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NAME OF AUTHOR/NOM DE L'AUTEUR Amanat U. Khan

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NAME OF SUPERVISOR/NOM DU DIRECTEUR DE THÈSE Roger Hayter

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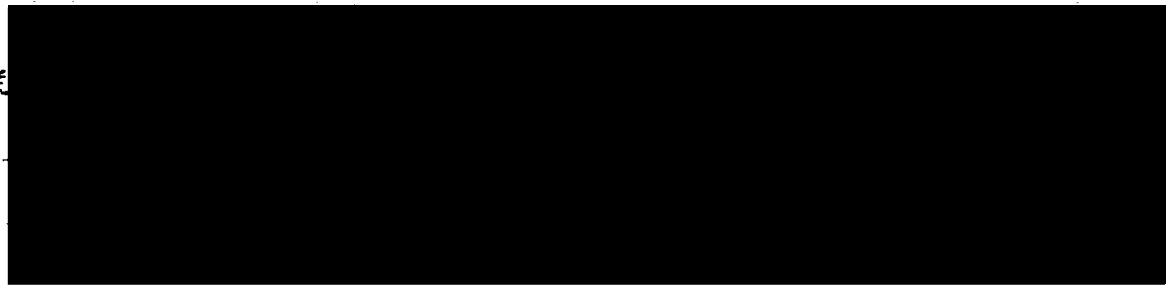
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MANUFACTURING DIVERSIFICATION IN THE VANCOUVER METROPOLITAN AREA

by

Amanat ullah Khan

B.SC., University of Dacca, 1970

M.SC., University of Dacca, 1971

THESIS SUBMITTED IN PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

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APPROVAL

Name: Amanat U. Khan

Degree: Master of Arts

Title of Thesis: Manufacturing Diversification in
the Vancouver Metropolitan Area

Examining Committee:

Chairman: S.T. Wong

R. Hayter
Senior Supervisor

J.W. Wilson

T.M. Heaps
External Examiner
Assistant Professor
Department of Economics
Simon Fraser University

Date Approved: August 18, 1981

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ABSTRACT

Within the framework of the staples thesis of regional economic growth this study examines recent trends in the diversification of the manufacturing sector in the Vancouver metropolitan area. In particular, traditional comparative static measures of diversification are used as a context for a survey-based examination of the characteristics and functions of newly established manufacturing plants. Various 'relative' and 'absolute' indices of diversification, calculated for 20 two-digit and 38 three-digit manufacturing industries using 1961 and 1971 census data, indicate a slight increase in diversification of the manufacturing sector of the study region. The results of the sample survey indicate, in accordance with expectations that new manufacturing establishments are typically small and owner-managed and that Vancouver still retains an 'incubator function'. A high percentage of Vancouver's manufacturing entrepreneurs are also immigrants to Canada. With respect to the extent to which new plants are diversifying the study region's manufacturing sector on the basis of their linkage characteristics, the main finding is that new plants are primarily established to serve British Columbian markets although backward and especially forward linkages around the traditionally important sectors remain important. Export links do exist but they are of a rather tentative, small scale nature and will likely remain so without substantial government help.

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I. Manufacturing Diversification in the Vancouver Metropolitan Area

In British Columbia pleas for greater diversification of the economic base, especially with respect to the establishment of an enlarged secondary manufacturing sector, have been a re-occurring theme of public concern at the provincial, regional, and community scale for decades. Initially this concern focussed on attracting primary manufacturing activities utilizing raw materials as their principal input. In more recent years, there has been an emerging view that the province needs to attract secondary manufacturing involving fabrication or assembling of already manufactured inputs. The city of Vancouver, for example, in 1978, established an office of economic development to stimulate secondary manufacturing in the area. At the Provincial level the replacement of the Ministry of Economic Development in 1977 by the Ministry of Industry and Small Business Development and even more recently the introduction of the Discovery Park Policy represent trends in the same direction.

Typically, the virtues of attracting so called high-value added manufacturing are stressed in relation to the problems of specializing too narrowly on primary resources and resource based industries. Specialized economic structures, it is argued, are highly vulnerable to changes in supply and demand conditions, such as shifts in consumer tastes, development of substitute products, exhaustion of local supplies, and the emergence of competition in other areas. On

the other hand, the establishment of new manufacturing activities is seen to be important in terms of enhancing stability, broadening the range of employment opportunities, increasing returns and in ensuring continued growth over the long run. It is the assumption of the Discovery Park policy, for example, that continued manufacturing growth in British Columbia is dependent upon the attraction of so-called high technology activities. The argument for diversification, it might be noted, does not - and should not - constitute a rejection of the importance of the principle of the division of labour as a source of productivity increase and of wealth. Rather it rests on the belief that a diversified economy is an important indication of economic maturity and, in particular, is typically more stable, vibrant, and capable of self-sustaining growth than a highly specialized one.

Despite the importance attached to the idea of diversification in British Columbia (and indeed in Western Canada as a whole) there have been surprisingly few studies which have specifically examined the relationship between diversification and urban and regional economic development. This is especially so with respect to the role played by the establishment of new manufacturing activities in the diversification process. Indeed in the Vancouver urban region, where the great proportion of the province's secondary manufacturing is situated, there have been relatively few published studies of the economic geography of manufacturing. Furthermore, the few studies that are available are based on data reflecting conditions no more

recent than the mid 1960's and, generally speaking, they were only tangentially interested in the issue of diversification. It can of course be reasonably supposed that given the size, importance, and situation of the Vancouver metropolitan area, as well as the rapidity of its recent growth, that diversification within the manufacturing sector has occurred. It is the purpose of this thesis to examine the validity of this presumption and, in particular, to determine the extent and direction of the diversification of manufacturing activity in the Vancouver metropolitan area over the past two decades. By way of introduction several studies which offered statements and impressions concerning the structure of manufacturing in the province, in general, and the Vancouver metropolitan area, in particular, are briefly reviewed.

In this regard judgements made about the size and scope of manufacturing, especially secondary manufacturing, in the province as a whole necessarily refer in large part to the Vancouver metropolitan area.

Diversification of Manufacturing in the Vancouver Metropolitan Area: Alternative Views

The most widespread interpretation of the industrial structure of British Columbia and Vancouver is that it is relatively narrow and specialized with a relative paucity of secondary manufacturing development. In the most comprehensive and best known study of the

province's economic structure, for example, Shearer (1973, p. 3) noted "In spite of the apparent complexity of the economy, the economic base of British Columbia is in fact relatively narrow and simple". With respect to the manufacturing sector, the author observed, on the basis of a detailed investigation of individual manufacturing activities, using 1961 census data, that it primarily involves the extraction and processing of a few natural resources, principally forest and mineral resources. He concluded that manufacturing employment in British Columbia is directly and indirectly more dependent on resource extraction and processing than is the rest of Canada. Although provincial in focus, the above views expressed by Shearer have been explicitly adopted in the context of the Vancouver metropolitan area. Thus in a study based on information collected in the mid 1960's (and before), Steed (1971, p. 257) found the urban region's manufacturing structure to be "deceptively narrow retains a marked emphasis on first stage resource processing, particularly in wood and food processing industries". Essentially Steed and Shearer interpret manufacturing in Greater Vancouver as principally comprising (a) an important but narrow resource-based export sector associated with some linked activities and (b) a small and somewhat inefficient secondary manufacturing sector serving principally British Columbia markets.

While the above view offers what might be termed as conventional wisdom, other interpretations have given more emphasis to the growth and diversity of manufacturing. At the provincial level, for example,

Denike and Leigh (1972, p. 80) and Denike (1978, p. 48) stressed the resilience and interconnectedness of the economic sectors, including manufacturing in a manner somewhat contrary to the views expressed by Shearer. These studies admittedly did not examine manufacturing in any great detail. Nevertheless in an earlier analysis Ingram (1958) did describe the evolution of secondary manufacturing industry in the province and noted the growth of the resource linked transport equipment and forest equipment industries in south western British Columbia as well as the development of small-scale industries to serve local consumer markets in the nationally isolated Vancouver area from as early as the 1890's. Similarly, in a study, specifically on the industrial development of Vancouver, which used employment data for different years between the 1930's and 1950's, McGovern (1961, p. 199) observed that although during the 1930's the industrial structure was specialized, with the wood based industries dominating, it has progressively become more diversified. In particular, he noted that the wood based industries had been complemented by the rapid growth of food industries, shipbuilding, printing, petroleum refining, bakery products, clothing and sheet metal industries.

The disagreements about the industrial structure of the region clearly stem from different empirical terms of reference. McGovern's favourable view on diversification in Vancouver follows from his evolutionary perspective while Steed's emphasis on the extent to which the area is specialized reflects implicitly a static comparison

with the rest of Canada. As such, both views can be accepted to the extent that historically Vancouver has diversified around the export base while its employment distribution is limited to relatively few categories. In fact as Taylor (1967) has pointed out the concept of diversification exhibits considerable ambiguity in the literature and is explicitly defined in several different ways in empirical analysis. Clearly diversification should be defined explicitly for empirical purposes. Preferably such a definition should derive from a specific conceptualization of the process of diversification. In this context, the staples thesis of regional economic growth offers a useful and appropriate point of departure and one which interprets diversification not only in terms of the region's activity mix, but also in terms of the linkage between activities.

Manufacturing Diversification and Urban Growth

With its roots in the works of Canadian historians, notably Innis, the staples thesis as applied in the context of regional economic growth is principally concerned with the pattern of economic development which arises from export-led growth in commodities (staples) in a newly settled land (Watkins, 1963). This interpretation of regional economic development as Watkins further elaborates is concerned with the initiation and the subsequent transmission of growth processes in areas which do not suffer from population pressure problems (i.e., favourable man/land ratio), have

an absence of inhibiting traditions, have grown up within the framework of capitalist institutions responding to profit maximizing opportunities in which factors of production are characteristically very mobile. Therefore, while the staple thesis model is conceptually closely related to export base theory (North, 1961), its articulation refers directly to Canadian experience. In recent years it has been used as a framework for an historical analysis of manufacturing change in Southern Ontario between 1851 and 1891, by Gilmour (1972) and by McCann (1978) specifically with regards to Vancouver's early growth.

While the staples thesis was originally designed to explain the initial and early pattern of growth in newly settled areas. Its specific relevance for this thesis is the manner in which it explains how export-led growth stimulates the rest of the economy in terms of industrial linkage. According to the staples thesis, regional economic growth occurs as a diversification process around the export base(s). Thus a successful export sector sets in motion a cumulative multiplier mechanism which expresses itself in the growth of the other sectors of the economy. In fact these other sectors may eventually become more important than the export sector itself. Consequently, over time, endogenous led growth increases in importance and interregional linkages are increasingly complemented by intra-regional linkages. Essentially the impacts of the export-led growth are transmitted to the other sectors of the economy through the operation of backward, forward, and final demand linkages so that

it is by the establishment of these linkages that diversification occurs. From a dynamic perspective, backward linkages are investments in activities which supply inputs to the expanding export sector. Building of transport systems for collection of the staple has been mentioned by Watkins (1963, p. 145) as the most important example of a backward linkage. In Vancouver some well-known examples of backwardly linked manufacturing activities around the forest products sector are the transport and equipment and logging machinery sector. Forward linkage activities represent investments in the production of goods using outputs from the primary sector. Instead of the export of the more or less unprocessed raw materials, these activities produce new commodities out of raw materials and thus add more value to the products. The wooden furniture industry and the prefabricated housing industry may be cited as examples of forward linkage activities developed around the export based forest staples of Vancouver. The final demand linkages are the investments in the production of consumer goods, primarily for local consumption. These occur because export-led growth generates population increases and this population growth reaches the threshold level for increasingly higher order goods. Finally, with time internally generated growth will likely become more important and the region less reliant upon exogenous demand.

In general, the extent to which forward, backward, and final demand linkages are generated depends on a variety of factors, including the nature of the staple itself; the existence of

appropriate location factors, and the institutional framework for development in the region. Staples vary in their ability to produce linked activities. For some staples little scope for backwardly linked activities are possible due to the simple nature of the extraction and refining process and the prohibitive economic costs of producing them locally. For other staples, the further processing of the primary raw materials by forwardly linked activities locally may be uneconomic because of the relatively high distribution costs, lack of locally skilled labour, lack of an adequate supply of risk capital and entrepreneurs and the inadequate size of the local market. The early staples of British Columbia like fur and gold thus generated little or no industrially linked activities in British Columbia. In contrast, the later staples like fisheries and forestry generated considerable spin offs through the establishment of linked activities within the region. The success of the linkages produced by the forest and fisheries industries also increased the size of the domestic market which, in turn, allowed the growth of final demand type activities such as breweries and many other products. Apart from the nature of the staple itself, as Watkins notes, the supply of entrepreneurs able to perceive and exploit market opportunities is critical to the development of new manufacturing activities. In newly settled regions and peripherally located cities like Vancouver these entrepreneurs must originally come from elsewhere. Over time, with urban and regional growth, an indigenous supply of entrepreneurs may be forthcoming and the newly emerging centres may take on an

incubator function typically associated with long established industrial core areas.

The implications of the above comments are that the diversification process around the export sectors should not be regarded as automatic. In general diversification may be arrested by failure to attract appropriate labour and entrepreneurial skills, by increases in economies of scale or improved transportation which serve to favour existing producers in established regions, the lack of sufficient domestic market potential, inflationary tendencies caused by too rapid growth in the export sectors and by the development of high levels of external control. In this latter regard, if growth is accomplished primarily by the establishment of branch plants which substitute corporate for local linkages, demands for local production of goods and services will be suppressed. For these and other reasons, then, resource-rich regions may fall into a 'staple trap' (Watkins, 1963, p. 151) resulting in stagnation and decline in growth.

The fact that diversification cannot be accepted as an autonomous process, of course, underlines the need for empirical investigation. From the above brief review of the staple thesis, however, it is clear that diversification is not a unidimensional process. Thus diversification can occur in several ways. In particular, diversification of a region can be thought of as the attraction of new activities to an area which (a) represent backwardly linked activities to the established export sector (b)

forwardly linked activities to the export sector; (c) activities which are set up to serve the local consumer market. In addition, it should be recognised that (d) new export-oriented industries may be established involving either primary or secondary manufacturers and that these new export activities may derive from previously established forward and backward linkages. In other words, the categories are not mutually exclusive. On the other hand new activities may be of a footloose type and represent a relatively new technological thrust to the region. The implication of this framework, however, is that diversification is defined both in terms of the characteristics of the new activities (e.g., technological characteristics) and their linkages with other sectors of the economy.

Objectives

Generally speaking most research on regional and urban diversification has adopted census defined categories as the unit of analysis and a comparative static perspective. In this regard the various comparative static measures of diversification which have been developed have provided useful insights into overall shifts in a regional economic structure. However, in addition to problems of aggregation such an approach does not provide information on the processes of change or on the nature of industrial linkage. A proper understanding of the concept of diversification, however, requires,

on the basis of the argument presented, information on the characteristics of newly established manufacturing activities and in particular their linkage characteristics. New manufacturing establishments can be founded in a variety of ways, including by the creation of new (and small) firms, establishment of branch plants of externally located firms, and also by the establishment of branch plants of local firms. In this regard it might be noted that in the last two or three years a few pioneering studies have attempted to explore the relationship between diversification and regional development by the monitoring of the characteristics of new establishments, specifically those involved in the creation of new firms (e.g. Finn & Swales, 1978; Johnson & Cathcart, 1979).

In this thesis traditional comparative static measures of diversification are used as a context and point of departure for a more detailed investigation of the characteristics of the linkage behaviour of the newly established manufacturing plants. In particular, the main empirical objectives of the study are:

(a) To critically examine the concept of diversification as traditionally used in the literature and to calculate selected summary indexes of diversification of Vancouver's industrial structure between 1961 and 1971.

(b) To examine the process of diversification of Vancouver's industrial structure during the 1970's by interviewing a sample of plants formed in the Vancouver metropolitan area over the past 14 years in order to determine their size, organizational structure, and

product characteristics, and the extent to which they represent forwardly linked growth, backwardly linked growth, consumer market orientation, or new export activities.

To fulfill these objectives the next chapter reviews selected conventional static diversification measures (Chapter II). The third chapter examines, in general terms, the role of the new manufacturing establishments in the regional diversification process (Chapter III). These chapters provide the basis for the empirical analysis of the thesis which consists of an aggregate analysis of statistical patterns of employment diversification in Vancouver (Chapter IV) and a micro analysis of the results of the sample survey of new manufacturing establishments (Chapter V). The thesis is completed by a summary of results and a brief discussion of implications.

Data Sources

Data for the research has been derived primarily from two sources, namely Census data and questionnaire survey.

A. Census Data: The Census of Canada publications numbers 94 - 519 and 94 - 742 and entitled 'Labour Force: Industries by Sex-Metropolitan Area' and 'Industries by Sex for Census Metropolitan Areas' respectively provide the most detailed published employment data for manufacturing industries at the metropolitan area level for the years 1961 and 1971. While it is only available at 10 yearly intervals and the only measure of manufacturing activities is

employment, the disclosure rule is rarely invoked, so that information is relatively complete. In any case there is no other Census source of data which publishes manufacturing data at the metropolitan level. Statistics for Canada as a whole for the years were obtained from publication numbers 94 - 518 and 94 - 740 entitled 'Labour Force: Industries by Sex - Canada and Provinces' and 'Industries by Sex for Canada, Regions and Provinces' respectively. At the time of the survey, these were data for the most recent period available.

B. Questionnaire Survey: The field data for the thesis was gathered by administering a questionnaire to a randomly selected number of new manufacturing establishments founded since 1966 in the region. The questionnaire was designed to elicit information on the general characteristics of the firms, e.g., entrepreneurship, size, location and pertaining to their linkages with Vancouver vis-a-vis elsewhere in terms of (a) input-output linkages (b) capital goods linkages and (c) service linkages as measured by dollar value. As will be discussed in Chapter V, it was impossible to specify the correct size of the population of new firms in Vancouver. Nevertheless there is no reason to suppose any systematic bias in the application of the sample except a slight tendency to favour small-scale operations, which is a characteristic of all unmodified random sample designs.

II. Statistical Measures of Urban Industrial Diversification: A Review

In the literature on growth and development the potential importance of diversification, in ensuring flexibility and stability in industrial pattern, has been recognized only in comparatively recent times. For the most part, conventional economic wisdom has accepted the value of specialization. Indeed shifting from self-sufficiency to specialization in production and a concomitant increased reliance upon trade has traditionally been the path taken by regions and cities in achieving greater productivity and income. The benefits of specialization - the division of labour - for increasing society's wealth were of course recognized long ago, notably by Adam Smith. As Lloyd and Dicken (1972, pp. 266) summarize, specialization leads to greater productivity through increased dexterity of workers; savings of the time which is commonly lost in passing from one type of work to another and the capability of equipping specialist workers with equally specialized machines.

