemberton-Lillooet highway is constructed, a Clinton-Ashcroft rail connection is built and B. C. Hydro develops Hat Creek coal deposits, the situation of region 26 might change dramatically. (See D.E.D. - "The Central Report '76").

B. Sex Structure

Table 11 shows the Female to Male (F/M) ratio by age groups. The big disadvantage of this table is that we do not have data showing the F/M ratio according to marital status in each age group and census area. As we will see later, F/M ratios can be very different when considering marital status. The problem is that data showing sex and marital status in age groups for B. C. census areas were not tabulated in the 1971 Census.

Without considering marital status we clearly see higher F/M ratios in more developed southern regions, especially 3 - Victoria, 7 - Central Okanagan, 15 - Vancouver,

TABLE 11

FEMALE TO MALE POPULATION RATIOS BY AGE GROUPS 15 AND OVER

Census Division	Total 15+	AGE GROUP 15-19	20-24	25-34	35-44	45-54	55-64	65 and Over
0	99	95	98	95	91	104	103	114
1	89	94	85	89	83	99	79	97
2	84	85	93	90	82	82	68	70
3	111	98	96	100	100	112	125	136
4	85	92	91	90	78	88	74	72
5	96	92	91	94	92	104	102	98
6	96	93	96	97	95	103	98	92
7	102	93	96	100	102	110	113	99
8	89	89	94	91	84	95	87	87
9	91	95	83	93	85	99	88	94
10	96	92	88	97	95	106	102	94
11	96	94	91	99	16	99	100	95
12	89	89	93	91	83	95	87	80
13	94	92	74	94	95	104	102	99
14	87	95	106	92	73	85	71	67
15	104	98	105	97	94	107	107	127
16	83	91	97	86	76	82	70	53
17	95	90	78	98	104	109	87	97
18	69	88	69	71	64	69	58	66
19	99	94	93	94	99	109	104	99
20	100	98	83	101	97	115	106	98
21	80	81	87	92	76	77	68	53
22	99	95	82	99	93	116	112	94
23	86	89	98	93	82	83	76	70
24	93	93	87	94	90	100	97	90
25	81	95	91	80	68	81	80	73
26	83	101	70	87	80	87	80	66
27	55	75	48	56	62	60	45	43
28	93	81	87	90	94	115	96	84
29	89	93	96	94	81	89	83	88

Source: Census 1971, #94-704

19 - Nanaimo, 20 - North Okanagan, 22 - Okanagan Similkameen. Some remote, underdeveloped census divisions such as 18, 21, 27, 16, 25 and 26* have quite low F/M ratios.

We also observe that the F/M ratio increases with age in developed regions, but decreases with age in frontier regions. In younger age groups, nature itself forces a balance - the F/M ratio has the tendency to be close to one. But from age 15, as economic and social forces take over, the natural balance becomes disturbed - the female population concentrates in developed areas and the male population, especially in younger age groups, is pushed by economic forces to work and live in frontier regions. The F/M ratio differences between regions become very large in older age groups as older women (more than older men) appear to migrate to southern developed areas).

C. Marital Status

The most important part of Table 12 is the Female to Male ratio by marital status. The drawback is that we do not have data which would show marital status by age groups in census divisions. Starting with the F/M ratio for the widowed, we observe that in every region there are more widowed women than men. In some regions

*Region 26 in this grouping is of some surprise, being not far from Vancouver. However, D.E.D. "Central Report" (1976: pg. 92) says" "Based on the possible improvement of Highways 24, 12 and the Lillooet-Pemberton link, it is conceivable that two centres along this route, Lillooet and Clearwater, could be developed into core areas in the future."

Table 12: Population 15 and Over by Sex and Marital Status

Census Area	Total No. of not Married (Single & Widowed) M	F	% Not Married to Population age 15+ M	F	% Singles to Population age 15+ M	F	Not Married M minus F Nr. M or F	%	F/M Ratio by Marital Status Single	Married	Widowed	Singles & Widowed
0	251,720	247,690	31.9	31.6	29.1	20.8	4,030	1.6	71	99	387	98
1	3,590	2,660	31.8	26.5	29.2	18.4	930	25.9	56	97	284	74
2	3,205	1,895	35.2	24.9	33.6	20.5	1,310	40.9	51	98	223	59
3	21,830	28,560	29.7	35.0	26.0	20.6	-6,730	-23.6	88	101	445	131
4	4,515	2,965	32.9	25.4	31.3	19.7	1,550	34.3	54	96	300	66
5	6,285	5,610	30.6	28.4	27.7	18.8	675	10.7	65	99	314	89
6	5,020	4,675	31.0	29.9	28.0	18.5	345	6.9	64	98	367	93
7	5,030	5,310	28.2	29.2	25.8	18.4	-290	-5.5	73	100	463	106
8	3,510	2,610	31.5	26.2	29.3	17.4	900	25.6	53	97	350	74
9	5,110	3,735	30.6	24.6	27.9	17.2	1,375	26.9	56	99	248	73
10	4,165	3,645	30.6	27.7	28.0	19.1	520	12.5	66	100	330	88
11	4,375	4,065	30.2	29.4	27.6	18.0	310	7.1	63	98	377	93
12	4,650	3,370	32.2	26.3	29.6	18.4	1,280	27.5	55	97	271	72
13	5,705	5,050	33.8	31.7	30.7	21.5	655	11.5	66	98	313	89
14	7,000	4,390	32.2	23.3	30.6	18.9	2,610	37.3	53	99	235	63
15	121,940	133,720	32.3	34.1	29.5	22.3	-11,780	-8.8	79	100	437	110
16	4,320	2,425	34.3	23.2	32.4	19.4	1,895	43.9	50	97	174	56
17	3,650	3,215	31.4	29.0	28.7	18.6	435	11.9	62	99	377	88
18	1,475	560	36.6	20.0	34.6	15.5	915	62.0	31	91	156	38
19	5,065	4,780	28.9	27.4	26.1	17.6	285	5.6	67	101	349	94
20	3,690	3,665	30.3	30.0	26.8	19.2	25	0.7	72	100	308	99

TABLE 12 (Continued)

Census Area	Total No. of not Married (Single & Widowed)		% Not Married to Population age 15+		% Singles to Population age 15+		Not Married M minus F		F/M Ratio by Marital Status			
	M	F	M	F	M	F	Nr. M or F	%	Single	Married	Widowed	Singles & Widowed
21	560	310	37.2	25.7	34.2	20.7	250	44.6	49	95	133	55
22	4,885	4,965	30.3	31.0	26.9	18.4	-80	-1.6	68	98	370	120
23	5,080	3,400	34.4	26.7	32.1	20.2	1,680	33.1	54	98	248	67
24	2,005	1,525	30.7	25.1	28.3	17.1	480	23.9	56	101	313	76
25	3,105	1,825	37.8	27.6	34.9	20.7	1,280	41.2	48	96	186	59
26	1,635	995	35.4	25.9	32.4	19.6	640	39.1	50	96	178	61
27	305	80	46.9	22.2	45.4	18.1	225	73.8	22	86	150	26
28	1,045	905	28.3	26.5	25.2	15.1	50	4.8	55	96	339	87
29	8,985	6,815	33.3	28.3	31.0	21.2	2,170	24.2	61	97	281	76

Source: Census 1971, #94-706.

these differences are very large - especially in regions 3, 7 and 15, which means (again) a tendency for widowed women to concentrate in southern-developed regions. In regions 3, 7, 15 and 22, the surplus of widowed women actually outweighs the shortage of single women, so that in total, these regions have more unmarried women than men.* Assuming that widowed women are mostly in the older age groups, and that single men are in younger groups, it would not help if there were a surplus of single men together with a surplus of widowed women. Frontier regions have relatively less widowed women, which means that the F/M ratio in this category is closer to one in underdeveloped regions.

The F/M ratio for singles shows the situation in younger age groups. And we come to the conclusion that Victoria, Central Okanagan, Vancouver and North Okanagan have all relatively more single women than other regions. On the other side, many less developed regions have very low F/M ratios for singles. For example, region 27 - Stikine has 22 single women per 100 single men and region 18 - Mount Waddington, has 31 single women per 100 single men. Many frontier regions have around 50 to 60 single women per 100 single men. When including information from Table 11 (marital status not considered) we can see that

*Because of insufficient data we do not include divorced into this ratio. However, we believe the ratios would not change significantly if divorced were included.

our previous observations are again confirmed: the most balanced population structure (F/M ratio closest to one) is in the southern developed and urbanized regions 3, 7, 11, 15, 19, 20 and 22; (as we have seen in Chapter 4, these areas also have the best industrial structure for female employment).

We do not have the data which would show the distribution of the population in census areas according to age groups and marital status. We have such data only for Canada and B.C.

TABLE 13

UNMARRIED POPULATION IN B.C. BY AGE GROUPS

		Age Groups						
	Total 15+	15-19	20-24	25-34	35-44	45-54	55-64	65+
M.	266,025	100,930	61,535	32,910	16,545	14,430	13,100	26,580
F.	266,095	89,110	36,635	19,635	12,750	18,285	25,200	64,470
F/M Singles								
	71.3	88.2	58.0	49.0	49.6	66.1	80.0	
F/M Not Married								
	100.0	88.3	59.5	59.7	77.1	126.7	192.4	244.6

Source: Census 1971, #92-730

Adding up the singles, widowed and divorced in every age group, we derive the number of unmarried males and females. Beginning with the group 15-19, there is a significant shortage of unmarried females. This situation worsens in groups 20-24 and 25-34, where there are close to 60 unmarried females

per 100 unmarried males. The F/M ratio is completely reversed in the age groups 45 and older, where there are more unmarried females and the disproportion grows with age. "The Canada Year Book" (1973: pg. 213) explains: "(there is a) . . . far greater number of single males than females at the younger age levels and the reverse for widows compared with widowers in the older age groups. The former condition results from the generally easier ages of marriage for females and the latter is due to the life expectancy of females as well as the greater tendency for widowers to remarry."

Taking into account these data, we infer that the F/M ratios in B. C. census areas according to age groups and marital status will be much worse than when considering only age or marital status.

The issue is whether this situation is desirable and what are its causes. It might be partly the result of economic conditions, and this in turn might contribute to some social and economic problems. However, similar patterns on a smaller scale are visible in many other countries, including those in Europe (U.N. Demographic Yearbook, (1971: pg. 412).

A low F/M ratio is one of the characteristics of underdeveloped-frontier regions. Thus we can use it as a proxy indicating the level of development in a region and further, how stable the population is settled (i.e. F/M ratio indicating

the degree of fluctuation and migration of population). We will try to verify this hypothesis by looking at the historical development of the F/M ratio in the provinces as shown in Table 14.

TABLE 14

HISTORICAL F/M RATIOS FOR PROVINCES

	Ontario		Quebec	
Year	F/M Populat.	F/M Singles Age 15 and Over	F/M Populat.	F/M Singles Age 15 & Over
1921	98.0	84.8	100.1	94.4
1931	96.2	81.3	98.6	92.7
1941	97.1	80.3	99.2	92.7
1951	98.7	77.6	100.6	95.6
1956	98.6	73.7	99.7	91.1
1961	98.9	74.8	99.8	91.0
1966	100.1	77.7	100.3	91.1
1971	100.6	79.3	101.3	90.9

	British Columbia		Alberta	
Year	F/M Populat.	F/M Singles Age 15 and Over	F/M Populat.	F/M Singles Age 15 & Over
1921	78.8	42.7	81.5	47.3
1931	80.2	50.7	82.8	54.0
1941	88.0	57.3	86.7	62.1
1951	95.2	57.2	90.9	65.1
1956	94.1	56.1	91.7	58.1
1961	96.5	58.0	93.2	63.8
1966	97.5	66.5	96.1	66.9
1971	98.5	69.5	96.7	71.3

Source: Census 1971 - #92-717

We can clearly see that in both Ontario and Quebec the F/M ratios are relatively stable over time and significantly higher than in B. C. and Alberta, where the F/M ratios continuously increase over time. This seems to support our hypotheses that as regions economically develop and change from a frontier to a more developed character, the F/M ratio increases.

As the Canadian frontier moved to the west, the F/M ratio was changing. However, there are still huge areas in Canada which can be considered frontier areas with a low F/M ratio. Black (1970: pg. 113) characterized B. C. as " . . . a continuously evolving frontier with a frontier population, a frontier economy . . ."

A similar situation existed in the U. S. at the time when a major portion of the country was still a frontier. P. H. Landis (1948: pp. 63-64) writes that there has been "a striking disparity in the sex ratio on the frontier fringes during the course of American history. Relics of this frontier are still found in the mountainous mining, lumber and cattle raising areas of the far western states. Gradually, as the frontier has been conquered, women have followed man."*

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*R. F. Wallace (pp. 14-15) writes that the high proportion of males in Montana reflects the overwhelming extent to which the Montana economy was devoted to production of primary products in agriculture, mining and forestry.

D. Age Structure

Table15 shows the population age structure of B.C. census divisions for females and males.

i) Age Group 15 - 19

Some developed areas, especially 15-Vancouver, 3-Victoria, 22-Okanagan Similkameen and 28-Sunshine Coast have a low percentage of the population in this group. This could be explained by the following points: a) Birth rates are lower in developed areas (Census '71 #92-718 - children born per 1,000 women 15 years and over: Vancouver - 2,203, Victoria - 2,218, B.C. - 2,412.), b) The young population, not settled and economically vulnerable, is pushed out to work in under-developed areas, and c) The older population tends to live in developed southern areas. This is probably the most important reason. The concentration of the older population in developed areas can be seen when looking at the age groups 55 and over.

Exceptions to this pattern are areas 18 and 27, which are under-developed regions, but have a low proportion of the population in this group.

ii) Age Group 20 - 44

This is the most productive age group according to labor force participation rates.

