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THE MULTI-ESTABLISHMENT FIRM
AND POLARIZED REGIONAL GROWTH IN CANADA

BY

Kathryn Elizabeth McMullen

Submitted in Fulfillment of the
Requirements of Geography 45:599

Department of Geography

Carleton University

Ottawa, Canada

1977

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1977

The undersigned recommend to the Faculty of Graduate Studies and
Research acceptance of the thesis

"THE MULTI-ESTABLISHMENT FIRM AND POLARIZED REGIONAL
GROWTH IN CANADA"

submitted by Kathryn Elizabeth McMullen, B.A., in partial fulfil-
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ABSTRACT

Large, multi-functional, multi-establishment firms are becoming the dominant form of industrial organization. Several consequences arise out of their size. Responsibilities within the firm are distributed among several functionally specialized units. In most cases the head office controls strategic planning and the allocation of finances. Spatially, there is a tendency toward the agglomeration of the head offices of most firms in the national heartland and specifically, in metropolitan areas of national importance. Production units tend toward greater regional dispersion. Hence, the manufacturing sector of most regions, particularly those in the national periphery, is controlled non-locally. Forward and backward linkages tend to occur on an inter-establishment basis within a single firm. As a result, regions where non-local control of manufacturing is great suffer the leakage of multiplier effects to the heartland region, offer few opportunities for upward mobility within the firm and are subject to decisions taken by management whose economic interests often overrule social concerns about distant regions.

Data were collected on a total listing of manufacturing establishments having more than 1000 workers in Canada in 1971. It was found that 88 percent of the head offices of these 108 firms were located in the heartland region. The quality and density of information available and the ease of direct contacts are the factors most influencing this distribution. A sample of 10 enterprises was examined in order to determine some of the factors leading to regional dispersion of activity. Low threshold industries and highly diversified enterprises exhibit wide regional dispersion. Concentration of activity in the head office region was exhibited by high threshold industries and enterprises involved in only a few related activities. The final stage of the analysis consisted of the testing of several hypotheses using principal components and multiple regression analyses to identify those factors influencing first, the distribution of large manufacturing establishments and second, of all manufacturing activity among those counties having one or more large establishments. Two components were found to be highly significant: a component measuring urban size and the degree of inter-urban connectivity; and, the amount of foreign control of employment in manufacturing activities. The implications of these findings are discussed in relation to three main themes: regional disparity; regional policy; and location theory as applied to multi-establishment manufacturing firms.

ACKNOWLEDGEMENTS

This paper could not have been produced without the advice and assistance of several people. Its statistical basis consists of a total listing of all manufacturing establishments in Canada having more than 1000 employees in 1971. This was a special data tabulation provided by Mr. Don Wilson, Chief, Regional Statistics Section, Manufacturing and Primary Industries Division, Statistics Canada.

Data on employment in, and location of, the component establishments of the sample enterprises were provided by Mr. John Falardeau, Assistant Director, Employment and Compensation, Labour Division, Statistics Canada. Neither of these two listings are found in published sources and without them, the paper could not have covered the material and topics that it has. I am grateful to Mr. Wilson and Mr. Falardeau for their help and appreciate the effort that help required.

The second group of people to whom special thanks must be extended are those who were involved in the technical and production aspects of the paper. Special appreciation is due to Mr. William Scollard, Systems Analyst, Office of the Vice Rector (Academic), University of Ottawa. Bill was

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Kathryn E. McMullen

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30 August, 1977

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CHAPTER 1

INTRODUCTION AND OVERVIEW

1.1 Introduction

The nature of industrial organization has changed radically during this century. The contemporary manufacturing sector in most nations is made up of several thousand small, single-plant manufacturing firms and a smaller number of large, multi-functional, multi-establishment firms. The socioeconomic impact of the latter group of firms is large and growing and arises to a great extent out of their size. The distribution of thousands of workers, the allocation of billions of dollars in investment capital, and the metamorphosis of a nation's resources into marketable goods all are affected by decisions taken within a relatively small number of manufacturing firms. These firms play a major role in the shaping of a nation's space-economy; in fact, their power to do so rivals that of the state.

The purpose of this paper is to examine some of the spatial characteristics of large, multi-establishment, manufacturing firms in Canada and to show how they are a major factor in growth, prosperity and opportunity differentials

among Canadian regions. It will be shown that corporate head offices exhibit a strong tendency toward agglomeration in the national heartland region extending from Windsor to Quebec City. The factors of uncertainty reduction, access to information and the need for face-to-face contacts play major roles in promoting the concentration of head offices in metropolitan areas of national importance. Employment in administrative positions is increasing whereas that in production activities is decreasing. The result is a widening gap in employment growth potential between the heartland and the periphery. The organization of large firms is such that the multiplier effects generated by them exhibit two tendencies: within the heartland, they are large and have a direct regional impact; multiplier effects in the periphery tend to 'leak' to other regions, particularly to the heartland where head office personnel control major planning and investment decisions. As a consequence, the size and power of the national heartland continues to grow whereas economic development in the periphery lags and is more susceptible to cyclical economic fluctuations.

One of the outstanding characteristics of the modern large corporation is the means by which its varied activities are controlled and coordinated. The adoption of hierarchical decision-making structures has been accompanied by specialization within diversity; the firm as a whole

often is involved in a wide range of activities each of which involves a single group of specialized workers. All units are ultimately supervised and monitored by the head office.

The functional disaggregation of a firm's activities has direct spatial consequences in that each unit is located according to its special needs and all are connected by a communications network. Consequently, different regions increasingly are associated with specific manufacturing functions. The head office of the majority of firms is responsible for the allocation of financial resources and the taking of major locational decisions. Head offices remain centralized in the heartland whereas production activities exhibit a more dispersed locational pattern. Differences in employment structures and income levels and distributions between the Canadian 'core' and 'periphery' are only two of the results. The issue of non-local control of regional resources, both physical and human, is of increasing concern, for dependency upon distant institutions for development decisions increases a region's vulnerability to external influences. Conversely, there are some benefits associated with the regional dispersal of multi-establishment firms: relatively isolated regions become involved in the web of inter- and intra-organizational linkages which, by reducing their isolation, increases their potential to attract new

activities. On balance, however, the effects tend to be unfavourable since resources, capital and people are drawn from peripheral regions to the heartland.

1.2 Multinational Corporations and Stages of Economic Growth in Canada

There is common agreement that the two most critical economic problems faced by Canada today are: severe and persistent regional disparities in employment, income and economic opportunities; and the extent to which manufacturing industry, mining and the petroleum industry are dominated by foreign-controlled corporations (Table 1.1).

The fundamental question addressed in this study is the degree to which the problems of regional disparities and multi-establishment corporation control, including that of multinationals, are interrelated. In considering this question, it is important to recognize that the multi-establishment corporation is not a recent creation superimposed on an existing industrial location pattern. On the contrary, an examination of the development of the Canadian economy and manufacturing industry emphasizes the importance of external markets, capital and entrepreneurship in the early stages of development (Chapter 2). Indeed, the staple export theory, a theory which relates the economic development of Canadian regions to the export of particular staple products such as furs, timber and wheat, explains the

TABLE 1.1

SELECTED PRINCIPAL STATISTICS OF FOREIGN-
CONTROLLED ESTABLISHMENTS AS A PERCENTAGE OF THE
TOTAL, BY INDUSTRY GROUP,¹ CANADA, 1970

Industry Group	Value of Manufac- turing Shipments	Total Employees	Total Value Added
Rubber Industries	89.2	82.4	88.3
Primary Metal Industries	45.9	44.8	46.7
Metal Fabricating Industries	40.0	37.7	39.2
Transportation Equipment Industries	86.8	76.3	83.0
Non-Metallic Mineral Products Industries	51.3	43.7	51.0
Petroleum and Coal Products Industries	97.9	96.8	96.5
Chemical and Chemical Products Industries	81.3	76.9	84.3
All Manufacturing Industries	51.9	44.3	50.9

¹The industry groups are classified as to 1960 S.I.C. groups.
See the Standard Industrial Classification Manual, Revised
1970, Catalogue 12-501, Statistics Canada.

SOURCE: Statistics Canada, Domestic and Foreign Control of
Manufacturing Establishments in Canada, 1969 and
1970, Catalogue 31-401, Biennial, p. 36.

early development of Canada as a resource hinterland serving the needs of heartland Europe, within an industrial organization dominated by European corporations (Innis, 1967).

Would the regional disparities in economic opportunity in Canada have been any less if economic development had been autonomous? Would the pattern of industrial location have been any different? No definitive answer can be given, but the evidence available supports an interpretation of development as a circular and cumulative causation process rather than as an accumulation of independent, optimally-located factories. If so, the initial location decisions enjoyed the greatest locational freedom with each subsequent set of location and development decisions increasingly circumscribed by previous decisions. The advantages offered industry in the manufacturing belt in Canada are of this derived type - the cumulative advantages of market, skilled labour force and so on, rather than inherent advantages of raw materials such as coal and iron ore, or of geographical advantages of site and situation such as good harbours, or of intrinsic human inventiveness such as associated with Ford of Detroit or Carnegie of Pittsburgh. If the interpretation presented in Chapter 2 of a circular and cumulative process of development is correct, the multi-establishment firms of the nineteenth and early twentieth centuries influenced not only the timing but also the location of

7
industrial development in Canada.

1.3 The Modern Multi-Establishment Corporation -

Organization and Decision-Making

The emergence of the multi-establishment corporation as a dominant force in the economy is, however, comparatively recent and, in Canada's case, has been associated with an increasing degree of American-control of manufacturing industry. Growing corporate power has been associated with changing corporate organization and this in turn has had locational implications. These organizational developments also have had wide economic and social ramifications, but it is the locational impact that is at issue in this study. Here the evidence is more definitive than in the case of earlier developments. The analysis of multi-establishment firms in Chapters 3 and 4 suggests that the reorganization of corporate decision-making structures into a hierarchy has resulted in a dichotomization of Canadian regions; the Canadian heartland is the 'control' centre of manufacturing industry in Canada, whereas all other regions, collectively referred to as the 'periphery', have been relegated to a position of dependency upon the heartland in the sense that they possess production facilities only, the activities of which are tightly controlled by the heartland-located head offices.

Modern corporate goals of survival and growth and the spatial consequences of the strategies adopted to achieve these, notably strategies of product diversification, are examined in an analysis of the distribution of the activities of ten sample enterprises (Chapter 3). Ideally, the spatial consequences of different types of decision-making structures and product diversification within multi-establishment firms can be determined through a detailed examination of two or three enterprises¹ using a case-study approach. In this way, precise relationships between particular organizational structures and their spatial impacts could be outlined. Restrictions of time and money, however, meant that a surrogate approach was necessary; since published data on this topic do not exist, Statistics Canada produced a special data tabulation giving the location of facilities and the types of activities in which each firm was involved. Due to confidentiality restrictions, not all of the requested data could be supplied: information on head office location was taken from a variety of published sources; it was necessary, however, to omit an analysis of the distribution of administrative as opposed to production workers.

¹An enterprise consists of a large number of firms linked through inter-corporate ownership of shares.

The ten sample enterprises were selected on the basis of manufacturing threshold: four are in the pulp and paper industry, four are food processing enterprises and two are involved in, among other things, the electric wire and cable industry. Trends in regional dispersion of activity among the enterprises are related to manufacturing threshold and degree of diversification of activities. Other factors, possibly of greater importance, also are at work, but their impact can be determined only through a detailed survey of each enterprise. For example, the organization structure of each firm and enterprise, the degree of decision-making freedom given to regional managers and the particular strategy adopted by each to meet its goals all will have a large impact upon the spatial distribution of its activities.

Following the analysis of the locational characteristics of enterprises in Canada is a description of the evolution of decision-making structures from the early stage of the single entrepreneur to the present stage of hierarchical-divisional structures. The vesting of responsibility for all major planning and investment decisions in the head office is emphasized for this, in combination with head office tendencies toward agglomeration in the economic 'core' of countries, results in marked regional differences in employment structures. National heartland regions are

gaining the bulk of new employment growth which is predominantly 'white-collar' or administrative in nature; employment growth in peripheral regions consists for the most part of slower-expanding 'blue-collar' or production and related employment. These trends are outlined for the U.S.A., Sweden, Britain and Australia (Chapter 4). Also, data relating to the location of head offices in Canada in 1971 are presented which indicate that head office agglomeration is occurring in Canada's heartland, within which Toronto and Montreal dominate as head office cities. Accessibility to information and the ease with which face-to-face contacts are made in metropolitan regions are the major factors contributing to head office agglomeration.

In examining regional problems, it is also necessary to ask, what are the factors influencing the distribution of production facilities? Principal components and multiple regression analyses are used to test hypotheses relating to the spatial distribution of one type of manufacturing unit - the 133 manufacturing establishments which each employed more than 1000 workers in Canada in 1971 (Chapter 5). The large establishments are distributed among 53 counties, most of which are found in the heartland region. The distribution of all manufacturing establishments regardless of size among these 53 counties is examined in parallel analyses, using the same hypotheses and statistical techniques. Due to the unavailability of data related to some

of the hypotheses tested, it was not possible to include in the analyses all counties in Canada in 1971. A comparison of the results of the two sets of analyses indicates that the distribution of all establishments regardless of size is influenced highly by two components: Urban-Connectivity and Foreign Control. The impact of these components on the distribution of large establishments is much less. Many of the large establishments are involved in head office activities as well as manufacturing and so are not located solely with regard to the typical manufacturing influences such as market and labour force size. They also are members of multi-establishment firms which take locational decisions with regard to a complex set of circumstances. For example, in order to protect a given market area, some large firms establish plants in a location before the minimal regional threshold is reached. In other words, it is possible for their reactions to anticipate changes in regional environments¹ thus deviating from the 'norm' for all manufacturing activity. This indicates the need which has been recognized in the literature for a manufacturing location theory relevant to the contemporary multi-functional, multi-

¹The environment of the firm is defined as the aggregate of all conditions affecting its existence, survival and growth.

establishment firm.

The implications of these concepts and empirical findings are discussed in relation to three main themes: regional disparity; regional policy; and location theory as applied to large, multi-establishment firms (Chapter 6). Also, suggestions are made as to the direction that could be followed in undertaking future research in this field.

This study is tentative and exploratory in nature; the task is humbling in its enormity. The goal is to outline a few of the locational characteristics of contemporary, large, multi-establishment, manufacturing firms, specifically within the Canadian context. It is hoped that by so doing some small contribution will be made toward illuminating their impact upon the national space-economy. The benefits are twofold: first, this may aid in defining a basis upon which new theories relevant to the organization and location of contemporary manufacturing activity can be built; second, it may lead to a better understanding of the distributional mechanisms of growth and prosperity which underlie the regional sectionalisms, rivalries and tensions of this country.

CHAPTER 2

THE DEVELOPMENT OF MANUFACTURING INDUSTRY

IN CANADA

2.1 Introduction

The Canadian manufacturing sector consists of many, small firms primarily serving local and regional markets and a smaller number of large multi-functional, multi-establishment firms whose markets are local, regional, national and international. One of its most pronounced characteristics is its marked spatial concentration in the heartland which extends across southern Ontario and southern Québec from Windsor to Québec City. In 1970, this region contained 55 percent of the national population, 71.7 percent of manufacturing employment and produced 75.3 percent of manufacturing value-added (Yeates, 1975, p. 27).

A characteristic unique to Canada among the industrialized nations is the very high level of foreign control of her manufacturing sector. In 1970, foreign-controlled firms employed 44.3 percent of the manufacturing labour force and accounted for 52.4 percent of manufacturing value-added (Statistics Canada, Catalogue 31-401, p. 30). In addition, 58 percent of the assets of all manufacturing firms

were foreign-controlled. Foreign-controlled firms, of which U.S.-controlled firms form the bulk, enjoy a competitive advantage in that they are more highly capitalized and enjoy higher levels of labour productivity than do Canadian-controlled firms (Daly, Keys and Spence, 1968).

The ability to achieve economies of scale plays a major role in the existence of the labour productivity differential between Canada and the U.S.A.. In most production processes, economies of scale increase with plant size. Market size requirements and capital expenditures increase concomitantly. It is significant, then, that foreign control exceeds domestic control in all plant sizes above fifty employees. Many of the foreign-controlled firms in Canada form parts of multinational companies. Therefore, they have access to the markets and capital resources of their parent companies. The majority of Canadian-controlled establishments are small in terms of employment size: 53 percent have a labour force of fewer than 100 employees; only 25 percent of the U.S.-controlled establishments fall into this category. The market sizes and capital resources of most of the Canadian-controlled establishments compare unfavourably to those which are U.S.-controlled.

The greatest degree of foreign-control in the manufacturing sector, whether measured by employment, assets or value-added, is found in the Canadian heartland, which is essentially an extension of the American industrial belt (Ray, 1975) (Figure 2.1). Even in the decades immediately preceding Confederation, manufacturing employment and output in southern Ontario and southern Quebec exceeded that in the remainder of the country. A brief description of the historical antecedents of the development of Canada's industrial heartland should contribute to understanding both the pronounced industrial concentration found here and the very high levels of foreign-, particularly U.S.-controlled activity. The works of Naylor (1975I, 1975II) and Clement (1975) provide much factual information regarding the early development of the Canadian manufacturing sector and are drawn upon heavily.

2.2 The Impact of British Mercantilism

At the broadest scale, Canada's space-economy exhibits a distinct dichotomy in terms of economic development. The heartland represents the most highly urbanized and industrialized region; the remainder of the country is less urbanized and its economic structure is dominated by primary activities. On average, per capita incomes are lower and rates of unemployment are higher in the periphery (Bennett, 1975). Such is the nature of centre-periphery contrasts at

Source : Canada. Statistics Canada, Domestic and Foreign Control of Manufacturing Establishments in Canada, 1969 and 1970, Catalogue 51-401.

the international, national and regional scales.

During the late eighteenth and nineteenth centuries, Canada was placed in the role of a hinterland to Britain, the industrial and commercial metropole of the Western world. As Canada became industrialized, this relationship weakened and was translated into a continental heartland-hinterland dichotomy; the U.S.A. supplanted Britain as the metropolis at the international scale. Before relinquishing control, British mercantile interests promoted the development of similar interests in Canada oriented toward staple production, for example, wheat and timber products. Powerful financial and commercial groups based in Toronto and Montreal became the beneficiaries of staple production. They recognized the importance of industrial development, but entrepreneurship did not interest them personally, nor did they wish to support others in this activity (Naylor, 1975I). Industrialization, however, grew increasingly important to economic development. Given the lack of indigenous interest, effective policy measures were instituted which made it extremely desirable to foreign interests to invest in, and develop, Canada's manufacturing potential; MacDonald's National Policy tariff is the best known but not the first of the conscious efforts to attract foreign industrial capital.

A significant portion of Canada's legacy of regional disparity and foreign domination of her industrial economy can be attributed to the British mercantilist ethic and to the desire on the part of powerful domestic groups to maintain the orientation of mercantilism in the form of an emphasis on staple production. In order to outline the linkages between regional disparity, foreign control of manufacturing and a staple orientation, two aspects of the economic history of Canadian business are examined. The first factor is the failure of the financial sector to support domestic industry. Second, the evolution of the Canadian economy from one based almost entirely on the export of primary resources to its present industrialized state is traced. Political developments during the nineteenth and twentieth centuries form the point of contact between the financial, commercial and industrial sectors.

2.2.1. Finance Capital and Staple Production

In the early post-Confederation years, political control lay firmly in the hands of a small group of individuals who simultaneously held key positions in the financial and transportation sectors. All but a few of them were foreign-born and most were of British Isles descent (Clement, 1975). Their financial and business ties were trans-Atlantic in orientation. The background and direction of interests of the elitist group which controlled the nation's development

were steeped in the British tradition which, during the nineteenth century, was one of mercantilism.

The export of furs and timber to Britain was the first of the colonies' activities to capture the support of mercantile interests. Later, the British North American colonies united, largely as an economic and political response to the westward movement of American settlers and the continentalism of the U.S.A. which was summarized in the doctrine of Manifest Destiny. By combining the markets of the Canadian colonies, it was hoped that east-west trade could be fostered more easily. The resources of Canada then could be directed toward extending settlement westward, thus protecting the vast agricultural and forest resources from American encroachment and eventual political union.

One of the means by which Canada's claim to the western provinces was staked was via the construction of a transcontinental railway. British portfolio capital¹ played a major role in this ambitious project. In fact, British

¹Portfolio investment consists of the purchase of new and outstanding securities and is associated with involvement in loans, mortgages, securities and so on. Direct investment is aimed at the acquisition of physical assets, for example, the purchase of plant and equipment. Both types of investment are long-term capital transfers; however, direct investment implies the acquisition of control over assets whereas portfolio investment consists only of the transfer of financial resources (Borehan and Leftwich, 1971).

portfolio capital almost exclusively favoured such commercial infrastructural development to move staples internationally (Naylor, 1975I). Those involved in wheat production and transportation and in the commercial sector were favoured by those controlling finance capital; most other sectors of the economy were left without institutional financial support. Rapid and extensive railway expansion was promoted particularly to the detriment of domestic industrial growth since national capital resources were diverted away from the latter to the former. The vast capital resources of the railway magnates and bank directors had resulted from prosperous international trade based on the export of staples. They saw no reason to reject the means of their past commercial successes and so oriented the economy of the new nation to a continuation of this activity.

By the mid-nineteenth century, financial control was centred in Montreal, Toronto and Windsor. Ontario, in the 1860's, became alarmed at the growing strength and dominance of the Bank of Montreal and so took measures to increase Toronto's control (Kindleberger, 1973). Political efforts by all levels of government were undertaken to direct major transportation routes through Toronto and foster the growth of new banks there. Thus, the Bank of Commerce was founded in Toronto in 1866, followed by the Dominion Bank in 1870. From 1900, with the growing western focus of activity,

Toronto gained, but did not crush Montreal as a financial centre. Also, the change in external finance from Britain to the U.S.A. strongly favoured the development of financial control in Toronto. Canada is somewhat unique in that Toronto and Montreal now exist in a stable and cooperative relationship sharing financial duties¹ whereas internationally, a single dominant financial centre is more common (Kindleberger, 1973).