There is no question that specialization and productivity are intimately linked (although this is not to say continued increases in specialization will invariably lead to productivity increases). However, there has been a growing realization that local specialization can create problems and that, for example, highly specialized regions are vulnerable to the cyclic fluctuations in

demand caused by shifts in consumer tastes or appearance of substitute products. Nevertheless even as late as the 1930's, apparently there was considerable opposition to government intervention to stimulate diversification in specialized regions which had experienced difficulties. Chisholm and Oeppen (1973, p.18) thus observed in this connection, "although in the 1930's there was a considerable discussion of diversification as a means for reducing unemployment in depressed areas, the classical doctrines of economic thought - the idea of comparative advantage in the theory of international trade, theories of location of industry and of large scale production - all pointed towards regional specialization as a means of economic efficiency. Diversification as an aim of policy was not a respectable proposition within these terms of reference."

Social distress in the specialized regions, however, remained acute and ultimately led governments and societies to consider diversification of the economic base as an appropriate strategy of development. It was assumed that regions with diverse types of industries could better handle the problems of economic fluctuations, in that contraction and decline in particular industries could be compensated by growth and expansion in other industries. The Royal Commission, under the chairmanship of Sir Montague Barlow, which was specifically set up to examine the problems of the hard hit industrial regions in Britain thus recommended that one aim of government intervention in industrial development should be the "encouragement of a reasonable balance of industrial development, as

far as possible, throughout the divisions and regions of Great Britain, coupled with appropriate diversification of industry in each division or region throughout the country" (Royal Commission, 1940, p.206).

Since the 1950's numerous governments around the world in both industrialized and industrializing countries have accepted to varying degrees, some commitment to diversification. Academic interest has also accordingly shifted and various studies on diversification have been published. Indeed to evaluate diversification related policies in various regions and nations a sizeable literature on the concept of diversification, including various ways of measuring the extent of regional diversification has emerged. The first measures of diversification were derived to be used as a means of assessing the effects of recently introduced policies of diversification. In addition, a number of studies used indices of diversification to examine the expected positive relationship between the degree of specialization and regional fluctuations in the business cycle (e.g. Vining, 1945, 1946, and 1949; Neff and Weifenbach, 1949; Borts, 1961). With the notable exception of Conroy (1975) interest seems to have waned in these latter kind of studies. At the present time diversification indexes are used as a simple descriptive summary statistic of industrial structure.

Comparative Static Indices of Diversification

In the literature on regional industrial analysis the use of the term diversification has been somewhat difficult to interpret. Admittedly it has been generally accepted that diversification in some ways implies the presence of a multitude of different industries. So far, however, there remains no way of determining the actual number that constitutes an acceptable 'multitude' and even an acceptable method of classifying industrial activities into 'different' industrial categories. Industries, for example, can differ in their product lines, technologies, supply and market linkage pattern, ownership pattern, management pattern, economies of scale and labour requirements. However, the relevant differences in terms of diversification, and ultimately in terms of regional growth potential and stability, are not readily apparent. Needless to say statistical analyses of diversification have adopted 'industry' as the typical unit of investigation. It should be noted at this point that employment has been the most widely used variable in measures of industrial diversification. It is true that other variables like value added in manufacturing, the value of exports, capitalization, value of products, consumption of power and wages may be equally useful. The popularity of employment figures lies in the fact that, first, they are the most easily available in terms of published statistics and, second, most diversification related policy measures are related to the employment stability of regions.

In the absence of a universally accepted definition of what constitutes an optimum pattern of urban and regional diversification in terms of, for example, maximizing a stable rate of increase of employment opportunities, most measures of diversification have been simple and arbitrary. Furthermore, as Taylor (1967, p.107) has emphasized different measures that have been developed imply different interpretations of diversification. Thus definitions vary depending upon the level of aggregation of industry, whether or not diversification is explicitly regarded as a process occurring over time or whether or not regional and urban diversification is interpreted from comparative static perspectives.

The great majority of indices of urban and regional diversification represent comparative static interpretation and they can be classified into two groups. The first group comprise absolute measures of diversification and these are defined by comparing the local industrial structure with a hypothetical ideal structure in which each industry is considered to be of the same importance. It is assumed that a meaningfully diversified urban and regional industrial structure will have an equal proportion of employment in each group into which it is disaggregated. The number and types of industries to be expected depends on the region itself and diversification is measured in terms of its deviation from the ideal equal distribution of employment in all categories.

The second comparative static measure of diversification considers the local economy to be fully diversified when the

structure of its industry is identical to a so called bench mark region, usually the national pattern. In other words, the national pattern is assumed as ideal and the extent of diversification of a region is measured in terms of its deviation from the national norm. Since in this second group, diversification is measured relative to the pattern in the bench mark region, they have been termed as relative measures of diversification. In the following sections the main absolute and relative measures of diversification are first described and then their limitations - which are many - are documented.

Absolute Measures of Diversification

One of the earliest measures of diversification presented in the literature is by Tress (1938). He offered the measure in an attempt to evaluate the effects of the various diversification related policy measures that had been taken during the 1930's in England. According to Ferguson and Forer (1973, pp. 122) the The formula for the Tress Score can be written as:

$$T_i = \sum_{j=1}^N (P_{ij} + C_{j-1}) \quad \text{--- (i)}$$

Where T_i = Tress Score of the i th region

N = the number of industry categories present in the regions

P_{ij} = Percentage of total employment in region accounted for by the j th largest category of industry

C_{j-1} = Cumulative sum of percentages up to the $j-1$ th category

The numerical limits for the Tress score lie between $N \times 100$ for maximum specialization (i.e. employment concentrated in only one industry) and $100(N + 1) / 2$ for total diversification (i.e. employment distributed evenly in all categories). Thus a region's industrial structure could be classified by its position in a continuum defined by the value for maximum specialization to total diversification. Although it appeared to have been long forgotten, Chisholm and Oeppen (1973) recently revived interest in the Tress score in an analysis of the diversification pattern in Britain between 1959 and 1968. It may be noted that the main qualifications pertaining to the Tress score are the limiting values and the range between maximum specialization and maximum diversification varies from region to region, unless a fixed number of categories is arbitrarily chosen.

In his study of the manufacturing geography of South Wales, Conkling (1962) modified the Tress measure to remove the difficulties noted above. His index is derived from a Lorenz curve. The percentage share of employment in each category of industry is arranged first into an ascending order from low to high. The cumulative percentages are then plotted in the graph resulting in a curve which is concave upwards and which can be visually compared to a diagonal straight line which represents the even employment distribution in all categories. Taking the area of the curve as a percentage of the area

of the triangle bounded by the diagonal, Conkling obtained an index which ranged from 0 (maximum specialization) to 100 (maximum diversification). As a result of uniform (constant) limiting values the index is useful in interregional comparative studies of diversification. On the other hand, its wider use has been prevented because the calculations are cumbersome.

An index developed by Britton (1967) appears to have been more widely used so far than any other indices in this group of diversification measures (e.g. Keeble and Houser, 1971 and 1972). In order to analyze the diversification pattern of the Bristol region, Britton derived his index in the following manner:

$$I_j = \sqrt{p_1^2 + p_2^2 + p_3^2 + \dots + p_n^2} \quad \text{--- (ii)}$$

Where I_j is the diversification index for region j :

P_1, P_2, \dots, P_n are the percent of employment in n different categories of industry.

If, for example, there were 100 industry categories in the region, then a uniform distribution of employment would yield an index of 1.0. On the other hand, if all employment is concentrated in one industry, the index would be 100. Thus the maximum value of the index is invariably 100, representing maximum specialization but the lower limit varies according to the number of industry classes. The index is therefore most useful for single regions where the change over

time in the diversification pattern is being studied. For a cross sectional study the index appears also to be suitable in that, the more the number of categories of industry present in a region the less is the value of the index, thus reflecting the regional variations in the number of industrial categories present. Britton calculated the indices for 14 subregions in the Bristol region for two years, 1952 and 1962, using a 29 industry classification.

Gibbs and Martin (1962) developed a measure of diversification for a somewhat different purpose. They hypothesized that the division of labour in a society is related to its urbanization and technological level. The more a society is urbanized and technologically advanced the more its industrial structure will be diversified. To test their proposition they developed a diversification measure for cities which they later tried to relate to the urbanization level of the country. Their diversification measure is given by: -

$$I = 1 - \frac{\sum X^2}{(\sum X)^2} \quad \text{--- (iii)}$$

Where X is the number of persons employed in each category of industry and I is the index of diversification. For complete specialization, the index yields a value of 0 and for complete diversification the value approaches 1. Thus, the range is not affected by the number of categories of industries. This property makes it better suited for both inter regional and historical studies. In terms of practical considerations however, this index requires considerable cumbersome and time consuming calculations and in fact has been rarely used by

others.

Relative Measures of Diversification

The relative measure of diversification are also just as simple, but they use the actual distribution pattern of a bench mark region for comparisons. These measures can be traced at least as far back as Sargent Florence's (1944) contribution to the study of industrial analysis. He provided two widely used indices and a popular third index in use, (namely the coefficient of specialization), was derived from his work. His best known measure in fact does not represent a single summary index of diversification as such. Rather the location quotient indicates the extent to which individual industrial categories are specialized in the study region vis-a-vis the bench mark region. The location quotient for any industry (i) in any region (j) is obtained from the following expression:

$$LQ \text{ of industry } i = \frac{\text{employment of industry } i \text{ in region } j}{\text{employment of all industries in region } j} \div \frac{\text{employment of industry } i \text{ in benchmark region}}{\text{total industrial employment in benchmark region}}$$

A ratio in excess of 1.0 implies that an industry is more highly localized in the region than is employment generally and as such is normally used for identifying basic industries of a region. In

addition, Hall (1962), using census data for 1861 and 1951 for industries in London, has suggested that location quotients can be used as a basis for determining whether or not a region has diversified over time. The high location quotient in 1951 were in general substantially less than the high value of 1961. For 11 industries in 1951, the median quotient was 1.8, compared with a median value (for 10 industries) of 2.8 ninety years earlier. Thus he found that the tendency for the London region was to approach more closely the industrial structure of the nation.

Florence's second index, the localization coefficient, is also calculated for individual industries and indicated the extent to which they are specialized (diversified) among a set of regions. The percentage share of employment of an industry in each region, is compared with its percentage share in the national manufacturing employment total. The positive (or negative) differences between these two figures for all regions are summed up and divided by 100 to arrive at the localization coefficient of that industry. If the spatial distribution of the industry is identical to that of the national pattern, the index will be 0.0. On the other hand, if the industry is located entirely in one region, the coefficient of localization will approach 1.0. These indices for all the industries for all the regions of the country at different points in time could be used to interpret the changing diversification - specialization pattern of the country or the individual regions.

Leser (1948) modified the above coefficient a little, so that

single indices for regional diversification could be calculated. This removes the necessity of looking at a large number of values (as in the localization coefficient and location quotient) to determine the diversification pattern. He obtained a coefficient of specialization for each region by comparing the percentage of employment in each industrial group of a region with the corresponding percentage of the nation. The sum of either all the positive differences divided by 100 or all the negative differences by 100 gives the index of specialization for the region. The range of values of this index is always from 0 for maximum diversification to 1 for maximum specialization. Its ready applicability for cross-sectional comparative studies and the simple method of calculation have made it one of the most used among the relative measures of diversification.

Since Leser's study, the national distribution of employment percentages as a basis for measuring regional diversification of industries has become very popular and widely accepted. Rodgers (1955), in an extensive study of the diversification pattern of U.S. industrial areas, essentially modified the Tress statistic by replacing the even distribution absolute norm with the national pattern of U.S. industries. The diversification pattern of the region were thus compared with the actual national pattern. From the range of the value of the indices calculated, he was able to group the industrial areas in the United States into: highly diversified, intermediate, moderately specialized, and highly specialized. The index was thus useful in the assessment of overall diversification,

comparison of the patterns on an areal base, and also provided "a statistical basis for the selection of areas to be studied as to the relative effects of diversification versus specialization on local economic development" (Rodgers, 1955, p. 20).

In a study of the diversification changes of the Munich region from 1953 to 1963, Krumme (1969) developed a measure which in contrast to all existing coefficients, attempted to measure the contribution of individual industries to the (statistical) process of diversification. Krumme (1969, p. 319) pointed out that: "An industrial structure can be more or less diversified at a point in time as well as it can be subject to a process of diversification". He thus offered a coefficient of diversification changes, which measures the extent to which individual industries contribute to overall changes in the degree to which an industrial structure is specialized or diversified as compared with the benchmark region. An individual industry's contribution to local diversification or specialization is defined as -

$$d_i = \frac{|r_i^t - n_i^t|}{|r_i^{t+j} - n_i^{t+j}|} \quad \text{--- (iv)}$$

where r_i^t and n_i^t = an industry's i share in the total employment of a region at period in time t and $t + j$;

n_i^t and n_i^{t+j} = an industry's i share in total employment of the bench mark region at point of time t and $t+j$

j = given time interval between cross section.

These differences are calculated for each industry. Thus the overall diversification is indicated by the sum of these differences (D): -

$$D = \sum_{i=1}^n d_i \quad \text{----- (v)}$$

The results of his study indicated a slight increase in specialization in Munich's manufacturing structure when compared with that of the Federal Republic of Germany. He found that numerous small-scale contributions were important. Since it attempts to measure the process of diversification, while at the same time revealing the contribution of individual industries this would seem to be an appropriate measure of diversification for studies which are concerned with single regions.

Limitations of the Comparative Static Measures

While both the major groups of comparative static measure are clearly crude empirically defined summary indices, it is interesting to note that some authors have come out strongly in favour of one or the other group.

Thus in spite of the inherent weakness in the assumption that employment requirements in all industries are similar, the absolute measures have been preferred by some (e.g. Parr, 1965; Chisholm and Oeppen, 1973) because of their superior applicability to monitor

changes over time. In particular, it is argued that as the changes over time in the industrial structure for any one area are compared with a constant value, instead of a shifting norm, they are better suited in temporal comparisons. Parr (1965, p. 24), in addition, strongly favours the absolute measures, on the basis that for cross sectional purposes these indices do not unduly favour any region over the other. He criticized the relative measure because: "A very large region from the point of view of population is likely to have an economic structure which corresponds more to the national structure than would be the case for a small region". Thus a large region will automatically come out as more diversified than a small one. In contrast, the relative measures, while they are less suitable for historical studies since the norm changes over time, they have been found to be more appropriate for interregional comparative studies for a single time period. Marshall (1975, p. 37), however, has rejected the absolute measures entirely because "the concept of equal shares (in all industries) is an unrealistic basis on which to measure industrial diversification. He favoured the relative measure by saying that the "actual interindustry employment ratios ... are incorporated within the national average employment profile" upon which the relative measures are based.

Whatever the relative merits of absolute versus relative measures of diversification (and of the individual indices that comprise both groups), all these indices have several important common limitations. For example, the value of the indices calculated

are largely influenced by the level of disaggregation used in the industrial classification. Krumme (1969, p. 319) thus observed that "every region could reach a nearly perfect degree of diversification just by regrouping and reaggregating industrial activities within a self-assigned classification system". In a low level of disaggregation some important features of the regional industrial structure may be obscured while, on the other hand, highly refined classifications can soon render an analysis unwieldy and confusing. Furthermore the 'differences' upon which the disaggregation of the industries are based may not be uniform throughout the classification. The magnitude of the differences between any two pairs of industries in the classification is not identical with the other pairs. Some pairs will be 'more different' from each other than other pairs. Conroy (1975, p. 12) thus observed "the expansion of the level of disaggregation by simple addition of different industries to a local industry-mix will not necessarily diversify in the appropriate sense". The arbitrariness of the industrial disaggregation contributes to even further difficulties when a historical analysis is attempted. Since qualitative changes in the industry-mix and changes in the principles of classification are likely. With respect to changes in industry-mix and product mix a comment by Allen (1961, p. 22) is interesting: "over a period of years, the terms that is used to describe a group of firms (the motor industry, chemical industry) takes on a new meaning, for the type and range of products turned out by that industry and the market it

serves alter, some times very considerably". In addition a region may diversify in one sense by substituting a new expanding product for an old traditional one but in terms of employment distribution among a set of categories experience no increase in diversification.

There exists a considerable body of evidence from the work of economists and economic geographers that indices of specialization and diversification in their present form have little explanatory or predictive value as far as local growth rates, vulnerability to the effects of business cycles, and levels of unemployment are concerned. This stems from the insensitivity of the indexes to such factors as the growth performance of individual industries, types of goods produced (durable or non-durable), the wage structure prevailing in each industry and the locational environment of the region under consideration (Parr, 1965, p.24). The indices also suffer from inappropriate and incorrect assumptions. The relative measures assume equal efficiency of the industries in all cities and regions of the nation. This implies that every region and city possesses the same factor endowments and the same spatial relationship to markets as is characteristic of the national economy on average. Identical factor endowments and spatial relationships are impossible to find in reality. The assumption of the absolute measure about identical labour requirements in all industries is even farther removed from reality. Lastly, the interconnectedness and interactive relationship between the industries have an important bearing on the diversification process of a region. Yet the comparative static

measures entirely fail to account for these relationships. As Krumme (1969, p. 321) pointed out, such indexes "do not indicate in any reliable manner the sensitivity of a regional economy, primarily because they neglect entirely the 'interactive' relationships within the structure and the system's external ties".

III. New Establishments, New Firms and Regional Diversification

The role of the introduction of new manufacturing activities in the diversification of an export based region has been intimated in the preceding chapters. It is the purpose of this chapter to examine this role in more depth on the basis of existing literature and thereby provide the foundation for the empirical analysis of recently established manufacturing plants presented in Chapter 5.

As outlined in chapter 1, given some export based growth, new manufacturing activities come into existence as a result of the growth in local demands for the various forward and backwardly linked activities to the export sector. In addition, a successful export sector (and associated linked activities) encourages the expansion of the domestic population base which, in turn, creates ever increasing threshold demand levels for "high order" economic activities within the region, so that consumer oriented activities alone may, over time, contribute significantly to diversification. It is useful, therefore, to interpret diversification as forwardly linked growth, backwardly linked growth, consumer oriented growth or as new export oriented growth.