Under-developed areas have a much higher proportion of

TABLE 15: B. C. STRUCTURE OF POPULATION AGE 15 AND OVER IN CENSUS AREAS - 1971

Census Area	15 - 19			20 - 24			25 - 34			35 - 44			45 - 54			55 - 64			65 and Over		
	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F
0	12.8	13.0	12.5	11.7	11.8	11.6	18.6	19.0	18.2	16.3	17.0	15.5	15.4	15.1	15.8	12.1	11.9	12.3	13.0	12.1	13.9
1	15.0	14.6	15.4	13.1	13.4	12.8	21.2	21.2	21.1	17.4	18.0	16.8	15.1	14.3	16.0	11.0	11.6	10.3	7.2	6.9	7.6
2	16.3	16.2	16.4	13.7	13.0	14.4	23.0	22.3	23.9	18.4	18.6	18.2	14.0	14.0	13.9	8.6	9.3	7.6	6.1	6.6	5.5
3	12.0	12.7	11.3	10.8	11.6	10.1	14.2	15.0	13.5	13.4	14.1	12.7	15.9	15.8	16.0	13.8	12.9	14.5	20.0	17.8	21.9
4	15.8	15.2	16.5	13.7	13.3	14.2	22.1	21.6	22.8	18.8	19.5	17.9	14.4	14.2	14.6	9.2	9.8	8.6	6.0	6.4	5.4
5	14.3	14.6	14.0	10.6	10.9	10.2	17.8	18.0	17.5	15.7	16.0	15.4	15.1	14.5	15.8	12.3	12.0	12.7	14.2	14.0	14.3
6	13.8	14.0	13.5	10.4	10.4	10.4	15.9	15.8	16.0	15.4	15.5	15.3	15.3	14.8	15.8	14.4	14.3	14.5	14.8	15.1	14.5
7	13.5	14.1	12.9	9.7	10.1	9.4	15.9	16.1	15.8	15.2	15.1	15.2	15.0	14.5	15.6	13.7	13.0	14.5	16.9	17.1	16.6
8	14.6	14.6	14.6	11.2	11.0	11.6	18.8	18.6	18.9	17.2	17.7	16.7	15.5	15.1	16.0	11.9	12.1	11.8	10.7	10.9	10.6
9	14.2	13.9	14.6	11.9	12.4	11.3	20.7	20.5	20.9	18.2	18.7	17.5	15.3	14.7	16.0	10.5	10.6	10.3	9.2	9.1	9.4
10	15.0	15.3	14.6	11.3	11.7	10.8	16.9	16.9	16.9	15.8	16.0	15.7	16.1	15.3	16.9	13.0	12.7	13.4	11.9	12.1	11.8
11	13.8	14.0	13.6	9.9	10.2	9.6	16.4	16.2	16.7	16.2	16.2	16.1	15.5	15.3	15.7	13.1	12.9	13.4	15.1	15.2	15.0
12	14.7	14.6	14.7	12.9	12.6	13.2	20.6	20.3	20.9	16.9	17.4	16.3	15.2	14.7	15.7	10.8	10.9	10.7	9.0	9.4	8.4
13	15.7	15.9	15.4	10.6	11.8	9.3	15.5	15.6	15.4	15.8	15.8	15.9	15.8	15.1	16.6	12.7	12.2	13.2	13.8	13.5	14.2
14	14.6	14.0	15.3	14.2	12.9	15.7	27.5	26.6	28.4	19.9	21.5	18.1	12.8	12.9	12.7	6.8	7.4	6.1	4.7	4.8	3.7
15	11.6	11.9	11.2	11.9	11.9	12.0	18.8	19.5	18.2	16.2	17.0	15.4	15.7	15.5	16.0	12.3	12.1	12.5	13.4	12.1	14.8
16	14.8	14.2	15.6	14.9	13.8	16.2	26.7	26.2	27.2	20.3	21.1	19.3	12.7	12.7	12.6	6.4	6.9	5.7	4.3	5.1	3.3
17	14.3	14.6	13.8	11.2	12.3	10.1	15.1	14.9	15.3	15.6	15.0	16.3	17.1	16.0	18.3	15.5	16.2	14.8	11.1	11.0	11.3
18	11.8	10.6	13.5	15.6	15.7	15.7	29.9	30.3	30.3	18.3	17.3	17.3	12.3	12.1	12.1	8.3	7.5	7.5	3.9	3.7	3.7
19	13.4	13.8	13.0	10.0	10.3	9.6	16.1	16.6	15.7	15.1	15.1	15.1	16.7	15.9	17.5	14.1	13.8	14.4	14.6	14.6	14.6
20	14.0	14.1	13.8	9.3	10.1	8.4	15.5	15.4	15.6	15.4	15.7	15.1	15.8	14.7	16.9	13.7	13.3	14.1	16.4	16.6	16.1
21	14.0	14.0	14.1	13.3	13.0	14.1	22.9	21.6	24.9	19.0	19.3	18.3	15.3	15.6	14.9	10.5	11.3	9.5	5.0	5.6	3.7
22	12.8	13.1	12.5	8.8	9.7	8.0	13.0	12.9	13.0	14.8	15.2	14.3	16.3	15.1	17.5	15.7	14.8	16.7	18.7	19.2	18.1
23	16.0	15.8	16.2	13.2	12.4	14.2	23.1	22.3	24.0	19.3	19.8	18.8	13.2	13.4	12.9	8.6	9.1	8.0	6.5	7.1	5.8
24	14.2	14.2	14.2	11.7	12.1	11.4	19.9	19.8	20.0	17.2	17.5	16.9	14.4	13.9	14.9	12.5	12.2	12.8	10.0	10.2	9.9
25	13.9	12.9	15.2	14.3	13.5	15.2	25.6	25.7	25.4	17.8	19.1	16.1	13.2	13.2	13.3	9.0	9.1	9.0	6.2	6.5	5.8
26	15.3	14.1	17.0	13.2	14.3	12.0	22.3	21.8	22.9	18.3	18.7	18.1	14.9	14.6	15.3	9.9	9.9	9.6	6.1	6.7	5.3
27	9.9	9.2	12.5	20.8	22.3	19.4	28.2	27.7	27.8	16.8	16.2	18.1	11.9	11.5	12.5	7.4	8.5	6.9	4.5	5.4	4.2
28	11.1	11.9	10.4	9.4	9.6	9.1	15.3	15.6	15.1	13.9	13.8	14.1	15.6	14.0	17.3	17.2	16.9	17.6	17.5	18.3	16.7
29	14.6	14.3	14.9	12.6	12.2	13.1	22.0	21.6	22.6	18.8	19.6	17.8	14.6	14.6	14.6	9.8	10.1	9.4	7.6	7.6	7.5

Source: Census 1971 - #94-704; Population in Census Area (total, males or females) is 100.

the population in this age group, which means that the population overall is potentially more economically active. Many frontier regions (1, 2, 4, 9, 12, 14, 16, 18, 21, 23, 25, 26, 27 and 29) have a very high percentage of the population in this group. But these people are mostly employed in primary, unstable industries. An economically advantageous age structure in frontier areas does not help to speed up the permanent development of these regions. For the most part, it appears to be characteristic for these regions, that they have unstable industries and unbalanced and unstable population.

iii) Age Group 45 - 54

This portion of the population is fairly evenly distributed among regions, but some tendency to concentrate in developed southern parts of B. C. reveals itself.

iv) Age Group 55 and Over

There seems to be a strong tendency for older age groups to concentrate in older, developed areas, or southern recreational areas* - 3-Victoria, 19-Nanaimo, 15-Vancouver, 5-Central Fraser, 6-Central Kootenay, 7-Central Okanagan, 10-Cowichan Valley, 11-Dewdney Alouette, 13-Fraser Cheam, 20-North Okanagan, 22-Okanagan-Similkameen and 28-Sunshine Coast. Sinclair, (1974: pg. 12) writing about Prince Rupert-Kitimat region says that " . . . the percentage of persons 45 years and older is approximately one-half that of the remainder

*The reason may be climate and amenities.

of British Columbia or the Lower Mainland. Thus, it appears that most of the Prince Rupert-Kitimat region's population live within the region only during their working lives."

E. Degree of Urbanization

We hypothesize that the degree of urbanization has some positive effect on the population structure, especially the F/M ratio in census areas.* This hypothesis is partly supported by Table 16:

TABLE 16

F/M RATIO FOR URBAN POPULATION BY SIZE GROUPS IN B. C. AND ALBERTA

Size of Community	F/M B.C.	F/M Alberta
500,000 and over	102.4	-
100,000 to 500,000	110.2	100.4
30,000 to 100,000	97.2	101.5
10,000 to 30,000	98.3	100.7
5,000 to 10,000	96.0	94.7
2,500 to 5,000	97.1	99.5
1,000 to 2,500	93.2	98.2
Rural	90.5	87.8

Source: Census 1971 - #92-709

*The reason may be the number of amenities.

TABLE 17

PERCENTAGE OF URBAN AND RURAL POPULATION IN CENSUS AREAS B. C.

	% Urban Total	% Urban 10,000+	% Urban 5,000+	% Rural Total	% Rural Non-Farm	% Rural Farm	F/M Populat. 15+
0	75.7	66.2	69.7	24.3	20.9	3.4	99
1	72.8	69.6	69.6	27.2	26.2	1.0	89
2	35.2	0	0	64.8	52.9	11.9	84
3	84.4	80.4	80.5	15.6	14.4	1.2	111
4	36.7	0	33.8	63.3	54.6	8.7	85
5	14.4	0	0	85.6	66.4	19.2	96
6	46.3	0	73.8	53.7	47.2	6.5	96
7	66.8	63.51	63.5	33.2	25.7	7.5	102
8	32.1	0	0	67.9	60.3	7.6	89
9	57.9	23.7	44.4	42.1	39.6	2.5	91
10	35.0	0	0	65.0	60.4	4.6	96
11	46.9	37.7	37.7	53.2	45.3	7.9	96
12	68.7	30.2	49.4	31.3	27.9	3.4	89
13	48.7	36.3	36.3	51.3	40.5	10.8	94
14	69.0	65.9	65.9	31.0	27.7	3.3	87
15	94.8	92.0	92.9	5.2	4.6	0.6	104
16	64.7	64.7	64.7	35.3	34.6	0.7	83
17	72.8	42.3	42.3	27.2	23.3	3.8	95
18	14.5	0	0	85.5	85.0	0.5	69
19	64.3	57.2	57.2	35.7	33.4	2.3	99
20	47.3	39.0	39.0	52.7	40.2	12.5	100
21	32.6	0	0	67.4	66.0	1.4	80
22	55.3	42.4	42.4	44.7	31.7	13.0	99
23	56.5	27.0	45.8	43.5	29.1	14.4	86
24	74.8	74.1	74.1	26.0	25.4	0.6	93
25	75.2	75.2	75.2	24.8	24.5	0.3	81
26	23.8	0	0	76.2	73.2	3.0	83
27	73.5	0	0	26.5	26.5	0	55
28	20.0	0	0	80.0	78.8	1.2	93
29	67.2	50.9	57.9	32.8	27.7	5.1	89

Source: Census 1971 - #92-709

TABLE 18

PERCENTAGE OF URBAN AND RURAL POPULATION IN CENSUS AREAS ALBERTA

	% Urban Total	% Urban 10,000+	% Urban 5,000+	% Rural Total	% Rural Non-Farm	% Rural Farm	F/M Populat. 15+
0	73.5	60.24	63.3	26.5	12.0	14.5	97
1	76.5	73.50	73.5	23.5	8.2	15.3	102
2	65.7	47.58	47.6	34.3	14.0	20.2	98
3	41.3	0	0	58.7	27.8	30.9	96
4	19.6	0	0	80.4	33.9	46.5	87
5	27.1	0	15.8	72.9	33.6	39.3	90
6	92.7	90.21	90.2	7.3	3.5	3.8	101
7	27.9	0	0	72.1	31.2	40.9	90
8	51.4	32.32	32.3	48.6	21.3	27.3	96
9	63.3	0	0	36.7	35.1	1.6	92
10	32.3	0	20.5	67.7	24.1	43.6	92
11	89.5	84.45	86.6	10.5	5.2	5.3	100
12	48.0	0	24.1	52.0	25.5	26.5	86
13	23.2	0	0	76.9	25.6	51.2	86
14	55.1	0	0	44.9	27.6	17.3	87
15	41.4	13.80	19.1	58.6	28.4	30.2	85

Source: Census 1971 - #92-709

There are only 5 regions in B. C. with cities of a population over 30,000: The Capital (Victoria); Central Okanagan (Kelowna); Fraser-Ft. George (Prince George); Vancouver and Thompson-Nicola (Kamloops). It appears that cities with over 100,000 have a positive effect on the

population structure (F/M ratio), but cities with between 30,000 and 100,000 have a mixed effect: Kamloops and Prince George have F/M below one, but Kelowna has F/M over one (Census #92-709). The threshold size with respect to its effect on population and industrial structure (and with gravity potential for females) is probably around 100,000 (see Table 16). (For the regression analysis in Chapter 7 we use "Urban Population 5,000 and Over" which shows relatively small effect on population structure.)

There are relatively large rural farm populations in regions 2, 4, 5, 7, 8, 11, 13, 20, 22, and 23. With the exceptions of 2-Bulkley-Nechako, 4-Cariboo, 8-Columbia Shuswap and 23-Peace River, these are developed regions with a high F/M ratio. (Agriculture has relatively high female employment in B. C. - contrary to Alberta). On the other hand, all regions with a relatively low farm population (1, 3, 9, 15, 16, 18, 21, 24, 25 and 28) are frontier regions (with the exception of the Capital and Vancouver, which do not have much agricultural land considering the size of population). The rest of the regions are mostly single industry areas with primary industries: 1-Alberni (pulp and paper), 9-Comox-Strachana (logging, sawmills and pulp), 16-Kitimat-Stikine (aluminum smelter, logging, pulp, sawmills), 18-Mt. Waddington (logging), 21-Ocean Falls (logging, pulp and

paper), 25-Skeena (logging, fishing, pulp and paper and transportation).

Agriculture probably has a positive effect on population structure and population stability*, and possibly also on the growth of non-primary industries.

An exceptionally high percentage of the rural non-farm population is in regions 5, 8, 10, 18, 21 and 28. This seems to have some positive relationship with the percentage of native population. But small mining, forestry and fishing-trapping communities are probably also influencing this category. A high percentage in regions 5 and 28 is probably the result of a concentration of pensioners who tend to live in rural areas not far from cities.

F. Labor Force Participation Rates (Table 19)

It is difficult to explain the variation of the participation rates (hearafter LFPR), but there seems to be a tendency for higher participation rates in frontier regions, especially in the case of male labor force participation rates. This could be partly explained by the better age structure in frontier areas. The female labor force participation rates are probably dependent on the availability of jobs for females.

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*Sax, S. (1973: p. iii): " . . . the amount of agriculture in a region helped to reduce the unemployment rate."

TABLE 19

LABOR FORCE PARTICIPATION RATES IN B. C. 1971

Census Division	Age Groups															
	Total 15 +		15 - 19		20 - 24		25 - 34		35 - 44		45 - 54		55 - 64		65 +	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
0	77.5	40.4	53.5	42.1	89.0	61.1	94.5	44.6	95.3	46.2	92.3	46.9	80.7	35.8	19.0	6.6
1	84.5	32.9	59.9	33.1	92.2	45.2	96.0	31.6	97.3	33.7	95.4	36.8	90.4	31.6	20.4	7.1
2	80.0	35.9	54.2	33.9	90.3	39.5	94.5	33.2	93.3	39.0	89.1	46.6	74.9	32.8	24.8	11.5
3	73.1	39.5	54.2	46.9	90.2	67.0	95.2	46.5	96.7	50.1	93.7	50.2	78.7	36.6	15.5	6.4
4	81.8	37.6	60.0	34.8	91.9	42.1	93.6	38.0	93.4	44.9	90.2	41.8	78.1	32.0	25.3	6.8
5	75.8	36.2	62.4	39.6	89.2	53.2	91.3	37.6	93.9	43.6	90.1	45.6	80.3	31.2	19.8	5.1
6	73.2	32.7	51.1	33.9	88.0	45.4	94.3	34.3	95.0	41.3	93.0	39.4	77.7	32.8	15.3	4.1
7	72.7	37.2	58.4	44.6	90.7	59.8	95.9	40.2	96.6	48.8	91.1	44.7	72.8	28.0	15.4	6.1
8	80.0	36.5	61.9	40.4	91.0	43.4	95.9	36.3	96.4	42.8	91.5	44.9	81.6	31.2	21.4	7.3
9	80.9	35.8	53.8	40.2	93.1	44.7	97.2	33.8	97.6	41.3	92.2	41.2	80.0	31.1	17.3	8.8
10	77.4	31.5	52.3	33.0	90.3	43.6	95.8	33.9	96.6	32.6	94.5	35.9	84.0	32.4	17.1	6.5
11	74.0	34.4	58.6	33.2	91.8	51.0	95.4	36.5	93.2	41.6	90.0	43.5	74.4	31.2	16.3	7.9
12	81.5	37.1	60.4	40.3	93.9	47.6	96.6	37.2	96.4	44.2	93.2	39.1	81.7	29.1	18.9	7.7
13	73.7	37.4	61.0	41.3	88.5	55.0	90.2	38.4	92.4	46.2	86.9	45.5	75.7	32.2	18.5	5.9
14	85.2	42.2	55.2	39.4	93.2	54.6	96.9	39.7	95.6	43.1	92.0	44.1	82.6	40.9	25.9	9.9
15	77.7	43.6	51.1	45.2	87.1	69.1	94.2	50.2	95.4	48.3	92.7	49.1	82.2	38.6	19.5	6.8
16	82.1	38.2	45.7	35.2	90.8	43.9	94.8	36.7	95.0	42.1	91.6	41.2	84.3	35.5	15.0	8.3
17	77.3	34.7	45.9	35.9	90.7	50.7	96.0	37.4	96.3	41.7	96.2	39.5	83.0	29.7	17.5	4.2
18	84.6	31.6	49.4	25.9	89.4	35.2	94.2	28.0	94.2	37.9	90.3	39.2	84.0	32.9	27.4	8.7

TABLE 19 (Continued)

Census Division	Age Groups															
	Total 15 +		15 - 19		20 - 24		25 - 34		35 - 44		45 - 54		55 - 64		65 +	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
19	75.6	35.8	54.2	44.8	90.6	54.3	95.5	38.8	96.7	39.5	91.6	44.3	79.0	28.0	20.1	6.1
20	73.3	36.8	55.7	40.0	87.6	53.0	96.3	45.2	96.1	48.6	89.8	44.1	77.3	29.5	18.8	5.3
21	76.4	29.8	33.0	18.7	74.5	33.1	90.1	26.5	88.4	32.1	93.1	40.9	84.2	35.0	33.7	13.0
22	72.1	38.2	60.2	44.9	90.7	66.0	96.9	44.1	94.6	49.8	91.9	47.6	73.8	30.7	19.5	6.0
23	81.9	41.3	55.6	35.6	91.1	49.8	95.1	38.6	94.3	46.7	92.7	50.2	78.3	40.8	32.4	11.5
24	79.8	30.2	51.3	31.2	92.3	36.7	95.1	33.4	96.2	37.4	93.8	33.6	87.4	25.5	18.5	3.8
25	82.0	43.6	45.0	35.3	89.7	55.3	94.2	41.6	95.5	47.9	90.1	52.0	87.0	47.3	27.4	7.3
26	82.8	34.9	48.0	29.7	91.5	36.2	95.8	32.5	95.5	42.6	94.7	42.2	83.5	36.8	32.6	9.3
27	87.2	44.8	68.4	34.8	95.2	50.7	95.6	39.2	93.4	50.8	89.3	62.2	75.0	42.3	33.3	0
28	68.4	30.5	56.6	27.5	90.1	40.8	92.2	37.4	94.7	44.4	85.1	37.3	66.3	28.2	13.8	4.2
29	80.1	39.9	54.4	41.8	90.8	49.3	91.7	40.1	93.0	43.4	91.6	44.7	79.6	35.4	23.8	7.6

Source: Census 1971 - #94-704

We will try to compare B.C. economic utilization of population with countries and regions which have diversified industrial structure. We will try to estimate labor force and unemployment under the assumption that labor force participation rates in 24 age and sex cohorts are the same in B.C. as in other countries or regions. LFPR for 1971 in 5 year interval age-sex groups of other countries are used as a standard for B.C. The findings are as follows:

B.C. Unemployment Rate for 1971 reported by Canada Yearbook:	7.0
B.C. Unemployment Rate for 1971 reported in Census:	9.0
B.C. Unemployment Rate using Ontario LFPR as a standard:	12.6
B.C. Unemployment Rate using Toronto LFPR as a standard:	15.8
B.C. Unemployment Rate using Japan's LFPR as a standard:	17.1
B.C. Unemployment Rate using West German LFPR as a standard:	11.8
B.C. Unemployment Rate using U.S. LFPR as a standard:	7.6

We clearly see that the British Columbia population is economically underutilized compared to other countries and regions. These areas also have significantly different industrial structures. This suggests a possibility that industrial structure may have some effect on the economic utilization of population. Furthermore, a disproportionately larger part of economically utilized population in B.C. is employed in service industries. The Economic Council of Canada (1975: p. 41) says that " . . . the substantial increases in employment in the service industries will tend to reduce productivity gains." On the following page we show the percentage of labor force in service industries (excluding Transportation, Communication and Utilities) in

different countries and regions as compared with B.C. and Vancouver:*

		Vancouver	60.3%
		Toronto	56.1%
B. C.	51.9%	Japan	39.8%
Ontario	42.1%	Sweden	37.6%
W. Germany	40.9%	E. European Countries	15 - 25%
U. S. A.	57.0%		

G. Other Characteristics of Population and Labor Force (Table 20)

The following regions have above average unemployment rates: 7, 11, 13, 14, 15, 19, and 22. All are developed regions with a fairly high F/M ratio. These areas are probably attractive to live in, but there are not enough jobs. Perhaps labor migrates from less developed regions to spend unemployment time in areas more socially attractive.**

Percentage of Labor Force with Grade 9 or Less

There seems to be a concentration of better educated people in developed areas, especially in Victoria and Vancouver.