Like so many Canadian institutions, the chartered banking system was modelled after the British system. The rapid success of the larger central Canadian banks in absorbing small, local, private and chartered banks meant that financial control became extremely concentrated, both economically and geographically. In terms of support of industry, the small local banks often provided a necessary source

¹Recent political developments in the Province of Quebec leading to changes in provincial language policy are having a significant impact upon the location of head offices of financial and other business organizations. As a consequence of these policies, a large number of organizations are relocating some head office personnel and, in many cases, the head office as a whole. Many of the moves are to Toronto. Hence, it is possible that within the next decade, Toronto will come to exert much more financial control nationally and internationally than will Montreal.

of finance capital.. These were particularly active in the Maritimes where an entrepreneurial spirit usually found financial support. The large Toronto- and Montreal-based banks, however, were commercially rather than industrially oriented and so their eventual financial dominance in all regions had an extremely unfavourable impact upon regional industrial development. The Maritimes essentially were abandoned except as a source of capital for western expansion; local staples worthy of development were lacking. With regard to the small local banks in Quebec, and particularly in the Maritimes, Naylor (1975I, p. 150) states that their "... demise showed a remarkable synchronization with the end of economic and social advance in the area. Maritime underdevelopment and the loss of its financial independence went hand-in-hand."

It was crucial that the power élite control the financial resources of all of the Canadian provinces because the rapid construction of commercial infrastructure in the form of canals and railways to facilitate the export of wheat represented a huge cost. This meant that the capital resources of Ontario, Quebec and the Maritimes had to be pooled. At the same time, the presentation of a solidified domestic financial structure aided significantly in convincing British financiers that Canadian infrastructural investment was a profitable exercise. Funds were mobilized

nationally to support the commercial cause:

[t]he flow of funds was largely from east to west, with the funds undergoing a major transformation between place of origin and place of use. The Maritimes and, to a lesser extent, small towns in Ontario, were the lenders, and the prairie agricultural communities, after the wheat boom was underway, were the chief borrowers. Funds that had previously been used in the Maritimes to sustain industrial growth that followed the National Policy tariff were now drained west as short-period accommodation to farmers, or lent to the big milling, shipping and grain speculating companies. As the West developed agriculturally as a commercial fiefdom of Montreal and Toronto capital, the Maritimes sagged industrially It was observed in both the Maritimes and small-town Ontario that "men of ability follow capital, able and efficient men who otherwise have remained in the community".

(Naylor, 1975I, p. 104).

Interest rates were increased in the Maritime provinces which were then labelled 'surplus' areas, while in the West interest rates also were high due to, according to the banks, higher operating costs. Western farmers were locked into a spiral of debt. Loans were short-term and fell due at harvest thus ensuring the rapid collection of wheat crops.

The economic development of the Western provinces was not the central goal of the concentrated flow of finance capital into the region; rather, the banks remained commercial in outlook. They would not lend capital to farmers to permit the development of mixed farming and so locked the

region into the production of a single staple product. The result was to make not only the West but the nation as a whole extremely vulnerable to the vagaries of the international market. Not surprisingly, the railway freight rate structure, controlled by the same interests as controlled the Banks, contributed directly to the development of a vulnerable Western and national economy. Farmers nationwide, but particularly in the West, paid higher freight rates than did American farmers. In fact, it was cheaper to ship products to a distant point in the U.S.A. than to a closer point in Canada. The rate structure favoured American routes over Canadian and trans-Atlantic trade over trans-continental (Currie, 1967). Rates on exports of raw materials were more favourable than on exports of finished or semi-finished products. The freight rate structure was wholly in keeping with a commercial, staple export orientation.

2.2.2. Finance Capital and Economic Growth

The organization of capital markets had a significant impact on both the location and the nature of economic growth. The profits arising out of the development of primary resources, principally wheat, flowed back to the financial centres of Montreal and Toronto. Transportation routes also focused on these centres. The dominant position of central Canada over its vast hinterland thus was

reinforced. The western shift in activity effected only a slight shift in the relative 'centre' of the country - from Montreal to Toronto, with Montreal retaining significant importance. The nature of national economic growth also reflected to a very large degree the commercial orientation of finance capital, even today. The retail and wholesale sectors are primarily Canadian-controlled, whereas foreign control dominates in the mining and manufacturing sectors. (Table 2.1).

This distribution of control was actively encouraged by the ruling commercial class in the late nineteenth century. Domestic entrepreneurs were not supported financially and so were relatively weak. Policy measures, such as high tariffs, were used to encourage manufacturing growth. Foreign interests, particularly American, invested heavily in Canada in order to protect their markets. Foreign-controlled firms brought the twin advantages of access to their parent companies' capital resources and the transplantation of manufacturing processes that had already been proven successful. Thus, Canada could reap immediate returns at no immediate investment cost, save that of the loss of control of her manufacturing sector. Foreign control was not seen as a serious concern, for it was felt that the balance of control could be tipped in favour of a domestic majority after the road to industrialization had been

TABLE 2.1
 PERCENTAGE CONTROL OF ECONOMIC SECTORS,
 CANADA, 1971

Sector	Assets		Sales		Profits	
	Candn.*	Foreign	Candn.*	Foreign	Candn.*	Foreign
Retail	57	22	60	22	75	14
Wholesale	59	33	63	29	62	31
Utilities	91	8	84	11	78	20
Mining	30	69	23	76	23	79
Manufacturing	40	58	40	57	33	66

* Includes both Canadian private and government control.

Values for Canadian and foreign control do not sum to 100 percent since some units in each sector cannot be classified as to country of control.

SOURCE: W. Clement, The Canadian Corporate Elite, 1975, Tables 10-14.

followed for a time (Naylor, 1975II).

2.3 The Role of Increasing American Involvement in Canadian Industrialization

Three major factors provided the means of Canadian industrialization: the immigration into Canada of American industrial entrepreneurs; licensing of American patents in Canada and/or joint ventures with Canadian capital; and foreign direct investment in branch plants (Naylor, 1975II). An indigenous manufacturing sector did develop, of course; however, it consisted primarily of many small firms, individually employing few workers and it was essentially rural in nature. The bulk consisted of blacksmith shops, handicrafts and agricultural implements producers (Clement, 1975). British involvement with industrialization in Canada shifted from an early emphasis on direct investment to one stressing portfolio investment. The latter route promoted greater Canadian independence, reflecting Britain's greater concern with internal affairs and her increasingly favourable attitude toward free trade.

2.3.1. Immigration of American Entrepreneurs

To some extent, the immigration into Canada of American industrial entrepreneurs filled the innovation gap left by domestic producers. Although the existence of a relatively untapped market formed part of the lure, the greatest attraction was Canada's primary resource wealth.

Early American capital and skill was concentrated in mineral and timber sources. Ontario's nickel and copper resources, and asbestos in Quebec, attracted much early American investment. Cheap and abundant power provided the basis for direct American involvement in the aluminum industry as, for example, Alcoa in Shawinigan Falls in 1899 (Wilkins, 1970). Similarly, the existence of cheap power sources encouraged the growth of lumber and paper mills, again predominantly in Ontario and Quebec and later in British Columbia, largely developed by American-controlled firms. Little processing of these resources occurred in Canada; rather, they were exported to the U.S.A. where a greater demand for raw materials existed. Although the commercial ruling class was oriented to the export of staples, it was not politically acceptable for them to allow the wholesale alienation of the nation's primary sources. The imposition of high export duties on raw materials effectively encouraged the development of processing facilities in Canada (Naylor, 1975II).

2.3.2. Licensing

A second influence affecting industrial growth in Canada was that of licensing; after the Canadian Patent Act of 1872, if patents were not worked within two years of issue, they became null (Wilkins, 1970). Canadian patents were few reflecting a vacuum in the field of indigenous inventive activity. American technology was utilized through the

gaining of a license to apply a particular process or manufacture a product for which patent rights had been obtained elsewhere. The result was that many American firms set up branch plants in Canada, while Canadian industrialists became dependent upon foreign innovations. The relationship of dependency tends to be self-reinforcing and has been reflected in a relative weakness of Canadian industry to perform well in the field of research and development. Hence, the competitive advantages of innovation in process, product and organization have been largely lost to domestic entrepreneurs.

2.3.3. Foreign Direct Investment

The two influences discussed thus far represent the dominant means of transfer of American technology to Canada prior to the National Policy tariff of 1879. American direct investment was relatively insignificant to this point; before 1879, only eleven American branch plants had been established (Naylor, 1975II). These were found primarily in border towns, especially Windsor and also Chatham, Walkerville, Sarnia and other towns in Ontario. In the Maritimes and Quebec, foreign interest was manifested more often in the form of joint ventures with local capital and with British investors. Thus, outside of Ontario, total Canadian control was not lost in taking advantage of foreign technology.

The greatest stimuli to American direct investment in manufacturing were the high tariffs of MacDonald's National Policy of 1879 and the practice of bonusing adopted at the municipal level. The imposition of a high tariff encouraged direct investment as foreign firms set up branch plants in order to protect their markets; domestic capital was then free to concentrate on infrastructural development and the continued support of staple production.

Meanwhile, the bonusing system, which consisted of municipalities offering substantial subsidies to manufacturing industries regardless of country of control, filled the large gap in the domestic industrial capital market. Banks and other financial institutions did not provide finance capital on any significant scale to industrial entrepreneurs. Those that did engage in this type of lending activity were most often small, local banks, which were quickly absorbed by the large chartered banks centre in Toronto and Montreal. Bonusing began with small cash grants and tax exemptions. However, as competition for manufacturing establishments became increasingly fierce, the values of the subsidies grew. Cash gifts, interest-free loans, free sites, long-term tax exemptions, low or free water, gas and electricity rates and other more specialized concessions were made. Firms would actively solicit bonuses and would play municipalities off against each

other in order to secure the best terms possible. Foreign firms that were reluctant to move on the basis of tariffs alone could be induced to do so if a large enough municipal bonus were made available.

The abuses of the bonusing system were innumerable and municipal bankruptcies were not uncommon. Once begun all towns had to become involved or else they would attract little manufacturing industry. British portfolio capital was a source of municipal funding with the town bearing the risk. The result was, in effect, a doubling of net international indebtedness. Bonusing, although wasteful, was necessary; it provided a means of obtaining capital for industrial fixed investment.

Not all regions in Canada were equally involved in the bonusing system which existed during the late nineteenth century. As mentioned above, the most active participants were municipalities in Ontario and Quebec. Municipalities in the Maritimes were more restrained, tending to finance small local industries. In the West, bonusing was even more restricted, largely due to its later settlement and smaller capital resources.

Towns in Ontario and Quebec tended to favour different types of manufacturing industries. Ontario's orientation was toward heavy industries and, at least in southwestern

Ontario, toward firms manufacturing producer goods. From 1851 to 1891, York, Brant and Waterloo counties were the most mature industrially and today these are among the most industrialized counties in Canada; in eastern Ontario, the primary sector remained dominant even in later periods when secondary manufacturing should have overtaken primary industries by a process of industrial evolution (Gilmour, 1972). Bonusing in Quebec tended to place emphasis upon textiles firms and after 1900, pulp and paper mills. The typical pattern was that of towns enticing firms out of Montreal. Toronto, however, was not as developed industrially as was Montreal and so suffered little out-migration of industry. Industrial development in Ontario was more decentralized than in Quebec with several towns in southwestern Ontario successfully financing the growth of many manufacturing firms.

The distribution of manufacturing industry in Canada today is very much a reflection of the pattern set just before the turn of the century. The Maritimes, though settled early, lost local financial control to Ontario and Quebec. As the locus of settlement shifted west and as the new staples of wheat and pulp and paper replaced the old, the Maritimes were left with relatively limited means with which to develop. The Western provinces were settled in a later period and so were unable to become very active in

attracting manufacturing industry, although significant American investment in the agricultural implements industry did occur. Ontario and Quebec, particularly the southern portions, received the bulk of both foreign and domestic manufacturing industries. The more diffused pattern in Ontario, particularly in the southwest, gave it an advantage over the more concentrated, consumer goods orientation in Quebec. The heartland region was settled early and political measures ensured that major transportation routes served the area well. Subsequently, the factors of initial advantage and industrial inertia working in concert created conditions conducive to circular and cumulative growth in the heartland to a much greater extent than in other regions.

2.4 Industrialization and Urbanization

Rapid industrial development in a region is usually associated with rapid urban growth. The mechanism which links the two is the multiplier effect. New local demands are created by the factories themselves, attracting supplier industries and industries consuming the initial factory's output. Forward and backward industrial linkages thus encourage the development of industrial agglomerations in some centres. Relatively lower production costs result. Increased employment and the increased purchasing power of the labour force lead to the creation of new service, trade, construction, transportation, local government, professional

and miscellaneous white-collar jobs (Pred, 1966). Urban growth results from the attainment of successive local and regional thresholds. This, essentially, is the means by which the process of circular and cumulative urban growth is set into motion. Additional factors come into play arising directly out of the concentration of people and activity which serve to give the region a competitive advantage over regions lacking manufacturing industry. The multiplication of interactions among the growing number of individuals enhances the possibilities of technological improvements and innovations and enlarges the likelihood of the adoption of more efficient managerial and financial systems (Pred, 1966). The speed of flows of information increases and the diffusion of skills and knowledge brought in by in-migrants is eased. The additional multiplier effects arising out of the application of new ideas to processes, products and forms of organization augment those associated with the mere volume of activity.

Developments in the late nineteenth century in the manufacturing sector itself deemed necessary a location within, or close to, a large urban centre. Industrial innovations led to increasing economies of scale with larger plant sizes. As a result, firms' market areas increased in size. Larger requirements for capital, labour and market area size meant that barriers to entry arose, leading to greater

economic and geographical concentration of industry. In general, transportation improvements and lower unit production costs work to the advantage of points with high accessibility; in terms of market potential, the Windsor to Quebec City corridor presented the best market location. With increasing plant size, labour and market thresholds increased for many industries. Larger centres offer more advantages with regard to both the quantity and quality of labour in terms of skills. In addition, the availability of capital is usually greater in traditional banking centres which tend to be the largest national urban centres. The diffusion of information regarding investment opportunities is more efficient in highly urbanized areas; levels of uncertainty increase with distance as knowledge of, and familiarity with, peripheral areas decreases (Webber, 1972). Interest rates reflect this phenomenon, tending to be lower in the largest urban centres.

Toronto and Montreal thus exerted a powerful attractive force on the location of newly established plants; this attraction was strongly felt by the marginal locator for whom the avoidance of uncertainty is of utmost importance. Southwestern Ontario as a whole offered most of these advantages. A number of relatively large urban centres, such as Hamilton, London, Windsor and Sarnia had developed. The accessibility they afforded to the U.S.A. and to Toronto was

particularly attractive to the large number of American-controlled firms that were establishing plants in Canada at this time. By 1911, four-fifths of manufacturing output by value was in Ontario and Quebec (Clement, 1975, p. 79). The resulting agglomeration of industry and the associated multiplier effects, both direct and indirect, meant that the differential between industrialization-urbanization in the heartland and in the rest of Canada grew ever more pronounced.

2.5 Merger Activity in the Twentieth Century

After 1900, merger activity within the manufacturing sector caused a growing concentration of corporate power into a few large multi-functional organizations. Mergers tended to occur in waves and reflected, to a large degree, similar developments in the U.S.A.. The first American merger wave occurred from 1897 to 1905 (Pred, 1974). The desire to eliminate competition formed the major impetus behind the joining of several companies. Horizontal integration was the common type of merger, leading to the emergence of oligopolistic structures where many producers of the same class were consolidated into a few organizations controlling a large share of the market. Some examples of mergers that took place during this period are the formation of Anaconda which is now the largest American producer in the copper industry (Wilkins, 1974); International Harvester which is.

now the largest American producer of farm machinery; Du Pont in chemicals; General Electric; International Paper; International Nickel; and several others.

The second merger wave, 1925 to 1929, saw the development of multi-functional organizations through vertical mergers and the internalization of forward and backward linkages (Pred, 1974). Marketing and distribution operations also were absorbed by several companies, leading to the development of conglomerates. The formation of multi-functional, multi-establishment firms meant that increasingly, economic power and competitive advantages accrued to a few powerful corporations.

Merger waves in Canada followed closely those in the U.S.A. since the large element of American control of industry tended to create spill-over effects. However, there were some differences. One of the effects of the National Policy tariff was to produce a wave of mergers in the 1880's. For example, four of the leading Canadian refineries were merged to form Imperial Oil in 1880 (Naylor, 1975II). A second merger wave took place in Canada from 1907 to 1914. This primarily involved American moves into the resource industries as a corollary of American manufacturing mergers. Canadian producers could not compete with the larger American firms and so U.S.-control of Canadian

resources increased.

It was at this point in time that the commercial ruling class began to become more highly involved in the domestic manufacturing sector, "... but at the ownership and control level through consolidation, and not in entrepreneurial activities" (Clement, 1975, p. 75). Once a Canadian manufacturing firm was operating successfully, the ruling commercial interests became more favourably disposed toward it. Merging usually followed leading to a concentration of economic power in a few large concerns. Between 1900 and 1933, there were 374 consolidations of which 58 were during the period 1909 to 1912 and 231 between 1925 and 1930 (Clement, 1975, p. 82). Financial control followed a similar trend toward concentration - by 1928, the Bank of Montreal, the Royal Bank and the Bank of Commerce accounted for about 70 percent of total Canadian bank resources. The remainder was controlled by seven smaller banks. Although the domestic ruling class diversified its interests, the high degree of concentration of power remained unchanged. Spatially, the control of finance and manufacturing remained in the Windsor to Quebec City corridor and within this region, Toronto and Montreal remained dominant.

2.6 Summary

The Canadian manufacturing sector today suffers from two major weaknesses. First, it exhibits a high degree of foreign-, particularly U.S.-control, unparalleled by other highly industrialized nations. Second, that portion of the manufacturing sector which is controlled domestically compares unfavourably with foreign-controlled firms in terms of unit cost of production, labour productivity and other measures of efficiency. Both of these characteristics are a direct result of decisions taken by the financial sector and the federal government during the decades immediately following Confederation. Investment capital was diverted away from the manufacturing sector to staple production and related infrastructural development. Since domestic entrepreneurs found it difficult to finance manufacturing, policies were put into effect which attracted foreign capital to develop Canadian resources.

Toronto and Montreal were the centres of control of the bulk of domestic financial resources. The profits associated with staple production and later, risk capital in the manufacturing sector, flowed from other regions to Toronto and Montreal. Early manufacturing development was concentrated in the heartland which then benefitted from a circular and cumulative growth process. The interaction of the concentration of capital and manufacturing in this region meant

that its domination of the rest of Canada economically grew through time. Centre-periphery contrasts within the Canadian economy are not a new phenomenon; rather, they existed during the colonial period and have become increasingly marked during the present century with the continuing growth of structural imbalances among Canadian regions.

Merger activity continued throughout the rest of the twentieth century. It was during the 1960's, however, that firms involved in totally unrelated activities amalgamated to form large, highly diversified conglomerates. The great size and complexity of modern corporations has called forth compensating changes in the structure of organizational control; there has been a change in the nature of the corporation, a significant shift from previous trends which were mainly of increasing size. Decision-making and 'control' functions as opposed to production activities have increased significantly in terms of the number employed. Organizational changes are reflected in spatial structures contributing to regional economic disparities and imbalances in the growth of the national urban system. The spatial impact of large, multi-functional, multi-establishment firms arises largely out of their functional organization. The evolution and nature of control systems within large manufacturing firms is presented in the following chapter, setting

[the context for a discussion of the spatial characteristics of the decision-making hierarchy in Chapter 4.

CHAPTER 3

THE ORGANIZATION OF LARGE MANUFACTURING CORPORATIONS

3.1 The Changing Organization of Industry

Changes in economic structure resulting from the waves of merger activity during the late nineteenth and twentieth centuries are reflected in the emergence of new forms of industrial organization. To use a phrase coined by John Kenneth Galbraith (1971), we have entered the age of the 'technocratic society'. No longer are individuals clearly responsible for decision-making in the control of large corporations, be they in the fields of manufacturing, sales or public service provision; rather, decision-making responsibility is now vested in groups or committees. This fundamental change in the structure of control - from the individual to the group - is a direct result of the growing complexity of the environments in which large corporations function.

For most manufacturing firms, the basis of survival and growth is diversity and flexibility for these give the firm an ability to react and adapt to such changes in their external environment as market fluctuations, changes in condi-

tions of materials supplies, labour and so on. Although the manufacture of several product-lines gives flexibility, flexibility also must characterize the management structure adopted. The adoption of formal hierarchical decision-making structures has given large, multi-functional, multi-establishment corporations the needed flexibility to react to changes in their environments. Information-processing has been made more efficient by the assignment of decision-making powers to different levels in the hierarchy on the basis of accountability to higher levels; thus routine or low-risk decisions are taken at the lower levels of the hierarchy, whereas strategic decisions - those affecting the survival and growth of the corporation - are reserved for the highest echelons.

Increasing product diversity within the firm has created pressures toward a lengthening of the decision-making hierarchy. Management structures can be organized along several lines depending upon the particular characteristics of different firms. In the majority of cases, however, the most important aspects of control in terms of the firm as a whole are highly centralized at the head office. Consequently, freedom of action on the part of subsidiary management is very limited. Reactions to significant changes in the local environment are considered within a national or international context, rather than solely as themselves.

It is with this new industrial organization, the relationship of enterprise-company-establishment and the changing role of the head office that this chapter is concerned. For the changing role brings new strengths and dependencies into industrial organization with, in particular, increasing size and scale, emergence of 'truncated decision-making hierarchies' in countries with 'branch plant economies' and greater dependency on access to capital, information on market trends, technological change and adaptation of borrowed technology to individual markets. Equally important, the goals of the enterprise change.

The particular strategy of growth adopted by a firm is reflected in the regional distribution of its activities. The location of the head office is a strong indication of the region in which most of a firm's activities will be found for it exerts a strong centripetal force on the location of branch plants.¹ Several other factors also will affect the extent of a firm's regional concentration: the activity threshold level; the degree to which a firm is diversified; raw material versus market orientation; and country of control. Data were collected on a sample of

¹The spatial implications of head office location are discussed more fully in Chapter 4.

ten enterprises operating in Canada in 1971 so that the effect of each of these influences on the distribution of manufacturing activities could be examined.¹

3.2 The New Corporate Goals: Survival and Growth

The multi-functional, multi-establishment firm has evolved from simple beginnings. The genesis of the manufacturing sector as we know it lies in the Industrial Revolution when handicraft production was replaced by a factory system of mass-production based on the use of inanimate sources of power. Radical changes in the methods of production required a corresponding adaptation of manufacturing firms' systems of organization. The firm's environment became more complex in terms of size of labour force, number of stages in the manufacturing process, size of market and so on; in this century, the role of the State in the economy also expanded as Keynesian doctrines spread. As the number of interrelated factors to be considered increased, locational decision-making on the part of the entrepreneur became more involved.