New manufacturing activities in the region may be set up in the region by local individual entrepreneurs or they may be set up by existing firms or corporations located within or outside the region. Keeble (1975, p. 117), for example, categorized new manufacturing

activities in a region into two types according to the above entry characteristics. The more common type is the coming into existence of a very small firm, as a result of the initiative, enterprise, and risk taking of one or two individuals with a particular idea or skill. Such individuals are, according to available evidence, often formerly employed as managers or technicians by a larger local firm and, for various reasons, break away from it to set up their own enterprise. In the overwhelming number of cases these types of activities are initially very small scale. The argument is that the risks and uncertainties involved with setting up a new manufacturing concern, especially if the entrepreneur has no previous entrepreneurial experience, are so great that operations must necessarily begin in a small-scale way. There would be in any case great difficulties in obtaining finances for large projects by single entrepreneurs. The second type of manufacturing activities, on the other hand, are much less frequent and are established by existing organizations, manufacturing and non-manufacturing. While less common than the first type, because of the greater financial resources and established entrepreneurial experience and the already large size of corporate operations (with which new plants are usually integrated), these establishments are typically large. The relative importance of these two ways of establishing new manufacturing activities has not yet been properly determined for a wide variety of regional environments. The accumulated evidence (at least in terms of the sheer number of establishments) so far indicates a potentially

stronger role of the activities introduced by the individual entrepreneur. In terms of employment creation, however, branch plant or subsidiary operations will, of course, increase in importance. Indeed in regions which have actively sought to attract manufacturing investments through industrial incentive schemes branch plants will be important in terms of their number. Certainly the geographical literature has concentrated more on branch plants than on new single plant firms. This is, doubtless, partly the result of regional policy emphasis on the attraction of branch plant operations rather than on facilitating the entry of new locally based entrepreneurs. In addition, however, difficulties in identifying new activities and obtaining information about them have prevented clearer statements in the literature about their comparative role. Census information has generally failed to provide much relevant data on new establishments and field research is the only alternative. In other words, while formation of new establishments is important to regional industrial change, these processes have largely been neglected.

It should be recognized that the formation of new activities is not the only way changes occur in a regional industrial structure. Keeble (1975), for example, has classified the change agents of an industrial structure into six basic components: the birth in the area of entirely new firms; the expansion, contraction, death or emigration of the area's existing firms and immigration to the area of existing firms from elsewhere by relocation or establishment of branch plants. However, a comprehensive analysis of regional

industrial change, encompassing all the change components, is beyond the scope of this thesis. Suffice it to say that the role of the entry of new manufacturing activity by the birth of new firms or immigration of branch plants would seem to be an important way in which diversification occurs in a staple based export region like Vancouver. The discussion accordingly focusses on the role of new manufacturing activities of the region.

Diversification: The Role of Branch Plants and Subsidiaries of Existing Firms

Existing firms or corporations may introduce manufacturing activities in the region by setting up branch plants and subsidiaries. These branch plants and subsidiaries may either be locally controlled or they may be controlled from outside. The evidence indicates that the early stages of corporate growth tend to be regionally focussed and within the same line of business (Taylor, 1975; Hayter, 1976). For firms wishing to continue to grow, they are ultimately likely to be faced with either expanding their existing and related businesses in other regions, or diversify into new lines of business locally. This latter kind of diversification is, however, most likely to be accomplished through acquisition or merger. Since this is the easiest way of acquiring necessary entrepreneurial experience. Such local corporate diversification, however, does not involve diversification for the region and, in fact, the opposite may

be the case. Hayter (1978, p. 112) thus states: "In order to compensate for the lack of expertise, diversification has so far been accomplished by acquisition. Indeed, to the extent that newly internalized resources, such as executive talent and ancillary services are removed from the marketplace and become part of multiregional corporate operating spaces, potential for urban diversification may be reduced". Even in cases where such corporate action introduces new businesses to the region, the scope for generating the various linked activities is much less due to the large measure of internalization of supplies and services within the corporate structure. The implication of this argument is that established firms which are already large in a region are not likely to contribute much to diversification.

Externally controlled firms can also enter a region by acquisition in which case the above arguments would also apply (only even more so). Acquisition, although it is often a preferred method of interregional expansion, may not be possible and whenever new products and technologies are involved it is extremely unlikely. In the cases of regions attempting to attract industries via incentive schemes, of course, subsidiaries are typically primarily available for the establishment of new plants. In this respect it might be noted that in the British regional problem areas, the branch plants of externally controlled firms made clearly significant contributions in direct employment creation (Firn, 1975; Watt, 1980).

There is, however, mounting evidence from a variety of regional

environments, that such branch plants may be counter-productive to local development. Thus numerous authors have argued that high levels of external control limit local autonomy over investment decision making, inhibit export potential in secondary manufacturing and, by substituting corporate for local linkages, increased dependency on imported goods, services and technologies (Britton, 1976; Stewart, 1976; James, 1964). Their integration with much larger multiplant and multiregional organizations is at the expense of local forward and backward linkages. Branch plants, it must be remembered, are established in response to the impulses and integrated needs of the corporation as a whole and are usually attracted to the various regions whether due to the presence of some natural locational advantage like the availability of cheap raw material, power source, or pool of skilled labour, the presence of regional planning incentives like tax exemptions or other financial subsidies or increasing local demands for the firm's products. Important decisions affecting branch plant operations, especially pertaining to decisions regarding these activities, their scale, type of product, even their continued existence are taken outside the region and with the perspective of the growth of the whole corporation in view. The matter of integration and linkage with the local economy are considered as they conform to the corporate growth strategy.

Besides directly limiting the growth of local linkages by way of internalization of the forwardly and backwardly linked activities within the corporate structure, the externally controlled plants

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influence the growth of local linkages in several other ways. Several authors (e.g. Pred, 1974; Dicken, 1977) for example, mention the leakage of the locally generated income via profits remitted to the head office region. Potential investment capital is thus removed from the region. The internalization of the links of the branch plants and subsidiaries also means loss of business and resulting loss of income to local suppliers. The absence of high level decision making functions of the branch plants and subsidiaries within the region attenuates its occupational ladder, lessening high level career opportunities, leading to the out migration of potential entrepreneurs and executive workers. Such losses may also be reinforced by the substitution of capital for labour and the shift towards employment of lower skilled workers. In other words, processes of economic development may be arrested or truncated by a preponderance of branch type operations within the economy. "Successful" attraction of branch plants may lead to considerable product diversification without enhancing growth potential within the region.

Diversification: The Role of the New Firms

The role of the new firms in the diversification of the regional industrial structure has been recognized only recently in the literature. This again reflects a growing policy interest in many regions faced with industrial stagnation and decline. In response to

the change impulses of the region's export sector, the local entrepreneurial community adapts by discarding old activities and introducing new ones. These change impulses may either originate internally (e.g. the exhaustion of the region's natural resources, an increase in the region's population base) or they may come from external sources (e.g. the appearance of competitive suppliers of the region's staples, the introduction of substitute products, the change in tastes and preferences of externally located consumers). A region's industrial structure is then determined, in part, by the manner in which new entrepreneurs perceive and react to the various forces of change and, in particular, to the type of new manufacturing activities which are established.

New manufacturing activities may involve new products, processes, and/or technologies acquired either from external sources or internally through invention and innovation. The systematic monitoring of the new firms of a region in terms of their rate of formation and their organizational, ownership, product type, technological and spatial characteristics is, therefore, potentially important for a full understanding of the regional diversification process. Gudgin (1978, p. 91), for example, in a recent study of industrial change in East Midlands (England) considered the role of new firms in industrial change and diversification to be more important than other change components. He argues that the other change components strongly reflect the original pattern of the industries of the region. In fact, it is interesting to note that

Taylor (1967, p.108) suggested the use of the pattern of distribution of employment in the region's new firms sector, as a possible measure of regional industrial diversification.

The small and new firm sector is important for regional industrial change in several respects, including as a source of future large firms. Beesly (1975, p. 49), for example, observed that

"a high birth rate of new firms is a form of insurance for employment in an area in the long run. A few of the small establishments will grow, and will be able to absorb resources falling into disuse in the area. Many new products which essentially command a wide market are first produced on a very small scale by 'breakaway' from existing industries. The more new establishments an area has, the greater are the chances for each development to occur and the better are its prospects for keeping in the van of industrial change".

All new firms that are set up do not ultimately survive while even fewer expand. The existing industrial firms of the region may work as an incubator from which a large proportion of new entrepreneurs are supplied.

Besides being the source of future large firms, the new and small firms help in producing balanced and dynamic industrial structures in regions in several other important ways. New firms, usually tend to concentrate in the faster growing sectors of the local and national economies and because of this, play an important part in the diversification of the region's economy. Chinitz (1961) in his comparison of the development of New York and Pittsburg concluded that the low level of entrepreneurial supply in the latter was a major reason for the city's failure to diversify out of the declining heavy industrial sectors. New firm formation thus acts as

an indicator of the changes in the industrial composition of a region.

New firms provide the regional economies with an important degree of industrial flexibility, with new enterprises being formed to enable the local economy to respond quickly both to new levels of demand and to new requirements in terms of local inputs. New firms may also help to reduce regional inefficiency by driving out old and lagging enterprises from key sectors and by providing large firms with specialized and/or small amounts of goods and services which the larger firms find uneconomic to produce. The new enterprises also help reduce the region's incremental capital-output ratio since many new firms are established on the basis of second-hand equipment, cheap premises and personal capital. Thus they are able to provide additional regional output and employment far more cheaply than the existing large plants within the region.

The new firms also provide a source of technological innovation for a region. They provide, for example, an outlet for highly skilled technical staff leaving existing companies to set up their own enterprises to exploit the discoveries they have made. To what extent the new and small firms are important for innovation and invention has not been properly determined. The debate on the contribution of small new firms to research, invention and innovation as compared to the large and established firms has been inconclusive. Views of both extremes are abundant in the literature. At one extreme, some writers regard the contribution of small individual firms to innovation as

relatively insignificant, whilst others regard them as the main source, if not of innovation in general, then at least of the more important ones. Typical of the first school is the approach by Galbraith (quoted in Freeman, 1971, p.2) who has derided the 'small man' theory:

There is no more pleasant fiction than that, technical change is the product of the matchless ingenuity of small man ... Technological development has long since become the preserve of the scientist and engineer. Most of the cheap and simple inventions have, to put it bluntly, have been made".

As against this, other writers have pointed out that such key innovations as Bakelite, the ballpoint pen, radio, the pill and insulin were the result of the initiative of individual inventors establishing small innovation firms (Freeman, 1971, p.3). The absence of empirical data on the role of innovative activities of small individual firms have resulted in the above difference of opinion. The comparison is all the more difficult due to the problems of quantifying the amount of invention and innovation contributed by the respective sectors. In reality the relative importance of small and large firms in innovation is likely to vary considerably from one industry to another.

Factors Influencing New Firm Formation

The majority of the new firms are small. Because of the risks and uncertainties involved in the introduction of new products and processes, and the highly individualized aspect of these investments,

new firms command less financial resources from the established capital market. New skills, techniques, and products do not necessarily find ready acceptance. Thus even if financial and other resources are available, new plants usually start at a small scale. Beyond this observation, however, the condition favouring entrepreneurship are not generally well understood and offer potentially rich research frontiers.

In the absence of empirical studies the factors influencing the formation of new firms can only be speculated upon. Thus the rate and the nature of the new firm formation in a region and the resulting diversification process would seem to be determined by a variety of environmental, economic and cultural factors. Some of these determinants for example are: the characteristics of the particular staples of the region, the characteristics of the domestic and the export market of the region in terms of its size and linkage relationship; the nature of the existing industrial structure of the region; the cultural characteristics of the region in terms of entrepreneurial supply and the rate of growth of the region. It should be pointed out that none of these factors are mutually exclusive. Information from empirical studies on the relative role of each of these factors on new firm formation studies is very scant.

The role of the staple commodity is an important determinant. Developing on the work of Harold Innis, C.R. Fay expressed the point most succinctly: "the emphasis is on the commodity itself; its significance for policy; the tying in of one activity with another,

the way in which a basic commodity sets the general pace, creates new activities and is itself strengthened or perhaps dethroned by its own creation" (quoted in Watkins, 1963, p.144). An important consideration here is the technology of the industry required to process the staple. Some industries (mostly the traditional resource processing ones) involve rather simpler processing and induce very little sub-contracted type manufacturing activity. On the other hand there are types of industries whose products require production in stages and in parts (e.g. Aerospace, Automobile), some of which are better produced by subcontracted work outside the main plant. These industries obviously will result in a favourable environment for individual entrepreneurs.

In addition the size of the domestic market and the export market determines the scope for the formation of new activities. Business endeavours, whatever the kind and size require a certain minimum threshold population base. The smaller the size of the market the more limited will be its capacity for a large number of manufacturing activities. Existence of a large market tends to minimize the risks of introduction of new products and processes. The demand pattern itself of a large market is varied and opportunities for many types of activities are greater.

The nature of the existing industrial structure is also thought to be very influential in inducing the growth of new individual manufacturing activities. As already stated a structure dominated by a few large highly concentrated industries usually militates against

the supply of entrepreneurs. This kind of structure tends to absorb the region's entrepreneurial manpower within its folds and thus retard the diversification process of the region. The spatial structure of a region is also thought to affect the formation of new firms. In particular, according to the incubator hypothesis birth rates of firms will typically be higher in the city core area of large industrial regions because of accessibility to cheap labour, buildings, business services and other types of infrastructure. In addition, land cost, density, and transportation networks should be considered.

Finally, it is possible that the region's growth rate could influence the growth of individual small manufacturing establishments. For example, it may be reasonably argued that an overall balanced and steady growth rate of the economy creates favourable conditions for individual entrepreneurs. A stagnant or declining rate apparently would result in the opposite. However, a very fast rate of growth in a region (as B.C. has been experiencing in the last two decades), based on the exploitation of certain resource factors, could conceivably discourage entrepreneurial activities in new sectors if the sectors experiencing success 'crowd out' the others by absorbing available factors of production.

Difficulties in Information Collection on New Firms

The difficulties of monitoring the process of birth (death, expansion and migration) of new firms are great. Difficulty in operationally defining a new firm make the mere identification and the determination of the size of a new firm population of a region a difficult task. Annual census reports rarely include data on these aspects. Local agencies seldom provide up to date information. The usual sources like the municipal offices, trade licensing offices or planning offices, where one might go for information on new firms may not be able to provide correct information because of several factors like: time lags in the information collected and when the information is required for research purposes; confidentiality requirements, which forbids the giving out of the information to others; sometimes the information collected about industries may not be separated from other aspects of the economy. Thus a careful and systematic recording of the appearance of new firms of a region is the first precondition to study their role in the industrial diversification process.

Conclusion

The role of new individual firms in the diversification process of a region may be considered important for a variety of reasons including the vitality and the responsiveness of these firms to the regional change impulses. Some factors influencing the rate of

formation of new firms in various regions have been identified although their relative importance is not well understood. Furthermore, the factors influencing the rate of formation of new industrial firms have not been adequately studied empirically. In this regard it might be noted that the studies of new firms mentioned so far have mostly been done in cities (and regions) which have long been industrially developed, usually, at least, since the nineteenth century. Typically these cities are situated in mature industrial regions in which there is a considerable accumulation of skills in the secondary manufacturing sector and in which central governments have for some time offered incentives to further attract secondary manufacturing. The Vancouver Metropolitan area is distinguished from the typical cases examined in the literature by virtue of its situation within a resource (frontier) region. It is the only dominant industrial area in its region and it is somewhat isolated by its remoteness from the rest of the prevailing consumer market of North America. Its industrial growth history is very recent and has primarily occurred within the last 100 years. All these differences offer an interesting area for the study of the role of new firms in the regional diversification process.

IV. Diversification of Vancouver's Manufacturing Structure, 1961--1971: A Statistical Overview

This chapter of the thesis provides a statistical profile of changes in Vancouver's manufacturing structure between 1961 and 1971. The salient features of the manufacturing structure of the metropolitan region and its changes during the study period are first noted. This is followed by a shift share analysis which provides further insights into the relative importance of the manufacturing sector of the study region vis-a-vis the nation as a whole. Shift share analysis essentially explains the regional employment change in terms of 'local' and 'industry mix' factors and is a widely used technique in regional economic analysis. Subsequently the related diversification indices reviewed in Chapter 3 are calculated for the study region for the two periods, using the 20 category standard classification of industries and also for a more disaggregated set of 38 categories of manufacturing industry. This analysis allows (a) a comparison of the role of the diversification measures themselves and (b) an assessment of the role of how industrial aggregation affects the value of the above indices. (c) an overall (statistical) indication of Vancouver's manufacturing structure, 1961, 1971 and a context in which to examine the survey results of sampled firms. It should be pointed out here that the selection of the years 1961 and 1971 was primarily dictated by data availability considerations.

Manufacturing Employment in Vancouver Metropolitan Area

In 1961 there were 57,485 workers employed in the manufacturing industries of the Vancouver Metropolitan area and this constituted about 4% of the nation's manufacturing employment (Tables 4.1 and 4.2). By 1971 the region added a further 19,290 workers to its manufacturing labour force which represented a 33% increase over the 1961 base in comparison to the 21% increase at the national level. In other words, manufacturing grew faster in the Vancouver metropolitan area than in the nation as a whole between 1961-1971. Within the province, manufacturing in the Vancouver Metropolitan region accounted for 51% of the total manufacturing employment and in 1971 this share slightly increased to 52%. Of course, outside of the metropolitan area the greater proportion of manufacturing is resource related.

As with other cities in North America, during the study period, manufacturing growth was greater in the municipalities immediately adjacent to the city and even further out. Thus between 1961-71 manufacturing employment in the city itself actually dropped in absolute terms from 28,269 to 22,445 representing a 20% decline from 1961. As a consequence of this decline, the city of Vancouver's relative share of manufacturing employment to the metropolitan area's industrial structure dropped from 49% in 1961 to 29% in 1971. It is apparent that a significant proportion of the decline of manufacturing employment in Vancouver city resulted from the

relocation of many manufacturing industries to the outer municipalities. The extent and nature of this relocation could not, however, be determined in the absence of any published data.

The wood industries and the food and beverage industries dominated the industrial composition in both years, although a decline of their importance by 1971 is also evident (Table 4.1). The location quotients of these two industry groups were 3.56 and 3.58 in 1961 and 1971 and 1.28 and 1.10 in 1961 and 1971 respectively (Table 4.9). The Wood industry group is thus Vancouver's most distinctive manufacturing function. Within the sub-groups included in the Wood industries sector, saw mills were easily the most important (Table 4.2). The decline in both the Wood industry group and the Food and Beverage group has been caused by a general decline in all the subgroups that make up these two broad groups, except for one or two exceptions. Sash and door and other mill work, and the miscellaneous Food subgroups have registered considerable growth. Industries showing significant increases in their relative proportion in the region's industrial composition are Metal fabrication, Machinery industries, Transportation Equipment industry, electrical products industry and Non-metallic mineral industry. Thus, evidence of a gradual decline in traditional resource processing industries and growth of machinery, engineering and some science based industries is apparent in the region's changing industrial composition. When compared with the industrial composition of the province of B.C. the Vancouver metropolitan region appears similar (Tables 4.3 and 4.4).