Native Population

With the exception of Vancouver, the native population does not tend to live in developed areas. There seems to be no positive relationship between the percentage of unemployed and

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*Sources for unemployment and percentage in service industries computations: Census 1971, #94-704, #94-740, #94-742, #94-747; W. German "Statistishes Yahrbuch" 1972, 1975; and U.N. Demographic Yearbook, 1972.

**Sinclair (1974: pp. 24-25): "It follows that the more willing a worker is to move out of a particular area, the more likely he will be to move when faced with the prospect of temporary unemployment or retirement." " . . . high labor turnover rates and the absence of retired persons suggests that once free of work, individuals tend to relocate outside the region."

TABLE 20: SOME OTHER CHARACTERISTICS OF L.F. IN CENSUS AREAS 1971

Census Area	Total* Unemployed	% of L.F.	Labor Force grade 9 or less	% of Total L.F.	Native Populat.	% of Total Popul	% Native Populat. Income Less 3000	% of All Popul. With Income Less 3000	Total No. of Families	Families With Female Heads	% of Total Families
0	83,660	9.0	174,030	18.7	52,210	2.38			533,640		
1	930	7.2	3,225	25.1	2,095	6.59	33.3	7.67	7,440	440	5.9
2	860	8.6	2,970	29.7	3,255	11.99	37.9	12.60	5,855	330	5.6
3	7,145	8.3	11,945	13.9	2,115	1.03	30.6	8.82	52,525	4,100	7.8
4	1,270	8.1	4,470	28.6	2,935	7.46	58.5	13.47	8,935	545	6.1
5	1,665	7.3	5,490	24.2	455	0.78	28.6	14.00	14,255	880	6.2
6	1,530	9.0	4,215	24.8	210	0.46	50.0	14.86	11,155	695	6.2
7	2,185	11.1	4,305	21.8	430	0.86	17.7	13.16	12,865	810	6.3
8	1,005	8.0	3,265	26.0	365	1.19	33.3	11.79	7,375	400	5.4
9	1,580	8.3	3,505	18.5	1,470	3.10	25.8	8.40	11,590	615	5.3
10	1,150	7.8	3,165	21.5	2,405	6.17	36.9	10.30	9,675	560	5.8
11	1,420	9.3	3,515	23.0	535	1.33	50.0	14.27	9,995	680	6.8
12	1,385	8.4	3,485	21.1	485	1.22	50.0	8.64	9,580	550	5.7
13	1,695	9.2	4,720	25.7	2,025	4.39	23.1	14.24	10,995	850	7.7
14	2,460	9.3	6,530	24.7	1,835	2.85	50.0	7.74	14,550	905	6.2
15	44,035	9.5	72,695	15.6	6,865	6.68	16.7	8.82	253,510	21,325	8.4
16	1,070	7.5	3,610	25.1	6,220	16.66	29.4	9.19	8,180	425	5.2
17	1,130	8.8	3,060	23.8	120	0.38	0	9.13	8,065	475	5.9
18	150	3.5	910	21.2	1,430	13.74	26.7	7.49	2,330	100	4.3

TABLE 20 (Continued)

Census Area	Total* Unemployed	% of L.F.	Labor Force grade 9 or less	% of Total L.F.	Native Populat.	% of Total Popul.	% Native Populat. Income Less 3000	% of All Popul With Income Less 3000	Total No. of Families	Families With Female Heads	% of Total Families
19	1,825	9.4	3,535	18.1	840	1.75	36.8	11.47	12,510	815	6.5
20	1,150	8.6	3,270	24.4	700	2.06	20.0	13.95	8,410	530	6.3
21	80	5.3	460	30.5	1,370	32.50	27.7	12.50	925	55	5.9
22	1,955	11.0	4,055	22.9	700	1.64	34.6	15.55	10,980	715	6.5
23	1,545	8.9	4,755	27.4	2,560	5.82	45.8	14.04	9,450	635	6.7
24	480	6.8	1,460	20.7	525	2.83	25.0	9.74	4,595	265	5.8
25	820	8.5	2,370	24.6	4,335	19.44	27.9	8.73	4,855	350	7.2
26	465	9.0	1,270	24.5	1,675	12.81	34.7	10.78	2,955	175	5.9
27	25	3.4	170	23.2	210	14.29	0	11.11	275	10	3.6
28	405	11.4	705	19.8	380	3.94	45.5	17.82	2,580	145	5.6
29	2,245	7.2	6,890	22.1	3,665	4.84	38.6	9.21	17,230	1,095	6.4

Source: Census 1971

*There is some inconsistency in unemployment statistics. The Canadian Statistical Review shows the B. C. unemployment rate in 1971 as being between 6.2% and 7.7% but the Census shows 9.0%.

the percentage of native people. On the contrary, the unemployment rate is high in regions with a low native population. Areas with a high percentage of native population show a poorly educated labor force. It also appears that the percentage of natives under the poverty level is lower in developed areas, but there might be considerable income in kind in rural areas (such as food and housing) which is not included in measured income. Thus the native people might still be better off in rural areas, where they can find some economic activity, than in cities where they cannot. The build-up of native-owned firms with government help was fairly successful in some areas such as Burns Lake. The percentage of poor native people as compared with the percentage of poor in the total population is high.*

Poverty

It is difficult to find any relationship between poverty and other population or labor force characteristics. However, with some exceptions, there could be a direct relationship between poverty and the rural population. This would probably diminish the impact of poverty, because people in rural areas usually have some income in kind, but prices of market goods may be higher in rural areas too.

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*D.E.D. - "The Central Report '76" (1976: p. 172) in Profiles 2 and 3, gives some consideration to this problem.

CHAPTER 6

ECONOMIC INCENTIVES

Relative wages do not adequately measure the attractiveness of various regions. This was discussed in Chapters 1 and 2. However, prices are the generally accepted allocative mechanism and wages do constitute an important part of overall incentives.

Average annual male employment income in B.C. during 1971 was $7,076. The following census divisions have male employment income at least 5% below the B. C. average (under $6,700.): 2, 4, 6, 7, 8, 11, 13, 20, 21, 22, 23, 26 and 28. Wages in three of these census areas were 15% below the B. C. average (under $6,000.). These three areas are 7, 20 and 22. The regions which had an above-average annual employment income above $7,200. were 1, 14, 15, 16 and 18.

In both cases, the regions listed represent both developed and under-developed areas. However, the Greater Vancouver Regional District (census division 15), which has by far the greatest weight in the province, has the second highest employment income. This suggests that there are not large monetary incentives for male workers to seek employment away from Vancouver.

TABLE 21: AVERAGE ANNUAL EMPLOYMENT INCOME IN B.C. AND ALBERTA CENSUS AREAS 1971

Census Area	British Columbia Males	Females	F/M Income	Census Area	Alberta Males	Females	F/M Income
0	7,076	3,083	43.6	0	6,461	3,007	46.5
1	7,247	2,850	39.3	1	5,774	2,810	48.7
2	6,344	2,655	41.9	2	5,916	2,663	45.0
3	6,777	3,006	44.4	3	5,118	2,710	52.9
4	6,296	2,733	43.4	4	5,178	2,489	48.1
5	6,729	2,560	38.0	5	4,896	2,503	51.1
6	6,189	2,556	41.3	6	7,369	3,124	42.4
7	5,955	2,462	41.3	7	4,477	2,648	59.1
8	6,464	2,565	39.7	8	5,244	2,747	52.4
9	7,142	2,736	38.3	9	6,310	2,752	43.6
10	6,816	2,743	40.2	10	4,379	2,596	59.3
11	6,442	2,813	43.7	11	7,117	3,165	44.5
12	6,934	2,704	39.0	12	5,251	2,789	53.1
13	6,177	2,492	40.3	13	4,246	2,716	64.0
14	7,477	2,915	39.0	14	6,337	2,496	39.4
15	7,481	3,360	44.9	15	5,033	2,715	53.9
16	7,365	2,927	39.7				
17	6,812	2,648	38.9				
18	7,691	2,689	35.0				
19	6,801	2,733	40.2				
20	5,990	2,585	43.2				
21	6,113	2,401	39.2				
22	5,545	2,387	43.0				
23	6,568	2,770	42.2				
24	7,358	2,784	37.8				
25	7,357	2,911	39.6				
26	6,689	2,473	37.0				
27	6,962	3,608	51.8				
28	6,206	2,828	45.6				
29	6,924	2,814	40.6				

Source: Census 1971 - #94-711

We also observe that female to male employment income ratio is higher in Alberta (46.5) than in B.C. (43.6). Female employment income in many of Alberta's census areas is more than 50% of male employment income, whereas in B.C., only in region 27, females earn over 50% of what males earn.*

TABLE 22: AVERAGE WAGES IN B.C. REGIONS, 1970

	Female Occupations		Male Occupations			
Region	Table Waitress Weekly Wage	Practical Nurse Weekly Wage	Electrician Hourly Wage	Carpenter Hourly Wage	Mechanic Hourly Wage	Chokerman Daily Wage
East Kootenay	62.70	103.20	3.94	3.93	3.73	27.97
West Kootenay	61.00	103.60	4.37	4.21	4.01	28.71
Okanagan	63.50	111.00	4.91	3.59	3.72	-
Lower Mainland	77.20	103.00	4.36	4.09	4.13	28.15
Vancouver Island	67.30	102.80	4.48	4.25	4.24	28.79
Southern Interior	73.80	103.00	4.41	4.16	3.90	25.65
Lower Coast	67.50	-	-	4.70	4.31	26.53
Central Interior	66.70	102.10	4.33	4.03	3.94	27.09
North Western	77.20	100.80	4.32	4.20	4.23	24.71
Peace River	66.20	103.00	4.19	3.65	4.18	-
British Columbia	71.10	103.40	4.37	4.15	4.09	28.16

Source: B.C. Regional Salary and Wage Rate Survey 1970.

*Curiously enough, region 27 has above expected employment of females in relation to its industrial structure. We discussed this in Chapter 4. The biggest employer in this region is Cassiar Asbestos.

TABLE 23: B.C. AVERAGE WEEKLY WAGES AND SALARIES AUGUST 1971 IN DOLLARS

Industrial composite		156.80
Forestry		168.25
Mining and Milling		189.70
Total Manufacturing		162.70
Food and Beverage	140.20	
Wood Products	156.90	
Paper and allied industries	194.80	
Printing and publishing	163.70	
Primary metal industries	176.10	
Metal fabricating	173.20	
Transportation Equipment	172.50	
Chemicals	164.00	
Construction		246.40
Transportation, communicat., utilities		176.30
Trade		127.10
Finance, insurance, real estate		128.10
Services		105.00

Source: B.C. Department of Labor - Annual Report 1971

Looking at the problem from a different perspective, Table 21 shows that Construction, Mining and Paper manufacturing pay above-average weekly wages. Because frontier regions usually have above-average employment in these industries, we could argue that there are some monetary incentives in such regions. However, Table 21 does not confirm this. Further, such incentives could be high enough to attract workers into a given industry, but not high enough into this industry in frontier areas.*

*However, higher availability of overtime in frontier areas should create some incentives.

We should mention here that there are also some non-wage economic incentives in frontier areas. Companies sometimes supply some amenities as well as housing and food at below-market prices. On the other hand, such advantages can be negated by higher prices of goods sold in the market. Some studies show that the cost of living is about 15% higher in frontier regions.*

In Chapter 1 we were discussing easy access to U.I.C. benefits and progressive income taxes as a possible economic disincentive to work in the North for long periods of time. This should be included in the over-all picture showing economic incentives in the frontier regions.

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*For example:
1. An article in "The Province", Nov. 18, 1976: "A Price on Distance"
2. Farstad (1975: pp. 77-81)
3. Statistics Canada: Prince Rupert/Vancouver Inter-City Retail Price Comparison (1971)
4. Wright, D.R.C. and Crawford, G.S.: Inter-City Consumer Price Differentials: Prince Rupert and Kitimat Versus Vancouver; B.C. Research, August 1972

CHAPTER 7

REGRESSION ANALYSIS

This chapter is a synthesis and quantitative analysis of the most important arguments presented in previous chapters. We intend to explore by regression analysis the relations between industrial structure and F/M employment, between F/M employment and F/M population, and between F/M population and turnover rates. We use different proxies for industrial structure, different equation specifications and different methods of regression estimation to get as reliable an overall picture as possible.

1. Determinants of F/M Employment

As we have stated earlier, we expect that the main determinant of the F/M employment in the region will be its industrial structure. However, we have to find the most realistic proxy for the industrial structure.

a) Proxies for Industrial Structure

Since we do not have output or other value data for industries in census areas and the only available data are in terms of employment, we base our measurements of industrial structure on employment.

The possibility of using shares of all 19 industries

in regression analysis is not feasible because we lose too many degrees of freedom, and with so many variables there is danger of multicollinearity. Instead of 19 industries, we use 6 industry groups aggregated in such a way that they are fairly homogeneous with respect to "ability" to employ females. However, we have to recognize that the more we aggregate, the greater the risk that our industries will be less homogeneous across census divisions. We have discussed this in Chapter 4 where, even using 19 industries, we have some homogeneity problems. We are in a dilemma - more industries will diminish our homogeneity problem, but will increase our regression estimation problem.

In equations where we use not only industrial structure but some other variables to explain F/M employment, we do not consider using 6 industry groups as a perfectly satisfactory approach, because too many explanatory variables could decrease the reliability of our estimates. In this case, we try to express industrial structure by one or two variables. We use percentage of labor force in the primary industry group (Forestry + Mining + Fishing + Construction) as a proxy for industrial structure. Such an approach has serious drawbacks because this aggregate is not homogeneous across regions and effects of industries left out are

disregarded. This argument prevails against our using percentage of employment in tertiary industries (Trade + Finance, Insurance, Real Estate + Services + Administration). For example, two regions might have the same percentage of L.F. employed in tertiary industries, but their composite (and also shares of industries left out) might be very different. These regions may have different industrial structures with respect to ability to employ females, but our measurement does not capture it. However, with a reducing number of variables, we decrease the estimation problems.