Traditional manufacturing location theory is oriented essentially to the early stage in the evolution of the industrial system. Its focus is on the individual entrepreneur

¹Appendix A contains a discussion of the methodology used to select the ten sample enterprises.

who is responsible for taking all decisions regarding his firm. The operational environment is assumed to approach perfect competition and is made up of a very large number of single plant, unfunctional firms. Traditional location theory is normative, describing the behavior of Economic Man who is an optimizer. - either transportation costs associated with production from the first to the final stages and distribution of the output to the market are minimized, or profits are maximized.

Normative theory is criticized perennially for its failure to accurately reflect reality and it is defended perennially as a yardstick against which man's imperfect behavior can be measured. Like all sound theories, industrial location theory, specifically that associated with Alfred Weber (1909), has endured; it has not been replaced by a theory which more ably explains industrial location. Yet the practical relevance of industrial location theory is lessening rapidly, although it retains its intellectual attractions as a form of rational argument, a statement of what should be, ideally. In fact, the environment in which large manufacturing firms operate and the nature of the firms themselves have changed so radically since the turn of the century that almost every aspect of Weberian location theory is no longer directly and simply applicable.

The contemporary industrial system is composed increasingly of highly diversified, multi-establishment firms operating in environments ranging from imperfect competition to oligopolistic and even monopolistic states. In terms of power and influence, the latter two types of environment are dominant. The attribution of such simple goals as transport cost minimization or profit maximization to these complex organizations indicates an inability on the part of economic geographers to model the behavior of large firms.

The preeminent goal of industrial corporations today is survival and this is closely followed by a second goal, which is that of growth as measured in sales:

[w]ith low earnings or losses [the corporation] becomes vulnerable to outside influence and loses its autonomy. But above a certain level more earnings add little or nothing to its security therein. This autonomy, especially for the very large corporation, has become nearly absolute. This casts light, in turn, on the assumption that the mature corporation will seek to maximize its profits. . . By the most elementary calculation of self-interest, the technostucture is compelled to put prevention of loss ahead of maximum return.

(Galbraith, 1971, p. 168).

The key word here is 'corporation'. The focus of traditional location theory is on the single plant which at the turn of the century was the totality of the firm in the majority of cases. This cannot be said to be true for all firms today. The performance of the individual plant is

secondary to the performance of the corporation as a whole. Individual plant losses are tolerated and even deliberately caused if they contribute to the overall growth of the firm. The strategies used to achieve the goals of survival and growth are many and varied and it is this complexity that has foiled any attempt to holistically remodel the system and put forward a satisfactory theory of industrial location applicable to the multi-establishment firm.

3.3 Corporation Strategies

The environments in which large multi-functional, multi-establishment firms exist have become increasingly complex during the twentieth century. Through time, the corporate system itself has come to exert more control over its environment. Four 'ideal' types of environment have been recognized which represent a continuum from total lack of individual influence to significant individual control: placid, randomized; placid, clustered; disturbed, reactive; and turbulent (Steed, 1971). If different groups within the manufacturing sector are examined, their environments will be found to exhibit the characteristics of one of these environmental types. In other words, the total industrial environment is actually composed of several contemporaneous environmental sub-sets.

Each of these sub-sets has evolved during a different period of time and they represent successive stages in the

growing concentration of power, influence and ability to modify their environments in the largest corporations. A placid, randomized environment is one of perfect competition. In terms of the manufacturing sector as a whole, competition in the immediate post-Industrial Revolution period could be said to most closely approximate this 'ideal' environmental type. Near perfect competition with many small-scale producers survives still in some parts of the agricultural sector, but in manufacturing gave way quickly to the dominance of larger firms and imperfect competition, characterized as a placid, clustered environment. On a regional basis, some firms dominate suppliers and/or markets, although at a larger scale their impact is less significant. With regard to the present-day manufacturing sector, the bulk of firms exist in an environment of imperfect competition as do, for example, the pulp and paper and agricultural implements industries.

The disturbed, reactive and turbulent environments represent conditions of increasing power and influence, as found in oligopolistic forms of competition. The environments of most, large, multi-establishment firms are of this type, where firms react to each other on an individual basis (Steed, 1971). The emergence of turbulent environments can be attributed to the increasing unpredictability of market development and competitive responses, the deepening inter-

dependence between economic organizations on the one hand and social and political institutions on the other and increasing reliance on research and development activities to gain control over uncertain environments (Krumme and Hayter, 1975). Competition among these firms assumes many non-price forms, the commonest being product competition, the bases of which are: small differences in products between firms; and advertising oriented toward a final demand market. Examples of product competition occur daily in the media where consumers are urged to purchase 'new and improved' automobiles, toothpaste, cleaning compounds and myriad other products. The characteristic which most clearly differentiates these firms from small-scale firms is the highly diversified range of activities in which they are involved.

3.4 Strategy and Pattern

The different strategies of survival and growth adopted by multi-establishment firms are reflected in the distributions of their activities. Some firms prefer to remain highly specialized and localized, producing only one or a few products for a particular market area. However, as a firm becomes more diversified, it tends to become decentralized spatially, establishing facilities in a variety of locations which often are dispersed across several regions within a single nation and increasingly across several nations. A

- major constraint upon the extent to which regional dispersion of activities within a firm can occur, however, is the threshold level associated with each type of activity. The threshold is "... the portion of the total national market for any specific product that an industrial plant must be able to secure in order to achieve economic operation" (Scorrrar and Williams, 1976, p. 108). Conceptually, it is synonymous with the term 'threshold' associated with the location of retail and service activities in Christaller's Central Place Theory. As the activity threshold level increases, the number of establishments involved in that activity will decrease. The degree of diversification, activity threshold levels and the extent of regional dispersion of activity were examined for a sample of ten enterprises: four in the pulp and paper industry; four in the food processing industry; and two which were involved in, among other things, the electric wire and cable industry. Before discussing the results of this analysis, however, the terms establishment, firm and enterprise must be defined since the latter two often are used interchangeably in the literature although they represent two distinctly different entities.

The relationship among the establishment, the firm and the enterprise is hierarchical: a firm consists of one or several establishments and an enterprise consists of

several firms. Enterprises tend to be highly diversified organizations and are a relatively recent development.

FIGURE 3.1

The Enterprise Hierarchy

They often are involved in several unrelated activities and, in their most extreme form, are known as conglomerates. The firm too, can be highly diversified, but it tends to be less so than the enterprise. It is common for activities to be related through horizontal, vertical or some other form of integration. The lowest tier in the hierarchy, the establishment, is the least diversified of the three. The orientation of the establishment tends to be toward the manufacture of a single product-line or of products that are closely related. Data on enterprises are not directly available; therefore, it was necessary to build the enterprises starting at the establishment level using special data tabulations provided by Statistics Canada.

3.4.1 The Pulp and Paper Enterprises¹

The threshold level associated with pulp and paper mills is 0.0682 (Ray, 1975, Table A.3.2); theoretically, in order to survive, a pulp and paper mill must capture 6.82 percent of the national market. This places the pulp and paper industry in the second highest threshold quartile. Two of the pulp and paper enterprises have head offices in Vancouver and two in Montreal. Each pair is made up of one Canadian-controlled and one U.S.-controlled enterprise. All four holding companies are included among Canada's 100 largest manufacturing, resource and utility companies in 1971, ranked by sales (Financial Post, July 24, 1971, p. 11).

The head office of Crown Zellerbach International Inc. is in San Francisco: its Canadian-level head office is in

¹Unless otherwise stated, the enterprises will be referred to using the name of the holding company. The linkage of firms is "... based on the intercorporate ownership of the voting rights attaching to the various classes of shares The intercorporate ownership complex begins with a holding corporation in which no other corporation owns 10 percent or more of the voting shares" (Statistics Canada, Catalogue 61-513, p. 6). Enterprise organization charts indicating the intercorporate ownership status of the firms constituting each enterprise are found in Appendix B.

TABLE 3.1

PERFORMANCE CHARACTERISTICS OF
THE PULP AND PAPER FIRMS, 1971

Firm Name	Sales (\$000's)	Sales Rank	Assets (\$000's)	Assets Rank	Net Income (\$000's)	Net Income Rank
1. MacMillan Bloedel Ltd.	646,116	15	834,275	16	17,426	29
2. Domtar Ltd.	484,938	17	531,609	20	17,618	28
3. Crown Zellerbach Canada Ltd.	192,970	45	253,204	49	6,500	54

NOTE: Since Canadian International Paper Co. does not publish financial statements and since reliable estimates are not available, it does not appear on the list of Canada's 100 largest manufacturing, resource and utility companies in 1971. However, it "... would undoubtedly rank in the 100 largest".

SOURCE: Financial Post, July 24, 1971, p.11.

Vancouver. This is the smallest of the pulp and paper enterprises in terms of employment (Figure 3.2). It is also the least diversified, being involved only in the production of lumber, paper, bags and boxes. Although Crown Zellerbach International Inc. has subsidiaries in the Prairie Provinces and Central Canada, they are wholesale distribution outlets for pulp and paper only. All processing facilities are found in southwestern British Columbia.

Macmillan Bloedel Ltd. is the largest employer among the pulp and paper enterprises. It is Canadian-controlled and has its head office in Vancouver. Despite its large size, however, its operations remain highly concentrated in British Columbia, particularly along the coast (Figure 3.3). Pulp and paper mills, sawmills, veneer and plywood mills and planing mills are the activities in which the enterprise is most involved. With the exceptions of Winnipeg and Hull where bags and boxes are produced, Macmillan Bloedel's activities in major centres in the Prairie Provinces and in Central Canada consist only of wholesale lumber outlets. The greatest range of products manufactured by both Macmillan Bloedel Ltd. and Crown Zellerbach International Inc. is found in Vancouver.

The International Paper Company is U.S.-controlled. The head office of the enterprise as a whole is in New York

Fig. 3.2

CROWN ZELLERBACH INTERNATIONAL INC: EMPLOYMENT DISTRIBUTION

★ HEAD OFFICE

Source : Special data tabulation provided by Labour Division, Statistics Canada.

Fig 3 3

MACMILLAN BLOEDEL LTD : EMPLOYMENT DISTRIBUTION

★ HEAD OFFICE

23 TORONTO
21 CALGARY
20 LETHBRIDGE
19 WINNIPEG
18 LONDON

Source : Spécial data tabulation provided by Labour Division, Statistics Canada.

22 TOFINO

21 CALGARY

20 LETHBRIDGE

19 WINNIPEG

18 LONDON

17 HULL

16 EDMONTON

15 DUNCAN

14 NANOOSE BAY

13 MONTREAL

12 SQUAMISH

11 JUSKATHA

10 CAMPBELL RIVER

9 PORT, McNEIL

8 HUDSON BAY

7 TORONTO

6 SAYWARD

5 CHEMAINUS

4 NANAIMO

3 POWELL RIVER

2 PORT ALBERNI

1 VANCOUVER

istics Canada.

City; Montreal is the location of the Canadian-level head office. Like Crown Zellerbach International Inc., the extent of its Canadian operations is small, at least as measured by employment. It is concentrated in Central Canada where it manufactures paper and paper products (Figure 3.4). Activities in Montreal are somewhat more diversified in that chemicals and beverages also are manufactured. Some tendency toward regional dispersion of activities is indicated: Campbellton, New Brunswick is the location of a pulp and paper mill and paper bags and boxes are produced in Regina. Vancouver is a wholesale outlet for paper.

The most diversified and regionally dispersed pulp and paper enterprise in Domtar Limited, whose head office is in Montreal (Figure 3.5). A range of activities is found in all regions: pulp and paper mills, paper products, miscellaneous wood industries, non-metallic mineral products and wholesale facilities. The two most highly diversified centres are Montreal and Toronto where high threshold goods such as lime, soap and plastic products are manufactured. In addition, Montreal is the location of iron and steel mills and chemicals and asphalt roofing production.

Of the four pulp and paper enterprises, the two which are Canadian-controlled are the largest employers. However,

Fig 3.4

INTERNATIONAL PAPER COMPANY: EMPLOYMENT DISTRIBUTION

★ HEAD OFFICE

Source : Special data tabulation provided by Labour Division, Statistics Canada.

Fig 35
DOMTAR LIMITED EMPLOYMENT DISTRIBUTION

★ HEAD OFFICE

55 GOLDEN	45 LONDON
54 HINTON	44 BLUBBER BAY
53 GYPSUMVILLE	43 PRINCE ALBERT
52 THUNDER BAY	42 ATIKOKAN
51 TIMMINS	41 SAULT STE MARIE
50 SUDBURY	40 STRATFORD
49 WINDSOR	39 WOODSTOCK
48 STONEHAM	38 NEWCASTLE
47 HALIFAX	
46 SASKATOON	

Source : Special data tabulation provided by Labour Division, Statistics Canada.

47 HALIFAX

46 SASKATOON

45 LONDON

44 BLUBBER BAY

43 PRINCE ALBERT

42 ATIKOKAN

41 SAULT STE MARIE

40 STRATFORD

39 WOODSTOCK

38 NEWCASTLE

37 SAINT JOHN

36 PRINCE GEORGE

35 LLOYDMINSTER

34 UNITY

33 BRANTFORD

32 HAMILTON

31 ORILLIA

30 JOLETTE

29 MONTGOMERY

28 AMHERST

27 BROCKVILLE

26 OTTAWA/HULL

25 QUEBEC CITY

24 TRURO

23 EDMONTON

22 ST CATHARINES

21 CHATHAM

20 BRAMPTON

19 PETERBOROUGH

18 RED ROCK

17 KITCHENER

16 BELLEVILLE

15 QUEVILLON

14 WINNIPEG

13 VANCOUVER

12 CALGARY

11 SAPIA

10 GODERICH

9 CALEDONIA

8 VALLEYFIELD

7 CORNWALL

6 DOBLEAU

5 EAST ANGUS

4 TORONTO

3 DONNACONNA

2 WINDSOR

1 MONTRÉAL

employment size alone does not seem to result in greater regional dispersion of activities. Macmillan Bloedel Ltd., though the largest employer, remains highly concentrated in British Columbia. It appears that a Montreal head office location is a better indication of regional dispersion tendencies for both the International Paper Company and Domtar Limited exhibit the greatest regional dispersion in terms of actual processing facilities. In all cases, the head office city contains the greatest range of activities. A final conclusion is that the head office does exert a strong centripetal force on the location of enterprise activities; however, the strength of this attraction tends to weaken as the enterprise becomes more highly diversified as in the case of Domtar Limited.

3.4.2 The Food Processing Enterprises

The food processing industry is a low threshold activity; the threshold levels for the Meat and Poultry Products Industries are 0.0317 and 0.0020 respectively, placing them in the third and fourth threshold quartiles. It is expected that food processing activities will be found close to most major urban areas in all regions and that the greatest concentration will occur in southern Ontario and southern Quebec, the home of most Canadians.

H. J. Heinz Co. is U.S.-controlled with its head office in Pittsburgh. Canadian operations are controlled from

Toronto (Figure 3.6). Southwestern Ontario, a prime agricultural area, is the location of fruit and vegetable processing. Meat and poultry products are manufactured in

- Toronto: H. J. Heinz Co. exhibits some degree of integration in that metal stamping, pressing and coating facilities are found in Chatham, Ontario. H. J. Heinz Co.'s activities are highly localized in southwestern Ontario and it is suspected that the role played by the Canadian operations within the multinational firm is primarily to serve the large Central Canadian market although its products are distributed nationally. By locating Canadian facilities close to the Canada-U.S.A. border, close contact with the American head office and integration with food processing activities in the U.S.A. can be maintained.

The remaining three food processing enterprises - McCain Foods Ltd., J. M. Schneider Ltd. and Canada Packers Ltd. - all are Canadian-controlled. However, they exhibit very different characteristics. McCain Foods Ltd. (Figure 3.6), although small in comparison with other manufacturing enterprises, plays a major role in the economy of the Atlantic Provinces where it is the largest food processor. Its head office is in Florenceville, New Brunswick where fruit and vegetables are processed. However, the enterprise does serve a national market and has wholesale facilities in Vancouver. The head office of J. M. Schneider Ltd.

Fig. 3.6
EMPLOYMENT DISTRIBUTIONS

JM SCHNEIDER LTD.

HJ HEINZ CO.

Source : Special data tabulation provided by Labour Division, Statistics Canada.

HJ HEINZ CO.

McCAIN FOODS LTD.

3 CHATHAM
2 TORONTO
1 LEAMINGTON

2 VANCOUVER
1 FLORENCEVILLE

2000
1000
100
10

Canada.

is in Kitchener (Figure 3.6) which is the centre of its Central Canadian meat and dairy products facilities. Vancouver is the centre of western Canadian operations; Winnipeg is a wholesale outlet.

Canada Packers Ltd. is the largest of the food processing enterprises. In 1971, out of the 100 largest manufacturing, resource and utility companies in Canada, it ranked ninth in sales (Financial Post, July 24, 1971, p. 11). When it is considered that only companies such as Imperial Oil Ltd., Bell Canada, Alcan Aluminum and Ford Motor Co. of Canada surpassed the sales performance of Canada Packers Ltd. in 1971, then the necessarily large scale of its activities is more apparent. Although its head office is in Toronto, no particular regional concentration of activities is exhibited (Figure 3.9). Fruit, vegetable and meat processing facilities are found in every region which can support the operation of this type of activity. The highly integrated nature of Canada Packers Ltd.'s activities makes it unique among the enterprises discussed thus far. With regard to the meat and dairy products portion of the enterprise, it is involved in feed production, slaughtering, meat processing and packing and distribution in all regions. In addition, many meat by-products are processed to produce fertilizer, soaps and leather.

Fig. 37
CANADA PACKERS LTD EMPLOYMENT DISTRIBUTION

★ HEAD OFFICE

43 POKKA
42 LACDUBÉ
41 WETASKIN/WIN
40 LINDEN
39 MEDICINE HAT
38 BANCROFT
37 ROUYN/NORANDA
36 TROIS RIVIERES
35 WOODS LOCK

Source : Special data tabulation provided by Labour Division, Statistics Canada.

- 43 PONKA
- 42 LACOMBE
- 41 WETASKWIN
- 40 LINDEN
- 39 MEDICINE HAT
- 38 BANCROFT
- 37 ROYAL/NORANQA
- 36 TROIS RIVIERES
- 35 WOODSTOCK
- 34 BRIDGEWATER
- 33 SUMMERSIDE
- 32 THUNDER BAY
- 31 HIGHGATE
- 30 PORT WILLIAMS
- 29 TRURO
- 28 STONEY
- 27 FORNERBROOK
- 26 QUEBEC CITY
- 25 MAGRATH
- 24 SASKATOON
- 23 MOOSE JAW
- 22 HALIFAX
- 21 RED DEER
- 20 SAINT JOHN
- 19 HARRISTON
- 18 HAMILTON
- 17 BURORA
- 16 ST JOHN'S
- 15 LETHBRIDGE
- 14 SUSSEX
- 13 VANCOUVER
- 12 CHILLIWAK
- 11 WALKERTON
- 10 HULL
- 9 JOLIETTE
- 8 CHARLOTTETOWN
- 7 CALGARY
- 6 BRAMPTON
- 5 EDMONTON
- 4 BRANTFORD
- 3 WINNIPEG
- 2 MONTREAL
- 1 TORONTO

Compared to the pulp and paper enterprises, the food processors are much more dispersed regionally. The lower threshold level associated with food processing activities means that there is scope for a larger number of establishments to exist since the minimum market size required for successful operation is lower than for pulp and paper and related activities. This also contributes to greater regional dispersion since minimum requirements for investment in plant and equipment are lower. The pulp and paper industry, for the most part, manufactures products which have a higher value per unit than does the food industry; hence, it can more easily withstand the higher transportation costs associated with regionally concentrated activities. It also tends to be more raw material oriented than the food processing industry which can locate close to both its market and its raw material sources.

3.4.3 The Electric Wire and Cable Industry

The two enterprises selected on the basis of the production of electric wire and cable are Noranda Mines Ltd. and Bell Canada. The threshold level associated with this industry is 0.2642, placing it in the highest threshold quartile. Both Noranda Mines Ltd. and Bell Canada are Canadian-controlled and are included among Canada's 100 largest companies. The head office of Noranda Mines Ltd. is in Toronto; Montreal is the location of Bell Canada's head office.

TABLE 3.2

PERFORMANCE CHARACTERISTICS OF

NORANDA MINES LTD. AND BELL CANADA, 1971

Firm Name	Sales (\$000's)	Sales Rank	Assets (\$000's)	Assets Rank	Net Income (\$000's)	Net Income Rank
1. Bell Canada	1,574,391	2	3,722,597	1	130,986	2
2. Noranda Mines Ltd.	456,748	18	871,319	14	58,222	9

NOTE: Figures in this table refer only to the performance of the firms, not of the enterprises.

SOURCE: Financial Post, July 24, 1971, p.11.

Noranda Mines Ltd. is a highly diversified and integrated enterprise. It operates miscellaneous metal and non-metal mines, iron foundries, smelting and refining facilities, some wood industries and produces plastics, chemicals, wire and cable and communications equipment. Mining activities are dispersed across all regions whereas secondary manufacturing tends to be found only in major metropolitan areas (Figure 3.8).

Bell Canada is a less diversified enterprise than is Noranda Mines Ltd.¹ It produces electric wire and cable, communications equipment and is involved in the wholesaling of machinery and equipment and in computer services. Bell Canada also exhibits less regional dispersion, although it does have manufacturing facilities in Calgary, Winnipeg, Kingston, Hull and Halifax (Figure 3.9). Its operations are highly centralized in Montreal, for unlike the previous enterprises, its head office is listed as the unit responsible for all employees, regardless of location.²

¹Discussion of the activities of Bell Canada includes only manufacturing, telephone systems offices and facilities are excluded.

²This is indicated by the results of a survey conducted by the Labour Division of Statistics Canada. All data regarding enterprise employment and diversification of activity were taken from this survey, the results of which were provided to the author as a special data tabulation.