Table 4:1

Distribution of Manufacturing Employment in Canada and the
Vancouver Metropolitan Area for 20 Industries, 1961 & 1971

Industry	<u>Vancouver</u>		<u>Canada</u>	
	1961	1971	1961	1971
Food & Beverage	11461 (19.9)	12085 (15.7)	219185 (15.6)	242430 (14.2)
Tobacco Products	11 (.02)	100 (.13)	8833 (.63)	8945 (.52)
Rubber & Plastics	156 (.27)	885 (1.1)	18844 (1.3)	44950 (2.6)
Leather Industries	286 (.50)	300 (.4)	33166 (2.4)	28700 (1.7)
Textile Industries	853 (1.48)	1115 (1.4)	62252 (4.4)	68785 (4.0)
Knitting Mills	316 (.55)	290 (.4)	19746 (1.4)	18315 (1.0)
Clothing Industries	1690 (2.9)	2275 (2.9)	91928 (6.5)	94700 (5.5)
Wood Industries	14422 (25)	16210 (21)	98871 (7.0)	100570 (5.8)
Furniture Industries	2050 (3.6)	2275 (2.9)	35696 (2.5)	44195 (2.6)
Paper & Allied Industries	3727 (6.5)	4310 (5.6)	101640 (7.2)	123825 (7.3)
Printing and Publishing	4691 (8.2)	6580 (8.6)	84265 (6.0)	103480 (6.0)

(Table 4:1 continued on next page)

Table 4:1 (continued)

Distribution of Manufacturing Employment in Canada and the Vancouver Metropolitan Area for 20 Industries, 1961 & 1971

Industry	<u>Vancouver</u>		<u>Canada</u>	
	1961	1971	1961	1971
Primary Metal Industries	1707 (2.9)	2370 (3.0)	90165 (6.4)	117040 (6.85)
Metal Fabricating	5182 (9)	8815 (11.5)	103216 (7.3)	135945 (7.9)
Machinery Industries	1543 (2.7)	3085 (4.0)	49821 (3.5)	77700 (4.5)
Transportation Equipment	2974 (5.2)	4875 (6.4)	118021 (8.4)	164195 (9.6)
Electrical Products	1343 (2.3)	1343 (2.3)	3130 (4.0)	84924 (6.0)
Non-Metallic Min. Indus.	1128 (1.9)	2860 (3.7)	47019 (3.3)	55850 (3.29)
Petroleum & Coal	1156 (2.0)	645 (.8)	16959 (1.2)	19710 (1.1)
Chemical & Chem. Prod.	1290 (2.2)	2265 (2.9)	69510 (4.9)	78735 (4.6)
Misc. Manufact.	1499 (2.6)	2315 (3)	50813 (3.6)	62240 (3.6)
Total	57485 (100%)	76775 (100%)	1404865 (100%)	1707325 (100)

Source: Census of Canada

1. Figures in parentheses refer to percentages.

Table 4.2

Distribution of Manufacturing Employment in Canada and the
Vancouver Metropolitan Area for 38 Industries, 1961 & 1971

Industry	Vancouver		Canada	
	1961	1971	1961	1971
Meat & Poultry	1837 (3.2)	2240 (2.9)	32135 (2.3)	38130 (2.3)
Fish Products	2401 (4.2)	1805 (2.3)	20464 (1.5)	30070 (1.8)
Fruit & Vegetables	865 (1.5)	825 (1.0)	13881 (.99)	18700 (1.1)
Dairy Products	1522 (2.6)	1260 (1.6)	39144 (2.8)	29895 (1.75)
Feed Industry	175 (.3)	380 (.5)	7308 (.5)	9615 (.56)
Bakery Products	2051 (3.6)	2115 (2.8)	45421 (3.2)	42480 (2.5)
Beverage Industries	1444 (2.5)	1790 (2.3)	29732 (2.1)	32370 (1.9)
Misc. Food	1166 (2.0)	1675 (2.2)	31100 (2.2)	41170 (2.4)
Tobacco Products	11 (.02)	100 (.13)	8833 (.63)	8974 (.52)
Rubber Products	156 (.27)	885 (1.2)	18844 (1.4)	44950 (2.6)
Leather Products	286 (.50)	300 (.4)	33166 (2.4)	28700 (1.7)
Textile Industries	853 (1.5)	1115 (1.5)	62252 (4.4)	68785 (4)
Knitting Mills	316 (.55)	290 (.38)	19746 (1.4)	18315 (1.1)
M/F Clothing	1306 (2.3)	2130 (2.8)	64493 (4.6)	78159 (4.6)
Other Clothing	384 (.67)	145 (.19)	27435 (1.9)	16505 (.7)

Table 4:2 continued

Distribution of Manufacturing Employment in Canada and the
Vancouver Metropolitan Area for 38 Industries, 1961 & 1971

Industry	Vancouver		Canada	
	1961	1971	1961	1971
Saw Mills	9096 (15.9)	9335 (12.2)	5813 (4.1)	61835 (3.6)
Veneer & Plywood	3461 (6.0)	4445 (5.8)	10455 (.74)	13065 (.77)
Sashdoor & Other	997 (1.7)	1535 (2)	19026 (1.35)	14365 (.8)
Wooden Box	179 (.31)	205 (.27)	4573 (.33)	4650 (.3)
Misc. Wood	689 (1.2)	685 (.9)	6654 (.47)	6655 (.4)
Furniture & Features	2050 (3.6)	2265 (2.9)	35696 (2.5)	44195 (2.6)
Pulp & Paper	2130 (3.7)	2065 (2.7)	72141 (5.1)	84875 (4.9)
Asphalt Roofing	287 (.50)	125 (.16)	2570 (.18)	950 (.06)
Paper Box & Bag	894 (1.6)	1695 (2.2)	17266 (1.2)	22765 (1.3)
Other Paper	416 (.7)	420 (.55)	9663 (.69)	15235 (.9)
Printing & Publishing	4691 (8.2)	6580 (8.6)	84265 (6.0)	103480 (6.1)
Primary Metal	707 (3)	2370 (3.1)	90156 (6.4)	117040 (6.9)
Metal Fabricating	182 (9)	8815 (11.5)	103216 (7.4)	135945 (7.9)
Machinery Industries	1543 (2.7)	3085 (4)	49821 (3.6)	77700 (4.6)

(Table 4:2 continued on next page)

Table 4:2 (continued)

Contribution of Manufacturing Employment in Canada and the
Vancouver Metropolitan Area for 38 Industries, 1961 & 1971

Industry	Vancouver		Canada	
	1961	1971	1961	1971
Truck Body/ Trailer	469 (.8)	820 (1.1)	3555 (.25)	13355 (.8)
Shipbuilding/ Repair	1518 (2.6)	1705 (2.2)	16271 (1.2)	13245 (.8)
Boat Building/ Repair	394 (.7)	700 (.9)	4634 (.33)	4970 (.3)
Other Trans. Equipment	593 (1)	1650 (2.1)	93561 (6.7)	132625 (7.8)
Electrical Products	1343 (2.3)	3130 (4.1)	84924 (6.0)	117075 (6.9)
Non-Metallic Minerals	1128 (1.9)	2860 (3.7)	47019 (3.3)	55850 (3.3)
Petroleum & Coal	1156 (2)	645 (.84)	16959 (1.2)	19710 (1.1)
Chemical & Chemical	1290 (2)	2265 (3)	69510 (4.9)	78735 (4.6)
Misc. Manu.	1499 (2.6)	2315 (3)	50813 (3.6)	62240 (3.7)
	57485 (100%)	76775 (100%)	1404865 (100%)	1707325 (100%)

Source: Census of Canada.

Figures in parentheses refer to percentages

This is not unexpected in that most of the province's manufacturing industry is concentrated in and around the Vancouver region.

Shift and Share Analysis of Vancouver's Industrial Structure

Shift and share analysis involves a comparison, usually on the basis of employment, of industry structure in a study region with the industry structure of a bench mark region which is usually the nation. In particular, shift and share analysis partitions regional employment change into two 'shift' and one 'share' components, although analyses typically focus only on the shifts. The national 'share' component represents the amount by which regional employment would have grown if it had grown at the national rate over the study period. This is the norm for the region from which deviations are measured. The 'shift' components represent any deviations of regional employment from the national share. They tend to be positive in prosperous growth areas and negative in relatively depressed areas. Net shifts from any region can be subdivided into two components: (a) the 'proportionality shift component' and (b) the 'differential shift component'. The proportionality shift component is also known as the 'industry mix' effect and measures the amount of net regional shift attributable to the composition of industrial sectors in the region. This component would be positive in areas specializing in nationally

Table 4:3

Distribution of Manufacturing in British Columbia for
20 industries, 1961 & 1971

Industry	1961	1971
01. Food & Beverage	16311 (14.8)	20290 (13.8)
02. Tobacco Products	16 (.01)	105 (.07)
03. Rubber & Plastics	171 (.2)	1035 (.7)
04. Leather Industries	297 (.3)	365 (.24)
05. Textile Industries	906 (.8)	1340 (.91)
06. Knitting Mills	331 (.3)	325 (.22)
07. Clothing Industries	1830 (1.6)	2400 (1.6)
08. Wood Industries	40842 (36.1)	44965 (30.6)
09. Furniture Industries	2326 (2.1)	2815 (1.9)
10. Paper & Allied	11545 (10.2)	17790 (12.1)
11. Printing & Publishing	7020 (6.21)	9700 (6.6)
12. Primary Metal	8062 (7.1)	7940 (5.4)
13. Metal Fabricating	6129 (5.4)	10480 (7.1)
14. Machinery Industries	1749 (1.5)	3670 (2.5)
15. Transportation	4844 (4.3)	7240 (4.9)
16. Electrical Products	1476 (1.3)	3550 (2.4)
17. Non-Metallic Minerals	1917 (1.7)	4920 (3.3)
18. Petroleum & Coal	1333 (1.12)	1275 (.86)
19. Chemicals & Chemicals	2234 (1.98)	3725 (2.53)
20. Misc. Manufacturing	1765 (1.56)	2295 (2.0)
	113508 (100%)	146995 (100%)

Source: Census of Canada

1. Figures in parentheses refer to percentages

Table 4:4
Distribution of Manufacturing in British Columbia for
38 Industries 1961 = 1971

Industry				
1. Meat & Poultry	2186	(1.9)	2785	(1.9)
2. Fish Products	4412	(3.9)	3710	(2.5)
3. Fruit & Vegetables	1864	(1.6)	2365	(1.6)
4. Dairy Products	2656	(2.3)	2350	(1.6)
5. Feed Industry	371	(0.3)	815	(.55)
6. Bakery Products	3492	(3.1)	3715	(2.5)
7. Beverage Industries	1978	(1.7)	2660	(1.8)
8. Miscellaneous Food	1267	(1.1)	1905	(1.3)
9. Tobacco Products	16	(.01)	105	(.07)
10. Rubber Products	171	(.15)	1035	(.7)
11. Leather Products	468	(.41)	365	(.2)
12. Textile Industries	906	(.79)	1340	(.9)
13. Knitting Mills	331	(.29)	325	(.22)
14. M/P Clothing	1343	(1.2)	2240	(1.5)
15. Other Clothing	487	(.42)	185	(.1)
16. Saw Mills	31459	(27.7)	33570	(22.8)
17. Veneer & Plywood	5127	(4.51)	7855	(5.34)
18. Sash Door & Other	3151	(2.8)	2195	(1.5)
19. Wooden Box	253	(.22)	280	(.2)
20. Misc. Wood	852	(.75)	1060	(.7)
21. Furniture & Fixture	2326	(2.04)	2815	(1.9)
22. Pulp & Paper	9810	(8.6)	15340	(10.4)
23. Asphalt Roofing	318	(.28)	170	(.1)
24. Paper Box & Bag	1310	(1.15)	1840	(1.2)
25. Other Paper	425	(.37)	435	(.3)
26. Printing & Publishing	7020	(6.18)	9700	(6.6)
27. Primary Metal Industries	8060	(7.1)	7940	(5.4)
28. Metal Fabricating	6129	(5.4)	10480	(7.1)
29. Machinery Industries	1749	(1.5)	3670	(2.5)
30. Truck Body/Trailer	491	(.43)	1540	(1.04)
31. Shipbuilding/Repair	2965	(2.6)	2475	(1.75)
32. Boat Building/Repair	653	(.57)	1195	(.8)
33. Other Transport Equipment	753	(.64)	2030	(1.38)
34. Electrical Products	1476	(1.3)	3550	(2.4)
35. Non-Metallic Minerals	1917	(1.7)	4920	(3.3)
36. Petroleum & Coal	1333	(1.17)	1275	(.86)
37. Chemical & Chemical	2234	(1.9)	3725	(2.5)
38. Misc. Manufacturing	1765	(1.5)	2295	(2.0)
	-----		-----	
	113508 (100%)		146995 (100%)	

Source: Census Canada

1. Figures in parentheses refer to percentage.

fast-growing sectors and negative in areas specializing in nationally slow growing or even declining sectors. The 'differential shift' component, also known as the 'locational' or 'regional' effect is the remainder of the shift. It measures the amount of net regional shift resulting from specific industrial sectors growing faster or slower in the region than nationally owing to internal locational factors in the region. Thus a region with locational advantages, such as good resources, would have a positive differential component, whereas a region with locational disadvantages would have a negative component. Methods of calculation of shift/share components and extensions of the technique have been extensively documented elsewhere (Dunn, 1960; Ashby, 1964; Thirwall, 1967) and as such have not been repeated here. Table 4.5 provides the summary results of the shift share analysis of Vancouver's industrial structure for 1961 to 1971.

As can be seen from the second column of table 4.5, a number of traditionally important industrial sectors of the region exhibited a relative decline in employment. Significantly, a large number of other non-traditional sectors have registered important gains. The traditionally important sectors, specifically the Wood Industry and the Food and Beverage Industry, were nationally declining ones although in the case of the former there were important offsetting local advantages. The same is true for the Printing and Publishing sector which presumably benefitted from the rapid growth of the market in the Vancouver area. In the case of the Food and Beverage sector and Paper and Allied sector both unfavourable locational

Table 4.5

Shift and Share Analysis of the Manufacturing Structure
of the Vancouver Metropolitan Area, 1961-1971

Industry ¹	Total Shift	'Differential' Component	'Industry Mix' Component
Wood Ind's.	-1385	1500	-2885
Food & Bev.	-1897	- 637	-1260
Metal Fab.	2493	1975	518
Print & Pub.	-1448	478	-1926
Paper & Allied	- 237	- 237	0
Transport	1247	738	509
Furniture	- 226	- 267	41
Primary Metal	288	151	137
Clothing	213	534	- 321
Machinery	1203	678	525
Misc. Manu.	486	486	0
Elect. Prod.	1492	1263	229
Chemical	691	807	- 116
Petro & Coal	765	- 695	- 70
Non-Metallic	1484	1518	- 34
Textile	74	177	- 103
Knit Mills	- 95	- 48	- 47
Leather	- 49	- 23	- 26
Rubb. & Plas.	695	614	81
Tobacco	67	13	54

Source: Calculations from Census of Canada figures.

¹Industries listed according to 1961 location quotients.

factors and unfavourable industry mix factors have contributed to the decline in employment. The industry mix advantage of the Furniture and Fixture sector have been largely negated by its locational disadvantage in the area. Of the industries experiencing positive change, Metal Fabricating, Transport Equipment, Machinery, Electrical

products, Non-Metallic Minerals, Petroleum and Coal, Chemical Industry, Rubber and Plastics have been the most important and they have enjoyed both favourable industry mix and local effects. The relative growth of these varied types of industries and the relative decline of the traditional resource base industries of the area at least implies the existence of diversification of the industrial structure of the region.

Diversification of Vancouver: Aggregate Shifts

With the continued industrial growth and expansion experienced during the last two decades, in the Vancouver Metropolitan region, a large measure of diversification within the region's industrial structure would be expected. Table 4.6 provides the results of the computations of selected indices of diversification for the two sets of industrial disaggregation for two periods, 1961 and 1971. The detailed calculations of each of these indices, all of which assume diversification and specialization to be the extremes of a single continuum have been provided in appendix 2. The relevant upper and lower limits of the indices have also been provided in the last two rows of the table.

Generally with the possible exception of the Tress score, the indices indicate a well diversified industrial structure. The coefficient of Specialization, Gibbs-Martin index, Britton index, all indicate values close to the maximum diversification. With time, all

Table 4:6

Diversification in Vancouver: Summary Statistics

Year	Coefficient of Specialization	Tress Score		Gibbs-Martin index		Britton Index		
		20 categories	38 categories	20	38	20	38	
1961	.28	.31	1619	2883	.87	.94	36.2	24.2
1971	.23	.30	1551	2793	.89	.95	32.9	23.4
Value for Max. Diversification	.0	0	1045	1938	1	1	22.4	16.2
Value for Min. Diversification	.1	1	2000	3800	0	0	100	100

1. Only the summary statistics have been provided in this table. For calculations see Appendix 2 (Tables 2.1 - 2.8)

the indices indicate a 'slight' tendency towards greater diversification. Thus, for example, in the case of the coefficient of Specialization, the results indicate that in 1961 it would have been necessary to redistribute 28% of the region's employment to meet the national 'norm' and by 1971 the proportion dropped to 23%. Similar results are obtained from other indices. All the indices, thus give

consistent results. In the case of the Tress Score the value of the index in both sets of calculations indicates a central location in the continuum defined by the terminal values. This indicates that the Tress score is perhaps a more useful and sensitive indicator of diversification than the others.

The effect of the number of categories used in industrial classification is readily apparent only in the cases of the coefficient of Specialization and the Gibbs-Martin index both of which have terminal values that are independent of the number of categories of industries used in the calculations. In the case of the coefficient of Specialization the effect of the more elaborated classification has been to indicate an increased level of specialization while in the case of the Gibbs-Martin index the result has been the opposite. A check on the formula of the Gibbs-Martin index would indicate that disaggregation itself will produce an increase in diversification. Thus, with respect to the expression $I = 1 - \frac{\sum X^2}{(\sum X)^2}$ increased disaggregation will almost invariably reduce the numerator on the right hand side of the expression by considerable amounts since all values are squared, while the denominator stays the same). As such this raises serious questions about the usefulness of the index. In the other two indices, since the terminal values are variable, the effect of the nature of industrial classification is unclear.