Another proxy used is (F/M) expected which was discussed in Chapter 5. This proxy has different advantages but also different problems. As we have seen in Chapter 5, (F/M) expected is industrial structure expressed in every region by a single number in the form of (F/M) employment ratio, i.e. it is (F/M) employment ratio under the assumption that each industry in the region employs females on some standard determined mainly outside the region. Since

$$(F/M)\ \text{expect.} = \sum_i \left((F/M)_{i\ \overline{BC}} \cdot \frac{Eij}{\sum_i Eij} \right)$$

and female employment standards for each industry $(F/M)_{i\ \overline{BC}}$ are B.C. (F/M) employment averages which are constant across all 29 regions for each industry, then the variation of

(F/M) expected is caused only by differences in $\frac{Eij}{\sum_i Eij}$ - i.e. differences in industrial structure and nothing else. In other words, under the assumption that each industry is homogeneous across all regions (we use 19 industries with better chances of fulfilling homogeneity requirements), and we use the same (F/M) employment standard for industry across all regions, then the variation of (F/M) expected is caused only by the variation of the industrial structure. Such an approach has advantages, since we get around homogeneity problems (we can use as many industries as data allows) and also diminish the problems with regression estimations (we decrease the number of explanatory variables).

The problem with this approach is how to interpret the coefficient on (F/M) expected. It only tells us what the explanatory power of industrial structure is in its total, not what the effects of different industries are on F/M employment. However, we know what these effects are from Tables 3 and 9. Since we know shares of industries in the region as well as female employment standards for different industries, we can easily compute (F/M) expected if we change shares of industries in the region. Multiplying such a new (F/M) expected by the estimated coefficient, we can estimate the effect of such a change of industrial

structure on F/M employment, but we do not see the effects of different industries directly from our regression coefficient.

There could be another objection to using (F/M) expected. The B.C. average (F/M) employment might not be the proper (F/M) employment standard for the industry, especially since region "j" is included into the calculation of B.C. (F/M) employment averages. However, since we have 29 regions, we expect such an influence to be rather small, i.e. the other 28 regions should have much bigger weight in determining the standard. The exception is region 15 - G.V.R.D., which has a high weight in the province, especially in service industries which tend to be concentrated there. We would not worry about goods producing industries because they are dispersed throughout B.C. and have disproportionally low concentration in Vancouver. In the case of service industries, G.V.R.D.'s standard will heavily influence the B.C. average which we use as a standard in computation of (F/M) expected. However, as we can see in comparing Tables 3 and 5, and also from Tables 7 and 8, the differences in F/M employment in services across B.C. and Canada are very small.

In the event that this argument is not convincing, we use average (F/M) employment ratios for industries in

Alberta and Canada as a standard for female employment in B.C. industries. Alberta (F/M) employment standards are not influenced by any of the B.C. regions. Canada's (F/M) employment standards are very little influenced by any B.C. region since Canada is so much larger than any B.C. census area and effects of any industry in this area on the Canadian average will be negligible. We derive another 2 proxies for industrial structure:

$$\underline{\text{(F/M) EXP. ALTA.}} = \sum_i \left((\text{F/M})i \text{ ALTA} \cdot \frac{Eij}{\sum_i Eij} \right)$$

$$\underline{\text{(F/M) EXP. CAN.}} = \sum_i \left((\text{F/M})i \text{ CAN} \cdot \frac{Eij}{\sum_i Eij} \right)$$

where $\frac{Eij}{\sum_i Eij}$ are shares of industries in B.C. census areas and (F/M)i ALTA, CAN are (F/M) employment standards for Alberta's and Canada's industries.

Such an approach has different problems. We have data only for 19 industries which are still highly aggregated groups; especially manufacturing, which is divided into only 2 groups (Food + Beverage; Other Manufacturing) is highly aggregated. Whereas in B.C. we have some assurance that manufacturing groups are fairly homogeneous across census divisions (because there is basically no other light manufacturing in B.C. except Food and Beverage,

and Other Manufacturing is mainly composed of primary processing) we cannot say the same for Canada, where such groups are composed of many different industries with different abilities to employ females. The same is true about Alberta, where especially Mining and Agriculture are not the same industries as in B.C. Alberta has a much larger share of Oil in the mining industry with a higher ability to employ females. Therefore, to use Alberta or Canada standards can be misleading because such standards are for different industries than those existing in B.C. (we are again in a homogeneity problem).

As we can see, no matter which proxy we use for industrial structure, we run into some problems. To get more reliable results, we use all of them.

b) Other Determinants of F/M Employment

Not all variation in F/M employment is explained by industrial structure, no matter which proxy we use. We can see this from Table 3, where there are differences in F/M employment between regions in the same industry. Table 9 shows that even the proxy which explains the highest portion of F/M employment - F/M Expect. B.C. - leaves, on the average, 10% of variation unexplained.*

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*Difference between F/M expected and F/M actual in Table 9..

Therefore, we include other variables which theoretically can influence F/M employment - such as Female LFPR, Female Average Employment Income, Male Average Employment Income, and later, when using the two stage least squares (2 SLS) method of estimation, F/M Population itself and through it, all variables influencing F/M population.

We hypothesize that Industrial Structure and Female and Male Employment Incomes are variables expressing mainly influence of labor demand on F/M Employment. On the other hand, the variables F/M Population and LFPR express mainly the influence of labor supply on F/M employment.

The variable female LFPR is partly freed from the influence of different age structures in the regions. This is done by extracting from the LFPR computation the population and labor force over 65 years. A concentration of the older female population in developed southern areas can seriously distort participation rates especially in B.C. where a disproportionate concentration of older population in some developed areas is especially significant. We might get the impression that the female LFPR are lower in high F/M employment ratio areas than in low F/M employment ratio frontier areas which, once we abstract from the influence of age structure, is not correct. Female LFPR's are higher in frontier regions because these regions have a

much higher percentage of females in the prime working age, i.e. an older female population with low participation rates is concentrated in developed southern areas.

Results of simple regressions on other variables which theoretically could influence (F/M) employment are listed below:

1. Equations expressing labor demand side:

(F/M) empl. = + 45.68 - 0.0023 (Ave. Emp. Inc. Females)
(t) (+2.23) (-0.30)
Means 39.47 1.00 2750
R^2 = 0.003 F = 1

2. (F/M) empl. = + 77.95 - 0.0057 (Ave. Emp. Inc. Males)
(t) (+3.36) (-1.66)
Means 39.47 1.00 6719
R^2 = 0.09 F = 3

3. Equations expressing effects of labor supply side:

(F/M) empl. = -16.61 + 1.3973 (Fem. LFPR)
(t) (-1.34) (+4.56)
Means 39.47 1.00 40.14
R^2 = 0.43 F = 21

4. (F/M) empl. = -29.83 + 0.7688 (F/M Population)
(t) (-3.21) (+7.50)
Means 39.47 1.00 90.14
R^2 = 0.68 F = 56

The influence of Female and Male Employment Incomes (equations 1 and 2) shows signs opposite than expected and insignificant "t" values. The insignificant influence of monetary incentives on F/M employment will be confirmed in multiple regressions to follow.

c) Regression Results Determining F/M Employment

Firstly we show results of regressions using shares of industry groups as the proxy for industrial structure. Both simple regressions (1 and 2) show expected signs with high significance.

In multiple regression (3) we use 6 industry groups; shares of these groups add up to 100 percent. We cannot include both the intercept and the shares of all 6 groups, because then we get a singular matrix. We omit the industry group with the highest share - Tertiary industry - in which case the intercept is the coefficient of the omitted industry (x 100) and the coefficient of included industries compare effects of these industries as a difference to the effect of omitted industry, i.e. effect of omitted industry is a standard to which effects of included industries are compared. Since in equation 3 we omit Tertiary industry, which has the highest positive effect on F/M employment, then all included industries have negative coefficients. Primary Industries, Other Manufacturing, Transportation, Food and Beverage are industries listed in the sequence beginning from the highest negative coefficient, which means the results are as expected; i.e. Primary Industries have the highest negative effect on F/M employment followed by Other Manufacturing, etc.

TABLE 24: (F/M) EMPL. EXPLAINED BY SHARE OF LF IN 6 INDUSTRY GROUPS (USING OLS)

F/M Employ.	Intercept	% LF Agric.	% LF Food & Bev.	% LF Other Mfg.	% LF Trans.	% LF Primary*	% LF Tertiary** Indust.	Female LFPR	Empl. Income Females	Empl. Income Males	R^2	F
Means 39.47	1.00	4.45	2.38	16.98	9.20	21.49	45.42	40.14	2750	6719		
				SIMPLE REGRESSIONS:								
1) coef.	+ 52.99					-0.6291					0.61	42
(t)	(+21.92)					(-6.45)						
2) coef.	+ 3.26						+0.7970				0.86	160
(t)	(+1.10)						(+12.64)					
				MULTIPLE REGRESSIONS:								
3) coef.	+ 75.31	-0.35	-0.32	-0.71	-0.54	-0.77					0.91	45
(t)	(+17.50)	(-1.88)	(-1.49)	(-7.98)	(-2.51)	(-12.68)						
4)	+332.75	-2.97	-3.09	-3.41	-3.47	-3.64	-2.90	+0.2200	+0.0089	-0.0010	0.97	61
	(+1.65)	(-1.48)	(-1.54)	(-1.69)	(-1.75)	(-1.80)	(-1.45)	(+1.00)	(+2.79)	(-0.85)		
				CORRELATION MATRIX:								
Agriculture		1.00	+0.19	-0.40	-0.20	-0.35	+0.32	+0.18	-0.48	-0.62		
Food & Bev.			1.00	-0.19	-0.24	-0.14	+0.03	+0.06	-0.18	-0.10		
Other Mfg.				1.00	-0.25	-0.21	-0.32	-0.61	-0.10	+0.27		
Transport.					1.00	+0.19	-0.14	+0.30	+0.24	0.07		
Primary						1.00	-0.78	-0.22	+0.37	+0.27		
Tertiary							1.00	+0.55	-0.15	-0.26		
Fem. LFPR								1.00	+0.45	-0.02		
Fem. Income									1.00	+0.57		
Male Income										1.00		
F/M Empl.		+0.46	+0.18	-0.35	-0.13	-0.78	+0.92	+0.66	-0.06	-0.31		

*Primary industries included here are Forestry, Mining, Oil, Fishing, Trapping and Construction.
**Tertiary industries included here are Trade, Finance, Insurance, Real Estate, Personal Service Industries and Administration.

We do not compute elasticities, because they do not have much sense, since coefficients compare effects of variables to effects of omitted variables. Also, increasing the share of one industry necessitates decreasing the shares of other industries and we do not know which industries will decrease their share. Thus we cannot include this effect into elasticity computation.

All variables in equation 4 show signs as expected, however all variables with the exception of Fem. Employment Income have low "t" values. This may be the result of using too many variables in the equation. In Table 25, we try to get around this problem by expressing industrial structure only by one or two variables.

The results of Table 25 show that no matter what proxy for industrial structure we use, industrial structure shows an important influence with the high significance and the coefficient always has the expected sign. On the other side, the coefficients for female and male employment incomes change signs and mostly have a low significance. Thus effects of these variables are in question and they can probably be disregarded. We do not include (F/M) population as an explanatory variable here since, according to our reasoning, this variable is not independent of (F/M) employment. We use F/M population as one of the determinants of (F/M) employment in the next section where we use an equation system in which F/M population and F/M employment depend on each other.

TABLE 25: OTHER PROXIES FOR INDUSTRIAL STRUCTURE IN EQUATION EXPLAINING (F/M) EMPLOYMENT (USING OLS METHOD)

F/M Employment	Intercept	F/M Expect. B.C.	F/M Expect. Alta.	F/M Expect. Can.	% LF Primary Const.	% LF Tertiary	Female LFPR	Average Employ. Income Females	Average Employ. Income Males	R^2	F
Mean: 39.47	1.00	42.29	43.94	42.51	21.49	45.43	40.14	2750	6719		
Expect. Sign		+	+	+	-	+	+	+	-		
5	-25.77 (-4.57)	+0.9784 (+18.59)					+0.2738 (+2.34)	+0.0050 (+2.30)	-0.0001 (-0.18)	0.97	221
6	-24.02 (-2.83)		+1.0297 (+11.80)				+0.5117 (+3.07)	-0.0013 (-0.43)	+0.0002 (+0.16)	0.94	94
7	-20.92 (-2.59)			+0.8823 (+12.28)			+0.7511 (+5.04)	-0.0001 (-0.02)	-0.0011 (-0.89)	0.94	102
8	+21.70 (+1.93)				-0.5207 (-7.28)		+1.0660 (+5.07)	+0.0012 (+0.26)	-0.0026 (-1.41)	0.87	41
9	+9.43 (+1.04)				-0.2655 (-3.28)	+0.4292 (+4.27)	+0.5737 (+2.90)	+0.0035 (+0.95)	-0.0024 (-1.76)	0.93	60

2. Determinants of (F/M) Population

We expect that the (F/M) population will be mainly determined by (F/M) employment (which in turn, as we have previously seen, is mainly determined by industrial structure*). Further, we suspect that the degree of urbanization (See Chapter 5) and the distance from major cities, will have some effect on the F/M population. We do not see any serious problems in specifying this equation, therefore we use single specifications.

TABLE 26: EQUATIONS EXPLAINING F/M POPULATION IN B.C. (USING OLS METHOD)

F/M Population 15 +	Intercept	F/M Employ.	% Urban 5000+	Distance from Vancouver		R^2	F
Mean: 90.14	1.00	39.47	39.54	3.45			
Expect. Sign		+	+	-			
1	+55.45 (+11.62)	+0.8788 (+7.50)				0.68	56
2	+71.52 (+18.40)	+0.5466 (+5.60)	+0.0538 (+1.85)	-1.4751 (-6.54)		0.88	62

(Correlation matrices are in Section 3 following - Equation system - 2 SLS).

All effects in the above regressions are in expected directions. We can see a strong positive influence of (F/M) employment on (F/M) population. The Distance from Vancouver shows a strong negative effect. Also, the effect of % Urban 5000+ is above the level of 95% significance.

In Chapter 2 we argued that the F/M ratio is especially important for the single population and has a strong effect on turnover rates of this part of the population. Equation 3 shows the relation between F/M population and F/M singles.

3) (F/M) popul. 15+ = 42.99 + 0.8096 (F/M singles 15+)

	(t)	(20.16)	(22.77)
Means	90.14	1.00	58.17

$R^2 = 0.95$ F = 518

Such a strong relation suggests that all variables determining F/M population will also have a strong effect on F/M singles and further on turnover. We will discuss this problem later in connection with turnover and outmigration.

3. Equation System - 2 SLS Method of Estimation, Correlation Matrices

Since there may be reasons to hypothesize that both F/M employment and F/M population are interdependent, in this section we use an equation system where both variables are functions of each other and are determined simultaneously, i.e. F/M employment depends also on F/M population and indirectly on all variables determining F/M population, and on the other side, F/M population depends also on (F/M) employment and indirectly on all variables determining F/M employment.

(F/M) empl. = f(Ind. Structure + Other Variables + F/M popul.)

(F/M) popul. = f(F/M Employ. + Other Variables)

We use the 2SLS method of estimation because equations have dependent variables on the right hand side (as explanatory variables), and such equations are over-identified.

Since there is a question of which proxy for industrial structure to use, we try different proxies and different equation specifications, again in order to get a better over-all picture.

At first we use shares of all 6 industry groups as a proxy for industrial structure. Together with industrial structure, the effect of labor demand is further expressed by Female and Male employment incomes. The effects of labor supply are expressed by F/M population and Female LFPR.

1a) (F/M) empl. = +258.21 -2.35(% LF Agric)-2.43(% LF Food/Bev.)
(+1.13) (-1.08) (-1.09)

-2.82(% LF Other Mfg.)-2.80(% LF Transport.)
(-1.30) (-1.31)

-2.98(% LF Prim. Const.)-2.38(% LF Tertiary)
(-1.33) (-1.13)

+0.2757(Fem. LFPR) +0.0085(Empl. Inc. Fem.)
(+1.19) (+2.70)

-0.0007(Empl. Inc. Males)+0.1524(F/M Popul.)
(-0.58) (+0.61)

$R^2 = 0.97$; F = 59

1b) (F/M) pop. 15+ = +71.32 +0.5519(F/M emp.)+0.0530(% Urban 5M+)
(+17.89) (+5.49) (+1.80)

-1.4693(Distance Vanc.)
(-6.47)

In equation 1a, determining F/M employment, all variables with the exception of Female Employment Income, have "t" values below 95% level of significance (perhaps the result of using too many variables). We should not discuss magnitudes in view of insignificance, however we want to point out that the coefficients for all variables show the expected effect.

In equation 1b, determining F/M population 15+, all variables have the expected effects with "t" values above 95% significance.

In Table 27 we use other proxies for industrial structure in the equation determining F/M employment. The corresponding results for the equation determining F/M population are listed in Table 28. We do not change variables in this equation since we believe there are no serious specification problems here.

The results of the first part of the equation system determining F/M employment (Table 27) confirm that, no matter what proxy we use, the effect of industrial structure on F/M employment appears to be important and significant. The effects of other variables with the exception of Fem. LFPR are insignificant and their signs unstable. This is apparent especially in the case of Employment Income variables.