Fig 3.8
 NORANDA MINES LTD. EMPLOYMENT DISTRIBUTION

★ HEAD OFFICE

20 CALGARY	19 SAINT JOHN	18 BRAMPTON	17 EDMONTON	16 MONTREAL
------------	---------------	-------------	-------------	-------------

Source : Special data tabulation provided by Labour Division, Statistics Canada.

Fig. 3.9

BELL CANADA: EMPLOYMENT DISTRIBUTION

★ HEAD OFFICE

23 THUNDER BAY
22 KITCHENER
21 ROUYN/NORANDA
20 ISLE DE LA MADELEINE
19 OTTAWA
18 LA TUQUE
17 CALGARY
16 MONT LAURIER

Source : Special data tabulation provided by Labour Division, Statistics Canada.

s Canada.

3.4.4 Threshold Diversification and Regional Dispersion

Characteristics of Multi-Establishment Firms

Two trends are apparent from an examination of the regional dispersion tendencies exhibited by the ten sample enterprises. First, higher threshold industries tend to be more concentrated regionally than are low threshold industries. Second, the more diversified enterprises exhibit greater regional dispersion than do those engaged in only a few closely related activities. The food processing industry is low threshold and regionally dispersed. The pulp and paper enterprises which exhibit little diversification tend to be concentrated in their head office regions. The highly diversified enterprises - Domtar Ltd., Canada Packers Ltd. and Noranda Mines Ltd. - exhibit great dispersion across all regions. Bell Canada, a high threshold enterprise with some diversification, remains centralized in the head office city of Montreal and a few other large urban areas.

Highly diversified firms tend to be the largest firms since investment in unrelated and integrated activities requires large financial resources. Diversification is a means of better guaranteeing survival for it avoids the weaknesses of specialization and dependence upon a single segment of the market. It also provides the means of growth, for firms which are willing and able to expand into

new product lines, whether through internal diversification or through merger and takeover activity, have open to them new avenues of development. As we have previously seen, oligopolistic competition is increasingly based upon product competition. At the same time, it appears that diversification leads to greater regional dispersion of manufacturing facilities.

The implications of these findings for development in national hinterland regions are mixed. On the one hand, the development of large, highly diversified enterprises means that the potential for hinterland development will increase. Branch plants have access to large, internal sources of capital and in addition, are looked upon by financial institutions as presenting lower levels of risk than do small, local firms. On the other hand, the establishment or acquisition of manufacturing facilities in regions in the national periphery by large enterprises also increases the potential for non-local control of regional manufacturing sectors to develop.¹

¹The issue of non-local control of manufacturing is discussed more fully in Chapter 4.

3.5 Organizational Structures

3.5.1 The Functional Structure

Just as the strategies of multi-establishment firms have changed through time, so have their structures. At the time of founding, the business is usually controlled by a single individual. As the firm grows, the organizational structure is adapted to increasing environmental complexity. Functional departments are established, such as sales, production and finance, each headed by a company officer reporting directly to the chief executive officer (Stopford and Wells, 1972). Each department is responsible for one specialized part of the firm's activities, creating a composite structure which is capable of accommodating considerable growth. Thus, one of the first adaptations to increasing size is the creation of a hierarchy of decision-making units. Communication and flows of information are coordinated such that routine 'control' aspects are distributed among several individuals leaving the chief executive officer free to handle strategic responses. A functional structure performs most efficiently when environmental change is slow and when product lines are not too broad (Rumalt, 1974). Hence, it is most characteristic of firms operating in stable or placid environments, that is, under conditions of imperfect competition.

3.5.2 The Divisional Structure

Another type of organizational structure is that organized on divisional lines, which is adopted most commonly when new product-lines are added or when new market areas are entered (Stopford and Wells, 1972). The functional structure is no longer efficient since the added number of responsibilities that would have to be assigned to departmental heads would multiply the number of coordination and communication linkages beyond the point where one individual could adequately cope with them. Therefore, product or area divisions are formed, each headed by a general manager who performs most of the duties previously assigned to the chief executive officer in the functional structure. The finance and planning aspects, however, remain centralized; that is, the head office retains control over strategy and growth. The multi-divisional structure is thought to be superior in situations in which the firm has many diverse products and its economic and technological environments are subject to rapid change (Rumelt, 1974).

Of course, not all multi-functional, multi-establishment firms conform to this general outline of the evolution of corporate decision-making hierarchies, for personality factors, particularities of firms' histories and so on will affect firms uniquely. However, studies of highly diversified, multinational corporations undertaken by several

2

researchers (Brooke and Remmers, 1970; Tugendhat, 1971; Stopford and Wells, 1972; Rumelt, 1974) have indicated that the outline of the evolution of decision-making structures discussed above represents the most common and successful path of evolution followed by the multinational giants of today.

Rumelt (1974) examined the strategies and structures of a sample of 244 firms listed among the top 500 by Fortune. He found that from 1949 to 1969, the product-division type of structure increased as a corporate characteristic from 20.3 percent to 75.9 percent of the sample, whereas the functionally organized structure fell from 62.2 percent to 11.2 percent (Rumelt, 1974, p. 65). These changes primarily represent structural reorganization among the top 500 firms rather than the entry of new firms organized along product-division lines. Strategy and structure exist in a cause-effect relationship. The conclusion is that diversification strategies predominated among large firms because price competition in oligopolistic environments can be very debilitating; hence, product and other non-price forms of competition have become the dominant strategy to ensure continuing growth. The unit responsible for devising growth strategies is the head office. Suggestions as to the form which growth strategies should take may be made by subsidiary managers; however, they cannot

implement such strategies until they have head office approval of their plans.

3.6 The Head Office - Branch Plant Relationship

A characteristic feature of multinational companies is that their subsidiaries operate under the discipline and framework of a common global strategy, and common global control. The head office is the brain and nerve centre. It evolves the corporate strategy, decides where new investment should be located, allocates export markets and research programmes to the various subsidiaries, and determines the prices that should be charged in interaffiliate exchanges. (Turgendhat, 1971, p. 126).

The three functions that remain centralized at the head office are the control function, the planning process and coordination of interaction between subsidiaries (Stopford and Wells, 1972).

3.6.1 Control and Planning

The control function monitors performance and allocates funds. The head office retains power of budgetary approval, thus determining the allocation of investment capital and hence growth or contraction of any of its subsidiaries. The planning process includes the formulation of long-range plans, market research and the searching for new products or new market areas. Its operations are based upon information gathered from the divisional offices and from the financial group. The highly centralized nature of decision-making relating to finance and planning acts as a severe and

effective constraint upon the autonomy of the activities of the firm's branch plants. If a plant manager proposes a short-term investment strategy that does not conform to the long-range strategic plan outlined by the head office, then the necessary funds will not be released for that purpose. Thus, planning activities are highly interrelated with control activities.

The principal means by which planning control is exerted is by annual budgets. Subsidiary managers submit estimates of operating costs for the upcoming years. In addition, capital budgets are required. These include lists of major, non-recurring and routine investments. The former would include such projects as the addition of a new subsidiary or a major expansion to an existing one, entering a new market, launching a new product or the acquisition of a foreign-owned concern (Brooke and Remmers, 1970). Subsidiary managers must obtain head office approval for major and routine investment proposals; only in day-to-day affairs do they exercise any independence and even in this, they respond to company-wide policy, taking decisions that in no way will jeopardize long-range company plans.

3.6.2 Sources of Investment Capital

With time, as a subsidiary becomes firmly established, it tends to become increasingly financially independent of

the parent. Internal cash flow and the utilization of local capital markets provide most of the capital required both for routine operations and major investments. The fact that a mature subsidiary has become fully self-financing, though, does not alter its relationship of subservience with the head office.

Growing financial independence on the part of foreign subsidiaries is of increasing concern to host countries. In recent years, American-based multi-nationals financed approximately 40 percent of their overseas operations from cash flows generated abroad, 35 percent from local borrowing abroad and 25 percent through capital transfers from the U.S.A. (Tugendhat, 1971, p. 185). Recent restrictions on capital outflows by the American government have probably increased the importance of foreign sources of capital. Countries allowing the establishment of foreign subsidiaries must accept that in the long-run, they will become net capital exporters for subsidiary remittances to the parent eventually will exceed the amount of the initial capital investment.

A second issue of concern is the increasing reliance of foreign subsidiaries on local sources of capital. In comparison to many domestic concerns, foreign subsidiaries have the advantage of being part of much larger and more

powerful corporations. This mere fact of association means that often domestic financial institutions perceive loans to such subsidiaries as being less risky than to small, domestic firms. Investment and risk capital, therefore, is loaned more readily to large foreign subsidiaries, giving them an added competitive advantage over domestic firms. Discrimination against domestic entrepreneurs by Canadian financial institutions early in the nation's history had a particularly great influence upon the subsequent structure of the Canadian manufacturing sector, leading to a high degree of foreign control of manufacturing (Chapter 2).

3.6.3 Transfer Pricing

The manipulation of transfer prices by large multinational corporations is a third source of irritation to host countries. If goods and services exchanged on an inter-subsidiary basis do not occur on the open market, then there is no fully standard basis on which to establish a suitable price. In the case of subsidiaries operating in the home country, prices are usually set according to a standardized formula, relating to cost, a fixed mark-up to cover profits, direct manufacturing costs and so on (Brooke and Remmers, 1970). In other words, 'arm's length' pricing usually is the rule.

However, in the case of foreign operations, prices often are constructed to achieve certain corporate goals

which may or may not mean the maximization of a particular subsidiary's profit performance. For example, if the host country's taxes on profits greatly exceed those in the home country, then goods and services sold to the foreign subsidiary from within the corporation may be over-priced in order to reduce that subsidiary's net profit. This is essentially a hidden revenue transfer mechanism. Similarly, transfer prices are manipulated by multinational corporations in order to remove capital from a country which is experiencing exchange rate difficulties (Tugendhat, 1971).

3.6.4 Coordination of Inter-subsidiary Interactions

The third function centralized at the head office, coordination of inter-subsidiary interactions, is responsible for organizing flows of raw, semi-finished and finished materials between plants. For small manufacturing establishments, transport costs are reduced by locating close to suppliers and markets. Agglomeration economies associated with the proximity of firms which exhibit many forward and backward linkages help to reduce production costs. However, this is not necessarily the case for manufacturing establishments which are members of large, multi-establishment firms. One of the stimuli to integration is the fact that costs and uncertainty relating to the quantity and quality of inputs and dependability of markets can be reduced by placing all of these under the control of one body - the head office. As a

result, plants belonging to integrated, multi-establishment firms tend to trade more frequently among themselves, thus reducing their dependency upon outside suppliers and markets. In other words, inter-subsidiary linkages become internalized by the firm, reducing their interaction with local isolated or agglomerated firms (Gilmour, 1974).

This is one means by which multiplier effects arising out of inter-plant linkages become 'leaked' to other regions. Rather than providing a market for local suppliers or a source of supply for local firms at stages further along in the manufacturing process, plants interacting with sister-plants remain isolated from the local environment. Usually, the head office undertakes ancillary activities such as advertising and consulting work itself, or it employs outside firms which are located close to it. Therefore, little opportunity is available for such activities to develop and thrive in the regions where its several plants operate.

The leakage of direct and indirect multipliers to other regions associated with highly integrated, multi-establishment firms means that regions in which single branch plants are found find it difficult to develop industrial agglomerations. Moreover, local firms therefore exist in relative isolation. They cannot reap the cost savings

associated with agglomeration economies and so endure higher production costs which place them in a poor competitive position relative to the larger, multi-establishment firms. Of course, the very fact that any manufacturing establishment is located in a region means that some direct multiplier effects are felt for the added regional employment and income leads to the growth of some service activities. However, these usually are oriented to the needs of the labour force only and create little basis upon which a highly integrated manufacturing sector can be built. Industrial and urban underdevelopment often are the results of non-local control of regional branch plants as will be discussed in Chapter 4.

3.6.5 'Open' versus 'Close' Relationships

The degree to which control, planning and coordination of inter-subsidiary interaction functions are centralized at the head office will vary with particular company philosophies and local conditions affecting the subsidiaries. The relationship between a head office and subsidiaries can be described as 'open' or 'close' (Brooke and Remmers, 1970). Some of the factors promoting an 'open' relationship in which subsidiary management has a considerable amount of freedom to act on its own are: the existence of great socio-economic differences between foreign countries and the home country; and good economic performance on the part of

subsidiary management. However, even in cases where an 'open' relationship could be justified, pressures toward closeness often are strong. These pressures include such factors as subsidiary management developing goals which are contrary to those of the firm as a whole and, most important, the organization structure of the firm (Brooke and Remmers, 1970). Firms organized on a product group basis, emphasizing a global strategy which often includes international rationalization of production, place great value on close head office control. Overall, long-term pressures are toward close relationships; the trend is toward greater personal independence in everyday matters, but with a limited area of discretion and narrowing limits of decision-making on the part of subsidiary managers.

If subsidiary managers wish to be upwardly mobile within the firm, they must eventually move to the head office. In the case of American-controlled firms operating in Canada, the corporate head office is found in the U.S.A.. Unwillingness to move to a foreign country and a tendency for American corporations to favour fellow-nationals over foreign employees means that the possibilities of upward mobility of Canadian managers within U.S.-controlled firms are reduced. As a result, Canadian management structures exhibit characteristics of a 'truncated decision-making hierarchy' - the peak of the hierarchy has been chopped off,

therefore reducing the number of opportunities available to Canadian managers for upward mobility within foreign-controlled firms.

3.7 The Multi-Establishment Firm and Non-Local Control

Although the preceding discussion refers specifically to multinational corporations, it should be borne in mind that at a general level they apply to the activities of any multi-establishment firm. The term 'multinational' implies, essentially, non-local control of economic activity with the added twist of the foreign ownership element. However, when dealing with large domestic concerns the same spatial element is observed even within single countries. The head office and related activities remain centralized in one part of the country whereas production activities exhibit wide regional dispersion. The aspect of non-local control remains for most regions, regardless of country of control. In the case of Canada, non-local control in a particular region will have similar effects whether emanating from Toronto or from New York.

It is at the national scale that the foreign element of control will have its greatest impact. Some examples are the influence of inter-subsidiary trade on the balance of payments, transfer pricing, the intrusion of foreign policies into domestic affairs, such as the American prohibition on trading with certain countries, and so on.

Discussion of each of these in detail is beyond the scope of this paper. However, the point being stressed is that non-local control, whether foreign or domestic, will have a similar regional impact in that a relationship of dependency develops between regions having production facilities and those having head office units.

3.8 Summary

The nature of manufacturing industry has undergone several changes during the twentieth century. One of the results of merger activity has been the development of large, multi-establishment firms. The first North American merger wave occurred from 1897 to 1905, leading to the emergence of horizontally integrated oligopolistic firms. Hierarchical decision-making structures were adopted as a means of coping with the added number of responsibilities which accompanied an expansion of the number activities. The earliest type of hierarchical decision-making structure was that organized along functional lines. Later, as merger actively continued and as horizontal and vertical integration increased, the management of large firms was reorganized; the functional structure was replaced by a divisional structure. In this way, large firms were able to adapt to increasing environmental complexity.

One of the stimuli behind the reorganization of management structures was the development of new corporate

goals. Cost minimization and profit maximization were the goals attributed to the single entrepreneur who operated under conditions of imperfect competition. As the relationship between large firms changed to one of oligopolistic competition, however, the new goals of the firm became survival and growth, leading to the adoption of strategies of diversification. Direct spatial consequences arise out of the diversification of firms' activities. An examination of the distribution of enterprises and their constituent establishments in Canada in 1975 indicates that the more highly diversified firms exhibit wide regional dispersion of activity. This means that the potential for economic development of regions in the national periphery will increase as they are drawn into the web of inter- and intra-organizational linkages. However, an additional implication of this is that non-local control of regional resources also will increase for the corporate head office retains control over all planning and investment decisions.

Although the organization of decision-making within large, multi-establishment firms has received great attention in the literature, the locational implications of these changes have been relatively neglected. It is, therefore, the locational aspects which must now be examined in order to consider the question of how far corporate reorganization has influenced locational shifts in manufacturing activity.

CHAPTER 4

HEAD OFFICE LOCATION AND POLARIZED

GROWTH

4.1 Introduction

Differential growth within the urban system can largely be attributed to the interplay of three factors: the spatial distribution of corporate decision-making units; the location of research and development activities; and the diffusion path followed by innovations. By implication, differential rates of regional economic development also result. The role of uncertainty and access to information looms large in relation to each of these causing a concentration of head offices and research and development facilities in metropolitan locations. The direct and indirect multiplier effects arising out of these activities are large and contribute substantially to the growth of retail and service activities and activities ancillary to administrative functions. For reasons of uncertainty and access to information, the results of research and development efforts are implemented first in these locations giving them a competitive advantage over regions which adopt these innovations at a later point in time. The result is that the size and power of the national 'centre' grows whereas

development in the periphery lags.

4.2 The Spatial Distribution of Head Offices

The hierarchical organization of decision-making within multi-functional, multi-establishment firms is expressed spatially as well as functionally. Generally, the distribution of the different levels in the corporate hierarchy exhibits a close correspondence with the several levels of the urban system hierarchy. Production facilities and routine decision-making activities are widely dispersed throughout the urban hierarchy; head offices and strategic decision-making activities are concentrated overwhelmingly in metropolitan centres (Pred, 1974). Thus, functional scale has a counterpart in physical scale.

Generally, even within the metropolitan class of urban centres there are a few which contain the majority of manufacturing firms' head offices. These are metropolitan centres of national importance within the heartland region. For example, in 1970, the U.S. north-eastern manufacturing belt contained 61.6 percent of the head offices of the 1000 largest manufacturing corporations, but only 31.9 percent of the total U.S. population (Pred, 1974, p. 19). Within this region, New York, Chicago and Pittsburgh dominated in terms of numbers of head offices. Similar high levels of head office concentration in national heartland regions have been found in other Western countries. London and the South-east

are dominant in Britain (Parsons, 1972; Westaway, 1974) and Stockholm and Göteborg dominate in Sweden (Thorngren, 1970; Törnqvist, 1970, 1973).

The two most critical factors affecting the location of head offices of private manufacturing firms are the high quality and quantity of information available in large metropolitan regions and the ease with which face-to-face contacts are made (Pred 1973, 1974, 1975a, 1975b; Thorngren, 1970; Törnqvist, 1970, 1973; Westaway, 1974).

4.2.1 The Role of Information

Routine or programmed decisions are those taken at the local or regional level within the organizational hierarchy and they involve an exchange of information with the immediate environment. The time-horizon involved is short and continuous feedback is ensured due to the immediacy of the impact of such decisions. Programmed responses involve only existing alternatives which themselves are set by higher decision-making levels (Thorngren, 1970).

Head-office units, however, are responsible for deciding upon the goals of the corporation as a whole and must set policies and planning procedures that will result in the attaining of these goals. Thus, they scan much broader sectors of the environment. The time horizon is long-term, usually greater than four years (Brooke and

Remmers, 1970), so that the outcome of decisions taken cannot be known with any certainty for several years. High levels of risk and uncertainty are associated, therefore, with strategic decision-making (Chamberlain, 1968). The development and choice of alternative courses of action - the planning function - demands comprehensive contacts with other groups such as government and competitors and potential technology or innovation activity as well as with the broader socioeconomic environment and existing technology (Thorngren, 1970). The orientation function involves continuous monitoring of the environment in order that future developments may be predicted and so prepared for, thus reducing the uncertainty and risk that envelop all organizations and individuals.

All activities possess different locational requirements as a result of their different functional demands. The demands made by head office functions focus on the need for highly specialized information:

... the nature of information flows in major urban regions is particularly relevant to orientation, and, to a lesser extent, planning relations. The information required for programmed activities, on the other hand, is available in smaller urban centres [I]nformation density and quality is a crucial factor in the location of head offices. (Westaway, 1974, p. 147).

Uncertainty increases with distance from the market, resulting in decreasing returns on investment; hence, activities

tend to concentrate in core regions (Webber, 1972) the development of which spans decades and depends largely upon initial advantage and circular and cumulative growth as discussed in Chapter 2. Large quantities of specialized information in metropolitan regions also attract other information-dependent activities such as financial and legal institutions and business service activities such as advertising and public relations agencies and management consultants. Particularly in the case of multi-establishment firms, information regarding competitors, government and national and international market, supply and labour conditions is gained most readily in metropolitan areas in heartland regions. Personal contacts, specialized publications and organized meetings are the most common information sources. The resulting agglomeration and urbanization economies and high densities of information, all of which interact to produce a high intensity environment, provide conditions which are significantly less uncertain than are to be found in peripheral regions. Consequently, a disproportionate number of corporate head offices are found in the national heartland.

4.2.2 The Role of Face-to-Face Contacts

Another distinction between head office units and lower level administrative and production units is the manner in which information is gained. Head office personnel require

face-to-face contacts with head office personnel of other organizations and with government as well as with specialized business service activities. The impact of telecommunications has been to eliminate almost entirely the need for direct contact at the lowest levels in the organization hierarchy. This has social significance in that it is at this level that the largest number of people is to be found. The very highly specialized and subtle nature of information generated by face-to-face contacts, however, has been found to be not yet amenable to replacement by telecommunication modes (Khan, 1974). It is expected that the importance of face-to-face contacts to head office personnel will increase as society becomes more complicated and unpredictable as a result of increasing specialization and accelerating change whereas for most members of society, the need will decrease (Törnqvist, 1970).

Thorngren (1970), in a study of the contact patterns of Swedish business executives, found that programmed decisions involved only short, fast contacts associated with daily coordination and routine activities. Although these accounted for 70 percent of the contacts made by the organizations, the breadth of the information exchanged was insignificant. The messages were one-way, well-structured and, without exception, consisted of written messages or telephone conversations. On the other hand, contacts associ-

ated with 'control' functions represented highly sophisticated and time-consuming relationships with the environment. These contacts accounted for only 5 percent of total organizational contacts made, but they represented more than 80 percent of all new contacts (Thorngren, 1970, p. 419).

Several advantages are associated with face-to-face contacts. The level of uncertainty associated with the making of nonroutine decisions is reduced since direct contacts permit immediate feedback. Additional information often is acquired unintentionally as a result of personal interaction. The bulk of executive time is consumed by face-to-face contacts and so the concentration of activities in selected metropolitan areas reduces the time and hence the costs associated with executive meetings (Törnqvist, 1973).