Notwithstanding the obvious inadequacies of these comparative static aggregate measures, the values of the indices conform to

expectations. By and large there was some 'slight' increase in diversification during the study period. To assess the contributions made by individual industries to this diversification trend, the calculations involved in Krumm's index may now be examined.

Tables 4.7 and 4.8 present the results of the computations of the Krumm index. As can be seen in both the tables, the new effect is consistent with the results obtained with the other indices. Industries can however contribute to diversification in one of two ways. According to this index they can be overrepresented (e.g. Location Quotient < 1) and then decline in relative importance with time in the region or they can be underrepresented (e.g. Location Quotient > 1) and subsequently increase in relative importance. Clearly on this basis it is also possible for an industry to contribute both to diversification and specialization.

With reference to Vancouver's situation, the first point to make is that a number of small changes rather than a few drastic changes in a limited number of sectors have altered the structure. Industries contributing most to diversification were in the Wood Industry sector (saw mills) and in the Food and Beverage sector (particularly fish products). Essentially these are traditional export oriented industries, which during the study period experienced rationalization of employment. Both remained distinctive industries in 1971. The Furniture and Fixture industry is the other industry which has contributed to diversification from a position of overrepresentation in the region. The largest contribution from a position of initial

Table 4.7

Diversification Changes for Vancouver, 1961-1971

Industry	Location Quotient		Diversification Changes	
	1961	1971	Net Values	Location Quotient >1 <1
01. Wood Ind's	3.56	3.58	2.84	2.84
02. Food & Bev.	1.28	1.10	2.80	2.80
03. Metal Fab.	1.22	1.44	-1.86	-3.52 1.66
04. Print & Pub.	1.36	1.41	-.35	-.35
05. Paper & Allied	1.00	.77	-.89	-.75
06. Transport	.61	.66	-.04	-.04
07. Furniture	1.40	1.14	-.26	-.26
08. Primary Metal	.46	.45	-.32	-.32
09. Clothing	.45	.54	1.03	1.03
10. Machinery	.75	.88	.34	.34
11. Misc. Manu.	.72	.84	.41	.41
12. Elect. Prod.	.39	.59	.93	.93
13. Chemical	.45	.64	.95	.95
14. Petro & Coal	1.66	.73	.49	-.31 .80
15. Non-Metallic	.59	1.14	.94	-.46 1.39
16. Textile	.33	.36	.37	.37
17. Knit Mills	.39	.35	.17	.17
18. Leather	.21	.24	.58	.58
19. Rubb. & Plas.	.20	.44	-.41	-.41
20. Tobacco	.03	.25	.09	.09

Gross Contribution to Diversification = 15.02

Gross Contribution to Specialization = -6.16

Net Effect = 8.86

The coefficient of diversification change = .0886

A slight increase in diversification

Table 4:8

Diversification Changes for Vancouver 1961 - 197138 Industries

Industry	Location Quotient		Diversification Changes		
	1961	1971	1961 - 1971		
			Net Value	>1	<1
1. Meat & Poultry	1.40	1.31	+ .22	+ .22	
2. Fish Products	2.86	1.34	+ 2.13	+ 2.13	
3. Fruit & Vegetables	1.51	.97	+ .48	+ .51	- .03
4. Dairy Products	.95	.94	+ .03		+ .03
5. Feed Industry	.58	.88	+ .15		+ .15
6. Bakery Products	1.11	1.10	+ .08	- .08	
7. Beverage Industries	1.18	1.23	- .04	- .04	
8. Miscellaneous Food	.92	.90	- .05		- .05
9. Tobacco Products	.03	.25	+ .22		+ .22
10. Rubber Products	.20	.44	- .41		- .41
11. Leather Products	.21	.23	+ .57		+ .57
12. Textile Industries	.33	.36	+ .37		+ .37
13. Knitting Mills	.39	.36	+ .16		+ .16
14. H/F Clothing	.49	.60	+ .51		+ .51
15. Other Clothing	.34	.20	+ .50		+ .50

(Table 4:8 continued on next page)

(Table 4:8 continued)

Diversification Changes for Vancouver 1961 - 1971

38 Industries 1961 - 1971

Industry

Industry	Location Quotient		Diversification Changes		
	1961	1971	Net Value	>1	<1
16. Saw Mills	3.82	3.36	+ 3.15	+ 3.15	
17. Veneer & Products	8.13	7.52	+ .26	+ .26	
18. Sash Door & Other	1.28	2.38	- .78	- .78	
19. Wooden Box	.94	1.00	+ .02	.00	- .02
20. Misc. Wood	2.55	2.28	+ .23	+ .23	
21. Furniture & Fixture	1.41	1.13	+ .26	.26	
22. Pulp & Paper	.72	.54	- .86	- .86	
23. Asphalt Roofing	2.78	2.67	+ .31	+ .31	
24. Paper Box & Bag	1.27	1.66	- .55	- .55	
25. Other Paper	1.04	.62	- .31	+ .03	
26. Printing & Publishing	1.36	1.41	- .34	- .34	
27. Primary Metal	.47	.45	- .34		- .34
28. Metal Fabricating	1.23	1.44	- 1.85	- 3.52	1.66
29. Machinery Indus.	.76	.88	+ .32		.32

Table 4:8 (continued on next page)

(Table 4:8 continued)

Diversification Changes for Vancouver 1961 - 1971

38 Industries 1961 - 1971

Industry	Location Quotient		Diversification Changes		
	1961 - 1971	1961 - 1971	Net Value	>1	<1
30. Truck Body/Trailer	3.28	1.37	+ .28	+ .28	
31. Shipbuilding/Repair	2.28	2.85	+ .04	+ .04	
32. Boat Building/Repair	2.06	3.14	- .27	- .27	
33. Other Transport	.15	.28	+ .02		+ .02
34. Electrical Products	.39	.60	+ .93		+ .93
35. Non-Metallic Minerals	.59	1.14	- .93	- .46	+ 1.39
36. Petroleum & Coal	1.66	.73	+ .49	- .31	+ .80
37. Chemical & Chemical	.45	.64	+ 1.04		+ 1.04
38. Misc. Manufacturing	.72	.83	+ .38		+ .38
			113508 (100%)	146995 (100%)	
Gross contribution to Diversification			+ 14.89		
Gross contribution to Specialization			- 6.65		
net Effect			+ 8.24		

The coefficient of Diversification change = .0824
 A slight increase in Diversification

overrepresentation towards specialization has been contributed by the Metal Fabricating sector. Other industries contributing to specialization are Printing and Publishing, Paper and Allied, Primary metal and Rubber and Plastic industries.

Location Quotient and Diversification

The other suggested way of studying the nature of diversification of a region in a statistically disaggregated manner is through the examination of the changes in the location quotient of the industries of a region. Table 4.9 and provide this calculation for 1961 and 1971. In 1961 seven industrial groups had a L.Q. value of 1 or more. While 1 signifies a distribution identical to the national pattern, values exceeding 1 indicates their overrepresentation in the region. The values less than 1 indicate their underrepresentation in comparison to the national pattern. The median value for all L.Q.s in 1961 was .59 (Table 4.9). The average value for all L.Q.s in 1961 was .85. Thus on both accounts the industries of the region in 1961 were not representative of the national pattern. The median value in 1971 changed to .69 and the average value remained at .85. Thus the median value indicates that in 1971 the industry structure of the region is moving more towards having the national pattern.

Table 4:9

Location Quotients for 20 manufacturing Industries in the
Vancouver Metropolitan Area 1961 & 1971

Industry	1961	1971
1. Wood Industries	3.56	3.58
2. Petroleum & Coal	1.66	.73
3. Furniture Industry	1.40	1.14
4. Printing & Publishing	1.36	1.41
5. Food & Beverage	1.28	1.10
6. Metal Fabricating	1.22	.88
7. Paper & Allied	1.00	.77
8. Machinery Industries	.75	.88
9. Miscellaneous Manufacturing	.72	.84
10. Transportation	.61	.66
11. Non-Metallic Minerals	.58	1.14
12. Primary Metal Industries	.46	.45
13. Chemicals & Chemical Products	.45	.66
14. Clothing Industries	.45	.54
15. Electrical Products	.39	.59
16. Knitting Mills	.39	.35
17. Textile Industry	.33	.36
18. Leather Industry	.21	.24
19. Rubber & Plastics	.20	.44
20. Tobacco Products	.03	.25

1961 x L.Q = .85

1961 x L.Q = .59

1971 x L.Q = .85

1971 x L.Q = .69


Conclusion

This chapter has examined Vancouver's manufacturing structure in terms of some simple comparative static tools of regional analysis. In terms of Vancouver's growth, generally speaking, regional advantages tended to be more significant than industry mix factors with respect to diversification. The various indices were all positive although the new overall shift towards diversification can be best described as slight. In detail this net shift towards diversification comprised numerous small statistical changes in industrial composition in which the changes favouring diversification outweigh those favouring specialization. It is interesting to note in this regard, however, that the most important contributions to the statistical process of diversification resulted from underlying declines in traditionally important activities. Contributions to diversification from the growing sectors were more limited.

V. Sample Study of the New Firms in Vancouver

Summary indices of the kind reviewed in the previous chapter, while useful in providing an overall picture of change, indicate little about the process of diversification in a functional sense. In particular it is not possible to determine to what extent the statistical dimension of diversification is also accompanied by changing technologies, organizational structure and changing input output linkages. The establishment of new plants, for example, may contribute to specialization from the point of view of aggregate employment distribution, but diversification in terms of specific product mix, marketing location, technological, and entrepreneurial and organizational characteristics and more generally by the nature of its linkage characteristics. To contribute to a better understanding of the process of diversification of the Vancouver metro region along these lines, this chapter presents the results of a sample survey of some new manufacturing establishments in the region.

The main thrust of the survey was to identify the manner in which recently created establishments have contributed to the diversification of Vancouver Metropolitan Area's industrial structure in terms of their local forward, backward and final demand linkages and their export orientation. In this context, 'local' refers to the Vancouver Metropolitan area, that is the municipalities of Vancouver,



Burnaby, New Westminster, North Vancouver City, North Vancouver district, West Vancouver, Richmond, Delta, Surrey, White Rock, Coquitlam, Port Coquitlam, and Port Moody. Reference to the central city or city refers solely to the city of Vancouver.

The questionnaire focussed on the various linkages generated by the sampled new firms (see Appendix 1). Questions were asked about the sources of Capital Equipment, sources of various raw materials and other inputs, the sources of different services required as well as the destinations of the various outputs. This information was also collected for two points in time in order to have some idea about the pattern of change in time. Besides the above, questions were also asked about the general characteristics of the industries including their size, organizational structure, management type and other relevant aspects. The linkages were measured in terms of their dollar values. Instead of directly asking about the exact value of the various transactions, the questions were framed in terms of percentage proportion of the transaction. This was done because it was thought that respondents would be reluctant to divulge financial details on operations.

Survey of Sample Firms

The initial and still unresolved problem of the field of study was to determine the size of the target population, that is, the number of new manufacturing establishments in Vancouver, between two selected dates. No listing of the number and types of new

manufacturing establishments found each year in Vancouver is readily available from any source. Accordingly several alternative sources were considered, including planning departments, newspapers, Provincial government publications and the provincial Manufacturing Directories. Surprisingly, planning departments indicated that they could be of little assistance in identifying new manufacturing activities. Information in newspapers was the second potential source considered. However it seemed at the time that to look for announcements in all the copies of all the local and regional newspapers for a number of years would be very time consuming and there could be no way of checking the completeness of the information. Consequently, (and in the light of future difficulties possibly mistakenly) newspapers were ignored as a source of identifying the establishment of new manufacturing activities. One potentially useful source not considered is B. C. Hydro's power listings which distinguish industrial from commercial establishments.

The annual editions of the B.C. government quarterly reports on industrial expansion were not useful for several reasons. First, they are not comprehensive. That is, only activities requiring more than \$100,000 investment are recorded. Second, the geographic units in which the data is published in those reports do not coincide with the study region, while the regional boundaries in those reports also varied during the time period of our study. Thirdly these reports were not regularly published during the study period. This left the Provincial Manufacturing Directories as potentially the best source

of information on new manufacturing establishments. The Manufacturing Directory of B.C. is published by the Ministry of Economic Affairs of the B.C. Government, supposedly on an annual basis. In practice the directories are not published every year. However it was decided to compare the list of manufacturing activities in 1971 with that of 1978 on the basis that new additions in the 1978 list would constitute new manufacturing activities of the region. It also seemed at the time that this procedure would provide a useful estimate of the target population.

On comparison of the 1971 and 1978 directory 1565 new manufacturing firms were identified and from this list firms were then sampled in order to administer the questionnaire. However, on contacting the firms by telephone and by mail several serious deficiencies of the published directory became apparent. First, many non-manufacturing establishments like warehouses, retail outlets, offices and even residences were listed as manufacturing establishments. Second, many establishments listed in 1978 but not in 1971 turned out in fact to have existed long before 1971. Consequently it became necessary to establish a cutoff date by which to determine whether or not a firm was new. The year chosen was 1966 since, by this time, the traditionally dominant industries were firmly entrenched and the present structure of the metropolitan area was established. Unfortunately the inadequacies of the Manufacturing Directory compilations mean that it is impossible to determine the size of the population of new establishments located in the Vancouver

Metropolitan region during the particular time period under investigation.

With respect to the size of the sample it was decided that an attempt should be made to survey 50 new establishments (and at least 35). Since it was revealed from the pilot survey over the phone that a large number of the 'master' list of 1565 prepared were not actually new establishments or manufacturing establishments, 100 firms were initially selected from the list randomly and contacted first by phone. Out of this 100, only 37 turned out to actually be new manufacturing establishments. To get to the target number to 50 firms another 35 establishments were picked up randomly from the list and this yielded another 15 actual new manufacturing establishments as determined by a phone survey. Questionnaires with stamped and self-addressed envelopes with a letter explaining the purpose of the survey were mailed to each of these new firms. Unfortunately the response rate was very poor and just 23 usable questionnaires were returned. Consequently a further 200 firms were selected randomly and contacted, and this generated a further 40 new manufacturing establishments. In an attempt to improve the response rate these latter firms were contacted in person and in fact 21 firms did agree to complete the questionnaire. Ultimately a total of 44 usable responses from new firms were obtained.

For what it is worth, it might be noted that the first 135 firms selected from the 'master' list and contacted during the survey exhibited the following characteristics: (See Table 5.1 on top of

next page). These data, of course, confirm the operational problem in identification of new firms. Perhaps the greatest significance of these figures lies in the high percentage of establishments not in manufacturing (11%) and the high proportion of 'old' establishments (14%). Thus, a very careful review of provincial government data collection procedures is in order. Notwithstanding the difficulties in sampling and surveying the newly established firms, it is felt that the sample actually chosen is not systematically biased except, as already noted earlier, against larger plants. Finally, it is worth noting that in the recently published studies of the characteristics of small firms, none has so far been able to correctly identify populations (e.g. Firth and Swales, 1978).

For the most part, examination of the empirical data is limited to descriptive statistics. However, whenever appropriate, the chi square test was performed to determine the significance (or otherwise) of relationships. Given the size of the sample, the nature of the data, and the relatively simple relationships explored, more sophisticated statistical analysis was not considered worthwhile.

General Characteristics of New Establishments

The 44 firms which responded to the survey represent a wide array of industry types and their characteristics provide useful insights into the emerging pattern of the 'new firm' sector of the Vancouver Metropolitan Region. As expected, most of the plants

Table 5.1

Characteristics of Contacted Firms

New Establishments	52	(38%)
Old Establishments (pre-1966)	19	(14%)
Closed down now	31	(23%)
Not Manufacturing	15	(11%)
Status Could not be Ascertained	18	(13%)
	135	(100%)

contacted are small and constitute small firms. The owners of these establishments represent the typical entrepreneur and typically provide the entrepreneurship necessary to initiate and maintain production.

The open-ended question concerning the stimulus underlying the owner/entrepreneur's decision to invest in a manufacturing plant generated some very interesting but not quite unexpected responses (Table 5.2). Thus the most important factor in their decision process turned out to be the perception about the region's market potential for their intended products. The three other factors mentioned are the opportunity to use the training and skills acquired in a job (21% of the response), the desire to be one's own boss (18% of the response) and the innovation of new products or processes (9% of the response). While these factors are not mutually exclusive, this pattern of responses does give an indication of relative importance. In this regard, it might be noted that the significance of market

Table 5.2

Stimulii for New Plants: Entrepreneurial Responses

<u>Stimulii</u>	<u>Distribution</u>
Innovation of New Products or Process	4 (9%)
Training & Skills Acquired in a Job	9 (21%)
To Do Independent Business	8 (18%)
Realization of the Market Potential of Vancouver	23 (52%)
	44 (100%)

Source: Questionnaire Survey

potential has frequently been cited in surveys of locational choice. It might also be mentioned that in this period of sustained government intervention to influence the region's industrial structure, questions concerning the nature of the locational decision-making process are pertinent. However, they do not constitute the focus of this thesis.

Spatial Distribution: The geographic distribution of sampled new establishments is presented in (Table 5.3). The core of the region, that is the city of Vancouver contains the largest proportion of the new industries (36%). The next in importance are the municipalities immediately adjacent to Vancouver, specifically Burnaby, Richmond and North Vancouver, which together account for another 34% of the sample. The peripheral municipalities account for the rest of the establishments (30%).

Table 5.3

Spatial Distribution of the Sampled
Establishments by Municipality

<u>Municipality</u>	<u>Distribution</u>	
Vancouver	16	(36%)
Adjacent		
Burnaby	7	(16%)
New Westminster	1	
North Vancouver ¹	1	
West Vancouver	1	
Richmond	7	(16%)
Peripheral		
Delta	1	
Surrey	2	
Port Coquitlam	2	
Port Moody	1	
Total	44	(100%)

1. North Vancouver District and North Vancouver City have been considered as one, throughout the study.

Source: Questionnaire Survey

The leading role of the core region in new firm location as evidenced here requires explanation. It is, of course, true that the adjacent and peripheral municipalities enjoy greater site availability than Vancouver itself, and during the 1970's these municipalities have doubtless continued to attract the lion's share of industrial growth (in comparison to the core). The significant proportion of new, relatively small establishments, located in the core, however, is consistent with the so-called 'incubator'

hypothesis. According to this hypothesis birth rates of new (and small) firms will be higher in city cores than in suburban areas because of availability of cheap labour, external economies, bus services and industrial infrastructure. Table 5.4 showing the types of premises taken by the sampled new firms in the core strongly hints at such a role for Vancouver's industrial core.