TABLE 27: DIFFERENT SPECIFICATIONS FOR FIRST EQUATION IN EQUATION SYSTEM EXPLAINING F/M EMPLOYMENT (USING 2SLS METHOD)

F/M Employment	Intercept	F/M Expect. B.C.	F/M Expect. Alta.	F/M Expect. Can.	% LF in Prim. & Const.	% LF in Tertiary	Female LFPR	Average Employ. Income Females	Average Employ. Income Males	F/M Populat. 15 +	R^2	F
Means 39.47	1.00	42.29	43.94	42.51	21.49	45.43	40.14	2750	6719	90.14		
Expect.Sign		+	+	+	-	+	+	+	-	+		
2a	-25.75	+0.9789					+0.2735	+0.0050	-0.0001	-0.0004	0.97	170
	(-3.11)	(+5.72)					(+1.72)	(+2.17)	(-0.17)	(-0.003)		
3a	-32.50		+0.7710				+0.6323	-0.0012		+0.1779	0.94	90
	(-2.37)		(+2.25)				(+2.72)	(-0.46)		(+0.78)		
4a	-35.58			+0.6189			+0.8612	-0.0017		+0.2097	0.94	87
	(-2.44)			(+1.82)			(+4.92)	(-0.66)		(+0.80)		
5a	-11.04				-0.2021	+0.3636	+0.7363	-0.0008		+0.1210	0.92	54
	(-0.38)				(-1.24)	(+1.66)	(+2.89)	(-0.24)		(+0.36)		

TABLE 28: SECOND EQUATION IN EQUATION SYSTEM EXPLAINING F/M POPULATION

F/M Popul. 15+	Intercept	F/M Employ.	% Urban 5000+	Distance From Vancouver in 100 Miles	R^2	F
Means 90.14	1.00	39.47	39.54	3.45		
Expect.Sign		+	+	-		
2b	+70.42	+0.5764	+0.0491	-1.4427	0.88	62
	(+17.72)	(+5.76)	(+1.67)	(-6.35)		
3b	+68.88	+0.6181	+0.0425	-1.3975	0.88	60
	(+16.76)	(+5.95)	(+1.42)	(-6.05)		
4b	+68.56	+0.6266	+0.0411	-1.3881	0.88	60
	(+16.73)	(+6.05)	(+1.38)	(-6.01)		
5b	+69.33	+0.6060	+0.0444	-1.4106	0.88	61
	(+16.65)	(+5.74)	(+1.48)	(-6.10)		

TABLE 29: CORRELATION MATRIX FOR THE VARIABLES EXPLAINING F/M EMPLOYMENT (EQUATION 1)

	% LF Prim. & Constr.	% LF in Tertiary	Female LFPR	Average Employ. Income Females	Average Employ. Income Males	F/M Populat. 15+	Dependent= F/M Employ.
F/M Exp. B.C.			+0.51	-0.26	-0.40	+0.89	+0.96
F/M Exp. Alta.			+0.53	-0.17	-0.35	+0.91	+0.95
F/M Exp. Can.			+0.43	-0.24	-0.33	+0.94	+0.93
% LF Prim.Const.		-0.78	-0.22	+0.37	+0.27	-0.90	-0.78
%LF Tertiary		1.00	+0.55	-0.15	-0.26	+0.87	+0.92
Female LFPR			1.00	+0.45	-0.02	+0.27	+0.66
Average Income Fem.				1.00	+0.57	-0.30	-0.06
Average Income Male					1.00	-0.31	-0.31
F/M Popul.15+						1.00	+0.82

TABLE 30: CORRELATION MATRIX FOR THE VARIABLES EXPLAINING F/M POPULATION (EQUATION 2)

	F/M Employ.	% Urban Pop. 5000+	Distance From Vancouver
F/M Employment	1.00	+0.52	-0.45
% Urban Pop. 5000+		1.00	-0.10
Distance from Vancouver			1.00
F/M Population 15+	+0.82	+0.47	-0.76

The weakness of the F/M population variable is of some surprise. We would expect that F/M population (as a proxy for labor supply) should have some positive effect on F/M employment. However, we expect this effect to be lower than the effect of industrial structure (one of the proxies for labor demand). The correlation matrix (Table 29) confirms this, but it also shows a collinearity problem between various proxies for industrial structure and F/M population. This may somewhat distort the real effect of F/M population.

There is also some collinearity between different proxies for industrial structure and Female LFPR. However, we can probably be safe in claiming that the 2SLS approacch (Table 27) confirms our hypothesis that one of the strongest determinants of F/M employment is industrial structure.

The results of the second part of the equation system

determining F/M population 15+ (Table 28) are very little influenced by changes in the first equation, which suggests that it does not matter very much in terms of effect on population structure which proxy we use for industrial structure.

This part of the equation system appears to have no problems except that the influence of an urban concentration is slightly below the 95% level of significance. We have argued in Chapter 5 (Section "Degree of Urbanization") that the influence of cities will be significant after passing the threshold size. Since we use "% Urban Population 5000+", it is not surprising that this variable shows low significance. Our hypothesis is confirmed by the much stronger explanatory power of the "Distance from Vancouver" - a city which is far above this threshold size. (This outcome supports "gravity potential" theories.) The strongest determinant of F/M population is the F/M employment. No matter which specification we use in the first equation (Table 27), the variable with the highest "t" values in the second equation (Table 28) is F/M employment, which, as we have seen from previous regressions, is mostly determined by industrial structure.

4. Comparison With Alberta

To substantiate and support our B.C. results, we show

a comparable 2SLS analysis for Alberta. To make the analysis short, we use only 2 proxies for industrial structure. In the equation explaining F/M population (Table 32) we use "Distance from Calgary or Edmonton", whichever is closer. We are assuming that both cities have passed the threshold size and have developed a gravity influence throughout Alberta.

Unlike in B.C., we are not trying to use shares of all 6 industrial groups as a proxy for industrial structure, because we have only 15 observations in Alberta, and by using too many variables, estimation would become even more difficult than in B.C.

Comparing the regression for Alberta (Tables 31 and 32) with those of B.C. (Tables 27 and 28), we can see that results are similar. The industrial structure always shows the expected sign with a fairly high level of significance (except % LF in Primary Industries). The higher coefficient for Female LFPR-65 in Alberta might be caused by a higher concentration of older, less productive females in the developed areas of B.C., as compared with Alberta's developed areas. (See section 1b.) To adjust for differences in age structure (which may cause the differences in the Female LFPR), we would have to further exclude the older age groups when computing LFPR. (We have already excluded age groups 65 and over.)

TABLE 31: 2 SLS ESTIMATION OF F/M EMPLOYMENT - ALBERTA (FIRST EQUATION)

F/M Employment	Intercept	F/M Expect. Alta.	% LF Primary Constr.	% LF Tertiary	Female LFPR -65	Female Employ. Income	F/M Populat. 15+	R^2	F
Means 47.88	1.00	50.27	10.97	48.08	46.03	2728	92.46		
Expect.Sign		+	-	+	+	+	+		
1a	-31.75 (3.04)	+0.6002 (4.20)			+0.7415 (2.83)	+0.0076 (1.90)	-0.0577 (0.28)	0.91	24
2a	-5.73 (0.23)		-0.2356 (1.00)	+0.4430 (2.13)	+1.2021 (2.31)	-0.00002 (0.002)	-0.2204 (0.54)	0.77	6

TABLE 32: 2 SLS ESTIMATION OF F/M POPULATION - ALBERTA (SECOND EQUATION)

F/M Population	Intercept	F/M Employ.	% Urban 5000 +	Distance from Calgary/ Edmonton	R^2	F
Means 92.46	1.00	47.88	27.31	1.33		
Expect.Sign		+	+	-		
1b	+69.57 (5.87)	+0.4316 (1.87)	+0.0983 (3.16)	-0.3451 (0.26)	0.79	14
2b	+72.21 (5.59)	+0.3795 (1.51)	+0.1016 (3.18)	-0.5194 (.037)	0.78	13

TABLE 33: CORRELATION MATRIX FOR EQUATION 1
EXPLAINING F/M EMPLOYMENT ALBERTA

	F/M Expect. Alta.	% LF Primary Constr.	% LF Tertiary	Fem. LFPR -65	Fem. Empl. Income	F/M Populat. 15+
F/M expect. Alta	1.00	-0.19	+0.74	+0.41	+0.49	+0.64
& LF Prim. & Const.		1.00	+0.32	-0.35	+0.16	-0.23
% LF Tertiary			1.00	+0.24	+0.77	+0.60
Fem. LFPR -65				1.00	+0.56	+0.59
Fem. Empl. Income					1.00	+0.65
F/M Populat. 15+						1.00
F/M Employment	+0.83	-0.16	+0.68	+0.73	+0.72	+0.78

TABLE 34: CORRELATION MATRIX FOR EQUATION 2
EXPLAINING F/M POPULATION ALBERTA

	F/M Employ.	% Urban 5000+	Distance From Calgary or Edmonton
F/M employment	1.00	+0.57	-0.64
% Urban 5000+		1.00	-0.40
Distance from Calgary or Edmonton			1.00
F/M Population	+0.78	+0.79	-0.52

As in B.C., we have a negative coefficient for the (F/M) population with an insignificant "t", as it simply suggests that the F/M population does not have much impact on the F/M employment. (However, as in B.C., we also have some collinearity problems.) We could probably say that the results confirm our hypothesis that the industrial structure is a strong determinant of the (F/M) employment

ratio. In the equation determining F/M population (Table 32) the size of the coefficient for (F/M) employment and also its significance, is lower than in B.C. (but still between 90 to 95% certainty).

The urbanization variable has a stronger influence on the population structure in Alberta than in B.C. We theorize that Alberta towns have a slightly different character with higher attractiveness than B.C. towns. This might be caused by their closeness to big cities and also the much higher percentage of the labor force employed in agriculture. Agriculture has a stable population with a relatively high F/M ratio*. These towns which are surrounded by such a population (and serving it) might have a greater attractiveness than B.C. towns serving an unstable nomadic population of the forest and mining communities.

The negative distance influence on the F/M population is much lower in Alberta than in B.C. With two large cities in a central location in Alberta, the distances to the nearest metropolis are much shorter. This may have a positive effect on small towns which, by closeness to big cities, can get a different character and pick up some influence of the metropolis. This means there may be some relation between the effects of Distance and Urbanization

*F/M ratio in Agriculture is lower in Alberta than in B.C., but is still high in relation to Mining, Logging, Construction and Primary Manufacturing (see p. 57).

variables. As small towns are more attractive in Alberta, the distance to metropolis plays a lower role (correlation -0.40, see Table 34).

Another explanation could be that the effect of Distance on F/M population may not be linear - but rather, with increasing distance, its effect increases. Since distances in B.C. are much greater (mean 345 miles) than in Alberta (mean 133 miles), the coefficient is larger and its significance greater in B.C.

If our results are close to reality, then they lend support to the suggestion of building another major city in central B.C., possibly shifting the provincial capital to a more central location. The government and public administration sector has a high F/M employment ratio and shifting the capital could positively influence the population structure in the B.C. interior as well as diminish the distances to the nearest metropolitan city. This could add to the stability of the population in interior areas by making them more attractive places to live in, thereby decreasing labor turnover.

5. Turnover and Migration

In order to find determinants of the turnover rates we should have turnover data for census areas. Since such data are not published, we will try to estimate them.

We must rely on old turnover data last published by the Dominion Bureau of Statistics in #72-006 for 1966 (see Table 2). These data are for industries (excluding agriculture) for the whole Pacific region (B.C. and Yukon).

The estimated turnover for census area "j" is:

$$\sum_i \left[(T/O)_i \frac{Eij}{\sum_i Eij} \right]$$ where -

i is industry

j is census area

$(T/O)_i$ is average separation rate in industry i for Pacific region and

$\frac{Eij}{\sum_i Eij}$ is percentage share of employment in industry i from region j total employment.

In other words, we assume constant turnover rates in each industry across all census divisions. Such average turnover rates in industries are weighted by employment shares of industries in census divisions to derive estimated turnover for census divisions. Differences of T/O estimates between regions are caused only by differences in industrial structure.

These estimates are crude, not only because turnover data are obsolete (we assume that T/O for each industry in 1971 is the same as in 1966), but also because they include the Yukon. Further, we do not have T/O data for agriculture, industry groups used in calculations are

highly aggregated (we use 8 industry groups), and not necessarily homogenous with respect to turnover. We also assume that turnover rates are affected only by industrial structure, i.e. industry i has the same T/O in every census area j. Another problem is that our T/O data are separation rates including both voluntary and involuntary turnover, the latter caused mostly by cyclical and seasonal fluctuations resulting in lay-offs and discharges.

To compensate for some of the above-mentioned problems we add another measurement of population stability, i.e. indexes of migration (data from Statistics Canada #92-719).

"Stayer rate" shows what proportion of the 1965 population stayed in a census area 5 years later (1971). Since we do not have death rates for census areas, we assume them to be constant. Such an assumption is not realistic since age structure is not the same in the census areas, i.e. older population tends to concentrate in southern areas (see Chapter 5). However, death rates are relatively low and should affect the stayer rate very little.

Since the outmigration rate is

$$\frac{\text{Outmigr. 66-71}}{\text{Population 66}} = (1-d) - \frac{\text{Stayers 66-71}}{\text{Population 66}}$$

and death rate (d) is assumed constant, then the outmigration rate and the stayer rate differ only by a constant and sign,

and it does not matter which rate we use in regressions.*

We suspect that the outmigration rates are positively correlated with turnover rates. However, not all those who lose their job leave the area. The outmigration rate is going to be affected not only by turnover, but also by the attractiveness of the area and by the amount of economic activity in the area. To measure attractiveness we use the degree of urbanization, distance from Vancouver and F/M ratio.

The size of economic activity could be measured, crudely, by the size of population, which should give us some idea of what the opportunity to find alternative employment in the region is. However, opportunity to find alternative employment is given not only by the size of the region (size of economic activity), but also by the degree of diversification of industries, i.e. industrial structure. But we know that the industrial structure is highly correlated with estimated turnover, F/M employment and F/M population. Therefore, we use these variables as a proxy for diversification of industries. The size of population is itself correlated, especially with the degree of urbanization and to include both as explanatory variables is redundant.

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*This is discussed further by Maki, D.: "The Effect of Infrastructure on Outmigration" (1977: p. 8.)

TABLE 35: ESTIMATED TURNOVER AND OUTMIGRATION RATES

Census Division	Estimated T/O	Stayer Rates	Outmigration Rates	Leak Coefficient
	1	2	3 = 100 -2	4 = 1 -2
0	89.1	70	30	19.1
1	96.0	76	24	20.0
2	93.9	64	36	29.9
3	68.1	73	27	4.9
4	91.7	65	35	26.7
5	72.9	72	28	0.9
6	83.4	63	37	20.4
7	86.7	71	29	15.7
8	98.2	64	36	34.2
9	87.8	58	42	29.8
10	94.1	72	28	22.1
11	78.0	71	29	7.0
12	96.5	71	29	25.5
13	75.9	67	33	8.9
14	90.5	64	36	26.5
15	77.7	73	27	4.7
16	98.2	65	35	33.2
17	83.3	68	32	15.3
18	129.8	43	57	86.8
19	81.4	72	28	9.4
20	77.6	68	32	9.6
21	91.3	45	55	46.3
22	72.4	68	32	4.4
23	86.3	61	39	25.3
24	89.3	73	27	16.3
25	82.4	56	44	26.4
26	97.4	61	39	36.4
27	113.8	25	75	88.8
28	97.6	66	34	31.6
29	91.4	67	33	24.4

Source: D.B.S. #72-006 and Statistics Canada #92-719.

We can probably visualize the turnover rate as a potential outmigration rate which is modified by F/M ratio, degree of Urbanization and Distance from Vancouver. Such a modification should result in actual outmigration

rates. (In equations where we use Turnover as one of the determinants of outmigration, we assume that the dependence ratio and consequently the age structure is constant across the regions.)

We hypothesize that the estimated turnover, which is mostly affected by variation of the industrial structure captures mostly involuntary turnover, whereas outmigration rates capture voluntary and involuntary turnover, but primarily voluntary turnover, i.e. total attractiveness of the region. Both measurements overlap; estimated turnover is partly affected by attractiveness of the region (since the industrial structure is different in more attractive developed regions), and outmigration rates are partly affected by industrial structure, i.e. include involuntary turnover.

The "Leak Coefficient" is the estimated turnover rate minus the stayer rate. It should tell us how much of the potential outmigration (given by the estimated turnover) is neutralized by factors measuring attractiveness of the region. The lower the leak coefficient is, the higher is the resistance of the region to potential outmigration. It shows what proportion of the potential outmigration was not neutralized by attractiveness of the region. We suspect that the resistance of the region to potential outmigration

will be affected by the same variables which determine population structure, i.e. F/M employment, degree of urbanization and distance from Vancouver, plus size and diversification of economic activity, which are already partly captured by urbanization and F/M employment.