4.2.3 Head Office Location and Urban and Regional

Growth

The growing size and importance of multi-establishment firms means that they are playing an increasingly important role in the growth of large urban areas. Head office units and other information-dependent activities are concentrated in metropolitan areas. They both require and generate information, thus creating the conditions for their own agglomeration. Activities responsible for the issue and exchange of information are employing an increasing number of people, whereas the number employed in activities involving

the manufacture and handling of goods is decreasing (Pred, 1974; Törnqvist, 1973). The growth of this post-industrial 'technostructure' (Galbraith, 1971) is now characteristic of most Western industrialized nations.

Inter-urban interactions are no longer purely hierarchical in nature. Communication flows are structured by the distribution of multi-establishment firms (Pred, 1974). The direction of flows is highly dependent upon the location of head offices: information flows up the urban hierarchy to centres of greater size, down the hierarchy and across it between centres of similar size. In the vast majority of cases, however, communications flows emanate from metropolitan centres located in the heartland region.¹ Communications between organizations follow similar patterns.

These trends have a significant impact upon urban system growth and regional development. Those urban areas with

¹For example, the dominance of New York City within the American economic system and the potential problems posed by such concentration of financial and business control are illustrated by the recent power failure experienced by this metropolitan region. The closing of Wall Street activities and the New York Stock Exchange resulted in the loss of billions of dollars and the disruption of business transactions nationally and internationally..

many organizational linkages become 'information-rich', thus attracting more activities in a self-perpetuating growth process, regions not highly involved in the organizational system remain comparatively underdeveloped. Differences in employment structure, income and educational levels and other socioeconomic characteristics also result (Törnqvist, 1973). The actual production of goods is becoming increasingly automated. As a result, employment in these activities is declining relative to employment in administrative activities. At the same time, the growth of diseconomies of scale in large metropolitan areas has led to the decentralization of production units to peripheral regions where the possibilities of lower production costs are greater. Availability of resources and amenities are additional factors promoting the decentralization of production facilities.

In essence, there is a growing dichotomization within the urban and regional systems: national heartland areas are highly diversified, containing both 'control' and production activities; the remainder of the country - the periphery - is involved predominantly in production activities only, reacting to decisions taken at the core and providing a market for goods, a source of labour and so on. Peripheral regions are in a 'colonial' relationship with the national system of cities (Pred, 1974). There are few interaction

ties between cities in distant regions; rather, they interact on an individual basis with metropolitan areas of national importance.

4.2.4 Head Office Location in Canada

The analysis of head office location in Canada and subsequent analyses in this paper are based upon a special data tabulation provided by the Manufacturing and Primary Industries Division of Statistics Canada. The data consist of a total listing of manufacturing establishments employing more than 1000 workers in Canada in 1971, hereafter referred to as 'large establishments'. This represents a total of 133 establishments which are branch plants of 108 firms.¹ The large foreign element of control of the Canadian manufacturing sector, particularly of very large establishments, is indicated by the following breakdown of the sample firms: 38.0 percent are Canadian-controlled, 44.4 percent are U.S.-controlled and 9.3 percent are controlled in other foreign countries.²

¹See Appendix C for a listing of the establishments and firms.

²Country of control could not be established for 8.3 percent of the firms primarily because of confidentiality restrictions. Data on 'country of control' were obtained from Statistics Canada, Intercompany Ownership, 1972, Catalogue 61-513.

The distribution of the Canadian-level head offices of the sample firms exhibits a very concentrated pattern (Figure 4.1). Of the head offices of the 108 firms, 95 or 88.0 percent are found in urban areas located in the heartland.¹ The southern Ontario portion of the heartland is clearly dominant, having 53.7 percent of all head offices, whereas 34.2 percent are found in southern Quebec. The highly uneven nature of economic development even within the heartland is indicated by the fact southwestern Ontario and the Montreal region in Quebec contain all but six of the head offices of the 95 firms. Only 12.0 percent of the sample firms have their head offices in non-heartland locations.

Some differences in location can be distinguished on the basis of 'country of control', particularly with regard to Canadian- versus U.S.-controlled firms. Only one out of a total of 47 U.S.-controlled firms has its head office in a non-heartland location. This one exception is a San Francisco-based pulp and paper firm whose head office is in

¹Data from several sources were integrated to derive head office locations at the Canadian level. The sources used were: Dun and Bradstreet of Canada, Ltd., Canadian Key Business Directory, 1972; Moody's Industrials, 1971; Scott's Industrial Directory, Ontario Section, 1970-71; Scott's Industrial Directory, Quebec Section, 1969-70.

Fig 41
LOCATION OF CANADIAN-LEVEL HEAD OFFICES OF LARGE FIRMS, 1971

COUNTRY OF CONTROL

	UNKNOWN
	OTHER FOREIGN
	UNITED STATES
	CANADA

Source : Dun and Bradstreet of Canada Ltd., Canadian Key Business Directory, 1972; Moody's Industrial Directory, 1971; Scott's Industrial Directory, Ontario Section, 1970-71; Scott's Industrial Directory, Quebec Section, 1969-70.

tory, 1972; Moody's Industrials,
 Scott's Industrial Directory,

Vancouver. U.S.-controlled firms operating establishments in Canada are based primarily in the U.S. manufacturing belt and in a few other large American metropolitan areas (Figure 4.2). Fourteen of the sample firms are controlled from New York City. This represents almost one-third of the U.S.-controlled firms. Detroit, Chicago, Akron and Minneapolis are the head office locations of another 27 percent of the U.S.-controlled firms operating in Canada. Southwestern Ontario and the Montreal region dominate the rest of Canada in terms of the location of the Canadian-level head offices of U.S.-controlled firms in 1971.

This pattern conforms well to the 'Economic Shadow' model as outlined by Ray for 1961 (Ray, 1971). The model emphasizes the importance of accessibility both to the U.S. head office and major Canadian metropolitan regions, particularly Toronto and Montreal, in locating branch plants of U.S.-controlled firms. Accessibility and ease of communication are of even greater importance in locating a Canadian-level head office for its situation must satisfy at least two basic conditions. First, the Canadian-level head office will perform some 'control' functions. Therefore, it must be located in an 'information-rich' region. Toronto and Montreal, being metropolitan areas of national importance, offer such advantages as a high density and quality of information, good accessibility to other urban areas in Canada.

Fig 4.2
US HEAD OFFICE LOCATIONS
OF US FIRMS HAVING LARGE
ESTABLISHMENTS IN CANADA
1971

Source : Moody's Industrials, 1971.

and the U.S.A., a large and skilled labour force and proximity to the largest domestic market area. Second, connectivity to major American cities must be high in order to allow the exchange of information required for strategic decisions taken at the head office of the firm as a whole to be implemented at the Canadian branch plant level. Thus, although the 'Economic Shadow' model applies explicitly to the location of U.S. subsidiaries, its components and reasoning apply equally well to the location of Canadian-level head offices of U.S.-controlled firms.

The distribution of the head offices of Canadian-controlled firms is at once more concentrated and more dispersed than that of U.S.-controlled firms. Only 78.0 percent are found in the heartland; however, the Toronto and Montreal regions dominate to a greater extent together containing 93.8 percent of the Canadian-controlled firms' head offices versus 80.9 percent of the Canadian-level head offices of U.S.-controlled firms. On the other hand, Canadian-controlled firms appear to be more willing to locate their head offices in non-heartland locations: 9 of the 41 Canadian-controlled firms have head offices in peripheral regions. Vancouver, the largest metropolitan area in western Canada, contains five of these.

The location of head offices of manufacturing firms in Canada, then, appears to conform well to the model of head office location outlined above. Metropolitan areas particularly within the Canadian heartland are, for the most part, the centres of 'control' of the Canadian manufacturing sector. Availability of information, accessibility to other major centres both in the U.S.A. and Canada, and urbanization and agglomeration economies afforded by these metropolitan regions are the major factors influencing this pattern. Unlike other sectors of the Canadian economy in which large corporations exist such as life insurance, banking, utilities, transportation and retailing, the pattern of head office location of manufacturing firms is becoming ever more concentrated. Semple (1973) examined regional dispersion tendencies of corporations in each of these sectors of the economy with the addition of diversified finance over the period 1966 to 1972. He found that in all classes, the trend was to greater corporate head office dispersion with the exceptions of manufacturing and diversified finance which became more concentrated.

The extent of control emanating from Toronto, Montreal and Vancouver varies greatly (Figure 4.3). Toronto-control in Quebec is found only in Montreal whereas Montreal-control is dispersed throughout southern Ontario. However, Toronto controls slightly more establishments in Montreal than

Fig 4.3
EXTENT OF CONTROL 1971
MONTREAL, TORONTO, VANCOUVER

HEAD OFFICE CITY

△ MONTREAL

□ TORONTO

○ VANCOUVER

Number = HQ established

No number = 1 HQ estab

Source : Special data tabulation provided by Manufacturing and Primary Industries Division, Statistics Canada.

mary Industries Division,

Montreal does in Toronto. Vancouver-control is very localized, being found only in southwestern British Columbia. Vancouver's strength and growth potential lies, somewhat paradoxically, in its distance from the Canadian heartland. The importance of Vancouver as the major regional centre serving western Canada parallels a similar situation in the case of San Francisco and Los Angeles. The national importance of Vancouver as a 'gateway' to oriental countries reinforces its dominant regional position.

4.3 Innovation and Regional Technologies

In an environment which exhibits many oligopolistic tendencies, competition takes the form primarily of production competition and diversity of output rather than of price competition (Utton, 1970). Significant competitive advantages accrue to firms which successfully introduce new products to the market, be it a final demand or intermediate market. One of the goals of competitive innovation is to create a short-term monopoly over a portion of the market. With time and assuming that there is a market for the product, knowledge about the innovation increases, more firms adopt the innovation and the initial competitive advantage decreases. The nature and location of production associated with the innovation also change. These spatio-temporal trends have several implications for the national distribution of manufacturing activity and can be illustrated

through an integration of literature regarding the product life cycle and innovation diffusion.

4.3.1 The Product Life Cycle

Strictly speaking, the application of the product life cycle model is to international trade theory. It states that as a product matures, it passes through several stages each of which represents a change in the method and location of production (Wells, 1972). The first commercial production is likely to occur in a large market, even if innovation does not first occur there. The greater availability of risk capital in large metropolitan areas plays a significant role in this. Also, since the product is new, demand is relatively inelastic. Hence, the price can be high and there is no need to search for a cheaper labour force (Wells, 1972). Levels of uncertainty are lower in large metropolitan areas primarily because of the availability of more and better information. Pressures to maintain quick communication with the market are great and often result in rapid product changes. Consequently, production runs initially may be short requiring large inputs of capital and highly skilled labour. The most highly industrialized nations, particularly the U.S.A., are most likely to be centres of industrial innovation (Wells, 1972).

With time, however, production becomes less concentrated. New foreign markets can no longer be tapped solely on

the basis of exports; rather, branch plants are established. By this point, production has become standardized. Economies of scale, elasticity of demand for the product and the income level and size of foreign markets are some of the factors influencing the rate with which branch plants are established. Gradually, exports from the innovating country decline.

With greater standardization and a larger market, the skills demanded of the labour force become less stringent and levels of uncertainty associated with production decline. At the same time, the competitive advantage also declines causing a decrease in the income effect. Therefore, regional skills and relative per capita incomes can be maintained only by a more or less continuous introduction of new products and technologies (Krumme and Hayter, 1975). At the final stages, relatively underdeveloped countries or, at a smaller scale, regions, take over production using the simplified technology, benefitting little in a competitive sense, while the centres of innovation initiate several more rounds of the process, benefitting greatly from the short-term monopolies they enjoy.

4.3.2 The Location of Innovation Activity

Pred (1966) has outlined the close interdependencies between industrial invention, industrial innovation and urban growth in the U.S.A. during the late nineteenth

century. Five major factors promoted the concentration of innovation activity in a few, large metropolitan areas. First, many inventions were developed in response to a demand for technological advances. This high demand was most likely to occur in rapidly growing centres where manufacturing was agglomerating and where there was an adequate supply of risk capital. Second, advances in technology usually occurred as a response to particular problems. These arose in greatest frequency in areas where the volume of manufacturing activity was greatest. Third, the modification of a product, process or the structure of organization meant that often, it was necessary to adapt 'linked' activities. Hence, a chain of innovation activity would be activated. The influence of "technological convergence" is a fourth factor. Technologies developed for a particular use could be adapted and applied to other activities, setting off a chain of reaction in another direction. Fifth, the social environments of rapidly growing metropolitan areas tended to encourage inventive activity. Levels of immigration were high. The new skills and new ways of looking at the world brought to the U.S.A. by immigrants provided a large impetus to inventive activity. The social milieu favoured progress and rewarded those who contributed to this end.

The contemporary location of innovation activity exhibits the same concentration in a few, major metropolitan areas, for many of the same reasons. Competitive advantages arising out of early adoption of past innovations gave an initial advantage to centres of present innovation. For the most part, these are the major metropolitan centres today. In the case of Canada, southwestern Ontario, Toronto and Montreal all were centres of rapid industrial growth in the late nineteenth century.

Most large firms are actively involved in innovation activity and the environment is one of risk and uncertainty. The impact of this environment is minimized by locating research and development facilities in regions where there is a high density and high quality information and where face-to-face contacts are facilitated. Close contact between research, marketing and management is required in order to ensure that a demand exists or can be created for a new product. A sufficiently skilled labour force willing and able to adapt to the new technology also is necessary (Krumme and Hayter, 1975). Functions performed by the head office such as monitoring of the environment and strategic decision-making must superintend research activities closely in order to ensure that the goals of the firm are met. Hence, research and development activities tend to be located in response to the same factors that influence head

office location. The fact that close contact must be maintained between research, marketing and management personnel provides an added constraint on the spatial mobility of research and development facilities (Buswell and Lewis, 1970).

4.3.3 Research and Development in Canada

The Canadian manufacturing sector has not been noted for its volume of research and development activity (Safarian, 1969). The bulk of Canadian companies are small and do not compete on the basis of product differentiation to the same extent as do large multi-establishment firms. The large capital expenditures required to finance research and development and associated activities such as re-equipping plants, means that the research and development threshold is high. Thus, a certain minimum size of firm is necessary before such expenditures can be undertaken. Traditionally, Canadian manufacturing industry has tended to rely heavily upon the adoption of foreign 'proven' technologies. The associated level of risk is lower than if innovations were developed domestically. Canadian manufacturers have been most dependent upon technology originating in the U.S.A.. The large element of American control of Canadian industry has both resulted from and caused this relationship of dependency:

Canadians are risk-aversers, or more accurately, the Canadian environment makes it more acceptable to be risk-aversers, as indicated by our predilection for debt securities. To a large extent, we can trace our difficulties with foreign ownership to risk-aversion and our resulting preference for debt securities, coupled with a desire to enjoy a higher living standard. When the Canadian industrial economy was emerging, instead of borrowing funds externally as the Americans did and retaining equity control, we did the reverse, allowing others to assume the risk of ownership, and, in many cases, LOANED them the funds to exploit our own opportunities. (Grasby, 1975, p. 19).

Data were collected on employment in research and development facilities associated with the sample 108 firms for which head office information was collected. Only 49 or 45.4 percent of these firms indicated that they operated research and development facilities.¹ Of the 41 Canadian-controlled firms, 46.3 percent indicated that they operated research and development facilities in Canada whereas only 39.6 percent of the 48 U.S.-controlled firms did so. Canadian-controlled firms represent 38.0 percent of the sample 108 firms and 38.8 percent of the firms reporting research and development establishments. U.S.-controlled

¹Data on research and development facilities were taken from Canada, Ministry of State for Science and Technology, Directory of Research and Development Establishments in Canadian Industry, 1973. These data must be treated with caution for firms were asked to submit reports on a voluntary basis only. Thus, it is very possible that the data are incomplete.

firms represent 44.4 percent of the total number of firms, but only 38.8 percent of those having research and development facilities in Canada.

The poorer performance of the U.S.-controlled firms is not unexpected; the bulk of their research activities will be found, for the most part, in proximity to the American head office location. Those that do undertake research and development in Canada do so for a variety of reasons depending upon the particular firm involved. Those firms in which Canadian-level operations enjoy some autonomy from the parent are more likely to be involved in independent research and development. However, it is suspected that most of the U.S.-controlled research and development remains highly linked with the parent firms and is oriented primarily to the adaptation of American technology to Canadian conditions. For example, the harsher Canadian climate often requires the modification of final demand and producer goods. Also, the smaller size of the Canadian market means that, in most cases, production runs are shorter (Daly, Keys and Spence, 1968) requiring some modification to plant and equipment.

The location of research and development facilities in Canada exhibits a highly concentrated pattern (Figure 4.4). Ninety percent of the sample research and development

Source : Canada. Ministry of State for Science and Technology, Directory of Research and Development Establishments in Canadian Industry, Ottawa, 1973.

Note: The large number of employees in research and development facilities in Ottawa is so anomalous; it is a result of the existence of a large research establishment - Bell Northern Research - within the 'Bell Canada' Enterprise.

ry of Research, and Development

ilities in Ottawa is somewhat
establishment - Bell

facilities are located in the heartland. Accessibility to the Canadian market and to the north-eastern U.S.A. and proximity to Canadian head offices play a major role in promoting this degree of concentration for reasons of accessibility to information and the reduction of uncertainty.

4.3.4 Innovation Diffusion

Geographical literature regarding innovation diffusion has tended to examine the spread of agricultural innovations and new consumer products, rather than of manufacturing innovations. Notable among these are studies undertaken by Hägerstrand (1972) and Berry (1972). These and other studies have found that an innovation tends to diffuse in two ways simultaneously. First, at the local level, flows of information and direct personal contacts gradually cause an increased awareness of the innovation. The innovation diffuses in a wave-like fashion referred to as the neighbourhood effect, to a point of saturation. Second, at the national or international scale, communication linkages based on business and personal ties causes the innovation to diffuse hierarchically through the urban system. The agglomeration of activities in large metropolitan areas generates dense communication networks. Also, innovations are usually first introduced to these market areas. Hence, information regarding new products, processes or organizational structures tends to reach these areas before centres lower

in the urban hierarchy. Consequently, initial advantages associated with early adoption accrue to the largest centres giving them a further impetus to rapid and stable growth. Imbalances in the size and importances of centres are therefore augmented.

The growing dominance of inter- and intra-organizational linkages means that increasingly, information diffusion does not travel across and down the urban hierarchy; rather, flows of information exhibit a much more complex pattern of distribution. In some cases, after first 'testing' an innovation in a large metropolitan area, head office personnel may decide to begin large-scale production immediately and centre that production in a smaller region where costs are lower. Imitation may only begin at this point, with the diffusion of the innovation flowing up the urban hierarchy to other centres. More often, however, the strongest linkages exist between head office cities.

Through time, the factors affecting production technology change. In the initial testing period, production runs are short and are frequently modified so as to match the supply and nature of the product to demand. As the market grows and economies of large scale are realized, both the nature and location of production changes. Production runs become longer as the market grows to accept a large volume

of mass-produced goods. Diseconomies of scale associated with large metropolitan areas encourage producers to search for new locations where land, labour and other inputs are cheaper. New regional and international markets are tapped. Gradually, as technology becomes simplified, it "trickles-down" to more distant regions (Pred, 1974). Through time, the income effect associated with the innovation also tends to decrease. Hence, peripheral regions, which are usually late in the adoption process due largely to their smaller quantities and poorer quality of information and fewer inter- and intra-organizational linkages, lag behind national core areas in terms of development (Westaway, 1974; Krumme and Hayter, 1975). The lack of a well-developed and integrated regional urban system plays a major role in maintaining the economic development gap.

4.4 The Heartland - Hinterland Paradigm

Friedmann (1972) has presented a model of polarized development which clearly outlines the mechanisms by which centre-periphery or heartland-hinterland contrasts are propagated. The space-economy is integrated through the pattern of authority-dependency relationships. Core regions are major centres of innovative change and so they dominate the national urban and economic systems. Peripheral regions "... are subsystems whose development path is determined chiefly by core region institutions with respect

to which they stand in a relation of substantial dependency" (Friedmann, 1972, p. 93).

Centre-periphery dependency relationships occur at the international, national, regional and local scales. Studies have been undertaken at each of these scales and in all cases, the mechanisms involved have been found to be the same. At the international scale, exploitation of Third World resources by Western nations from the colonial era to the present has been focused upon as the causal agent. Similarly, at the national scale, the impact of organizational linkages on economic development in the periphery has been examined, for example: in Britain by Parsons (1972) and Westaway (1974); in Sweden, Törnqvist (1970, 1973) and Thorngren (1970); in South America, Pederson (1975) and Friedmann (1966); in Australia, McKay and Whitelaw (1977); and in the U.S.A., Pred (1973, 1974).

The nature, direction and timing of development in the periphery are controlled by core institutions. Primary and human resources flow from the periphery to the core where processing takes place. Later, peripheral regions must purchase the higher-priced manufactured goods. Of course, the periphery benefits from rapid growth in the core, referred to as 'spread effects'; however, income and employment benefits tend to decrease with time and with distance from

the centre. Hence, periphery growth lags relative to that in the core. The relatively high rates of unemployment and lower than average incomes in the Atlantic Provinces and Quebec indicate that these mechanisms are very powerful forces in perpetuating regional disparities in Canada (Figures 4.5a and 4.5b). The Prairie Provinces, too, experience these same problems but, being a predominantly agricultural region, much of the unemployment found there is disguised.

Non-local control of manufacturing activity is frequently put forward as one of the major obstacles to economic development in the periphery. Periphery urban areas are oriented to major metropolitan regions in the heartland. As a result, significant regional external economies are absent, employment multipliers escape to the core and, frequently, earned profits are removed from the local area (Pred, 1974; Westaway, 1974; Parsons, 1972). Few intra-organizational multipliers are felt due to the lack of many administrative positions. Plants commonly utilize 'trickled-down' technology which does not require highly skilled labour. Any indirect multipliers that do result are, consequently, very weak. Peripheral regions are more dependent upon imports of goods from other regions; the 'openness' of their economies means that they are more sensitive to national business cycles and hence, are economi-

cally unstable (Sant, 1973).