Sectoral Distribution: With respect to the sectoral distribution of sampled plants, shown in Table 5.5, several points are worth noting. First, eight (2 digit) sectors account for more than 80% of new firm growth and the largest, machine industries, accounts for 16% of the total. Second, the two traditionally most important industries of the region, namely Food and Beverage, and Wood Industries, are still showing some growth. New firm formation, however, is greater in other long established sectors, particularly Furniture and Fixtures, Metal Fabricating, and Printing and Publishing, and in sectors such as Machinery, Transport Equipment, and the Miscellaneous Manufacturing industries in which the metropolitan area has been traditionally underrepresented. The Machinery Industries, Transportation Equipment, Miscellaneous Manufacturing, and Primary Metal Industries, for example, all had location quotients well below 1 in 1971 (Table 4.9). Of the other four sectors, Printing and Publishing had a location quotient greater than 1 in both 1961 and 1971 and, to the extent that it involves market oriented activities, continued formation of new firms is likely so long as the population grows. The same is true for Non-Metallic Minerals, which registered a

Table 5.4

Types of Premises occupied by New Establishments

<u>Location</u>	<u>Old Building</u>	<u>New Building</u>
Vancouver	12 (75.0%)	4 (25.0%)
Other areas	8 (28.6%)	20 (71.4%)
Total	20	24

$\chi^2 = 7.35$ (Significant at 5% level of confidence).

Source: Questionnaire Survey

location quotient greater than 1 for the first time in 1971.

Interestingly, both Metal Fabrication and the Furniture and Fixture industry declined markedly in relative importance from 1961 to 1971 (Table 4.9), and possibly, the formation of new firms in this sector is evidence of a reversal of fortunes which, in turn, may reflect the introduction of new products (and production functions).

In aggregate, while the five sectors with location quotients greater than 1.0 in 1971 accounted for 56.2% of manufacturing employment, they account for just 28% of the sampled firms. While Wood Products, and Food and Beverages accounted for 44.2% of employment in 1971, they accounted for a mere 7% of the sampled firms. In terms of sectoral distribution, then, new firms are encouraging diversification. This does not, of course, take into account their linkage characteristics.

Ownership and Organizational Pattern: The new establishments

Table 5.5

Sectoral Distribution of Sample Manufacturing
Establishments by SIC¹

<u>SIC</u>	<u>Distribution</u>
Food and Beverage	1
Clothing Industries	1
Wood Industries	2
Furniture and Fixture	4 (9%)
Paper and Allied	1
Printing and Publishing	4 (9%)
Primary Metal Industries	3 (7%)
Metal Fabricating	6 (14%)
Machinery Industries	7 (16%)
Transportation Equipment	5 (11%)
Electrical Products	2
Non-Metallic Minerals	3 (7%)
Miscellaneous Manufacturing	5 (11%)
Total	44 (100%)

Source: Questionnaire Survey

typically represent single plant operations (Table 5.6) which are mainly privately owned (Table 5.7) and mostly owner managed (Table 5.8). These characteristics are, of course, to be expected. Indeed, out of the 44 respondents only 5 were not owner managed. There were just 4 branch plants and they were all externally controlled (2 Canadian and 2 Foreign) and the only ones belonging to firms operating at least three other facilities. It is interesting to note, however, that 10 of the sample firms that were privately owned operated one or two additional plants.

Size Distribution. As would be expected, the size of the new establishments in terms of employees is generally small (Table 5.9). Thus 62% of the firms employ less than 15 persons and 84% employ less than 50 persons on a permanent basis. The limited scale of operation is also reflected in the costs of initial capital equipment (Table 5.10). Thus, 61% of these establishments spent less than 100,000 dollars in new capital equipment.

Characteristics of the Owners. The most distinctive characteristic of new plants in Vancouver is that most of the entrepreneurs were born outside of the study region (Table 5.11). This finding differs from other relevant studies which have mainly concentrated on long established industrial regions and found that new entrepreneurs generally located their plants in the region of their birth. The fact that most of Vancouver's entrepreneurs were born elsewhere, however, is not to be taken as an indication of the

Table 5.6

Number of Additional Plants Operated by
Owners of Sampled Manufacturing Establishments

<u>Number</u>	<u>Distribution</u>
0	30 (68%)
1-2	10 (23%)
3-5	2
More than 5	2
	44 (100%)

Source: Questionnaire Survey

Table 5.7

Organizational Status of the Sampled Manufacturing Establishments

<u>Organizational Status</u>	<u>Distribution</u>
Privately Owned	40 (99.91%)
Branch Plant (Canadian Owned)	2
Branch Plant (foreign owned)	2
	44 (100%)

Source: Questionnaire Survey

Table 5.8

Types of Management of the Sampled Establishments

<u>Management Type</u>	<u>Distribution</u>
Owner Managed	39 (89%)
Not Owner Managed	5 (11%)
	44 (100%)

Source: Questionnaire Survey

region's unfavourable environment in terms of the development of entrepreneurship. Indeed, the role of comparatively recent immigrants in supplying the Vancouver Metropolitan Area with entrepreneurship is not unexpected, particularly in view of the newness of Vancouver's settlement history. That about 27% of the entrepreneurs come from within the study region is perhaps an indication of the resourcefulness of the region. It would be an interesting question for research to know whether this proportion of local entrepreneurs is increasing or not.

The entrepreneurs from outside British Columbia appear not to have come as ready investors in an expanding region. Rather, the evidence suggests that, prior to establishing business, entrepreneurs born outside the region lived in the metropolitan area for some time before deciding to invest. Indeed, 82% had lived at least 15 years in the area (Table 5.12). In other words, the conventional argument that newly established firms are set up in their 'home' region to reduce

Table 5.9

Distribution of Sampled Manufacturing Establishments
by Employment Size

<u>Employment Size</u>	<u>Distribution</u>
1 - 5	14 (32%)
6 - 14	13 (29%)
15 - 24	5 (11%)
25 - 49	5 (11%)
50 - 99	2
100 - 199	4 (9%)
200 - 499	1
	44 (100%)

Table 5.10

Cost of Initial Capital Equipment of Sampled
Manufacturing Establishments

<u>Cost (in dollars)</u>	<u>Distribution</u>
1 - 10,000	13 (29%)
10,001 - 100,000	14 (32%)
100,001 - 500,000	13 (29%)
500,001 - 10,000,000	4 (9%)
	44 (100%)

Source: Questionnaire Survey

Table 5.11

Birth Place of the Entrepreneurs
of the Sampled Establishments

<u>Place</u>	<u>Distribution</u>
Vancouver	12 (27%)
Rest of B.C.	7 (16%)
Rest of Canada	4 (9%)
Elsewhere	<u>21 (48%)</u>
	44 (100%)

Source: Questionnaire Survey

Table 5.12

Duration of Residence of Entrepreneurs in Vancouver
Immediately Prior to Investment in the Sampled Plant

<u>Duration</u>	<u>Distribution</u>
0 - 5 years	0
> 6 - 9 years	1
11-15 years	7 (16%)
15 + years	<u>36 (82%)</u>
	44 (100%)

Source: Questionnaire Survey

spatial uncertainties can still be accepted in the case of Vancouver. Indeed, the tendency of several foreign born entrepreneurs to first work in wage employment reinforces the argument. At the same time, the role of immigration in supplying skilled and innovative individuals clearly continues to be important for the vitality of the region's industrial structure.

With respect to the industrial origins of entrepreneurs, manufacturing and professional services constitute the most important sources (Table 5.13). Manufacturing would seem to be an obvious generator of new entrepreneurs in manufacturing for reasons related to skills, interest and experience. The capital accumulated by professionals in their work in many cases finds its way into investment in manufacturing. A good proportion of entrepreneurs also come from sales and management people outside of manufacturing.

Linkage Characteristics of the New Industries

The extent to which the new industries are integrated to the local economy in terms of their various relationships to suppliers and markets indicates the nature and extent of the diversification of a region's industrial structure. A diversified industrial structure will have new industries that are very much linked to the local economy in terms of the above relationships. In this regard, those linked activities with inputs to local manufacturing plants are usually termed as backward linkages, while activities utilizing the

Table 5.13

The Sampled Establishments:
The Entrepreneur's Previous Business

<u>Business</u>	<u>Distribution</u>
No Answer	6 (14%)
Manufacturing	9 (20%)
Management	6 (14%)
Professional Service	14 (31%)
Sales	5 (11%)
No Work	4 (9%)
	44 (100%)

Source: Questionnaire Survey

output of established producers are termed forward linkages. Another perspective on a region's industrial maturity and diversification is provided by the extent to which new firms utilize local professional services such as banking, insurance, and accounting (service linkages), and to the extent to which initial investments are based on procurement of local equipment (capital goods linkages). The remainder of this chapter is concerned with an analysis of these linkages.

For the purposes of this thesis, industrial linkages were classified as 'technical' (operational material linkages), service and capital goods linkages, and these were measured in terms of relative rankings according to dollar value and between various sources or destinations. The nature of the technological linkages

were further studied by examining the actual raw material inputs, the actual products of the sampled firms and their relationship to the region's traditional staples. An elaborate table listing responses by each firm in regard to their inputs and products was prepared for this purpose (Table 5.16).

To get some idea about the nature of the rate of change of the linkage pattern in absolute terms the data for two time periods - the first year of operation and in the year 1978 - were tabulated. The linkage characteristics of the sampled plants were further examined by distinguishing between the region's traditional industries and the new industries. The traditional or 'old' and the 'new' industries among the sampled firms were identified according to the location quotient of the industries in 1961. Industries with a location quotient of more than one in 1961 were defined as an 'old' industry for the region. Industries which could not attain a unity value until 1961 were defined as new industries.

Technical Linkages: Table 5.14 shows the distribution of sources of raw materials for the sampled industries. The study region is by far the most important source both in the year sampled plants were started-up and in 1978. There was, however, a slight decline in the importance of local supplies by 1978. Thus, while 50% of the sampled plants received more than 75% of their inputs from local sources in the first year of their operation, in 1978 only 41% of the sampled firms did so. The most likely explanation for this reduced dependence on local inputs is that, with time, new firms gradually became aware

Table 5.14

Sources of Material Inputs of the Sampled
Manufacturing Establishments

Percent of Total Inputs Received	From Vancouver		From Imports	
	First Year of Operation	1978	First Year of Operation	1978
0	14 (32%)	14 (32%)	29 (66%)	25 (57%)
1-25%	4 (9%)	2	7 (16%)	9 (20%)
26-50%	2	6 (13%)	1	3 (7%)
51-75%	2	4 (9%)	2	2
76-100%	22 (50%)	18 (41%)	5 (11%)	5 (11%)
Total	44 (100%)	44 (100%)	44 (100%)	44 (100%)

Source: Questionnaire Survey

of alternative and superior sources, some of which happen to be more distant than the initially chosen ones. In this regard, there is a slight increase in the relative importance of foreign sources of material inputs. While 66% of the sampled plants did not purchase imports at start-up, for example, by 1978 the number of plants not importing had declined to 25 (57%).

The distribution of the sources in terms of 'new' and 'old' industries of the region reveal some interesting patterns (Table 5.15). In particular, firms belonging to the new industries of the region are more dependent on the metropolitan area in both time

Table 5.15

Raw Material Source and Types of Industry of the Sampled
Manufacturing Establishments

From Vancouver

	First Year		1978	
	Up to 50%	50-100%	Up to 50%	50-100%
Old Industries	11 (61.1)	7 (38.9)	11 (61.1)	7 (38.9)
New Industries	9 (34.6)	17 (65.4)	11 (42.3)	15 (57.5)
Total	20 (45.5)	24 (54.5)	22 (50.0)	22 (50.0)

$\chi^2 = 3.0$ (Significant at 10% level of confidence.)

$\chi^2 = 1.50$ (Not Significant)

From Imports

	First Year		1978	
	Up to 50%	50-100%	Up to 50%	50-100%
Old Industries	14 (77.8)	4 (22.2)	14 (77.8)	4 (22.2)
New Industries	23 (88.5)	3 (11.5)	23 (88.5)	3 (11.5)
Total	37 (84.1)	7 (15.9)	37 (84.1)	7 (15.9)

$\chi^2 =$ Not Significant $\chi^2 =$ Not Significant

Figures in Parentheses are Percentages

Source: Questionnaire Survey

periods for the bulk of their raw material supply, although the relationship can only (somewhat generously) be considered significant with respect to the first year of operation. Firms representing the old industries remained heavily dependent on the metropolitan area. Clearly, the 'old' industries purchase relatively more of their inputs from the rest of British Columbia and Canada. There is no significant difference in the import behaviour of the two categories. Thus, 22% of the old and 11% of the new industries depend on imports for the bulk of their supply, and this pattern remained unchanged in 1978.

While the above figures in Tables 5.14 and 5.15 provide some measure of the extent of the linkage pattern of the new industries with the local economy, the list of actual inputs required (third column in Table 5.16) reveal the extent to which these linkages are with the traditional staples of the region. Out of 44 firms 10 or 23% used raw materials mainly derived from forestry or forest products, while one firm used inputs from agriculture. Interestingly, as many as seven plants utilized aluminum as an input and for the most part these supplies were obtained from British Columbia. Thus 18 (41%) of the sampled plants utilized raw materials or primary processed inputs obtained from within the province so that forwardly linked activities around staple products continue to be an important means of manufacturing diversification in the metropolitan area. Other inputs are to some extent obtained from British Columbia but for the most part materials such as steel, marble, cotton and cast iron are

Table 5.16

List of Major Products and Inputs of the Sampled Firms

Serial no. of Sampled Firm	Major Products	Major Raw Material Inputs
671	Ice pack chicken	Live chicken
378	Leather and fabric garments	Fabric, leather
0004	Door, household furniture and fixtures	Plywood, Foam
1375	Precut log homes	Cedar lumber
229	Desk, bookcase, tables and tabletop	Plywood, formica particle board
151	Store fixtures, millwork, refrigeration	Plywood, lumber laminate
0005	Household furniture	Plywood, particle board
1255	Upholstery	Cloth, fabric, vinyl
0002	Plastic bags	Plastic sheet
297	Cards, advertisement features etc.	Paper, cards,
686	Books, periodicals	Paper, printing plate ink
405	Printed cards	Paper
378.	Card	Paper
0001	Gold grain, Silver grain	Gold scrap, silver

(Table 5.16 continued on next page)

Table 5.16 (continued)

List of Major Products and Inputs of the Sampled Firms

Serial no. of Sampled Firm	Major Products	Major Raw Ma- terial Inputs
1045	Gutter, Pipe	Aluminum
579	Fastener, Screws	Carbon steel wire, stainless steel
1512	Winchet, Machinery parts Construction machinery	Cast iron, steel pipe
1344	Wire rope, nail, spring wire	Steel rod, netting wire
760	Aluminum combination doors	Aluminum, glass
64	Store fixtures, Metal furniture	Steel
0003	Commercial doors & windows	Aluminum
518	Structural Steel Marine structures	Steel & Pipe
783	Logging and Rigging machinery	Steel, alloys
996	Presses and shears	Steel
135	Mill Machinery Parts	Cast iron
102	Saw Mill Machinery	Steel
1318	Machinery Parts for Mining Industry	Steel
175	Logging and rigging Machinery, truck components pulp mill machinery	Scrap steel Aluminum ingots Alloys

(Table 5.16 continued on next page)

Table 5.16 (continued)

List of Major Products and Inputs of the Sampled Firms

Serial no. of Sampled Firm	Major Products	Major Raw Material Inputs
676	Small Marine Winch Fishing Winch Towing Winch	Steel Non-Ferrous Metal
538	Canopies, Van Conversion Tops, Cartop Boats	Resin, fibre glass, paint
1440	Pick up truck boat lifts	Aluminum, bolts, rope
304	Concrete flats and barges	Cement, steel
863	Sail	Polyester Fabric, Nylon
691	Motor Homes, Vans, Ambu- lances, Coffee Trucks	Aluminum, steel, plywood
775	Store fixtures, Fume Hoods, Incubators	Acrylic P.V.C.
361	Batteries	Plastic cardboard
880	Marble for construction	Marble, granite
998	Construction pipe	Steel
763	Wooden gift box, jewelry box	Wood
38	Decals, Nameplates	Vinyl, Ink, Aluminum
881	Craft Items	Fabric screen
411	Wooden signs	Wood
564	T-shirt, flags, crests decals	Nylon, cotton, vinyl

Source: Questionnaire Survey.

obtained from outside the province.

It is also important to note that at least nine (20.5%) of the sampled plants are backwardly linked to the traditionally important staple industries of British Columbia. In particular, eight of the plants manufacture machines for the forest, mining and fishing industries. In the majority of cases, however, including many of the forward linkages already referred to, the sampled plants serve local consumer rather than other industrial markets.

Table 5.17 reveals the destination of the outputs produced by the sampled new firms. In the first year of operation sales to the study region dominated, as 55% of the firms sold from 75% to 100% of their output and another 18% sold from 50% to 75% of their output within the region. By 1978 there were some noticeable changes in the destination of sales. In particular, markets appeared to have become more diversified as the sampled plants have been able to increase their sales outside of the metropolitan area, including by export. Thus, 31% of the firms sold from 76% to 100% of their merchandise in the metropolitan area in 1978, which was a substantial relative decrease from the situation during the first year of operation. On the other hand, the number of firms exporting doubled from 9 to 18 between the first year of operation and 1978. The sampled firms also increased their sales efforts to the rest of Canada.

The characteristics of the export oriented firms within the sampled industries were investigated by disaggregating the sample

Table 5.17

Distribution of Sales of the SampledManufacturing Establishments

Percent of Total Sales	To Vancouver		Exports	
	First Year of Operation	1978	First Year of Operation	1978
0	0	1	35 (79%)	26 (59%)
1-25%	4 (.9%)	7 (16%)	7 (16%)	12 (27%)
26-50%	8 (18%)	9 (21%)	2	4
51-75%	8 (18%)	13 (30%)	0	2
76-100%	24 (55%)	14 (31%)	0	0
Total	44 (100%)	44 (100%)	44 (100%)	44 (100%)

Source: Questionnaire Survey

firms into exporting and non-exporting categories. A number of tables were generated to explore their relationship with aspects like firm size, SIC and their location within the study region. As far as export oriented firms are concerned there is a significant relationship with their size. (Table 5.18) No other distinguishing characteristics of the export oriented firms could be identified, however.