The estimated turnover rates, outmigration rates and leak coeffecients for census areas are listed in Table 35. We clearly see that the southern developed areas have the lowest estimated turnover and outmigration rates as well as the highest resistance to the potential outmigration. On the other hand, the underdeveloped areas have relatively high estimated T/O and outmigration and also low resistance to potential outmigration. This suggests that industrial structure and its derivatives could have serious effects on both turnover and outmigration rates.

Such conclusions are partly confirmed by the regression results in Table 36 where industrial structure is not used directly as an explanatory variable (except % LF in Primary+Construction). However, estimated T/O, F/M employment and F/M population are highly correlated with industrial structure and can be used as reasonably good proxies for industrial structure. All three are primarily determined by the industrial structure and are thus highly correlated with each other (see Table 37).

To prevent double counting and collinearity, we include in each equation only one of them. (Variation of estimated T/O is caused only by the variation of the industrial structure.)

In Table 37 some attention should be given to the correlation relationships of F/M singles. Considering the discussion in Chapter 2, we should not be surprised that F/M singles is highly correlated with the estimated T/O and outmigration rates.

Unemployment rates are negatively correlated with outmigration rates (-0.67) and with resistance coefficients (-0.72). This confirms our hypothesis that many unemployed leave the less attractive underdeveloped areas for more developed areas (see Chapter 5).

Because of the crude data and estimation problems, we do not compute elasticities and will not do a benefit-cost analysis (of changed industrial structure) based on our regressions. However, in the next chapter, we intend to show that there are some possibilities for building economically viable industries with the "ability" to employ more females, diversifying the industrial structure and consequently decreasing the turnover rates. Measuring the productivities of Secondary Manufacturing industries, we intend to show that some of these industries could be build and operated as extensions of the existing primary industries and can be economically viable.

TABLE 36: DETERMINANTS OF OUTMIGRATION RATES AND LEAK COEFFICIENT

OUTMIGRATION	Intercept	Estim. T/O	F/M Employ.	F/M Popul.	% LF in Prim. Constr.	Urban-ization	Distance from Vancouver	R^2	F
Mean 35.79	1.00	89.09	39.47	90.14		39.54	3.45		
Expect.Sign		+	-	-	+	-	+		
	+15.43 (+1.41)	+0.2074 (+1.78)				-0.0985 (-2.23)	+1.6772 (+4.82)	0.70	19
	+42.38 (+6.71)		-0.2145 (-1.35)			-0.1011 (-2.14)	+1.7043 (+4.65)	0.68	18
	+90.75 (+5.24)			-0.6138 (-3.27)		-0.0488 (-1.12)	+0.6673 (+1.39)	0.76	27
	+24.02 (+7.17)				+0.4692 (+3.82)	-0.0484 (-1.21)	+1.0463 (+2.95)	0.78	30
LEAK COEFFICIENT									
Expect.Sign			-			-	+		
Mean 24.88	+74.28 (+7.66)		-1.3015 (-5.35)			-0.1050 (-1.44)	+1.7774 (+3.16)	0.80	34

TABLE 37: CORRELATION MATRIX FOR VARIABLES EXPLAINING TURNOVER AND OUTMIGRATION

	Size of Popul.	F/M Employ.	F/M Popul.	F/M Singles	Urban-ization	Distance from Vanc.	Estim. Turn-Over	Outmi-gration	Leak Coeff.	% LF Tertiary	% LF Primary & Const.
Size of Popul.	1.00	+0.45	+0.35	+0.43	+0.42	-0.23	-0.27	-0.23	-0.28	+0.39	-0.29
F/M Empl.		1.00	+0.82	+0.87	+0.52	-0.45	-0.89	-0.62	-0.85	+0.92	-0.78
F/M Popul.			1.00	+0.97	+0.47	-0.76	-0.80	-0.86	-0.92	+0.87	-0.90
F/M Singles				1.00	+0.49	-0.68	-0.83	-0.80	-0.91	+0.90	-0.87
Urbanization					1.00	-0.10	-0.46	-0.45	-0.51	+0.53	-0.51
Distance from Vanc.						1.00	+0.42	+0.72	+0.62	-0.58	+0.62
Estim. Turnover							1.00	+0.62	+0.92	-0.80	+0.86
Outmigration								1.00	+0.88	-0.67	+0.84
Leak Coeff.									1.00	-0.82	+0.95
% LF Tertiary										1.00	-0.78
% LF Prim. & Const.											1.00

CHAPTER 8

PRODUCTIVITIES AND GROWTH OF INDUSTRIES

In this chapter we will examine labor productivity and capital requirements in relation to the female/male employment ratio in industries. This information could be useful for planning the development of frontier regions. Industries with high productivities and with good employment opportunities for females should be preferred.

A. Productivities

We do not have complete estimates of the number of employees by industry and province.* Labor force estimates in Table 38, for example, are not consistent with census data. In order to facilitate comparison of value added per worker for Canada and B. C. we use the labor force rather than the number of employees. As a result, Tables 38 and 39 are not comparable with Tables 1, 40 and 41.

We should be able to make comparisons between industries in each table regardless of whether we are using "Labor Force" or "Number of Employees", provided that our basis for comparison is consistent. Such comparisons, however, should be considered with some degree

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*Statistics Canada #52-513 and #52-514 does not show the number of employees for all industries. Other estimates are given in Statistics Canada #71-001, but are not provided on a provincial basis.

of reservation since the "Labor Force" includes unemployed persons and the unemployment rate varies between industries. But this may have some advantage as we are partly considering the seasonal and cyclical character of the industries. That is, when comparing the value added per "Labor Force", the unemployment costs are partly included.

In order to get the proper picture showing productivities of industries, we have to consider the amount of capital used to produce the dollar of value added (V.A.). The amount of consumed capital (depreciation) is usually not taken into account when computing productivities. Many studies use unadjusted value added per worker.*

For us, V.A. per worker is only the first approximation of the productivity measurement. Such measurement is crude since value added includes capital depreciation. Unadjusted value added is not net output; it cannot be consumed without diminishing capital stock and decreasing the ability to produce. In other words, such "gross" V.A. cannot be considered in its whole amount as addition to social welfare which can be consumed or used to increase wealth (capital).

Our second approximation of productivity measurement is "Net Value Added Per Worker", which shows how much each worker, combined with capital in the production process,

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*See for example Statistics Canada #14-201.

produced, (on the average) in net terms after capital used up to produce this V.A. is potentially replaced by subtracting depreciation from "gross" V.A. Producing such net V.A. we are not diminishing capital stock, which means the whole net V.A. can be considered as an addition to the welfare of society resulting from employment of certain amounts of labor and capital. (Whole net V.A. can be consumed* or added to increase stock of capital.)

As a third approximation of productivity measurement we use "Adjusted Productivity" which further takes into consideration that in order to have capital at all (i.e. to give up present consumption), we have to increase future consumption by more than we sacrificed on present consumption. Otherwise, capital accumulation does not make economic sense. To induce capital accumulation at all, or to hold existing capital in industry, we have to pay the opportunity cost of capital. In 1971, this cost, as measured by the interest rate on government savings bonds, was around 7.5%. We are using 8% of net capital stock (in 1971 prices) as a necessary return which induced existing capital to stay in the industry and further induced additional capital accumulation in 1971. The 8% of net capital stock (which is "necessary" property income) is subtracted

*However, we are not suggesting that the net V.A. be wholly consumed. It may in fact be desirable to maximize capital accumulation. We recognize that capital creation is extremely important, especially in Canada. However, any part of net V.A. could be converted into capital, i.e. both profits and employment incomes (wages and salaries) can be saved and invested.

from the Net V.A. per worker to get "Adjusted Productivity".

The question may be asked, "Is 8% high enough?". However, all data in our productivity tables, including capital consumption allowances (C.C.A.), net capital stock and V.A. are in current (1971) prices. C.C.A. should be in current prices in order to be able to replace used up capital*, but for computation of necessary return to capital, net capital stock would be better measured in original prices, since in order to hold original capital in industry**, we have to pay at least the long term nominal interest rate (which should take account of inflation) on principal in original prices. For inflationary adjustment it should be enough to adjust the interest rate (by using the nominal rate) and not both the interest rate and the principal. Because service life of capital stock is usually between 5 and 50 years, the difference between net capital stock in current prices and original prices might be quite substantial. Therefore, long term interest rates on net capital stock in current prices may underestimate the real rate of return on capital stock in original prices.

However, capital stocks are not published in original prices, so we are forced to use net capital stock in current

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*C.C.A. is computed from the net capital stock in current prices.

**In case of corporations ones shares are sold and physical capital stock is accumulated - the shareholders are not able to withdraw capital from the corporation, no matter how low return on outstanding shares is.

prices together with a lower interest rate of 8%. A second option is to use net capital stock in 1961 prices, which is published. The 8% returns on net capital in 1971 prices represents 11.2% return (on the average) on net capital stock in 1961 prices.

Further, we should mention here that all our productivities are combined productivities of labor and capital and we do not attempt to measure them separately.

The question may be asked whether our productivity measurement is better than simple profitability. It is, because our productivity measure explicitly takes wages into consideration. Consider a hypothetical example of a highly profitable industry paying below subsistence wages. According to our measurement, such an industry would have lower productivity than the same highly profitable industry paying higher wages. We can roughly estimate profitabilities by subtracting wages and salaries per employee from our adjusted productivity.*

In order to compute these productivities in B.C. industries, we need C.C.A. and capital stock estimates. However, we have such data only for Canada. To estimate capital intensities for B.C. industries, we first compute capital intensities (C.C.A. per worker and 8% of net capital

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*Such estimates do not include all costs - see Dominion Bureau of Statistics #61-504 "Private and Public Investment in Canada". In addition, taxes and interest to variable capital (which is usually only a fraction of fixed capital) are not included.

stock per worker) for Canadian industries (Tables 38 and 40).

Further, we assume that capital intensities for B.C. industries are the same as for Canadian industries. Such an assumption could be quite unrealistic, especially in the case of the highly aggregated industry groups in Table 39. We are more comfortable with Table 41 (Manufacturing Industries B.C.) where we have lower aggregation and such industries are probably more homogenous across Canada.

From Tables 38 and 39 we can see that Mining and Construction* have highest "Net" and also "Adjusted" productivities in Canada. In B.C. net productivities are in similar order, but adjusted productivities are in a different order: Construction, Fishing, Forestry, Manufacturing, Mining, Agriculture. Agriculture has by far the lowest productivities with better results for Canada than for B.C. On the other hand, Forestry and Fishing have much better productivities in B.C.

We also notice that mining is a highly capital intensive industry (C.C.A. per worker), but the "Capital Productivity" (V.A. per $ of C.C.A.) is not very high. With a difficult labor situation, it is not surprising that frontier regions have a high proportion of capital-intensive mining industries. (As we argued before, capital intensive industries with high value added per worker will have better chances to survive in frontier regions.)

*Variable capital in construction may be relatively higher than in other industries, so that necessary return to variable capital could play a significant role and "adjusted" productivity would be lower.

TABLE 38: PRODUCTIVITIES IN GOODS PRODUCING INDUSTRY GROUPS FOR CANADA 1971

Industry Group	V.A. Mill $	Labor Force	V.A. per Worker	C.C.A. per Worker	V.A. per $ of C.C.A.	Net V.A. per Worker	8% of Net Capital per Worker	Adjust.* Product.	F/M
	1	2	3=(1):2	4	5	6=(3)-(4)	7	8=(6)-(7)	9
Agriculture	3,035.4	481,190	6,308	1,811	3.48	4,497	1,572	2,925	30.2
Forestry	697.6	74,380	9,379	1,090	8.60	8,289	910	7,379	4.7
Fishing & Trapping	216.2	25,435	8,500	1,805	4.71	6,695	1,151	5,544	3.7
Mining	3,826.3	139,035	27,520	4,779	5.76	22,741	6,762	15,979	7.2
Manufacturing	23,187.9	1,707,330	13,581	1,086	12.50	12,495	1,338	11,157	31.1
Construction	7,580.9	538,220	14,085	456	30.88	13,629	222	13,407	5.1

Source: Canada Yearbook 1974 and Statistics Canada #13-211

V.A. = Value Added

C.C.A. = Capital Consumption Allowances

V.A. per $ of C.C.A. shows capital productivity

Net V.A. per Worker = V.A. per worker minus C.C.A. per worker

Adjusted Productivity = Net V.A. per worker minus 8% of net capital stock in current prices (1971) per worker.

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* "Adjusted productivities" should be further adjusted by the cost of variable capital and external costs of production, such as environmental damage and social external costs.

TABLE 39: PRODUCTIVITIES IN GOODS PRODUCING INDUSTRY GROUPS FOR B.C. 1971

Industry Group	V.A. Mill $	Labor Force	V.A. per Worker	C.C.A. per Worker	V.A. per $ of C.C.A.	Net V.A. per Worker	8% Net Capital per Worker	Adjust. Product.	F/M
	1	2	3=(1):2	4	5	6=(3)-(4)	7	8=(6)-(7)	9
Agriculture	134.8	23,050	5,850	1,811	3.23	4,039	1,572	2,467	45.5
Forestry	357.5	27,690	12,909	1,090	11.84	11,819	910	10,909	6.9
Fishing & Trapping	59.3	3,840	15,435	1,805	8.55	13,630	1,151	12,479	8.3
Mining	316.9	14,710	21,544	4,779	4.51	16,765	6,762	10,003	6.7
Manufacturing	1,912.6	146,925	13,017	1,086	11.99	11,931	1,338	10,593	18.7
Construction	1,099.3	63,910	17,201	456	37.72	16,745	222	16,523	5.5

Source: Canada Year Book 1974

C.C.A. per worker is taken from Table 22.

Agriculture has low productivity. It was mentioned before that there might be quite significant income in kind, which is not included in V.A. and distorts the productivity index.* Farm owners also get some compensation from increases in land values. Agriculture may also have other advantages - it uses a renewable resource, world demand for agricultural products is rising, and female employment opportunities are relatively good.

Repeating the same procedure as above, we will go into more detail and try to find the most productive manufacturing industries with a high F/M ratio. In the manufacturing sector we have data showing the number of employees so we can drop L.F. as a measure of the number of workers in industries.

Together with Table 40a we include Table 40b - "Productivities in Manufacturing Industries in Canada 1961" in order to facilitate longer run comparison of our productivities. Because Table 40b is in 1961 prices and Table 40a is in 1971 prices, we cannot compare absolute numbers between these tables, with the exception of V.A. per $ of C.C.A., which is ratio of values and should not be much affected by inflation (assuming that the relative price changes for output and capital are about the same). We

*According to Statistics Canada #61-202, income in kind is included into Value Added. However, house rents are not included.

see that capital intensities (or productivities) of industries measured by this ratio are very similar when comparing 1961 to 1971, which should give us more confidence in the data. Also, the sequence of industries according to productivities is with some exceptions similar in 1961 and 1971. This suggests that, if our data are reliable, productivity differences between industries are of longer run nature and there may be some barriers to a free capital flow between industries.

Comparing Tables 40a (Canada) and 41 (B.C.), we can see some differences in productivities and F/M ratios, but the general trend is preserved.

Considering both productivity and the female to male ratio, the Food and Beverage, Electrical Equipment, Printing and Publishing, and Furniture and Fixtures industries have some advantage. Petroleum and coal industries have high productivities but have low F/M ratios. The same is true for the Paper, Non-metallic minerals, Chemical, Metal fabricating, Machinery and Transportation industries.

We could go further into more detailed disaggregation of manufacturing industries, but we do not have the necessary depreciation data. Some data for value added and F/M ratios are available in Statistics Canada #31-203.