On the other hand, peripheral regions which contain branch plants of firms based in the heartland can be considered to be better off than peripheral regions which do not have any direct linkages with the core. People react to their environments in a spatially biased manner and corporate decision-makers are no different (McNee, 1960). Unfamiliarity with a region causes an individual to perceive it with greater uncertainty than if he has had personal contact or even general information about that region. Corporate decision-makers have greater knowledge about regions in which their branch plants are located, at least with regard to specific economic conditions influencing the operation of their plants. Flows of information are spatially biased. They are densest in the core, but they also extend to peripheral branch plants. Regions without branch plants do not suffer the loss of local multipliers and do not experience outflows of capital in the form of profits. However, they also do not benefit from the input of investment capital into new plants and many suffer seriously from a lack of communication linkages with the core. Innovations diffuse along these communication channels and, although branch plant regions may only receive 'trickled-down' technology, at least they are involved in the process of technological change to a greater extent.

At best, regional plant managers may be given autonomy and resources sufficient to stimulate the development of linked industries and contain the outflow of capital and migrants. Isolated regions lack these opportunities.

4.5 Summary

The hierarchical organization of decision-making within large, multi-functional, multi-establishment firms has a direct spatial expression which corresponds closely to the urban system hierarchy. Locational requirements related to the need for large quantities of specialized information and ease of face-to-face contacts dictate that head office units be located in metropolitan areas of national importance. A communications network links the head office with production facilities which are then left free to decentralize to locations less afflicted with diseconomies of urban scale. As a result, corporate activities are becoming increasingly regionalized; the heartland performs 'control' functions in addition to manufacturing, placing the production-oriented periphery in a situation of dependency.

In Canada, the heartland region is the centre of agglomeration of the head offices of both Canadian- and foreign-controlled firms. Since production facilities are located in many regions, non-local control of regional resources, physical and human, has developed. The disadvantages of non-local control such as the leakage of

regional multipliers to the heartland are countered by several advantages, the most important of which is the inclusion of peripheral regions in the national system of inter- and intra-organizational linkages.

The implications of these findings for regional development policy are discussed in Chapter 6. First, however, it is necessary to examine some of the factors affecting the location of production facilities. In the following chapter, two distributions are analyzed, that of large manufacturing establishments and that of all manufacturing establishments regardless of size. Such an analysis, in conjunction with the findings of this chapter, provides a composite view of some of the influences to which large manufacturing firms are reacting in taking locational decisions.

CHAPTER 5

THE DISTRIBUTION OF LARGE MANUFACTURING ESTABLISHMENTS IN CANADA

5.1. Introduction

In Canada in 1971, there were 133 large manufacturing establishments.¹ More than fifty percent of these were foreign-controlled; 44.4 percent were U.S.-controlled; 7.5 percent were controlled in other foreign countries; and 41.3 percent were Canadian-controlled.² A number of hypotheses are tested so that the factors influencing the distribution of large manufacturing establishments may be identified and compared to those affecting the distribution of all manufacturing establishments regardless of size. Principal components analysis with an orthogonal varimax rotation is used due to its parsimony, that is, as a data-reduction technique. It simply defines the basic dimensions of the data, making no assumptions about common factors. (Rummel, 1970).

¹Large manufacturing establishments' have been defined earlier in the paper as those establishments which each employ more than 1000 workers.

²The 'country of control' could not be established for 6.8 percent of the sample primarily due to confidentiality restrictions.

The advantages associated with this application of principal components analysis are twofold: several variables measuring different aspects of a given characteristic are collapsed to form a single aggregate indicator, the components thus defined are statistically independent and so, when used in subsequent analyses such as multiple regression models, meet rules of statistical independence among independent variables. Since several variables exhibit very skewed distributions, some transformations are utilized. Two sets of multiple regression analyses follow.

The use of dual sets of principal components and multiple regression analyses using first untransformed and then transformed data was necessary in order to meet two usually conflicting requirements: conceptual clarity of interpretation and satisfaction of statistical rules. The use of untransformed data satisfies the former requirement whereas the use of transformed data satisfies, to some extent, the latter.

The 133 large manufacturing establishments are distributed throughout 53 counties (Figure 5.1) which, in all analyses, comprise the cases examined; that is, $N = 53$. Ideally, it would have been desirable to include all 256 counties of Canada in 1971; this was not possible, however, due to the fact that in the case of one dependent variable

ary Industries Division,

(the number of large establishments) and three independent variables, no values or zero-values only could be obtained for 203 counties.

Central Canada contains 87.22 percent of the large manufacturing establishments. Therefore, the analysis is focused upon the relative attraction of locations within the most highly urbanized and industrialized region in Canada. The fact that other regions which are less highly developed have no large establishments is not taken into account. In other words, these analyses are applied to only one portion of a multi-population universe.

5.2 Rationales for Selection of Input Variables

In developing hypotheses to explain the distribution of large manufacturing establishments, two discriminatory characteristics were used: the establishments each employed more than 1000 workers and so make large supply, market and labour demands; and 74.44 percent of them are found at a location different from that of the head office of the firm as a whole. This latter point indicates conclusively that almost three-quarters of the sample establishments are members of multi-establishment firms.¹ The hypotheses are

¹The data do not indicate how many of the remaining 25 percent also are members of multi-establishment firms, for the large establishment location and the head office location are identical. It is probable that the above-

divided into two groups: those which apply to the location of all manufacturing activity in general and those applicable to multi-establishment firms in particular. These two categories are not mutually exclusive; variables found in each category are relevant to all manufacturing activity. However, a few of the variables are of particular importance to the location of establishments which are spatially divorced from their head offices.

5.2.1 Variables Applying to All Manufacturing Activity

The hypotheses forming the basis of this set of variables are those relating to market and labour force conditions, access to finance capital and foreign control characteristics.¹

Market influences are measured by five variables relating to population size and by one variable relating to income as surrogates for measures of purchasing power.

stated figure of 74.44 percent of the establishments being members of multi-establishment firms is an underestimation of the actual figure.

¹The importance of supply conditions is recognized; however, these cannot be taken into account explicitly without examining the particular practices of each establishment involved. Detailed case studies of this nature were beyond the scope of this paper.

Manufacturing industry is an urban-oriented activity. The concentration of a large number of people and of purchasing power, that is, demand, is one of the factors encouraging this concentration of activity. The impact of demand requirements is measured by: percentage of the county population which is urbanized, 1971 (URB % 71); population growth by county, 1951 to 1971 (POPCH 517); population potential by county, 1971 (MP 71), which is a measure of the aggregate accessibility of each county to the total Canada population; absolute population of the largest urban area, by county, 1971 (POPLGURB); and absolute value of the total county population, 1971 (POP 71).¹ The latter two variables (POPLGURB and POP 71) measure not only the absolute size of the regional market but also are threshold-related indicators. A certain minimum level of population size and urbanization must be reached before most manufacturing industries will be attracted to an area. As market requirements increase, the threshold level associated with a particular type of manufacturing activity also increase. Hence, those counties which contain very large urban areas will have few restrictions on the type of activity and size of establishment. The fact that the number of people in an area is great, however, does not necessarily mean that demand

¹Table 5.1 contains a list of all variables and their corresponding labels.

requirements will be met. for it is the purchasing-power of that market that adds strength to demand. As the level of average income in a county increases, the aggregate demand also will increase, thus attracting new industries and encouraging the expansion of those already present. Average family income by county, 1971 (AVINC 71) is a measure of regional purchasing-power.

The size of the regional labour force is expected to have an impact upon the location of manufacturing activity. The hypothesized relationships between this variable (MANULF %) and each of the dependent variables are mixed. In the case of large establishments, a large labour force should exert a further, powerful, attractive force. However, when all manufacturing establishments regardless of size are examined, the size of the regional labour force will be both cause and effect. Large urban areas, by offering a large quantity of labour skilled in different activities, present the labour conditions necessary to allow industrial agglomeration. The very fact that a large number of manufacturing establishments is found in a particular location, though, means that inevitably there will be a large regional manufacturing labour force.

Access to financial resources is measured by the percentage of the labour force in finance, insurance and real estate positions (FINANCE).¹ Uncertainty has a spatial dimension and tends to increase with distance from major metropolitan centres. As a result, investment capital tends to be easier to obtain and has lower interest rates attached to it in major metropolitan centres. Therefore, "... as distance from the market increases, rising uncertainty forces firms to become smaller and also, because of lower returns, fewer economic activity tends to concentrate at the centre of the market (Webber, 1972, p. 204). Toronto and Montreal are the dominant financial centres in Canada with Vancouver forming a growing, but still small, centre on the west coast. Southern Ontario contains the greatest number of secondary financial centres, followed by southern Quebec (Kerr, 1972). Therefore, in terms of access to finance capital, the Canadian heartland should provide better conditions for attracting manufacturing activity than do regions in the periphery.

¹The variable 'FINANCE' is a surrogate measure for the availability of investment capital in each of the counties examined. Ideally, a variable measuring the actual availability of investment capital such as total financial resources of banks and other lending institutions would permit a more accurate assessment of the relative accessibility of investment capital than does a variable measuring employment in such activities. However, these data were not readily available and so a surrogate measure was used.

Small manufacturing establishments will be greatly affected by the location of financial resources. First, due to their size, they will be very vulnerable to uncertainty since, in most cases, their information about and ability to affect their environments is minimal. Second, again due to their size, they will have greater need to rely on external sources of capital in order to survive and grow. Large manufacturing establishments, particularly those which are members of multi-establishment firms, are more able to generate investment capital internally (Brooke and Remmers, 1970) and so are less affected by the location of financial institutions. When necessary, it is possible for them to utilize capital provided by the parent company. However, this is rarely necessary since, by virtue of belonging to multi-establishment firms, they are perceived by financial institutions as carrying lower levels of risk. As a result, they often can secure loans with greater ease and at least cost. It is expected, therefore, that the location of a large labour force in finance and related activities will have a smaller impact upon the location of large manufacturing establishments.

A major element in Canada's manufacturing sector is foreign control. Spatially, it is highly concentrated and is found, for the most part, in the heartland cities in the Windsor to Quebec City corridor (Scorror and Williams,

1976). With the exception of a few centres where foreign control is high, notably Montreal, Windsor, Niagara and Hamilton, foreign control as a percentage of total manufacturing value-added tends to decrease with increasing distance from Toronto. Much of this is due to the 'economic shadow' effect arising out of the proximity of the United States' manufacturing belt to southern Ontario. The number of large establishments and the volume of manufacturing activity should decrease, therefore, with distance from Toronto (DISTO) and should increase as the percentage of the labour force which is foreign-controlled increases (FORCONT) (Table 5.1).

Spatially, Toronto can be taken as the centre of the Canadian heartland. The region also can be defined functionally through the specialization index which measures the extent to which excess employment in a city is concentrated in a single or in a few activities. When the specialization index is calculated for the 137 Census Agglomerations and Census Metropolitan Areas in Canada for 1970,

[a] clear distinction emerges between the heartland cities, which form a manufacturing belt stretching from Windsor to Quebec City, and the hinterland cities. Hinterland cities, with the notable exception of mining towns, tend to have a more diversified employment structure as shown by their lower specialization indexes:

(Li, 1976, p. 85).

The specialization index (SPECIND), therefore, is used as

one measure defining the heartland and as it increases so too should the volume of manufacturing activity.

5.2.2 Variables Applying to Large Establishments in

Particular

There are four variables that apply with particular relevance to large establishments which are members of multi-establishment firms. Two of these are measures of connectivity, one measures access to information and one measures the proportion of the manufacturing labour force which is involved in administrative activities. The head office of the firm as a whole of 74.44 percent of the establishments are at locations distant from that of the establishment. However, many of the establishments are members of foreign-controlled firms which also have a Canadian-level head office; consequently, 53.38 percent of the large establishments perform head office functions in addition to manufacturing. Therefore, these variables can be regarded as factors affecting head office location.

In the case of both head office and production units, connectivity with major domestic and foreign urban areas is of great importance in location. The allocation of responsibility for strategic decision-making to the head office and the preference for face-to-face contacts when exchanging critical types of information means that a significant amount of executive travel takes place on an inter-organization

basis between head offices and between these and manufacturing establishments, that is, on an intra-organization basis. The friction of distance associated with the movement of people is great and has "... a perceptible influence on the location of activities and therefore also on the regional development of employment" (Törnqvist, 1970, p. 80). Administrative functions are contact-intensive. They tend to favour locations which facilitate ease of contact. Consequently, administrative functions agglomerate in major metropolitan areas and, in choosing sites for production facilities, favour those locations which allow efficient inter-urban travel. In most cases, and particularly in Canada, these favoured locations are those which offer good inter-urban air connections (Stafford, 1974). Two variables relating to air connectivity, therefore, are included in the analysis: distance in miles to the nearest airport,¹ which is the lowest level of air connectivity (DISNEAIR); and distance in miles to the nearest international airport (DISINTER), which is oriented toward

¹ Airports can be divided into two broad classes: those offering regularly scheduled commercial services and those offering services which vary as to demand. Only the former type is included in calculations of connectivity since regularity of flights is the major consideration affecting the location of branch plants.

identifying locations which offer the greatest accessibility to foreign-controlled firms.

Accessibility to information is another factor which has a great influence upon the location of manufacturing activity, particularly upon the location of administrative units. The generation of information increases with population size; therefore, the size of the county population in 1971 and the absolute population of the largest urban area in each county can fulfill the dual purposes of being threshold indicators and measures of potential information accessibility. However, in the case of multi-establishment firms, information about the local socio-economic environment is a necessary, but not sufficient, condition of location. Head office units also must have access to a wide variety of information about regional, national and international developments. The potential model,¹ by measuring mass, should be an indication of the

¹The population potential model is:

$$V_i = K \sum_{j=1}^n \frac{P_j}{D_{ij}} \quad \text{where}$$

V_i = population potential at place i ; P_j = population at place j ; D_{ij} = distance between i and j ; and K = constant.

Often the term ' D_{ij} ' has an exponent attached to it. However, the size of the exponent varies as to a number of

total amount of information generated in a region, within a national context (Pederson, 1975). As the population potential of a county (MP 71) increases, so too should the number of head offices and the volume of manufacturing activity. A final variable measuring the extent to which administrative functions are agglomerating in major metropolitan areas is the percentage of the manufacturing labour force which is employed in administrative activities by county, 1971 (ADMIN %).

These fourteen variables (Table 5.1) were subjected to two separate principal components analyses. A comparison of the means and standard deviations of the variables (Appendix F) indicated that five of them were highly skewed; these were subjected to either a ' $\log_{10}$ ' or a 'square-root' transformation.

characteristics, for example, the level of economic development of a region. It commonly is empirically derived. Since the application of the exponent suffers from lack of consistency, it has been omitted from the calculation of the population potential for each county.

TABLE 5.1

THE INPUT VARIABLES AND THEIR LABELS

Label	Variable	Transformed Variable
1. URB % 71	Percentage Urbanized Population, 1971	-
2. POPCH 517	Percentage Population Change, 1951-1971	-
3. MP 71	Population Potential, 1971	-
4. POPLGURB	Population Size of Largest Urban Place, 1971	LOG_{10} POPLGURB
5. POP 71	Population Size of County, 1971	LOG_{10} POP 171
6. AVINC 71	Average Family Income, 1971	-
7. MANULF %	Percentage Labour Force in Manufacturing, 1971	-
8. FINANCE	Percentage Labour Force in Finance, Insurance and Real Estate, 1970	-
9. FORCONT	Percentage of Manufacturing Labour Force Which is Foreign-controlled, 1970	-
10. DISTO	Distance to Toronto	$\sqrt{\text{DISTO}}$

Continued

TABLE 5.1 continued

Label	Variable	Transformed Variable
11. SPECIND	Specialization Index	-
12. DISNEAIR	Distance to Nearest Airport	$\sqrt{\text{DISNEAIR}}$
13. DISINTER	Distance to Nearest International Airport	$\sqrt{\text{DISINTER}}$
14. ADMIN %	Percentage of Manufacturing Labour Force in Administrative Positions	-

NOTE: See Appendix D for a list of the sources used to calculate each variable.

5.3 Principal Components Analyses

5.3.1 Untransformed Data

The fourteen variables collapsed to form five components having eigenvalues equal to or greater than 1. Together the components account for 73.1 percent of the information contained in the input variables. The five components were subjected to an orthogonol varimax rotation in order to derive the best aggregate fit, defining conceptually

clear dimensions within the data.¹

Component One is the largest of the five components, containing 21.79 percent of the variation within the total data matrix. The variables loading highly on Component One are: DISNEAIR (-.72), DISINTER (-.76), URB % 71 (.68) and POP 71 (.68). The dimension defined by this component is that of 'Urban-Connectivity'; it identifies urban areas which enjoy high accessibility and, therefore, ease of inter-urban travel. The second component accounts for 18.86 percent of the total variation. High loadings are exhibited by POPCH 517 (.94), AVINC (.75), POPLGURB (.62) and FINANCE (.60). Each of these variables is a measure of 'Urban Size'. The high loadings of DISTO (-.86) and FORCONT (.76) indicate that the third dimension, accounting for 13.59 percent of the variation, is that of 'Foreign Control', for as distance from Toronto, the major Canadian market, increases, the extent of foreign control tends to decrease. Component Four identifies centres which are specialized in 'Non-Manufacturing Activities' as indicated by component loadings of .80 for SPECIND and -.63 for MANULF %. Finally, Component Five, which is the most specialized of the dimensions, is loaded upon highly by only

¹Appendix F.1 contains a list of the rotated components and their loadings.

a single variable, ADMIN % (.51), and so identifies those locations where there is concentration of manufacturing administrative workers.

5.3.2 Transformed Data

The input to the second principal components analysis consisted of 9 variables that remained in their original forms and 5 variables which were transformed in an attempt to normalize their distributions (Table 5.1). This resulted in a few changes in the component structure. A total of five components were extracted, together accounting for 76.7 percent of the information contained in the input data matrix. These also were subjected to an orthogonal varimax rotation.

The same five dimensions were identified in this principal components analysis as in the analysis using all variables in their untransformed state. However, the magnitude and order of importance of the extracted components changed. The proportion of the variation accounted for by the 'Urban-Connectivity' component increased to 26.29 percent. 'Foreign Control', which was the third largest component extracted in the first principal components analysis, increased to second position, accounting for 16.23 percent of the variation in the data matrix. 'Urban Size' decreased in magnitude to 14.84 percent, while 'Non-Manufacturing Centres' and 'Manufacturing Administration'

changed only slightly. Most of the component loadings experienced minor increases. The only notable change in component structure was the shift of FINANCE from the 'Urban Size' component to 'Urban-Connectivity'. Theoretically, it could load highly on either component since an urban size dimension is included in both.

The results of the two analyses, then, are fairly consistent. The basic dimensions of the data are summarized by five components which vary little in magnitude and order of importance: Urban-Connectivity, Foreign Control, Urban Size, Non-Manufacturing Centres and Manufacturing Administration. The five components form the independent variables of two sets of multiple regression analyses, the purposes of which are to explain the distribution of large manufacturing establishments in the first case and second, to explain the distribution of all manufacturing establishments.

5.4 Multiple Regression Analyses

5.4.1 Dependent Variable: Number of Large Establishments
Two multiple regression analyses were performed using the number of large establishments as the dependent variable: in the first, the dependent variable is used in its untransformed state and the independent variables are the five components derived from the principal components

analysis using untransformed variables. In the second multiple regression analysis, the dependent variable is $\log_{10}$ number of large establishments and the independent variables are those derived from the principal components analysis using transformed variables.¹

The 'untransformed' multiple regression analysis resulted in the equation:

$$Y = 2.51 + 1.93X_1 + 0.92X_3 + 0.74X_2 + 0.72X_5 + 0.36X_4$$

The regression equation is significant at the .001 level and accounts for 42.98 percent of the variation in Y. The 'transformed' equation is:

$$Y = 0.21 + 0.13X_2 + 0.13X_1 + 0.06X_3 + 0.03X_4 + 0.02X_5$$

This equation also has a significance level of .001 and accounts for 37.21 percent of the variation in Y. In both cases, the distribution of manufacturing establishments remains highly skewed and the standard errors of the regression equations are large (Appendix G). In fact, if the analysis is taken to -1 standard error of the estimate, then a negative quantity of Y is predicted. This result is conceptually unsatisfactory. In the case of both the

¹ Hereafter, these will be referred to as the 'untransformed' and the 'transformed' multiple regression analysis respectively.

TABLE 5.2
VARIABLES AND THEIR SIGNIFICANCE LEVELS:
'UNTRANSFORMED' AND 'TRANSFORMED' REGRESSION
EQUATIONS, $\bar{Y}$ = NUMBER OF LARGE ESTABLISHMENTS

'Untransformed' Regression Equation				'Transformed' Regression Equation			
	Variable Name	Beta	Signi- ficance Level		Variable Name	Beta	Signi- ficance Level
X_1	Urban-Connectivity	0.53	.001	X_2	Foreign Control	0.41	.001
X_3	Foreign Control	0.25	.05	X_1	Urban Connectivity	0.40	.01
X_2	Urban Size	0.20	-	X_3	Urban Size	0.19	-
X_5	Manufacturing Adminis- tration	0.20	-	X_4	Non-Manufacturing Centres	0.10	-
X_4	Non-Manufacturing Centres	0.10	-	X_5	Manufacturing Administration	0.07	-

NOTE: See Appendix G for summary tables of the two multiple regression analysis;
'-' denotes 'not significant'.

'untransformed' and the 'transformed' analyses, the relationship between the number of large manufacturing establishments and each of the independent variables is positive as was hypothesized.

Some important conclusions can be reached when the significant variables are examined. In both analyses, only two variables are statistically significant: 'Foreign Control' and ~~'urban-Connectivity'~~. If the 'transformed' regression equations are examined, it will be noticed that the impact of 'Foreign Control' on the distribution of large establishments ($b = 0.13$) is equal to that exerted by 'Urban-Connectivity' ($b = 0.13$). Similarly, the increase in R^2 associated with each of these variables is approximately the same: the change in R^2 associated with 'Foreign Control' is 0.17 and with the addition of 'Urban-Connectivity', the R^2 increases again by 15.64 percent (Appendix G.2). The addition of the remaining three variables does little to increase the explanatory power of the regression equation.

As discussed earlier in the paper, foreign control of Canada's manufacturing sector tends to be greatest in the 'large establishment size' classes. The importance of this component in both analyses confirms this tendency. The hypothesis that large urban areas which possess good air

connections will present favourable location conditions for large establishments also is supported. Most of the establishments are members of multi-establishment firms and the majority of these are foreign-controlled. Therefore, although the regression equations themselves are weak, they do lend support to the arguments presented above.