Table 5.19 shows that there is no difference in the distribution pattern of 'old' and 'new' industries in both the starting year and in 1978 with respect to sales. Thus, both groups of industries were heavily dependent on the local market, as old industries distributed 78% of their sales and new industries sold 69% of their output within

Table 5.18

Employment Size and Export Oriented Firms

Type of Industry	Employment Size	
	up to 24 persons	more than 24 persons
Industries with at least some exports	22 (84.6%)	4 (15.4%)
Industries with no exports	10 (55.6%)	8 (44.4)
Total	32 (72.2%)	12 (27.3%)

$\chi^2 = 4.53$

Source: Questionnaire Survey

the Vancouver metropolitan region in the first year of operation. By 1978 this dependence had dropped by about 10% in both cases. In 1978 there were also two firms whose exports were larger than domestic sales.

Tables 5.17 and 5.19 provide an aggregate summary of the output linkage pattern of the studied new industries and this information can be compared with that in Table 5.16 which lists the final products produced in the industries. It becomes clear that most of these products are 'consumer' goods sold within the Vancouver metropolitan area. Thus, the majority of the new industries studied can be said to be linked to the final demand activities. Of the consumer items produced, however, certain specializations can be readily detected. These specializations are of course reflections of the region's staple base and its history of industrialization. There are thus more furniture (both wooden and metal), door making (both wooden and metal) and paper products (printed cards, computer cards) industries than others. While most industries produce consumer items for the final market there are some industries which distinctly are backwardly related to the region's traditional staple industries. Two specializations can be detected among these industries. One group represented by at least 7 new firms studied produce a variety of machinery and parts for mining, logging, rigging, sawmilling, pulpmill, presses and shears which directly go to the various staple industries of the region. The second group produce a variety of transport equipment like pickup truck and boat lifts, concrete floats

Table 5.19

Distribution of Sales and Type of Industry of the Sampled
Manufacturing Establishments

Vancouver

	First Year		1978	
	Up to 50%	50-100%	Up to 50%	50-100%
Old Industries	4 (22.2)	14 (77.8)	6 (33.3)	12 (66.7)
New Industries	8 (30.8)	18 (69.2)	11 (42.3)	15 (57.5)
Total	12 (27.3)	32 (72.7)	17 (38.6)	27 (61.4)

χ^2 = Not significant χ^2 = (Not Significant)

Exports

	First Year		1978	
	Up to 50%	50-100%	Up to 50%	50-100%
Old Industries	18 (100.0)	0 0	18 (100.0)	0 0
New Industries	26 (100.0)	0 0	24 (92.3)	2 (7.7)
Total	44 (100.0)	0 0	42 (95.5)	2 (11.5)

χ^2 = Not significant χ^2 = (Not Significant)

Figures in Parentheses are Percentages

Source: Questionnaire Survey

and barges, boats, sail, marine structures, wire rope and others for the mining and logging industries of the region. The specialization in forest product machinery and heavy transport equipment machinery has, in fact, made Vancouver an important centre for these goods. Indeed, these industries are now important exporters.

Capital Goods Linkages: Table 5.20 shows the distribution of the sources of capital goods of the sampled firms. As many as 59% of the firms obtained from 76 to 100% of their equipment from the Vancouver metropolitan area. The region evidently has become a major source for industrial machinery for newly established firms. This indicates a positive shift towards diversification of the region's industrial structure which was initially characterized by the region's various staple processing industries. However, 29% of the industries received their equipment largely from imports. These industries are perhaps the region's 'new' industries whose machinery and equipment cannot be met by the region's existing machinery sector. Table 5.21 does not, however, support the contention just expressed. It can be seen in the table that there is virtually no difference between the 'new' industries and the old industries in terms of sources of their capital equipment. In both the industries they are largely dependent on the study region for their capital equipment and in both cases some of the industries are largely dependent on imports. This perhaps indicates the range and capacity of the machinery sector of Vancouver

Table 5.20

Sources of Capital Equipment of the Sampled
Manufacturing Establishments

Percent of Total Equipments Received	From Vancouver		From Imports	
0	8	(18%)	24	(54%)
1-25	6	(14%)	5	(11%)
26-50	4	(9%)	1	
51-75	0		1	
76-100	26	(59%)	13	(29%)
Total	44	(100%)	44	(100%)

Source: Questionnaire Survey

Table 5.21

Capital Equipment Source and Types of Industry

	Vancouver			Imports		
	Up to 50%	50 to 100%	Total	Up to 50%	50 to 100%	Total
	Old Industries	7 (38.9%)	11 (61.1%)	18 (40.9%)	12 (66.7%)	6 (33.3%)
New Industries	11 (42.3%)	15 (57.7%)	26 (59.1%)	18 (69.2%)	8 (30.8%)	26 (59.1%)
Total	18 (40.9%)	26 (59.1%)	44 (100%)	30 (68.2%)	14 (31.8%)	44 (100%)

$\chi^2 =$ Not significant $\chi^2 =$ Not significant

Source: Questionnaire Survey

Table 5.22

Business Services Purchased from Vancouver

Vancouver Purchases	Legal	Accounting	Advertising
None	0	3 (6.8)	3 (6.8)
1 - 10%	4 (9.1)	2 (4.5)	6 (13.6)
11 - 25%	0	0	0
26 - 50%	3 (6.8)	2 (4.5)	3 (6.8)
50 + %	<u>37 (84.1)</u>	<u>37 (84.1)</u>	<u>32 (72.7)</u>
Total	44 (100%)	44 (100%)	44 (100%)

Figures in Parentheses are Percentages.

Source: Questionnaire Survey

being equally able to supply to both old and modern industries. Further field observation is required here. The important observation nevertheless remains that to an important degree new firms have been able to obtain their inputs from local sources.

Service Linkages: Table 5.22 shows the proportion of three business services received from the study region by the sampled manufacturing establishments. These services are legal, accounting, and advertising. Vancouver's primacy in providing these services is unquestionable. The dependence pattern is unaltered by distinguishing between new and old industries (Table 5.23). All industries, irrespective of old and new, receive almost all their business services from Vancouver.

Table 5.23

Services Received from Vancouver and Types of Industry

<u>Legal</u>			
	Up to 50%	50 to 100%	Total
Old Industries	3 (16.7)	15 (83.3)	18 (40.9)
New Industries	4 (15.4)	22 (84.6)	26 (59.1)
Total	7 (15.9)	37 (84.1)	44 (100%)

<u>Accounting</u>			
	Up to 50%	50 to 100%	Total
Old Industries	5 (27.8)	13 (72.2)	18 (40.9)
New Industries	2 (7.7)	24 (92.3)	26 (59.1)
Total	7 (15.9)	37 (84.1)	44 (100%)

<u>Advertisement</u>			
	Up to 50%	50 to 100%	Total
Old Industries	6 (33.3)	12 (66.7)	18 (40.9)
New Industries	6 (23.0)	20 (76.9)	26 (59.1)
Total	12 (27.3)	32 (72.7)	44 (100%)

Figures in Parentheses are Percentages

Source: Questionnaire Survey

Conclusions

It is clear from the preceding discussion of the various linkage relationships that these are highly integrated with the local industrial structure in a way envisaged by the staples theory of economic growth discussed in Chapter 1. The exports of the forest staples for the last two or three decades in British Columbia have stimulated secondary manufacturing in the region. The growth of the local economy has permitted numerous backward, forward, and consumer market linked industries in the region. Thus, in this sense, the industrial structure can be said to have diversified. On the whole, the evidence indicates forward linkages around traditional staples are more important than backward linkages. However, many forwardly linked activities are clearly also 'market oriented'. Indeed, new firm formation is predominantly diversifying the manufacturing sector of the Vancouver metropolitan area through final demand linkages. Over time new firms do step up their extra-regional sales, including by export. Exports, however, seem to be concentrated in activities linked to the traditional sector. No evidence was found for a broadly based shift towards a more export oriented "footloose" type of manufacturing.

Early staples of B.C. like the fur and gold mining did not result in the kind of spinoff that the forest resources produced. As already has been mentioned in the first chapter, these staples had very little potential for generating other local linked

activities--because not much further processing was involved. Also, the major markets of these products at the time was far away--mainly in Europe. In the case of forestry, the story has been different. First, forest products had the potential for being processed into hundreds of different finished goods ranging from lumber to various chemicals. Second, at the time the forest resources were being utilized, markets for them grew nearby in the U.S. The tremendous increases in the demand for lumber and lumber products in the U.S.A. and Japan in the 1950's and 1960's have helped the continuous growth of forest industries. Third, together with this growth, the local region, centered in Vancouver, also grew tremendously in population and economic activities. The sizeable local market supported other different industries. These factors have thus allowed the initial forest industries of B.C. to spur the various forward, backward and final demand linked activities in Vancouver and thus have resulted in a diversified industrial structure for it.

VI. Conclusions

The present thesis has attempted to study the regional industrial diversification process in Vancouver using the staples theory of growth framework as propounded by Melville Watkins among others. The framework provided a useful perspective for understanding the "process" of diversification which most conventional diversification measures ignore or oversimplify. Conventional measures have largely measured diversification as a static phenomenon and calculated it from the census data on the distribution of industrial employment. These static indices were reviewed in the thesis and were applied in the context of data from the Vancouver Metropolitan Area for 1961 and 1971. These calculations revealed a slight shift towards further diversification between the years in question.

The conceptual difficulties with the various indices have been noted. It has been pointed out that due to variations in the terminal values of the different indices it was difficult to compare the results of one index to that of the other. The effects of the nature of the industrial classification including its level of disaggregation were also examined by calculating all the indices using two different sets of disaggregation. It was found that the level of disaggregation used in the calculation of diversification indices does influence the results, but only slightly.

While the static indices provided a useful summary of employment diversification across a set of industrial categories, the statistics themselves were of little pragmatic or explanatory value. An inherent weakness of these statistics, for example, are that they indicate nothing of the linkage characteristic of industries. In the staples theory, however, the development of linkages are an important aspect of the diversification process of a region. Thus, a successful export sector sets in motion a cumulative multiplier mechanism which expresses itself via linkages in the growth of the other sectors of the economy, so that over time endogenous led growth increases in importance and interregional linkages are increasingly complemented by intraregional linkages.

The impacts of export led growth are transmitted to the other sectors of the economy through the operation of backward and forward linkages. Thus, it is through the gradual establishment and expansion of these linkages that a region diversifies. As the region grows and diversifies, the various linked activities to its basic staple sector are taken up by the appearance of new firms in the region. The study of the nature of these new firms and linkage characteristics provides opportunities for studying the diversification process of the region. Accordingly, the main thrust of the empirical study in this thesis was the manner in which the new industrial establishments are shaping the diversification process of Vancouver's industrial sector.

The determination of the actual population size of the new industrial establishment in the region turned out to be a formidable

task. The various problems, including data unavailability, along with the definitional ambiguities that complicated data collection about new firms have been noted. Nevertheless, a random sample of recently established plants was obtained and a questionnaire administered to 44 of them.

The results of the sample survey indicate, in accordance with expectations, that new manufacturing establishments are typically small and owner-managed and that the Vancouver Metropolitan area's still retains an 'incubator function'. A high percentage of Vancouver Metropolitan area's manufacturing entrepreneurs are also immigrants to Canada. With respect to the extent to which new plants are diversifying the study region's manufacturing sector on the basis of their linkage characteristics, the main findings are that new plants are primarily established to serve British Columbian markets, although backward and especially forward linkages around the traditionally important sectors remain important. Export links do exist but they are of a rather tentative, small scale nature and will likely remain so without substantial government help.

5

Appendix - 1

Questionnaire for New Industry Survey

SURVEY OF NEW PLANTS

A. BACKGROUND INFORMATION.

1. Company name and address _____

2. Name and Position of the Respondent _____

3. Head Office Location (if not same as above) _____

4. When did this plant begin production? _____

5. Indicate whether the plant is :

- Privately owned, Joint venture,
 Branch Plant of a Canadian owned firm, Branch plant of a Non-Canadian owned firm,
 Other,

6. How many other plants does your firm operate ?

None, 1 to 2, 3 to 5, more than 5,

7. Is this plant owner-managed? Yes, No,

8. If the above answer is yes :

A. What was the owner's previous principal business? _____

B. Where did the owner(s) live immediately prior to establishing this plant ?

- Within Vancouver, Within B.C. , Western Provinces,
 Eastern Provinces, United States, Elsewhere,

C. How long has the owner(s) lived in Greater Vancouver ?

- 0-5 yrs, 6-9 yrs, 11-15 yrs, 15+ yrs,

D. Where was the owner(s) born ?

- Vancouver, B.C. , U.S. , Elsewhere,

12. What was the initial stimulus for establishing this plant ? _____

13. What were the main reasons for locating in Greater Vancouver ? _____

14. How many people, on the average are permanently employed at this plant ?

- 1 to 5, 6 to 14, 15 to 24, 25 to 49,
 50 to 99, 100 to 199, 200 to 499, 500 to 999,
 1000+ ,

15. Indicate seasonal fluctuations of employment :

- None, 10% +, 11 to 25% +, More than 25% + ,

16. At start up indicate whether this plant was :

- A new building, An older building converted to present use,

17. What was the overall cost of Capital Equipment (\$) ?

- 1 to 10,000 ; 10,001 to 100,000 ;
 100,001 to 500,000 ; 500,001 to 10,000,000 ;
 10,000,001 to 50,000,000; 50,000,001 to 100,000,000 ;

18. With respect to overall Capital expenditure on plant machinery estimate the proportion purchased from :

Greater Vancouver _____ % ; Rest of British Columbia _____ % ;
Other Western Provinces _____ % ; Eastern Provinces _____ % ;
United States _____ % ; Elsewhere _____ % ;

19. Identify the main reasons for purchasing outside British Columbia :

1. _____
2. _____
3. _____

20. Identify your major product groups (up to 3) at start up and in the past year (1978) :

Start up	1978
1. _____;	1. _____;
2. _____;	2. _____;
3. _____;	3. _____;

21. Estimate annual sales turn over during First year of operation () and in 1978 () :

- 0 to 9,999; 10,000 to 24,999; 25,000 to 49,999;
 50,000 to 99,999 100,000 to 199,999; 200,000 to 499,999;
 500,000 to 999,999; 1,000,000 to 4,999,999; 5,000,000 to 10,000,000;

B. GEOGRAPHICAL LINKAGE

22. Estimate approximately the percentage distribution of sales of your major product groups by the following market regions :

Market Areas	Sales in the first year of operation	Sales in the past year (1978)
Greater Vancouver	_____	_____
Rest of British Columbia	_____	_____
Other Western Provinces	_____	_____
Eastern Provinces	_____	_____
United States	_____	_____
Elsewhere	_____	_____

23. Do the above differences (or lack of differences) in the geographic distribution of sales reflect consistent trends ?

Yes ;

No ;

24. Account for the changes (or stability) evident in the geographic distribution of sales :

Greater Vancouver	_____
Rest of B.C.	_____
Western Provinces	_____
Eastern Provinces	_____
United States	_____
Elsewhere	_____

25. What are the main difficulties in achieving :

A. Greater Sales in the rest of Canada _____

B. Greater Exports _____

26. What is the proportion of your sales going to affiliated plants ?

0% ; 1 to 25% ; 26 to 50% ; 51 to 75% ; 76 to 100% ;

27. In terms of marketing does your plant utilize :

Within Plant Salesman ; Outside Agencies ; Parent Company Services;

28. Indicate the three most important material inputs used in the plant ?

In the first year of operation

In the past year (1978)

1. _____

1. _____

2. _____

2. _____

3. _____

3. _____

29. Estimate the percentage distribution (%) of your main material inputs from the following source regions :

Source Regions	Purchase in the first year of production	Purchase made last year (1978)
Greater Vancouver	_____	_____
Rest of British Columbia	_____	_____
Western Provinces	_____	_____
Eastern Provinces	_____	_____
United States	_____	_____
Elsewhere	_____	_____

30. Do the above differences (or lack of differences) in the geographic distribution of inputs reflect consistent trends? Yes ; No ;

31. Account for the changes (or stability) evident in the geographic distribution of inputs :

Greater Vancouver _____
 Rest of B.C. _____
 Rest of Canada _____
 Elsewhere _____

32. What are the main difficulties in obtaining more local purchases ? _____

33. What is the percent proportion of inputs purchased from affiliated plants :

0% ; 1 to 25% ; 26 to 50% ; 51 to 75% ; 76 to 100% ;

34. With respect to purchasing do you use :

In plant employees ; External Agencies ; Parent Company services ;

35. Indicate your firm's use of the following "business services" :

Types of Services	Not used at all	Sporadically Used	Used regularly but infrequently	Used regularly & frequently
Legal				
Accounting				
Advertising				

36. To what extent are these "services" bought from within Greater Vancouver ?

Services	0 - 10%	11 - 25%	26 - 50%	50% +
Legal				
Accounting				
Advertising				

37. Indicate the extent to which parent companies provide these services :

Services	0 - 10%	11 - 25%	26 - 50%	50% +
Legal				
Accounting				
Advertising				

Appendix - 2

Calculations of the Static Indices of

◦ Diversification

APPENDIX - TABLE 2.1

DIVERSIFICATION OF MANUFACTURING EMPLOYMENT IN THE VANCOUVER

METROPOLITAN AREA FOR 20 INDUSTRIES 1961 & 1971

The Tress Score

Industry	1961		1971	
	% of Emp.	Cum. %	% of Emp.	Cum. %
1. Wood Industries	25.09	25.09	21.10	21.10
2. Food & Beverages	19.94	45.03	15.74	36.84
3. Metal Fabricating	9.01	54.04	11.48	48.32
4. Printing & Publishing	8.16	62.20	8.57	56.89
5. Paper & Allied	6.48	68.68	5.61	62.50
6. Transportation	5.17	73.85	6.35	68.85
7. Furniture & Fixture	3.57	77.42	2.96	71.81
8. Primary Metal Industries	2.97	80.39	3.08	74.89
9. Clothing Industries	2.94	83.33	2.98	77.87
10. Machinery Industries	2.68	86.01	4.02	81.89
11. Mix Manufacturing	2.61	88.62	3.05	84.94
12. Electrical Products	2.34	90.96	4.08	89.02
13. Chemical and Chemical	2.34	93.30	2.95	91.97
14. Petroleum & Coal	2.01	95.31	.84	92.81
15. Non-Metallic Minerals	1.96	97.27	3.72	96.53
16. Textile Industries	1.48	98.75	1.45	97.98
17. Knitting Mills	.55	99.30	.38	98.36
18. Leather Products	.50	99.75	.40	98.76
19. Rubber & Plastics	.27	99.99	1.15	99.91
20. Tobacco Products	.02	100.00	.13	100.00
		1619.29		1551.24