TABLE 40a: PRODUCTIVITIES IN MANUFACTURING INDUSTRIES IN CANADA 1971

Industry	V.A. Mill $	No. of Employ.	V.A. per Employee	Wages & Salaries per Employee	C.C.A. per Employ.	V.A. per $ of C.C.A.	Net V.A. per Employee	8% of Net Capital per Worker	Adjusted Product.	Most Product. Size of Plant No. of Employ.	F/M* Ratio
	1	2	3=(1):(2)	4	5	6	7=(3)-(5)	8	9=(7)-(8)	10	11
Food & Beverage	3,342.7	218,315	15,311	6,738	892	17.17	14,419	1,344	13,075	500-999	36.9
Rubber & Plastic	649.4	44,672	14,537	7,016	792	18.35	13,745	734	13,011	500 + .	39.7
Leather	219.2	27,930	7,848	5,013	279	28.10	7,569	272	7,297	any	118.9
Textiles	748.9	69,326	10,803	6,096	1,073	10.07	9,730	1,228	8,502	1000 +	63.9
Clothing	716.2	98,457	7,274	4,682	127	57.30	7,147	101	7,046	1-4	357.7
Wood	1,017.0	91,846	11,073	6,948	890	12.45	10,183	983	9,200	100-199	4.2
Furniture & Fixture	415.0	43,021	9,646	5,893	286	33.74	9,360	349	9,011	any	17.3
Paper	1,803.7	119,709	15,067	8,681	2,835	5.31	12,232	3,261	8,971	1000 +	10.3
Printing & Publishing	1,125.3	84,110	13,379	7,722	530	25.23	12,849	805	12,044	any	29.2
Primary Metal	1,841.8	114,314	16,112	8,902	2,586	6.23	13.526	2,786	10,740	1000 +	1.3
Metal Fab.	1,889.3	137,015	13,789	7,737	706	19.54	13,083	796	12,287	1000 +	9.3
Machinery	1,010.5	71,062	14,220	8,225	682	22.66	13,592	743	12,849	200-999	5.6
Transport. Equipment	2,756.6	150,155	18,358	8,907	824	22.27	17,534	1,205	16,329	1000 +	7.7
Electrical Products	1,578.2	123,181	12,812	7,468	562	22.81	12,250	626	11,624	1000 +	56.7
Non-Metal Minerals	889.3	51,291	17,338	7,898	1,837	9.44	15,501	2,223	13,278	200-499	6.7
Petro/Coal	435.3	15,517	28,053	11,122	5,233	5.36	22,820	9,635	13,185	500-999	0.3
Chemicals	1,582.5	77,377	20,451	8,650	2,282	8.96	18,169	3,016	15,153	any	22.7

Source: Statistics Canada #31-201, #13-211 and #31-210

*F/M is here for production workers only; office workers are not included.

TABLE 40b: PRODUCTIVITIES IN MANUFACTURING INDUSTRIES IN CANADA 1961

Industry	V.A. Mill $	No. of Employ.	V.A. per Employee	Wages & Salaries per Employee	C.C.A. Mill $	C.C.A. per Employ.	V.A. per $ of C.C.A.	Net V.A. per Employee	8% of Net Capital per Worker	Adjusted Product.	F/M* Ratio
	1	2	3=(1):(2)	4		5	6	7=(3)-(5)	8	9=(7)-(8)	10
Food & Beverage	1,782.7	210,762	8,458	3,718	89.6	425	19.9	8,033	666	7,367	37.0
Rubber & Plastic	175.7	21,821	8,052	4,387	15.6	715	11.3	7,337	603	6,734	25.6
Leather	142.1	33,283	4,269	2,928	4.7	141	30.2	4,128	143	3,985	88.7
Textiles	397.1	64,969	6,112	3,458	38.5	593	10.3	5,519	692	4,827	52.5
Clothing	381.4	93,306	4,088	2,745	8.4	90	45.4	3,998	83	3,915	287.5
Wood	451.6	82,085	5,502	3,566	34.2	417	13.2	5,085	474	4,611	4.2
Furniture & Fixture	187.3	33,475	5,595	3,499	5.5	164	34.1	5,431	183	5,248	12.2
Paper	1,082.5	98,292	11,013	5,020	139.4	1,418	7.8	9,595	1,664	7,931	11.6
Printing & Publishing	589.6	75,193	7,841	4,570	21.9	291	26.9	7,550	446	7,104	25.1
Primary Metal	898.6	89,956	9,989	5,284	136.2	1,514	6.6	8,475	1,689	6,786	1.0
Metal Fab.	788.3	101,054	7,801	4,531	48.8	483	16.2	7,318	494	6,824	7.9
Machinery	444.1	50,639	8,770	4,807	17.9	353	24.8	8,417	416	8,001	4.4
Transport. Equipment	840.8	99,280	8,469	4,976	46.3	466	18.2	8,003	687	7,316	4.4
Electrical Products	679.5	89,360	7,604	4,583	28.3	317	24.0	7,287	380	6,907	41.9
Non-Metal Minerals	394.8	43,320	9,114	4,428	42.8	988	9.2	8,126	1,212	6,914	7.8
Petro/Coal	288.0	16,392	17,570	6,119	38.9	2,373	7.4	15,197	4,728	10,469	0.7
Chemicals	808.5	63,357	12,761	5,030	74.6	1,177	10.8	11,584	1,512	10,072	19.6

Source: Statistics Canada #31-201 and #13-211

*F/M is here for production workers only.

TABLE 41: PRODUCTIVITIES IN MANUFACTURING INDUSTRIES IN B.C. 1971

Industry	V.A. Mill $	No. of Employ.	V.A. per Employee	Wages & Salaries per Employee	C.C.A. per Employ.	V.A. per $ of C.C.A.	Net V.A. per Employee	8% of Net Capital Stock per Worker	Adjusted Product.	F/M Ratio
	1	2	3=(1):(2)	4	5	6	7=(3)-(5)	8	9=(7)-(8)	10
Food & Beverage	273.5	16,958	16,128	7,385	892	18.08	15,236	1,344	13,892	51.0
Rubber & Plastic	9.4	911	10,322	7,348	792	13.03	9,530	734	8,796	26.4
Leather	2.2	277	7,880	4,856	279	28.24	7,601	272	7,329	152.6
Textiles	9.5	1,025	9,245	5,741	1,073	8.62	8,172	1,228	6,944	181.7
Clothing	17.4	2,297	7,592	4,868	127	59.78	7,465	101	7,364	486.8
Wood	530.3	41,652	12,732	8,467	820	14.31	11,842	983	10,859	1.7
Furniture & Fixture	20.3	1,809	11,219	6,823	286	39.23	10,933	349	10,584	23.6
Paper	350.0	18,327	19,098	10,451	2,835	6.74	16,263	3,261	13,002	4.1
Printing & Publishing	87.8	6,297	13,936	8,360	530	26.29	13,406	805	12,601	20.6
Primary Metal	118.5	8,032	14,749	9,003	2,586	5.70	12,163	2,786	9,377	1.0
Metal Fab.	142.6	9,391	15,186	8,478	706	21.51	14,480	796	13,684	6.5
Machinery	46.9	3,525	13,312	9,047	628	21.20	12,684	743	11,941	2.4
Transport. Equipment	68.0	5,406	12,581	8,481	824	15.27	11,757	1,205	10,552	2.2
Electrical Products	31.4	2,880	10,915	8,255	562	19.42	10,353	626	9,727	53.1
Non-Metal Minerals	70.4	3,732	18,868	8,629	1,837	10.27	17,031	2,223	14,808	7.7
Petro/Coal	41.1	976	42,096	10,593	5,233	8.04	36,863	9,635	27,228	0.2
Chemicals	64.6	3,371	19,150	7,853	2,282	8.39	16,868	3,016	13,852	8.9

Source: Statistics Canada #31-201 and #31-203

Using data for Canada and disregarding capital consumption, we find that from the Food and Beverage group, fruit and vegetable processing seems to have favorable parameters - F/M is 74.4 and value added per employee is $14,978. (The most productive size of the plant is over 200 employees with about $20,000. V.A. per employee.) From the Chemicals and chemical products group, the manufacturing of pharmaceuticals and medicines has an F/M ratio of 96.9 and V.A. per employee of $23,711 (there seems to be no clear cut economies of scale in pharmaceuticals and medicines production), manufacturing of soap and cleaning compounds has an F/M ratio of 29.3 and V.A. per employee of $28,443 (most productive size of the plant is 500-1,000 employees with V.A. over $40,000. per employee). Manufacturing of toilet preparations has an F/M ratio of 175.8 and V.A. per employee of $23,369. Such industries could grow on the basis of wood and coal and together create a viable industrial complex. (A similar complex could consist of Agriculture and Food and Beverage industries.)

Some attention should also be given to choosing a proper scale of operation in frontier regions. To compensate for more difficult conditions in frontier regions, operations should exploit all economies available - modern techniques and technology and also scale economies. There are indica-

tions that large firms in B.C. primary industries have higher wages, lower turnover rates and employees are more satisfied. Ross and Partners, (1973: p. 81) examining the turnover rates in the logging and sawmill industry in B.C., continuously found higher turnover rates in small companies: "The large company turnover rates in the four areas averaged approximately 35 percent per annum while the small contractor rates were 230 percent and 550 percent." Similarly, Department of Industrial Development, Trade and Commerce (1976: p. 58) says that "Turnover problems are often more severe in relatively smaller operations".

Hildebrand and Liu (1965: pp. 6-9), measuring economies of scale in U. S. manufacturing industries* came to the conclusion that:

> ". . . the bulk, if not all, of these industries were experiencing increasing returns to scale in 1957. The scale returns, including technological effects, are, of course even greater than those withoug these effects. They range from 2.0 for food products** to 1.5 for leather products and they are greater than 1.4 in 11 of 15 industries."

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*An excellent description of economies of scale (especially from an international trade perspective) is given by Grubel (1976: Ch. 4). Many other studies emphasize importance of economies of scale: Economic Council of Canada (1975-1), Wonnacott (1975), Gorecki (1976), Lithwick (1967), etc.

**This means that one percent increases in all inputs (including capital-technique changes) in the food industry would yield two percent increase in output.

Of course, different production activities will have a different optimum size of plant. To illustrate the point, we include the column "Most Productive Size of Plant" in Table 40a. The size of plant is measured here by the number of employees. The size with the highest value added per employee is the most productive.* The data is from Statistics Canada #31-210. We used the results of both 1971 and 1973 in order to eliminate short run variations, and to be more confident of the results. We notice that except for Leather, Clothing, Furniture & Fixtures, Printing & Publishing and Chemicals, the most productive size of the plant is quite large. Since we use Canadian data, the most efficient size of plant in our Table 40a is probably understated. Even the biggest manufacturing plants in Canada might be too small to be most efficient. The Economic Council of Canada (1975: p. 33) has acknowledged that plant sizes in Canada are small by international standards.

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*Depreciation is not taken into consideration because C.C.A. are not published according to size of the plant. Not considering C.C.A., we are actually comparing gross V.A. per worker. It means that we assume C.C.A. per worker is the same across industry no matter what size the plant is, which may be unrealistic, since bigger plants will probably have higher C.C.A. per worker.

B. Growth of Industries

Table 42 shows that the fastest growing industries over the 1961-71 period were Services, Construction, Mining and Milling, Finance, Insurance, Real Estate and Paper.

TABLE 42: GROWTH OF EMPLOYMENT IN B.C. INDUSTRIES
1961 = 100

Industry	Index August 1971 (1961=100)	
Industrial composite		151.7
Forestry		140.0
Mining and Milling		165.3
Total Manufacturing		135.0
Foods and Beverages	123.1	
Wood Products	125.8	
Paper & Allied Industries	163.1	
Printing & Publishing	133.7	
Primary Metal	116.9	
Metal Manufacturing	213.0	
Transportation Equipment	125.8	
Chemicals	97.3	
Construction		195.3
Transport, Communication, Utilities		143.9
Trade		149.2
Finance, Insurance, Real Estate		164.9
Services		215.2

Source: British Columbia Department of Labor, Annual Report, 1971

The Construction, Mining and Milling and Paper industries are strong in under-developed regions. Their above-average growth is a sign that frontier regions have a tendency to

grow fast in goods-producing industries.

Service industries are strong in developed areas, especially in Vancouver. Above-average growth in Service industries is mostly in these regions. G.V.R.D.'s "The Lower Mainland's Economy", (1970, pg. 53) shows that in the Lower Mainland the employment in tertiary industries increased from 60.2% in 1951 to 68.6% in 1961 and to 71.2% in 1971. The dichotomy between frontier areas with goods-producing industries and the Lower Mainland with service industries may be widening instead of narrowing. We have to accept that some service activities will grow faster than average. But is the regional concentration of such activities good for the B.C. economy? Are some of the service industries over-invested? Under present regulations, investment in equities may be too risky for small investors and the only place where they can control their investment is in Trade and Services. Economies of scale in goods-producing sectors require substantial investments and necessitate a corporate structure. However, we are not capable of dealing with these questions in this study.

There were suggestions that one of the causes of turn-over is the lack of shopping facilities and services in frontier areas. Is the lack of shopping opportunities the cause of turn-over, or vice-versa? Most people know they

will not stay long, so they do not buy too many durables, only the necessities - one reason for low frontier area multipliers. Some studies suggest that even in remote towns shopping facilities and services are not bad. We discussed this in Chapter 2. For the reasons stated above, and possibly through higher mark-ups, there may be too many people employed in trade, which may cause a drain of resources away from the goods-producing sectors. We are not advocating the increase of share of trade and services in B.C., only the shift of part of these activities from Vancouver to the Interior and only when it is possible. The reason is to diversify industrial structure, employment opportunities and population structure in B.C. regions.

CHAPTER 9

GROWTH OF THE GREATER VANCOUVER REGIONAL DISTRICT

We include this chapter because the Greater Vancouver Regional District (G.V.R.D.) has, by far, the highest weight in the province. What occurs in the G.V.R.D. effects potential development throughout the province. We also want to incorporate the G.V.R.D.'s "Livable Region 1976/1986" plan as an example for a settlement plan for all of B.C.

The Greater Vancouver Regional District (census area 15) covers a very small part of B.C. (about 900 square miles of B.C.'s 366,000 square miles) and has a relatively small land area in which to grow. Compared to other large Canadian cities, Vancouver has 700 square miles within a 35 mile radius, while Toronto has 1,500 square miles and Montreal has 3,000 square miles within the same radius. Population saturation for the G.V.R.D. is 2,208,000 people - there is only room for 87% more people than there were in 1976. With present growth, this saturation point will be reached around the year 2000.*

A disproportionate concentration of population and economic activity in this area can be seen from Table 43.

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*Most of the above data is from the G.V.R.D. - "Livable Region 1976/1986" - further quoted as "Livable Region".

TABLE 43: COMPARISON BETWEEN G.V.R.D. AND REST OF B. C.

	G.V.R.D.	REST OF B.C.
% of B.C. population	47.1	52.9
Population growth 1971/1966	115.2	117.8
% population 55 and older (from 15+)	25.7	24.6
% of female B.C. population	49.9	50.1
F/M population 15+	104	94.5
L.F.P.R.	60.3	57.8
Female L.F.P.R.	43.6	37.6
% of B. C. L.F. in manufacturing	52.2	47.8
% of B. C. Value Added in manufacturing	49.9	50.1
% L.F. in goods producing industries	27.0	38.3
% L.F. in trade	19.9	15.6
% L.F. in finance, insurance, real estate	6.6	3.6
% L.F. in personal services	29.4	24.5
% L.F. in transport., communic., utilities	11.6	9.2
% L.F. grade 9 or less	15.6	21.4
% L.F. unemployed	9.5	8.6
Average annual employment income Males	7,481	6,717
Average annual employment income Females	3,360	2,837
F/M employment income	44.9	42.2

Source: Census 1971

The G.V.R.D. has much more favorable industrial structure for female employment than any other part of B.C. (with the exception of Victoria). It has slightly below the B.C. average growth of population, but is strongly above the Canadian average (index 1971/1966 is 107.8). There are less children born per 1,000 "ever married women" in the G.V.R.D. (2.203) than in B.C. (2.412) or in Canada (2.775). According to the G.V.R.D.'s "Brief to Federal Minister of Manpower and Immigration" (further quoted as "Brief") over 40% of the annual population growth in the G.V.R.D. is made up of immigration compared to a national average of 20%.

Such a situation causes some problems for the G.V.R.D. as well as for the rest of B.C. "Livable Region", pp. 3-4, complains about municipal growing pains, the burden of growth, traffic problems, crowded parks, lineups at bridges, disappearing farmland, escalating house prices, etc. The G.V.R.D takes too much private and public funds and little is left for the rest of the province. T.N. Brewis (1971, pp. 67-68) says that over 90% of all firms contemplating establishing in B.C. have Vancouver in mind. D.R.E.E. in "Western Region", (1973, pg. 27) states that: "There is a concern about de-population of rural areas and communities, the shift from rural to urban life styles and the problems of social stress arising from an over-concentration of population in urban areas."

R. Hill (1975, pp. 7-8) writes that with the urbanization the costs of reproducing the labor force have risen enormously, and have increasingly been shifted to the state.

The G.V.R.D.'s planning department is aware of the interdependencies of the city and its hinterland. "Livable Region", p. 5, states that the federal government should work with provincial and regional governments to create a settlement policy for the country, just as G.V.R.D. is working with municipalities to develop a settlement policy in the region, to coordinate immigration policy with a national settlement policy and to work to create growth centres outside of the fast growing metropolitan areas. The same authors in "Brief", p. 3, say that: "Serious consideration should be given to the establishment of a network of small and medium size cities to relieve the pressure on large towns while still offering an alternative to rural living." " . . . we have proposed creation of alternative growth centres outside of G.V.R.D." "We feel that growth in our region can be controlled only through creation of other centres to attract growth."

"Livable Region", p. 13: "The more we keep the Greater Vancouver livable, the more it will continue to attract people to come to live here." "The lowering of our growth rate can come about by senior governments

working on urban settlement policy for the province and the country, trying to make other centres as attractive for jobs and living as Lower Mainland - and revising the immigration policy in accordance with these provincial and national objectives.