5.4.2 Dependent Variable: Total Number of Manufacturing Establishments

Two multiple regression analyses were performed using the total number of manufacturing establishments, regardless of size, per county ($N = 53$) as the dependent variable. In the first, all variables are input in their untransformed state. In the second, a log transformation is applied to the dependent variable and the independent variables are the components derived from the 'transformed' principal components analysis.

The 'untransformed' multiple regression analysis produced the equation:

$$Y = 388.78 + 596.49X_1 + 192.79X_2 + 180.04X_5 + 125.59X_4 + 99.99X_3.$$

The equation is significant at the .001 level and accounts for 50.25 percent of the variation in Y. The use of transformed variables increased the strength of the regression equation significantly. The regression equation, which is significant at the .001 level and which accounts for 69.32

TABLE 5.3

VARIABLES AND THEIR SIGNIFICANCE LEVELS,
'UNTRANSFORMED' AND 'TRANSFORMED' REGRESSION
EQUATIONS. Y = TOTAL NUMBER OF MANUFACTURING ESTABLISHMENTS

'Untransformed' Regression Equation				'Transformed' Regression Equation			
	Variable Name	Beta	Significance Level		Variable Name	Beta	Significance Level
X_1	Urban-Connectivity	0.63	.001	X_1	Urban-Connectivity	0.68	.001
X_2	Urban Size	0.20	-	X_2	Foreign Control	0.41	.001
X_5	Manufacturing Administration	0.19	-	X_3	Urban Size	0.24	.01
X_4	Non-Manufacturing Centres	0.13	-	X_4	Non-Manufacturing Centres	0.10	-
X_3	Foreign Control	0.11	-	X_5	Manufacturing Administration	0.06	-

NOTE: See Appendix H for summary tables of the two regression equations; '-' denotes 'not significant'.

percent of the variation in Y, is:

$$Y = 2.09 + 0.40X_1 + 0.24X_2 + 0.14X_3 + 0.06X_4 + 0.03X_5$$

The untransformed dependent variable exhibits a highly skewed distribution, which is largely remedied by the log transformation (Appendix H). The final 'transformed' analysis presents very satisfactory results, having a standard error of the estimate of 0.34. The relationship between the number of all manufacturing establishments in each county and each of the independent variables is positive as hypothesized above.

Again, 'Urban Connectivity' is statistically significant as is 'Foreign Control'. In addition, 'Urban Size' emerges as a strong variable affecting the distribution of manufacturing activity among the 53 counties. When the results of the 'transformed' analysis only are examined (Appendix H.2), it is apparent that the contribution made to R^2 by 'Urban-Connectivity' is much greater than that made by any of the other variables. In fact, more than 50 percent of the total R^2 , which equals 69.32 percent, is made up by this variable. The addition of 'Foreign Control' to the equation causes a further increase in R^2 of 16.68 percent, bringing the total variation in Y explained by these two variables to 62.37 percent. The addition of subsequent

variables adds little to the explanatory power of the regression equation.

5.5 Summary

Upon examination of the results of the principal components and multiple regression analyses, it is possible to make some very conclusive statements regarding the factors affecting both the distribution of large manufacturing establishments and of manufacturing activity in general among the 53 sample counties.

The two components having the greatest impact upon these distributions are: 'Urban-Connectivity' and 'Foreign Control'; the dimension 'Urban Size' is a secondary influence. Large urban areas which enjoy high accessibility to airports, particularly to international airports, attract manufacturing establishments of all sizes. Being large, they will generate large quantities of information which is a major factor in reducing the uncertainty with which manufacturers must contend. The impact of uncertainty is greatest on small firms since, individually, they can affect the broad socioeconomic environment very little. Small firms are less self-sufficient than large firms and so tend to be more dependent upon the cost advantages associated with external economies of scale offered by industrial agglomerations (Gilmour, 1974; Britton, 1976).

Flows of information tend to be directed by the pattern of metropolitan interdependencies, which is synonymous with the pattern of inter- and intra-organizational linkages. The growth and development of highly integrated subsystems of cities within a country is a circular and cumulative process. Historically, southern Ontario and southern Quebec dominated the Canadian urban and economic systems in terms of manufacturing growth and the concentration of financial resources. This initial advantage led to rapid population growth, the passing of successive thresholds and manufacturing growth that through time provided a continuous reinforcement of the region's dominant economic position in Canada. Metropolitan interdependencies were moulded by this pattern of growth such that the largest cities possessing good inter-urban connections became the centres both of manufacturing activity and of manufacturing control. The two components of the manufacturing system most oriented toward the dense flows of information generated within this highly integrated urban system are small firms and the head offices of large firms; hence, they exhibit a locational pattern which is highly concentrated in these large centres. Large manufacturing establishments which are members of multi-establishment firms do not require such a high degree of spatial concentration. Their strongest linkages are intra-organizational; the head office,

by remaining centralized in the national heartland, provides the communication linkage, leaving the large establishments free to choose locations which satisfy more mundane needs such as access to large quantities of cheap labour or land, or to raw materials. It therefore is possible for large establishments to decentralize to locations less afflicted by diseconomies of urban scale.

Foreign control of Canada's manufacturing sector also exhibits a highly concentrated pattern, tending to be greatest in the heartland. The distribution of all establishments and of large establishments are equally affected by 'Foreign Control' as indicated by the beta-weights attached to this component in the 'transformed' regression equations. This leads to the conclusion that, although foreign-, particularly U.S.-control, is greatest in the large establishment size classes, there is very little variance in the location of this investment across all size groups. Therefore, it is not establishment size considerations which lead to the concentration of U.S. direct investment in southern Ontario. Since uncertainty tends to increase with distance from the major market area, U.S.-controlled firms will tend to associate investment in Canada with higher levels of risk and so will take measures to locate their investment in areas where risk is minimized. The southern Ontario and southern Quebec region offers

locational advantages: it is accessible to, and highly integrated with, major urban areas in the U.S. manufacturing belt. Consequently, communication linkages are well-established. Studies which have examined the behavioral aspects of locational decision-making have found that the search for a new plant location conducted by a firm often is very limited in scope. Uncertainty is reduced by seeking standard successful solutions by copying its own past successes or by imitating competitors, thus contributing to agglomeration tendencies (Rees, 1974). Therefore, large urban areas which are highly interdependent due to inter- and intra-organizational linkages will attract a large volume of both foreign and domestic investment in their manufacturing sectors.

Although the locational freedom enjoyed by large manufacturing establishments is greater than for small establishments, it still remains circumscribed. It is possible for them to decentralize out of major urban areas; however, the heartland region continues to present the most favourable locational conditions.

CHAPTER 6

SUMMARY AND CONCLUSIONS

6.1 Economies of Scale, Functional Specialization and the Multi-Establishment Firm

Large, multi-establishment firms increasingly are becoming the dominant form of industrial organization. Although their number is small in comparison with all manufacturers, the impact they have upon the socioeconomic environment is of great significance. Several consequences arise out of their size. Each firm individually employs a large labour force; therefore, locational decisions which, if they are major are taken at the head office, will affect the placement of a large number of workers. In the case of relatively small urban areas, decisions taken by people who often have no interest in the area beside the fact that it is one element in a much larger web of production, can mean either the continued prosperity of the town and region or, if a decision is taken to reduce production and therefore employment, the economic future of that town is placed in some peril.

Economies of large scale are not associated with a single plant only, although these are important, but also

with multi-establishment operations. The allocation of specific, specialized duties to each unit within the firm allows the utilization of resources at their maximum efficiency. A study conducted by Daly, Keys and Spence (1968) found that in comparison to the U.S. manufacturing sector, Canadian manufacturing suffered from an inability to reap economies of large plant scale due primarily to the small size of the domestic market. Production runs were short and a single plant often manufactured a wide variety of products. The existence of multi-establishment firms offers the potential for this problem to be overcome. Although each establishment must remain oriented to its external environment, it also retains an internal orientation to the rest of the firm which, in many cases, may exceed in importance the external orientation. A feature of multi-establishment firms is that of integration and rationalization of production. Hence, constituent establishments commonly exist within a linked chain of activities. Some units may be responsible solely for the attraction and primary processing of raw materials, others manufacture the final products. Specialized administrative units take care of the organization of inter-establishment flows of materials, some have responsibility for the marketing of the final goods, including advertising, and still others allocate and otherwise plan the use of the financial resources of the

firm as a whole. Specialization of activity leads to greater efficiency. The large, multi-establishment firm epitomizes this on a broad scale. The orientation of each unit inward to the firm means that all production can be rationalized. Units can be established having very long ~~production~~ runs since market areas can extend across large regions and even across nations.

The functional breakdown of a firm's administrative and production activities into discrete units means that each can be located so that its particular needs are met. There is no single optimum location for a firm; rather, there are several optima, each being applicable to a particular functional unit. A web of communication linkages forms the arterial system through which flow the impulses of action and reaction. Some of these impulses are of a routine nature and so have a very localized impact; the particular unit affected adjusts to the change with little impact upon other units. Other impulses, however, are large and ~~require~~ a flow of information to the head office, the centralized 'control' unit. Decisions as to the nature of the reaction to the change in the environment are taken here and a flow of information returns to the affected units.

6.2 Multi-Establishment Firms and Regional Growth

The new corporate goals of survival and growth are reflected in strategies of product diversification. An examination of enterprise diversification and locational characteristics led to two major conclusions: firms involved in low threshold activities tend to exhibit a dispersed locational pattern; and firms involved in a wide range of activities tend toward a regionally dispersed distribution. These are tendencies only and the degree to which any one firm can be classified into either of these categories depends to a large extent on its age and size. The finding regarding dispersal tendencies among 'low threshold' firms is not unexpected for the very meaning of the term 'threshold' indicates that when the threshold value is low, relatively small regional markets and supplies of material inputs and labour will be sufficient to attract such activities. One of the stimuli to the development of functionally diversified, multi-establishment firms has been the fact that the organizational structure of these firms is such that the particular advantages offered by a variety of regions can be tapped with little or no loss due to decentralization. The head office remains centralized in the economic heart of the country, providing vital communication links with facilities that are then left free to locate with regard to the specific requirements of each unit. In other words, specialized functions can satisfy specialized

locational requirements provided that organizational linkages are maintained at an efficient level of operation. The regional dispersal of the activities of multi-establishment firms is advantageous to the regions involved since their inclusion in the national network of inter- and intra-organizational linkages will enhance their potentials for economic growth and development.

The major disadvantage is the orientation of branch plants inward to the firm. If, however, regions can offer cost advantages in terms of supplies of materials that otherwise would be obtained through intra-firm linkages, then the possibilities of more independent regional growth will be increased. Efforts directed toward the encouragement of the growth of ancillary services such as consulting firms, regional advertising agencies and legal services could contribute toward the development of regional agglomerations of manufacturing and related activities. Manufacturing activities, regardless of whether they are members of larger organizations, are conscious of the cost and quality of services they utilize. There also is a tendency on the part of regional plant managers to increase their independence from head office controls (Brooke and Remmers, 1970). If it can be demonstrated by a particular region that it can efficiently supply some of the services normally provided by the head office and related units with no loss

in the quality of operation of an establishment, then a slight reorientation of the establishment from complete dependence on the firm to a higher degree of integration with other regional activities could be made possible.

Some regional linkages could replace intra-firm linkages and so provide a basis for some independent regional development through the reduction of regional multiplier leakages.

The critical factor is the upgrading of human resources in peripheral regions for the growth of services ancillary to manufacturing requires a highly skilled and professional labour force.

6.3 Head Office Location and Non-Local Control

Since for most firms the head office has responsibility for taking all major decisions and for assuring that the goals of survival and growth are met, its impact is felt over the broadest area; all but the everyday activities of each unit are closely monitored and directed by the head office.

In many ways, the head office can be thought of as the "brain" of the "nervous and circulatory" system which constitutes the firm. By remaining highly centralized in the most information-rich environment, it relays information of a critical nature to each of the more decentralized units

which are, for the most part, the purely production-oriented units. In order to perform its duties well, the head office must be located at the point where information

relevant to each of the firm's operations is most readily available. Major metropolitan areas of national importance, being centres of economic activity, best satisfy the locational requirements of head offices. The concentration of people, business and information about national and international economic conditions provides the data necessary for the taking of strategic decisions which will affect the whole of the firm or the operation of one component of the firm.

The multi-establishment firm is no longer reliant upon a single product-line, but reduces its vulnerability to environmental vagaries by producing and marketing a variety of products. The key aim of a strategy of functional diversity is the creation of a short-term monopoly over a given product. Research and development facilities and the initial introduction of a new product to a market are located in major metropolitan areas close to the head office. Good accessibility to high quality information again is the primary locational determinant since knowledge about competitors, markets, availability of ancillary services and so on plays a key role in the reduction of uncertainty. Metropolitan areas, particularly those of national importance, offer 'minimum uncertainty' environments and so attract those activities which are surrounded with the greatest amount of uncertainty. Well-established production units are left free to seek locations which satisfy.

their needs since a connecting link to information is supplied by the head office.

In Canada, the head offices of multi-locational firms are found with few exceptions in the heartland region. Toronto and Montreal, the major Canadian metropolitan centres, contain the largest proportions of head offices. Historical factors of initial advantage and circular and cumulative growth have contributed much to the development of Toronto and Montreal into metropolitan areas which dominate the rest of the Canadian urban and economic systems in terms of the volume and national importance of activities. As a result of head office agglomeration in the heartland, manufacturing found in the Canadian periphery is controlled non-locally. Non-local control is a mixed blessing. Some of the advantages are: the utilization of a region's resources, both physical and human; the generation of some local multipliers; the in-flow of capital investment; the inclusion of the region in the intra-organizational communications network and therefore an enhanced potential for relatively early adoption of new products, processes or methods of organization. However, there are also disadvantages associated with being in a position of dependency: upward mobility within the firm eventually requires relocation to the head office; which in many cases, is in a foreign country; eventually, if the establishment is successful

financially, the amount of capital flowing out of the region in the form of profits will exceed the amount of the initial capital investment in plant, equipment and other facilities; if the firm's operations are highly integrated, multipliers arising out of inter-establishment linkages will 'leak' to other regions, thereby reducing the impact of the establishment on the local socioeconomic environment.

Employment in manufacturing administrative activities is increasing whereas employment in production activities is decreasing. In other words, the organization of production which, in a complex world, is a head office function, is consuming more time and energy while the application of technology to actual production is reducing the volume of human input. The location of head office units appears to be very sensitive to agglomeration economies.

Agglomeration occurs in those locations where the quality and quantity of information is great and where direct and indirect inter-urban contacts are most numerous and most accessible. Peripheral regions, therefore, are placed in a position where employment in production activities is declining and they have few administrative positions. Partially this is due to the fact that functionally, their urban centres are linked individually to the centres of control in the heartland. Their regional urban hierarchies are not well-developed and inter-urban linkages at the regional level

are not strong.

It has been suggested that the problem of peripheral regions lies in their lack of low-cost, efficient transportation systems linking them with the heartland. However, the improvement of physical linkages between regions will not of itself encourage the decentralization of administrative units for this is not the critical factor in their location. This is not to deny the importance of inter-regional linkages to multi-establishment firms for they are important in terms of the location of production units. It is, however, unlikely that transportation improvements alone will encourage the decentralization of head office units for they locate with regard to head office units of other firms, both competitors and suppliers of ancillary services. A firm whose central core is removed from an agglomeration must, of necessity, lose some of the advantages offered by proximity to other firms and in so doing increase, even if only slightly, the uncertainty within which it operates.

Regions which possess the potential for rapid economic growth through the attraction of new activities can offer the conditions necessary for the agglomeration of head offices. The protective quality of distance with regard to competition offers the potential for Vancouver, for example,

to become a head office city on Canada's west coast.

Similarly, the rapid growth of the petro-chemical industry in Alberta may lead to head office agglomeration in Calgary or Edmonton. Control of this industry is not yet fully dominated by the heartland and so may locate in response to the locational advantages offered by this oil-rich region. The possibility of the dissolution of a functioning agglomeration is small; however, the potential still exists for the development of new agglomerations oriented to activities which are growing in importance and complexity. Linked firms will be attracted by the volume of activity and a new agglomeration based upon relatively untapped linkages could form.

6.4 Traditional Location Theory and the Multi-Establishment

Firm

The emphasis of traditional manufacturing location theory is on the single plant firm and its relations with the local environment. Cost minimization in the collection of material inputs and distribution of the final product is the goal attributed to the firm by Weberian theory.

In Chapter 5, the factors affecting the distribution of all manufacturing activity and the distribution of large establishments only among 53 counties in Canada in 1971 were analyzed. A comparison of the relative impact of a single set of factors on these two distributions indicates the

extent to which large establishments belonging to multi-establishment firms react to the influences commonly accepted as affecting the distribution of all manufacturing establishments regardless of size. It was found that the degree to which large urban centres exhibit good connectivity to the rest of the domestic urban system and to foreign metropolitan areas has a strong association with the volume of manufacturing activity, as measured by the number of manufacturing establishments. Secondly, as the amount of ~~foreign control of~~ employment in a given location increases, so does the volume of manufacturing activity.

These two factors have a much greater impact on the distribution of all manufacturing activity than on the distribution of large establishments indicating that there is an intrinsic difference in the nature of these two forms of manufacturing organization. The majority of manufacturing establishments are small and therefore are oriented to the immediate environment; regional market, labor and accessibility conditions are highly important locational influences. Large establishments which are, for the most part, branch plants, have a more mixed orientation. The impact of the immediate regional environment is lessened because of the strong internal orientation of branch plants to the firm in terms of supplies of materials, markets for output and organizational linkages such as head office control of financial

and research and development activities. Therefore, although the factors of 'Urban-Connectivity' and 'Foreign Control' do have an influence on the distribution of large establishments, their impact is less than on the distribution of all manufacturing activity.

The relative weakness of these results partially can be attributed to the fact that 53.4 percent of the large establishments also are the Canadian head offices of domestic- and foreign-controlled firms. Therefore, the locations of many of the large establishments are subject to different sets of pressures. The manufacturing aspect of their activity is focused upon in the analysis, although some measures relating to head office location were included such as MP 71, DISTO, DISNEAIR, DISINTER and ADMIN %.¹ The tendency of head offices to agglomerate in a few metropolitan areas of national importance is not adequately accounted for by these variables, leading to a large underprediction of the number of large establishments in Toronto and Montreal. These two urban areas are unique among major urban centres in Canada. The factors of initial advantage and circular and cumulative growth have played a major role in elevating Toronto and Montreal to their present dominance of the domestic economic and urban systems. Although many other

¹See 5.2.2.

heartland cities have enjoyed several of the same advantages, head office units are not distributed evenly among them. It appears that the pressures toward head office agglomeration are more than connectivity to other urban areas and high aggregate accessibility to the total Canadian population. The dominance of Toronto and Montreal results largely from the cumulative impact of head office location decisions taken by several organizations. The impact of prestige of location and proximity to competitors, suppliers of ancillary services, government and independent research and development organizations also should be considered when attempting to explain the location of head offices.

The concentration of the head offices of foreign-controlled firms in the heartland region partially can be explained by the 'economic shadow' effect. Also, most foreign-controlled production facilities are located in this region; the local presence of other units within the firm is both a cause and an effect of the location of the head office units. The highly concentrated pattern of foreign-controlled activity is largely a response to the uncertainty which accompanies expansion into foreign socioeconomic environments. Similarly, domestic-controlled firms will locate their head offices in such a manner that levels of uncertainty will be reduced.

In conclusion, the results of the analyses show that the treatment of large, manufacturing, branch plants as being the same as all manufacturing establishments, most of which are small in terms of employment, will yield less than satisfactory results. The immediate socioeconomic environment has a lesser impact on branch plants of multi-establishment firms than on all manufacturing activity since, in fact, the environments in which the two operate differ substantially. The orientation of branch plants inward to the firm means that specialized advantages offered by regions can be tapped even if regional market, supply or other conditions are less than optimal. Those large establishments which also perform head office functions are located so as to satisfy two sets of conditions: manufacturing requirements must be met simultaneously with head office needs. The latter involves a more rigorous set of conditions met predominantly by metropolitan areas of national urban and economic importance. With few exceptions, these locations also provide ideal environments for large manufacturing establishments.

6.5 Needed Future Research

Before a manufacturing location theory which adequately explains and predicts the spatial behavior of multi-functional, multi-establishment firms can be developed, a much fuller understanding of these firms must be gained.

Organization theory provides a useful starting point for it has outlined in a detailed manner the linkages between organizational structures and the various strategies of survival and growth followed by large firms. Case studies of the location and freedom of decision-making associated with different units within the firm could introduce a more explicitly spatial element into organization theory.

The location of head office units and the factors influencing this pattern have been examined in some detail in the literature. However, this in itself is far from adequate since the degree of control exerted by the head office varies greatly from firm to firm depending partly on management's attitudes toward the advantages and disadvantages of 'open' versus 'close' control relationships. The mere fact that head offices are agglomerated in a single region of a country does not necessarily mean that the nature and timing of economic development of peripheral regions is totally dependent upon the heartland. In the case of some firms, regional managers are given a significant degree of freedom of action in supervising production activities. Inclusion in the national system of inter- and intra-organizational linkages increases a region's potential for economic development since it benefits from flows of information regarding innovations and knowledge about it increases at least within the firm and at best within other

organizations. Therefore, the identification of the types of firms which allow independent action on the parts of regional managers could be useful as one regional development tool. Efforts could be directed toward attracting these firms to peripheral regions where they could be encouraged to utilize local physical and human resources. The weaker relationship of dependency between the periphery and the heartland would mean that leakages of regional multipliers would be lessened leading to stronger regional economic growth.

A second area in need of detailed study is that of the pressures influencing firms to follow strategies of regional dispersal of activities. The relative importance of factors such as the age and size of the firm, the degree to which it is diversified, the types of activities in which it is involved, and policies regarding regional or national origin of management should be outlined. With regard to the latter point, for example, the employment of management from a variety of locations may reduce spatial biases in decision-making and could lead to greater decentralization of activity.

Increased understanding of the nature of multi-functional, multi-establishment, manufacturing firms and of the spatial implications of their actions can be reached

through case studies. The type of research involved would include: interviews of management personnel at both the head office and regional branch plants; the examination of company records; and the gathering of historical information relating to the firm so that the linkages between its functional and spatial evolution and the timing of its expansion can be determined. The examination of the functional and spatial characteristics of some enterprises in Canada in Chapter 3 indicates that these factors do have implications for regional growth and deserve much greater attention than they have received so far in the geographical literature.