Tress Score I = Sum of the Cumulative Percentages

In 1961 = I = 1619

In 1971 = I = 1551

APPENDIX - TABLE 2.2

DIVERSIFICATION OF MANUFACTURING EMPLOYMENT IN THE VANCOUVER

METROPOLITAN AREA FOR 38 INDUSTRIES 1961 & 1971

The Tress Score

Industry	1961		1971	
	% Emp. in Vancouver	Cum. %	% Emp. in Vancouver	Cum. %
1. Saw Mills	15.83	15.83	12.16	12.16
2. Metal Fabricating	9.02	24.85	11.48	23.64
3. Printing & Publishing	8.17	33.02	8.57	32.21
4. Veneer & Plywood	6.02	39.04	5.79	38.00
5. Fish Products	4.10	43.22	2.35	40.35
6. Pulp & Paper	3.71	46.93	2.69	43.04
7. Bakery Products	3.57	50.50	2.75	45.79
8. Furniture & Fixtures	3.57	54.07	2.95	48.74
9. Meat & Poultry	2.20	57.27	2.92	51.66
10. Primary Metal Industries	2.99	60.26	3.09	54.75
11. Machinery Industry	2.69	62.95	4.01	58.76
12. Dairy Products	2.65	65.60	1.64	60.40
13. Ship Building	2.64	68.24	2.22	62.62
14. Misc. Manufacture	2.61	70.85	3.02	65.64
15. Beverage Industry	2.51	73.36	2.33	67.97
16. Electrical Products	2.34	75.70	4.08	72.05
17. Cloth (M/W)	2.27	77.97	2.77	74.82
18. Chemical & Chemicals	2.25	80.22	2.95	77.77
19. Misc. Food	2.03	82.25	2.18	79.95
20. Petroleum & Coal	2.01	84.26	.84	80.79
21. Non-Metallic Minerals	1.96	86.22	3.73	84.52
22. Sash Door & Other	1.73	87.95	2.00	86.52
23. Paper & Box	1.56	89.51	2.21	88.72
24. Fruit & Vegetable	1.50	91.01	1.07	89.80
25. Textile Industry	1.48	92.49	1.45	91.25
26. Misc. Wood	1.20	93.69	.89	92.14
27. Other Transport	1.03	94.72	2.15	94.29
28. Truck Body & Trailer	.82	95.54	1.07	95.36
29. Other Paper	.72	96.26	.55	95.91
30. Boat Building	.68	96.94	.91	96.82
31. Other Clothing	.67	97.61	.19	97.01
32. Knitting Mills	.55	98.16	.38	97.39
33. Asphalt Roofing	.50	98.66	.17	97.56
34. Leather Products	.50	99.16	.39	97.95
35. Wooden Box	.31	99.47	.27	98.22
36. Feed Industry	.30	99.77	.49	98.71
37. Rubber Products	.21	99.98	1.15	99.86
38. Tobacco Products	.02	100.00	.14	100.00

2883.53

2793.14

cont.

4
APPENDIX - TABLE 2.2 (Cont.)

Tress Score, I = Sum of the Cumulative Percentages

In 1961 I = 2883

In 1971 I = 2793

APPENDIX - TABLE 2.3

DIVERSIFICATION OF MANUFACTURING EMPLOYMENT IN THE VANCOUVER

METROPOLITAN AREA FOR 20 INDUSTRIES, 1961 & 1971

The Coefficient of Specialization

Industry	1961			1971		
	% in Vancouver	% in Canada	Diff.	% in Vancouver	% in Canada	Diff.
1. Wood Industry	25.09	7.04	18.05	21.11	5.89	15.22
2. Food & Beverages	19.94	15.60	4.34	15.74	14.20	1.54
3. Metal Fabricating	9.01	7.35	1.66	11.48	7.96	3.52
4. Printing & Publishing	8.16	6.00	2.16	8.57	6.06	2.51
5. Paper & Allied	6.48	7.23	-.75	5.61	7.25	-1.64
6. Transportation	5.17	8.40	-3.23	6.35	9.62	-3.27
7. Furniture & Fixture	3.57	2.54	1.03	2.96	2.59	.37
8. Primary Metal	2.97	6.42	-3.45	3.09	6.85	-3.76
9. Clothing Industries	2.94	6.54	-3.60	2.96	5.55	-2.59
10. Machinery Industries	2.68	3.55	-.87	4.02	4.55	-.53
11. Misc. Manufacturing	2.61	3.62	-1.01	3.05	3.65	-.60
12. Electrical Products	2.34	6.04	-3.70	4.08	6.85	-2.77
13. Chemical & Chemical	2.34	4.95	-2.61	2.95	4.61	-1.66
14. Petroleum & Coal	2.01	1.21	.80	.84	1.51	-.31
15. Non-Metallic Minerals	1.96	3.35	-1.39	3.72	3.27	.45
16. Textile Industries	1.48	4.43	-2.95	1.45	4.03	-2.58
17. Knitting Mills	.55	1.41	-.86	.38	1.07	-.69
18. Leather Industries	.50	2.36	-1.86	.39	1.68	-1.29
19. Rubber & Plastics	.27	1.34	-1.07	1.15	2.63	-1.48
20. Tobacco Products	.02	.63	-.61	.13	.52	-.39

Coefficient of Specialization, I = $\frac{\text{Sum of Positive or Negative Differences}}{100}$

In 1961, I = .2804

In 1971, I = .2360

APPENDIX - TABLE 2.4

DIVERSIFICATION OF MANUFACTURING EMPLOYMENT IN THE VANCOUVER

METROPOLITAN AREA FOR 38 INDUSTRIES 1961 & 1971

The Coefficient of Specialization

Industry	1961			1971		
	% Emp. in Vancouver	% in Canada	Diff.	% Emp. in Vancouver	% in Canada	Diff.
1. Saw Mills	15.83	4.14	11.69	12.16	3.40	8.76
2. Metal Fabricating	9.02	7.35	1.67	11.64	7.48	4.16
3. Printing & Publishing	8.17	6.00	2.17	8.71	5.70	3.01
4. Veneer & Plywood	6.02	.74	5.28	5.87	.72	5.15
5. Fish Products	4.18	1.46	2.72	2.38	1.66	.72
6. Pulp & Paper	3.71	5.13	-1.42	2.73	4.67	-1.94
7. Bakery Products	3.57	3.23	.34	2.79	2.34	.45
8. Furniture & Fixture	3.57	2.54	1.03	3.00	2.43	.57
9. Meat & Poultry	3.20	2.29	.91	2.96	2.10	.86
10. Primary Metal Industry	2.99	6.42	-3.43	3.13	3.35	-.22
11. Machinery Industries	2.69	3.55	-.86	4.01	4.55	-.54
12. Dairy Products	2.65	2.79	-.14	1.66	1.64	.02
13. Ship Building	2.64	1.16	1.48	2.22	.78	1.44
14. Misc. Manufacturing	2.61	3.62	-1.01	3.02	3.65	-.63
15. Beverage Industry	2.51	2.12	.39	2.36	1.78	.58
16. Electrical Products	2.34	6.04	-3.70	4.08	6.85	-2.77
17. M/F Clothing	2.27	4.59	2.32	2.81	4.30	-1.49
18. Chemical & Chemical	2.25	4.95	-2.70	2.95	4.61	-1.66
19. Misc. Food	2.03	2.21	-.18	2.27	2.26	.01
20. Petroleum & Coal	2.01	1.21	.80	.84	1.15	-.31
21. Non-Metallic Minerals	1.96	3.35	-1.39	3.73	3.27	.46
22. Sash Door & Other Millwork	1.73	1.35	.38	2.02	.79	1.23
23. Paper Box & Bag	1.56	1.23	.33	2.24	1.25	.99
24. Fruit & Vegetable	1.50	.99	.51	1.09	1.03	.06
25. Textile Industry	1.48	4.43	-2.95	1.45	4.03	-2.58
26. Misc. Wood	1.20	.47	.73	.90	.37	.53
27. Other Transport	1.03	6.66	-5.63	2.15	7.76	-5.61
28. Truck Body & Trailer	.82	.25	.57	1.07	.78	.29
29. Other Paper Converters	.72	.69	.03	.55	.89	-.34
30. Boat Building	.68	.33	.35	.91	.29	.62
31. Other Clothing	.67	1.95	-1.28	.19	.97	-.78
32. Knitting Mills	.55	1.41	-.86	.38	1.07	-.69
33. Asphalt Roofing	.50	.18	.32	.16	.06	.10
34. Leather Products	.50	2.36	-1.86	.39	1.68	-1.29
35. Wooden Box	.31	.33	-.02	.27	.27	0.00
36. Feed Industry	.30	.52	-.22	.49	.56	-.07
37. Rubber Products	.27	1.34	-1.07	1.15	2.63	-1.48
38. Tobacco Products	.02	.63	-.61	.13	.52	-.39

cont.

APPENDIX - TABLE 2.4 (cont.)

Coefficient of Specialization, $I = \frac{\text{Sum of Positive or Negative Differences}}{100}$

In 1961, $I = .3170$

In 1971, $I = .3001$

APPENDIX - TABLE 2.5

DIVERSIFICATION OF MANUFACTURING EMPLOYMENT IN THE VANCOUVER

METROPOLITAN AREA FOR 20 INDUSTRIES 1961 & 1971

The Gibbs-Martin Index

Industry	No. of Employment (X)		No. of Employment ² (X) ²	
	1961	1971	1961	1971
1. Wood Industry	14422	16210	207994080	262764100
2. Food & Beverages	11461	12085	131354520	146047220
3. Metal Fabricating	5182	8815	26853124	77704225
4. Printing & Publishing	4691	6580	22005481	43296400
5. Paper & Allied	3727	4310	13890529	18576100
6. Transportation	2974	4875	8844676	23765625
7. Furniture & Fixture	2050	2265	4202500	5130225
8. Primary Metal	1707	2370	2913849	5616900
9. Clothing Industries	1690	2275	2856100	5175625
10. Machinery Industries	1543	3085	2380849	9517225
11. Misc. Manufacturing	1499	2315	2247001	5359225
12. Electrical Products	1343	3130	1803649	9796900
13. Chemical & Chemical	1290	2265	1664100	5130225
14. Petroleum & Coal	1156	645	1336336	416025
15. Non-Metallic Mineral	1128	2860	1272384	8179600
16. Textile Industries	853	1115	727609	1243225
17. Knitting Mills	316	290	99856	84100
18. Leather Industries	286	300	81796	90000
19. Rubber & Plastics	156	885	24336	783225
20. Tobacco Industries	11	100	121	10000
Total	57485	76775	432552810	628686120

$$\text{Gibbs-Martin Index } I = 1 - \frac{\sum X^2}{(\sum X)^2}$$

$$\text{In 1961, } I = 1 - \frac{432552810}{3304525200} = .87$$

$$\text{In 1971, } I = 1 - \frac{628686120}{5894400600} = .89$$

APPENDIX - TABLE 2.6

DIVERSIFICATION OF MANUFACTURING EMPLOYMENT IN THE VANCOUVER

METROPOLITAN AREA FOR 38 INDUSTRIES, 1961 & 1971

The Gibbs-Martin Index

Industry	No. of Employment (X)		No. of Employment ² (X) ²	
	1961	1971	1961	1971
1. Saw Mills	9096	9335	82737216	87142225
2. Metal Fabricating	5182	8815	26853124	77704225
3. Printing & Publishing	4691	6580	22005481	43296400
4. Veneer & Plywood	3461	4445	11978521	19758025
5. Fish Products	2401	1805	5764801	3258025
6. Pulp & Paper	2130	2065	4536900	4264225
7. Bakery Products	2051	2115	4206601	4473225
8. Furniture & Fixture	2050	2265	4202500	5130225
9. Meat & Poultry	1837	2240	3374569	5017600
10. Primary Metal Industries	1707	2370	2913849	5616900
11. Machinery Industries	1543	3085	2380849	9517225
12. Dairy Products	1522	1260	2316484	1587600
13. Ship Building	1518	1705	2304324	2907025
14. Misc. Manufacturing	1499	2315	2247001	5359225
15. Beverage Industries	1444	1790	2085136	3204100
16. Electrical Products	1343	3130	1811716	9796900
17. M/F Clothing	1306	2130	1705636	4536900
18. Chemical & Chemical	1290	2265	1664100	5130225
19. Misc. Food	1166	1675	1359556	2805625
20. Petroleum & Coal	1156	645	1336336	416025
21. Non-Metallic Minerals	1128	2860	1272384	8179600
22. Sash Door & Other Millwork	997	1535	994009	2356225
23. Paper Box & Bag	894	1695	799236	2873025
24. Fruit & Vegetable	865	825	748225	680625
25. Textile Industries	853	1115	727609	1243225
26. Misc. Wood	689	685	474721	748225
27. Other Transport	593	1650	351649	2722500
28. Truck Body & Trailer	469	820	219961	672400
29. Other Paper	416	420	173056	176400
30. Boat Building	394	700	155236	490000
31. Other Clothing	384	145	147456	21025
32. Knitting Mills	316	290	99856	84100
33. Asphalt Roofing	287	125	82369	15129
34. Leather Products	286	300	81796	90000
35. Wooden Box	179	205	32041	42025
36. Feed Industry	175	380	30625	144400
37. Rubber Products	156	885	24336	783225
38. Tobacco Products	11	100	121	10000
Total	57485	76775	194199380	322253950

cont.

APPENDIX - TABLE 2.6 (cont.)

Gibbs-Martin Index $I = 1 - \frac{\Sigma X^2}{(\Sigma X)^2}$

In 1961, $I = 1 - \frac{19118962}{3304525200} = 1 - .057677 = .94$

In 1971, $I = 1 - \frac{322253950}{5894400600} = 1 - .0546711 = .95$

APPENDIX - TABLE 2.7

DIVERSIFICATION OF MANUFACTURING EMPLOYMENT IN THE VANCOUVER

METROPOLITAN AREA FOR 20 INDUSTRIES, 1961 & 1971

The Britton Index

Industry	1961		1971	
	% Emp. in Vancouver (P)	P ²	% Emp. in Vancouver (P)	P ²
1. Wood Industry	25.09	629.51	21.10	445.21
2. Food & Beverage	19.94	397.60	15.74	247.75
3. Metal Fabricating	9.01	81.18	11.48	131.80
4. Printing & Publishing	8.16	66.59	8.57	73.44
5. Paper & Allied	6.48	42.00	5.61	31.47
6. Transportation	5.17	26.73	6.35	40.32
7. Furniture Industries	3.57	12.74	2.96	8.76
8. Primary Metal	2.97	8.64	3.08	9.47
9. Clothing Industries	2.94	8.64	2.98	8.88
10. Machinery Industries	2.68	7.18	4.02	16.16
11. Misc. Manufacturing	2.61	6.81	3.05	9.30
12. Electrical Products	2.34	5.48	4.08	16.64
13. Chemical & Chemical	2.34	5.48	2.95	8.70
14. Petroleum & Coal	2.01	4.04	.84	.71
15. Non-Metallic Minerals	1.96	3.84	3.72	13.84
16. Textile Industries	1.48	2.19	1.45	2.10
17. Knitting Mills	.55	.30	.38	.14
18. Leather Industries	.50	.25	.40	.16
19. Rubber & Plastics	.27	.07	1.15	1.32
20. Tobacco Products	.02	.0004	.13	.02

$$\text{Britton Index, } I = \sqrt{P_1^2 + P_2^2 + \dots + P_{20}^2}$$

In 1961, I = 36.18

In 1971, I = 32.86

APPENDIX - TABLE 2.8

DIVERSIFICATION OF MANUFACTURING EMPLOYMENT IN THE VANCOUVER

METROPOLITAN AREA FOR 38 INDUSTRIES, 1961 & 1971

The Britton Index

Industry	1961		1971	
	% Emp. in Vancouver (P)	P ²	% Emp. in Vancouver (P)	P ²
1. Saw Mills	15.83	250.59	12.16	147.87
2. Metal Fabricating	9.02	81.36	11.48	131.79
3. Printing & Publishing	8.17	66.75	8.57	73.44
4. Veneer & Plywood	6.02	36.24	5.79	33.52
5. Fish Products	4.18	17.47	2.35	5.52
6. Pulp & Paper	3.71	13.76	2.69	7.24
7. Bakery Products	3.57	12.74	2.75	7.56
8. Furniture & Fixtures	3.57	12.74	2.95	8.70
9. Meat & Poultry	3.20	10.24	2.92	8.53
10. Primary Metal Industries	2.99	8.94	3.09	9.55
11. Machinery Industry	2.69	7.24	4.01	16.08
12. Dairy Products	2.65	7.02	1.64	2.69
13. Ship Building	2.64	6.97	2.22	4.93
14. Misc. Manufacturing	2.61	6.81	3.02	9.12
15. Beverage Industries	2.51	6.30	2.33	5.43
16. Electrical Products	2.34	5.48	4.08	16.48
17. M/F Clothing	2.27	5.15	2.77	7.76
18. Chemical & Chemical	2.25	5.06	2.95	8.70
19. Misc. Food	2.03	4.12	2.18	4.75
20. Petroleum & Coal	2.01	4.04	.84	.71
21. Non-Metallic Minerals	1.96	3.84	3.73	13.91
22. Sash Door & Other	1.73	2.99	2.00	4.00
23. Paper Box & Bag	1.56	2.43	2.21	4.88
24. Fruit & Vegetable	1.50	2.25	1.07	1.14
25. Textile Industry	1.48	2.19	1.45	2.10
26. Misc Wood Industries	1.20	1.44	.89	.79
27. Other Transport	1.03	1.06	2.15	4.62
28. Truck & Body Trailer	.82	.67	1.07	1.14
29. Other Paper Converters	.72	.52	.55	.30
30. Boat Building	.68	.46	.91	.83
31. Other Clothing	.67	.45	.19	.14
32. Knitting Mills	.55	.30	.38	.14
33. Asphalt Roofing	.50	.25	.17	.03
34. Leather Products	.50	.25	.39	.15
35. Wooden Box	.31	.10	.27	.07
36. Feed Industry	.30	.09	.49	.24
37. Rubber Products	.21	.04	1.15	1.32
38. Tobacco Products	.02	.0004	.14	.02

cont.

APPENDIX - TABLE 2.8 (cont.)

$$\text{Britton Index, } I = \sqrt{P_1^2 + P_2^2 + \dots + P_{38}^2}$$

In 1961, I = 24.35

In 1971, I = 23.37

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