What is probably not fully recognized by the G.V.R.D. is that there might not be enough funding to both create new, attractive growth centres in the interior, and at the same time to go ahead with the G.V.R.D.'s propositions to improve conditions in Greater Vancouver itself. Not only that, but some businesses and jobs would have to be shifted from Vancouver to new interior growth centres if such centres are to become attractive. It will not be possible for Vancouver to have a highly disproportional share of service and public administration industries. Part of the Greater Vancouver jobs would have to be shifted to the interior if the provincial settlement policy is to work. But the G.V.R.D.'s present projections are contrary to this procedure - the share of service industries is planned to increase. The G.V.R.D. in "Livable Region", p. 16, projects increase of the share of tertiary industries (including wholesale trade and transportation) from 73.1% in 1971 to 78.3% in 1986, while the share of goods

producing industries is planned to decrease. Similar projections hold for the whole Lower Mainland where the G.V.R.D. in "The Lower Mainland Economy", (1970, p. 53) projected the increase of tertiary industries share from 71.2% to 74.5% between the years 1971 and 2000. Such projections are disturbing and contradict the ideas of a provincial settlement plan and growth centres in the interior. If such proposals are to be realistic, such new centres must have diversified industries including a fair share of service industries with opportunities to employ females.

However, the G.V.R.D.'s proposals to spatially redistribute and manage growth within the Greater Vancouver area are interesting and can serve as an example for a settlement plan for the whole province. The idea is to attack the problem on many fronts, similar to a "big push" development theory while recognizing interdependencies of many factors. This is especially useful. The G.V.R.D. intends to attack the problem on five fronts simultaneously:

1. Population growth targets
2. Jobs growth targets
3. Regional town centres
4. Transportation system
5. Open space policy.

Such a complex, balanced approach is important. The

G.V.R.D. in "Livable Region", p. 10, states that the five parts of the strategy make sense on their own, but more importantly, they also reinforce each other and will have a far greater impact if put into effect together.

Interior growth centres could involve similar problems as the town centres proposed in Greater Vancouver. They should help disperse jobs, entertainment, shopping facilities and education to areas outside Vancouver and the Lower Mainland in the same way town centres do from downtown to the suburbs. "Livable Region", p. 18, states: "A regional town centre is like the downtown of a small city, it has virtually everything one needs on a day to day basis. The idea is to make such centres attractive enough to prevent people going to downtown." If the G.V.R.D.'s experiment is successful, it could be an example of how to influence development in other parts of B. C.

To conclude, we repeat that perhaps the interdependence between Vancouver and its hinterland is not fully recognized. The government and private investors cannot spend hundreds of millions of dollars in both Vancouver and the interior when financial resources are limited. We can hardly increase employment in service industries in Vancouver and

at the same time build attractive growth centres in the interior which would require the growth of the same industries. The question of priorities is important. As we argued in the first chapter, the growth of the metropolis without the adequate growth of a goods producing hinterland is undesirable.* The priorities should be shifted in favour of the hinterland. We could even go so far as to completely liquidate all government subsidies to business and individuals in Vancouver, including housing subsidies, which ultimately increase the land prices. Saved 'funds' could go towards the building of productive capacities, housing, and infrastructure in the interior.

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*The G.V.R.D. region does not have a proper economic base (goods producing industries) to support as many people as presently live here, and is extremely vulnerable to the level of economic activity in its hinterland.

CHAPTER 10

RECAPITULATION AND CONCLUSIONS

A. Classification of B.C. Census Areas

Considering our previous discussion, we choose to divide B.C. census areas into three groups; developed, underdeveloped (frontier) and intermediary.

Developed areas have diversified industries, high female employment and an above-average F/M population ratio. These areas have above-average unemployment rates, an above-average percentage of older, less productive population, and an above-average number of divorced females - which probably results in lower labor force participation rates. With some exceptions, these regions have low employment in the goods producing industries and above-average employment in services. Developed areas have also slightly higher employment in agriculture. We include the following census areas into this group: 3, 5, 7, 11, 13, 15, 19, 20, 22 and 28 which creates a belt from Victoria to approximately Salmon Arm, including the Okanagan, Lower Mainland and South Eastern part of Vancouver Island.

Underdeveloped - frontier areas have exactly the opposite characteristics - very high employment in primary

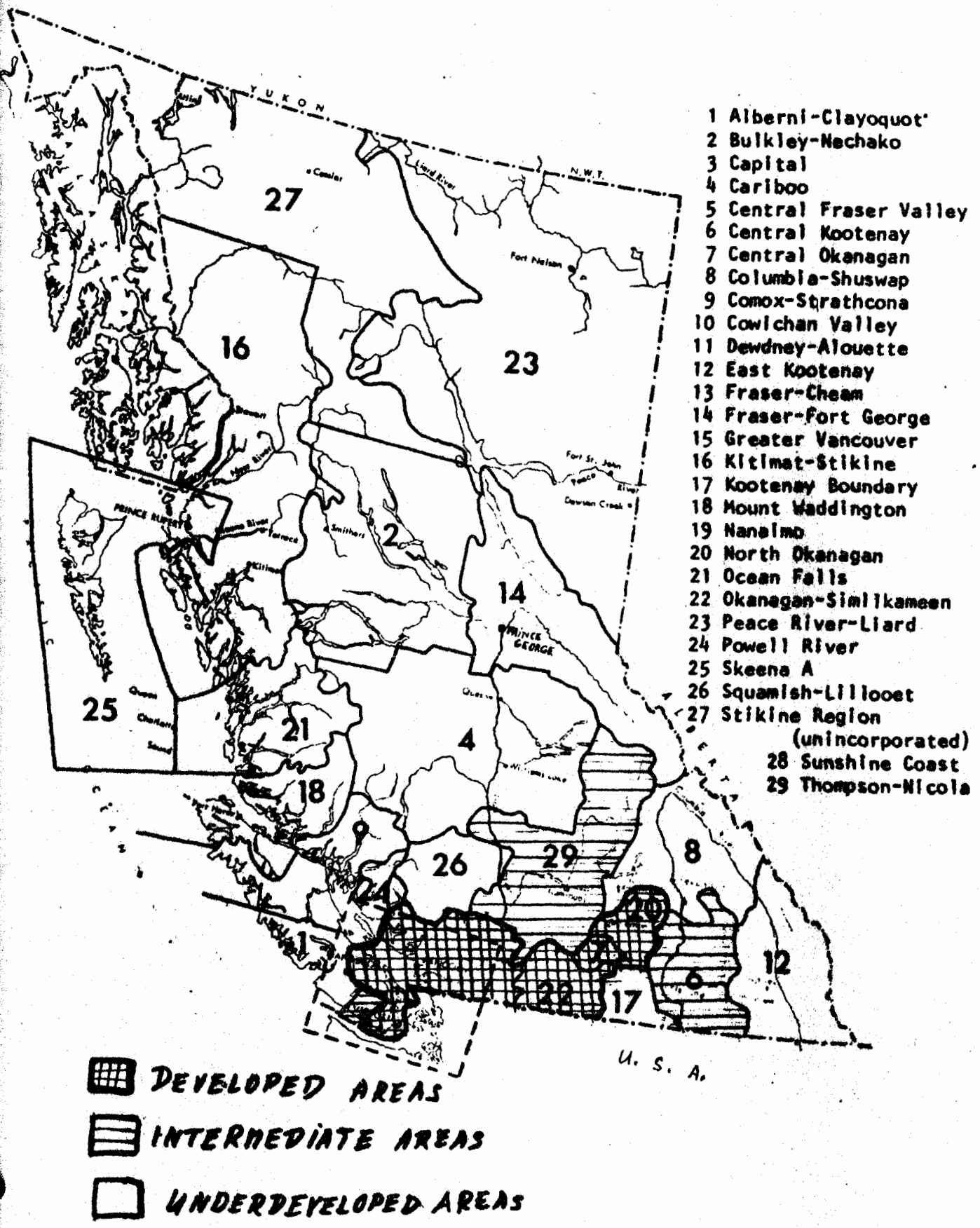
industries, low employment in agriculture and service industries, and a very low F/M population ratio. They have a one-sided industrial structure with few opportunities to employ females. Employment in the goods producing industries is above average. They have a relatively higher portion of the population in the middle-aged highly productive age groups and a low percentage in the older groups. All this results in relatively higher participation rates. Areas in this group have a poor population structure, an unstable population and high labor turnover. They also have lower unemployment rates - unemployed move out to socially more attractive regions. Such areas have a low population density. We include here census divisions 1, 2, 4, 8, 9, 12, 14, 16, 17, 18, 21, 23, 24, 25, 26 and 27. This is basically the very large area north, west and east of the boundary of Port Alberni - Campbell River - Williams Lake - Revelstoke and Creston. In this huge area only a few "pockets" are somewhat developed.

Intermediate areas are all others left out, namely 6, 10, and 29. All are southern or central areas relatively close to Vancouver.

With some reservation we could include here census divisions 12 and 14, which are relatively fast growing, have a population F/M around 90 and have relatively high employment in service industries. Region 14 also has above-

CENSUS DIVISIONS

FIGURE 3 - Classification of B.C. Census Divisions



1 Alberni-Clayoquot
2 Bulkley-Nechako
3 Capital
4 Cariboo
5 Central Fraser Valley
6 Central Kootenay
7 Central Okanagan
8 Columbia-Shuswap
9 Comox-Strathcona
10 Cowichan Valley
11 Dewdney-Alouette
12 East Kootenay
13 Fraser-Cheam
14 Fraser-Fort George
15 Greater Vancouver
16 Kitimat-Stikine
17 Kootenay Boundary
18 Mount Waddington
19 Nanaimo
20 North Okanagan
21 Ocean Falls
22 Okanagan-Similkameen
23 Peace River-Liard
24 Powell River
25 Skeena A
26 Squamish-Lillooet
27 Stikine Region (unincorporated)
28 Sunshine Coast
29 Thompson-Nicola

average female labor force participation rates. However, these regions have low population density.

B. Recapitulation

It has been previously stated that frontier regions are based on primary industries. Towns and camps are single industry communities with little employment opportunities for women. Work is often physically demanding; mostly young or middle-aged men are employed, a high percentage are single and most of them are not able to find employment in the southern developed and socially more attractive areas. Because of this bad population structure and remoteness, most single men remain only a short time. Many companies are aware of these problems and attempt to supply recreation and other amenities for their employees. However, companies alone cannot provide the complete set of needed requirements.

There are also some economic incentives to work in the frontier regions. Basic hourly wages are not much higher than in the Lower Mainland, however the availability of overtime work makes employment in these regions economically attractive. But this nevertheless does not help to substantially decrease the labor turnover and maintain a "steady" labor force.

One-sided industrial structure oriented towards primary industries makes the economy cyclically sensitive, increases labor turnover, produces private and social costs to the economy and hinders further development of frontier areas. With high labor turnover we have difficulties in permanently populating and industrializing frontier regions. Some authors stated that labor turnover is the single greatest obstacle to the expansion of the northern industries and communities. Because of unstable labor there are also higher costs to the whole society, such as unemployment insurance costs, welfare payments and perhaps other social costs. We can hardly blame the companies or the transient men for this. These problems are normal and have always existed in frontier areas. However, if we want to speed up the development of frontier regions and decrease some social costs, we will have to deal with them. Improvement of the industrial and population structure is vital to the B.C. economy. The growth of a service-oriented Lower Mainland without the proper growth of a goods-producing hinterland can only be detrimental to the economy in the long run.

C. Some Long Run Proposals

The present industrial structure may cause under-utilization of the existing labor force. To increase

employment of females, Indians, welfare recipients and people with minor health problems may be impossible when we have only mines and primary processing plants. However, in the present "belt tightening" situation, better utilization of an existing labor force could be important. It could prevent decrease of living standards and diminish social conflict. The welfare of these people is of concern to us all. Increases of their employment should bring net economic gain and maintain their ability to produce. However, such people in large part can be employed only in light manufacturing, services and some types of agriculture.

Every government development plan should take into consideration the implied industrial and population structure and the costs and problems connected with it. Industries in northern growth centres which can employ females, use local resources and have high productivity, should have priority. These would probably supply mostly local and Canadian markets. One method of improving the industrial structure could be to give permission to open a primary plant in the frontier area only if the company contractually guarantees that after a certain time period it will also construct secondary industry.

Chemical and pharmaceutical production based on coal, gas or oil could create a viable industrial complex.

Another industrial complex could be food and beverage production together with agriculture.

As a reward to people for working a certain length of time in northern industries, they could get a piece of Crown land. This might induce them to stay in the North. (There should be some conditions attached land should not be transferable for a certain time period and the owner should develop it.) There could also be a few agricultural growth centres as a supplement to industrial growth centres, to teach people farming and to give them some knowledge of their new environment before they get their own land.

The question is, how effective are some of the well-intended business subsidies and social programs? Many such programs now under way may result in disincentives and in the continuation of government aid for both welfare-UIC recipients and business. Instead of this, it might be more advantageous for the government to initiate and maintain partial or complete control of some productive capacities.*

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*Some special projects could be built for people who are considered unemployable. For example, cattle ranching does not place heavy requirements on labor quality. Such projects should be close to primary industrial centres and the companies should have some responsibility to such projects. Good accomodation, food, balanced F/M ratio, well organized social activities, proper medical care, strict rules and work might help to re-create social and economic values which some say are economically so important.

Of course, the idea would be not to hinder private investment and initiative. The government could advertise projects it intends to build and if private sectors are interested, the government could retreat and supply available documentation to private firms. Success depends only on organization - many profitable government enterprises in Europe are good examples of it. People who propose the project should also be responsible for its planning and operation. Such projects should operate under exactly the same rules as in the private sector. Any such undertaking should use the most progressive technology and all economies of scale, especially when building in frontier regions where conditions are more difficult. Businesses, especially in frontier regions, should consider such programs as a means to diminish turnover and social problems, and support them.

Society places much importance on social status, which might be a real disadvantage for people working in the north. Cawsey and Richardson (1975, p. 12) state that the miners felt that they were perceived inferior by both company management and society at large. The schools, the media and the public should stress the importance of these people.

It might be useful for northern companies and labor

unions to pay some attention to contacts, and cooperation with southern communities and to the organization of recreation for their workers in southern areas. Companies and labor unions can even own some accomodation and recreational facilities for their own exclusive use. (Such systems exist in Europe.) It could save Canada foreign exchange, decrease labor turnover, and avert possible employee problems with the "shock" of being again in civilization. On the other hand, southern companies, unions, clubs and other organizations (including universities) could have recreational facilities in the North, close to mining towns and have such towns under their patronage.

More money created in frontier areas should stay there. It might be better to support the development of frontier regions instead of further investment in the infrastructure and social overhead capital in already developed areas. Subsidies in the developed regions should be decreased to a minimum and funds shifted to build up frontier regions.

Forecasts of further disproportional increases of tertiary industries in Vancouver are disturbing. Part of these activities should be allocated to the interior (if it is possible) to diversify the industrial structure there. In connection with this the build-up of a major city in the

interior or even a shift of provincial capital could be a good idea. To improve incentives in frontier areas, regional income tax and profit tax adjustments could be considered.

Our attempt has been to suggest a balanced long run economic and settlement plan for the province and use administrative and economic methods to achieve its goals.

D. Possible Short Run Solutions

Improvement in the industrial and population structure is vital for the B.C. economy. However, to do so is not an easy task and is a long run proposition. But we have to deal with turnover costs and some social problems immediately.

First, we should utilize all opportunities to increase female employment in existing primary industries. This might be difficult, but with some good will and realization on the part of employers, that such a move might decrease labor turnover and consequently decrease operating costs, and with the help of manpower training, some substitution of females into traditionally male occupations should be possible.

Another method to decrease turnover in frontier areas may be to encourage trade-offs with those who receive services from the government and supply them only on a contractual basis under the condition that they will work in developing areas. Basically, we can trade off immigration, manpower

training, welfare and business subsidies. With these methods, we could even try to improve the population structure in frontier regions.

One possibility is to give an immigration visa only to people who will guarantee (by contract) to work for a certain period of time in a frontier region.* The contract would be signed by the immigrant, the employer and the government. Such a contract would guarantee a job, a wage, training and housing to the immigrant, who in turn would guarantee to stay with the company for a certain period of time.

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* Proposed changes in the Immigration Act (see The Province Nov. 25, 1976) were in this direction. However, such an action should be well defined, not be discriminatory and in order to be easily and efficiently administered should apply to all immigrants without exception. Such an approach is also fair to the immigrants. They will know in advance what conditions they will have in Canada. This by itself should diminish turnover. Cawsey and Richardson (1975: p. 47) speaking about recruitment rules advise companies to be realistic in description of the company and environment - not to oversell and create unrealistic expectations. Similarly, Black (1970: p. 118) advises to make sure that a new employee (in our case, immigrant) was aware of the work that was expected from him in order to avoid the initial frustration which many times resulted in high turnover.

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