The organization of the manufacturing sector increasingly is taking the form of the large, multi-functional firm. The power and influence exerted by these firms is viewed by some with misgiving since their foremost orientation is inward to themselves. They have developed in such a way structurally that their impact upon the socioeconomic environment is great and, to some extent, uncontrollable by government. However, the disadvantages associated with large, manufacturing firms are, in most cases, countered by several advantages, the benefits of which can be reaped only if their structure and behavior are fully understood.

APPENDIX A

METHODOLOGY OF SELECTION OF SAMPLE ENTERPRISES

The initial sample of large manufacturing establishments - those with more than 1000 employees - operating in Canada in 1971 was provided by the Manufacturing and Primary Industries Division of Statistics Canada. The location, the S.I.C.¹ of each establishment and the firms' names were included in the data listing. It was hypothesized that one of the most important factors affecting the extent to which a firm's activities was concentrated in a single region would be the threshold level associated with each of its activities. The threshold is "... the portion of the total national market for any specific product that an industrial plant must be able to secure in order to achieve economic operation" (Scorror and Williams, 1976, p. 108). Conceptually, it is synonymous with the term

¹For a description of the S.I.C. classification and a comprehensive definition of each category, see Canada, Dominion Bureau of Statistics, Standard Industrial Classification Manual, Catalogue 12-501, Occasional, 1970. The manual includes the 1960 classification and its 1970 revised form. The former is used in this paper.

'threshold' associated with the location of retail and service activities in Christaller's Central Place Theory. The threshold level associated with each S.I.C. category was taken from Canadian Urban Trends, 1976, Table A3.2.

The intent was to select a high and a low threshold activity having large manufacturing establishments in each of the Atlantic Provinces, Central Canada (Ontario and Quebec), the Prairie Provinces and British Columbia. The establishments selected on this basis would then form the base upon which the enterprises would be constructed. Regional differences in the extent of concentration of enterprise activity then could be compared. However, it was found that no very high threshold activities existed outside Central Canada with the exception of S.I.C. 289 (Printing and Publishing) in British Columbia. This in itself is a strong indication of the extreme importance of Central Canada as the national market area.¹

The only activities found in at least three of the four regions were S.I.C. 271 (Pulp and Paper Mills) and S.I.C.'s 101 and 103 (Meat and Poultry Products Industries). It was

¹It must be pointed out that the degree of concentration of high threshold activities is exaggerated by these data. The mere size of the establishments means that their market, labour and other input requirements are already large. High threshold and large size together dictate a location which is central to the national market.

necessary to group the Prairie Provinces and British Columbia into a single region since large establishments in the former were involved only in S.I.C. 101. The threshold level associated with pulp and paper mills is 0.0682; theoretically, in order to survive, a pulp and paper mill must capture 6.82 percent of the national market. This places the pulp and paper industry in the second highest threshold quartile. The threshold levels for S.I.C.'s 103 and 101 are 0.0317 and 0.0020 respectively, placing them in the third and fourth threshold quartiles. The fact that no large establishments involved in high threshold activities were found outside Central Canada suggested that the regional distribution of these activities would differ from that exhibited by the other sample enterprises and activities. An additional consideration in the selection of the high threshold activity was that it was felt desirable that the spatial organization of a high-technology, secondary manufacturing industry be examined since both the pulp and paper industry and meat and poultry processors are primary manufacturers. The selection of S.I.C. 338 (Manufacturers of Electric Wire and Cable) satisfied these conditions; its threshold level is 0.2642.

A total of ten establishments representing ten firms was selected to form the basis of enterprise construction: four pulp and paper firms; four food processing firms; and

two firms manufacturing electric wire and cable (Table A.1). Inter-firm organization linkages are listed in the Inter-corporate Ownership manual, 1972 (Statistics Canada, Catalogue 61-513). The linkage of firms is "... based on the intercorporate ownership of the voting rights attaching to the various classes of shares The intercorporate ownership complex begins with a holding company in which no other corporation owns 10% or more of the voting shares" (p. 6). Enterprise organization charts appear in Appendix B.

The final step in deriving distributions of enterprise activities consisted of locating all establishments of each of the constituent firms. A listing of approximately 50,000 firms, their names, addresses, establishment locations, S.I.C. categories and employment size ranges was provided by the Labour Division of Statistics Canada. Data regarding firms comprising the sample enterprises were extracted from this tabulation.

Not all affiliated establishments appear on the maps (Chapter 3); therefore, the extent of enterprise operations is understated by an unknown amount. There are several factors contributing to an understatement of enterprise activities. First, there are inconsistencies in firms' names in the Labour Division data compared to the InterCor-

TABLE A.1

THE TEN SAMPLE ENTERPRISES

No.	SIC	Sample Firm	Holding Corporation ¹	Country of Control ¹	Head Office ²	
					Chdn. U.S.- Level Level	
1.	271	Canadian International Paper Co.	International Paper Company	U.S.A.	Mon-treal	New York
2.	271	Domtar Fine Paper Ltd.	Domtar Limited	Canada	Mon-treal	
3.	271	Crown Zellerbach Canada Ltd.	Crown Zellerbach International Ltd.	U.S.A.	Van-cou-ver	San Francisco
4.	271	Macmillan Bloedel Ltd.*	Macmillan Bloedel Ltd.	Canada	Van-cou-ver	
5.	101	Canada Packers Ltd.	Canada Packers Ltd.	Canada	To-ron-to	
6.	101	J. M. Schneider Ltd.	J. M. Schneider Ltd.	Canada	Kit-chen-er	
7.	103	McCain Food Ltd.	McCain Foods Ltd.	Canada	Flor-ence-ville, N.B.	
8.	103	H.J. Heinz Co. of Canada Ltd.	H. J. Heinz Co.	U.S.A.	To-ron-to	Pitts-burgh

Continued

*The ultimate holding corporation of Macmillan Bloedel Ltd. is Canadian Pacific Ltd. However, its interest is less than 50 percent. Consequently, all future reference to this enterprise will treat Macmillan Bloedel Ltd. as the holding company for the constituent firms in this block of investments by Canadian Pacific Ltd.

TABLE A.1 continued

No.	SIC	Sample Firm	Holding Corporation ¹	Country of Control ¹	Head Office ²	
					Cndn. level	U.S.-level
9.	338	Canada Wire and Cable Co. Ltd.	Noranda Mines Ltd.	Canada	Toronto	
10.	338	Northern Electric Co. Ltd.	Bell Canada	Canada	Montreal	

SOURCE: ¹Statistics Canada, Intercompany Ownership, 1972;

²Moody's Industrials, 1971.

porate Ownership manual. Often, what is listed as a firm in the latter is listed as a division in the former. Second, the nature of the operation may be such that a precise location cannot be given. This has most affected firms involved in transportation and logging activities. Third, in the case of foreign-controlled enterprises, many of the constituent firms operate completely outside Canada and therefore are not included in the Labour Division data. Fourth, the Labour Division listing tabulates data for 92 urban-industrial employment areas and includes all major and most secondary urban areas. However, confidentiality or size

considerations restrict publication of detail for numerous small centres and at present, preclude publication of any data for: Woodstock, New Brunswick; Elliott Lake, Ontario; and Port Alberni, British Columbia. Several firms having less than twenty employees are not included in the listing. Fifth, employment figures given in the Labour Division data are not exact, but refer to employment size ranges. The mid-point of each size range was taken as the employment estimate. If it is assumed that there is no systematic bias against any one enterprise, then it is possible to compare their relative employment and activity distributions.

APPENDIX B

ENTERPRISE ORGANIZATION CHARTS

I PULP AND PAPER ENTERPRISES

1. Crown Zellerbach International Incorporated
2. Macmillan Bloedel Ltd.
3. International Paper Company
4. Domtar Ltd.

II THE FOOD PROCESSING ENTERPRISES

1. H. J. Heinz Co.
2. McCain Foods Ltd.
3. J. M. Schneider Ltd.
4. Canada Packers Ltd.

III THE ELECTRIC WIRE AND CABLE INDUSTRY

1. Noranda Mines Ltd.
2. Bell Canada

The component firms of each of the ten sample enterprises are found in the following enterprise organization charts. Ownership linkages are indicated in two ways: a less than fifty-one percent ownership linkage is indicated by a vertical dotted line; a solid vertical line indicates an ownership linkage greater than or equal to fifty-one percent.

THE 'CROWN ZELLERBACH INTERNATIONAL INC.' ENTERPRISE

Crown Zellerbach
International Inc.

Crown Zellerbach
(Canada) Ltd.

Elk River
Timber Co. Ltd.

continued at B

Canadian Boxes
Limited

Canadian Tugboat
Co. Ltd.

Canadian Western
Lumber Co. (1968) Ltd.

Crown Zellerbach
Building Materials
(Eastern) Ltd.

Crown Zellerbach
Stores Ltd.

Crown Zellerbach
Paper Co. Ltd.

Seaboard Shipping
Co. Ltd.

Seaboard Lumber
Sales Co. Ltd.

Hudson Paper
Co. Ltd.

B

International Wood
Briquetting Ltd.

Seaforth Plastics
Ltd.

Crown Zellerbach
(Hardwicke Island) Limited

Canadian Overseas
Paper Co. Ltd.

Export Sales Co. Ltd.

THE INTERNATIONAL PAPER CO. ENTERPRISE

THE 'H. J. HEINZ CO.' ENTERPRISE

H.J. Heinz Co.

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graph TD; A[H.J. Heinz Co.] --> B[H.J. Heinz Company of Canada Ltd.]; A --> C[Star-Kist Foods Inc.]; B --> D[Galco Food Products Ltd.]
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H.J. Heinz Company
of Canada Ltd.

Star-Kist
Foods Inc.

Galco Food
Products Ltd.

THE 'MCCAIN FOODS' ENTERPRISE

MCCAIN FOODS

THE J. M. SCHNEIDER LTD. ENTERPRISE

J.M. Schneider Ltd.

continued at B

Apple Hill Cheese Limited	Chicago Kosher Sausage Mfg. Co. Ltd.	Economy Sausage Company Ltd.	Schneider-Hormel Ltd.	J.M. Schneider Foods Ltd.	J.M. Schneider (Manitoba) Ltd.
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B

Weidman Bros.
Limited

Canada Packers
Ltd.

continued at B

Alberta Canning
Co. Ltd.

Anglo-Canadian
Leather Co. Ltd.

Davis & Lawrence Co.
(Canada) Ltd.

Beardmore & Co. Ltd.

Wilsil Limited

Calgary Packers
Ltd.

MCC Pharmaceuticals
Ltd.

Abbatoirs
Ltd.

continued at C

Canard Poultry Ltd.

Feather Industries
Ltd.

Federal Cold Storage
& Warehousing Co. Ltd.

Nine Five
Investments Ltd.

Parent, Goyer &
Company

Spruceleigh
Farms Ltd.

continued at D

Spruceleigh Farm
Co. Ltd.

Sussex Poultry
Ltd.

Allen, T.B. Ltd.

Berard, Marcel Ltee.

Ferne Ramsay Inc.

Floradale Feedmill Ltd.

Kola Feed
Service Ltd.

Poirier, Rene
Ltee.

Valmore Lacoste
Inc.

Yantzi's Feed &
Seed Limited

THE 'BELL CANADA' ENTERPRISE

Bell Canada

continued at B

Capital Telephone
Co. Ltd.

Lievre Valley
Telephone Company

Newfoundland Telephone
Company Ltd.

Telephone

Northern Electric
Company Ltd.

Northern Telephone
Limited

Tele-Direct Ltd.-
Tele-Direct Ltée.

Microsystems
International Ltd.

Dominion Sound
Equipment Ltd.

Northern Electric
Distribution Co. Ltd.

Nevron Industries
Company Limited

continued at C

Teleontario
Incorporated Ltd.

Maitland Teleservices

North American
Telegraph Company

Maritime Telegraph
& Telephone Co. Ltd.

Telebec Ltée.

Carador Ekfrid
Telephone Co. Ltd.

Maritime Computers
Ltd.

Island Telephone
Company Ltd.

Telesat Canada

New Brunswick
Telephone Company
Ltd.

APPENDIX C

THE SAMPLE LARGE ESTABLISHMENTS: LOCATION, COUNTRY OF CONTROL AND HEAD OFFICE LOCATION

Company Name	Location	Country of Control	Canadian H.O. Location	U.S. Head Office Location
1. Abitibi Paper Co. Ltd.	Iroquois Falls	Canada	Toronto	
2. Alberni Pulp and Paper Ltd.	Port Alberni	Canada	Vancouver	
3. Algoma Steel Corp. Ltd.	Sault Ste. Marie	Other Foreign	Sault Ste. Marie	
4. Aluminum Company of Canada Ltd.	Kingston	Canada	Montreal	
5. " "	Kitimat, D.M.	Canada	Montreal	
6. " "	Arvida	Canada	Montreal	
7. American Motors (Canada) Ltd.	Brampton	U.S.A.	Brampton	Detroit
8. Anaconda American Brass Ltd.	Toronto	U.S.A.	Toronto	Waterbury, Conn.
9. Anglo-Canadian Pulp & Paper Mills Ltd.	Quebec City	Other Foreign	Quebec City	
10. B.F. Goodrich Canada Ltd.	Kitchener	U.S.A.	Kitchener	Akron, Ohio
11. Babcock & Wilcox Canada Ltd.	Galt	U.S.A.	Kitchener	New York City
12. Bombardier Ltd.	Valcourt	Canada	Valcourt	
13. Bowaters Newfoundland Ltd.	Corner Brook	Other Foreign	Corner Brook	
14. Bruck Mills Ltd.	Cowansville	Canada	Montreal	
15. Canada Packers Ltd.	Montreal	Canada	Toronto	
16. " "	Winnipeg	Canada	Toronto	
17. " "	Toronto	Canada	Toronto	
18. Canada Wire and Cable Co. Ltd.	Toronto	Canada	Toronto	

APPENDIX C continued

Company Name	Location	Country of Control	Canadian H.O. Location	U.S. Head Office Location
19. Canadair Limited	Montreal	U.S.A.	Montreal	New York City
20. Canadian Breweries Quebec Ltd.	Montreal	Other Foreign	Montreal	
21. Canadian Copper Refiners Ltd.	Montreal	Canada	Toronto	
22. Canadian General Electric Co. Ltd.	Peterborough	U.S.A.	Toronto	New York City
23. "	Montreal	U.S.A.	Toronto	"
24. Canadian International Paper Co.	Trois Rivières	U.S.A.	Montreal	New York City
25. "	Cap De La Madeleine	U.S.A.	Montreal	New York City
26. "	Gatineau	U.S.A.	Montreal	"
27. Canadian Kodak Co. Ltd.	Toronto	U.S.A.	Toronto	Rochester, N.Y.
28. Canadian Marconi Co.	Montreal	*	Montreal	
29. Canadian Reynolds Metals Co. Ltd.	Baie Comeau	U.S.A.	Montreal	Richmond, Va.
30. Canadian Vickers Ltd.	Montreal	Other Foreign	Montreal	
31. Chemocell Ltd.	Diamondville	*	Montreal	
32. Chrysler Canada Ltd.	Ajax	U.S.A.	Windsor	Detroit, Mich.
33. "	Windsor	U.S.A.	Windsor	"
34. "	Windsor	U.S.A.	Windsor	"
35. Cominco Ltd.	Trail	Canada	Montreal	
36. Computing Devices of Canada Ltd.	Ottawa	U.S.A.	Ottawa	Minneapolis, Minn.
37. Crown Zellerbach Canada Ltd.	Campbell River, D.M.	U.S.A.	Vancouver	San Francisco, Cal.
38. Davie Shipbuilding Ltd.	Leuzon	Canada	Montreal	
39. Dominion Bridge Company Ltd.	Montreal	Canada	Montreal	
40. "	Toronto	Canada	Montreal	
41. Dominion Engineering Work Ltd.	Montreal	U.S.A.	Montreal	New York City

Continued

APPENDIX C continued

Company Name	Location	Country of Control	Canadian H.O. Location	U.S. Head Office Location
42. Dominion Foundries And Steel Ltd.	Hamilton	Canada	Hamilton	
43. Dominion Textile Ltd.	Magog	Canada	Montreal	
44. Domtar Fine Papers Ltd.	Cornwall	Canada	Montreal	
45. Douglas Aircraft Company of Canada Ltd.	Mississauga	U.S.A.	Mississauga	St. Louis, Missouri
46. Dow Chemical of Canada Ltd.	Sarnia	U.S.A.	Sarnia	Midland, Mich.
47. Dryden Paper Co. Ltd.	Dryden	Other Foreign	Quebec City	
48. DuPont of Canada Ltd.	Kingston	U.S.A.	Montreal	Wilmington, Del.
49. Electrohome Ltd.	Kitchener	Canada	Kitchener	
50. Ensite Limited	Windsor	U.S.A.	Windsor	Dearborn, Mich.
51. Firestone Tire and Rubber Co.	Hamilton	U.S.A.	Hamilton	Akron, Ohio
52. Ford Motor Co. of Canada Ltd.	Southwold, Twp.	U.S.A.	Oakville	Dearborn, Mich.
53. "	Oakville	U.S.A.	Oakville	"
54. "	Windsor	U.S.A.	Oakville	"
55. G.S.W. Limited	London	Canada	Toronto	"
56. General Motors of Canada Ltd.	St. Catharines	U.S.A.	Oshawa	Detroit, Mich.
57. "	Oshawa	U.S.A.	Oshawa	"
58. "	St. Therese Quest	U.S.A.	Oshawa	"
59. "	Toronto	U.S.A.	Oshawa	"
60. "	London	U.S.A.	Oshawa	"
61. General Motors Trim Ltd.	Windsor	U.S.A.	Oshawa	Detroit, Mich.
62. General Spring Products Ltd.	Kitchener	U.S.A.	Kitchener	Santa Monica, Cal.
63. Great Lakes Paper Co. Ltd.	Thunder Bay	Canada	Thunder Bay	
64. GIE Automatic Electric (Canada) Ltd.	Brockville	U.S.A.	Brockville	New York City

Continued

APPENDIX C, continued

Company Name	Location	Country of Control	Canadian H.O. Location	U.S. Head Office Location
65. H. J. Heinz Co. of Canada Ltd.	Leamington	U.S.A.	Toronto	Pittsburgh
66. Hawker Industries Ltd.	Halifax	Other	Toronto	
67. Hiram Walker and Sons Ltd.	Windsor	Canada	Walker-ville	
68. Honeywell Limited	Toronto	U.S.A.	Toronto	Minneapolis, Minn.
69. IBM Canada Limited	Toronto	U.S.A.	Toronto	New York City
70. Imperial Tobacco Products Ltd.	Montreal	Other	Montreal	
71. International Harvester Co. of Canada Ltd.	Hamilton	U.S.A.	Hamilton	Chicago, Ill.
72. "	Chatham	U.S.A.	Hamilton	Chicago, Ill.
73. International Nickel Co. of Canada Ltd.	Port Colbourne	Canada	Toronto	
74. "	Copper Cliff	Canada	Toronto	
75. "	"	Canada	Toronto	
76. J. M. Schneider Limited	Kitchener	Canada	Kitchener	
77. John Inglis Company Limited	Toronto	U.S.A.	Toronto	Benton Harbour, Mich.
78. Kraft Foods Ltd.	Montreal	U.S.A.	Montreal	New York City
79. La Cie de Publication de la Presse Limitee	Montreal	Canada	Montreal	
80. M. L. W. Worthington Ltd.	Montreal	U.S.A.	Montreal	New York City
81. MacDonald Tobacco Inc.	Montreal	Canada	Montreal	
82. Maclean-Hunter Ltd.	Toronto	Canada	Toronto	
83. Macmillan Bloedel (Alberni) Ltd.	Port Alberni	Canada	Vancouver	
84. Macmillan Bloedel Industries Ltd.	Vancouver	Canada	Vancouver	

Continued

APPENDIX C continued

Company Name	Location	Country of Control	Canadian H.O. Location	U.S. Head Office Location
85. Macmillan Bloedel Industries Ltd.	Nanaimo	Canada	Vancouver	
86. Macmillan Bloedel Ltd.	Rowell River, D.M.	Canada	Vancouver	
87. Marine Industries Ltee	Tracy	Canada	Montreal	
88. Massey Ferguson Industries Ltd.	Toronto	Canada	Toronto	
89. McCain Foods Ltd.	Florenceville	Canada	Florenceville	
90. Microsystems International Ltd.	Ottawa	Canada	Montreal	
91. Millhaven Fibres Ltd.	Ernestown Twp.	*	Montreal	
92. Minnesota Mining and Manufacturing of Canada Ltd.	London	U.S.A.	London	St. Paul, Minn.
93. Molson Breweries Ltd.	Montreal	Canada	Montreal	
94. National Steel Car Corp. Ltd.	Hamilton	Canada	Hamilton	
95. New Brunswick International Paper Co.	Dalhousie	U.S.A.	Montreal	New York City
96. Northern Electric Co. Ltd.	Montreal	Canada	Montreal	
97. "	Montreal	Canada	Montreal	
98. "	Bramalea	Canada	Montreal	
99. "	London	Canada	Montreal	
100. "	Bramalea	Canada	Montreal	
101. "	Montreal	Canada	Montreal	
102. Orenda Limited	Mississauga	Other Foreign	Mississauga	
103. Otis Elevator Co. Ltd.	Hamilton	U.S.A.	Hamilton	New York City
104. Outboard Marine Corp. of Canada Ltd.	Peterborough	U.S.A.	Peterborough	Waukegan, Ill.
105. Pacific Press Ltd.	Vancouver	Canada	Vancouver	

Continued

APPENDIX C continued

Company Name	Location	Country of Control	Canadian H.O. Location	U.S. Head Office Location
106. Philips Electronics Industries Ltd.	Toronto	*	Toronto	
107. Polymer Corporation Limited	Sarnia	U.S.A.	Sarnia	Reading, PA.
108. Price (Nfld) Pulp and Paper Ltd.	Grand Falls	Canada	Quebec City	
109. Quebec Iron and Titanium Corp.	St. Joseph de Sorel	U.S.A.	St. Joseph de Sorel	New York City
110. Quebec North Shore Paper Co.	Baie Comeau	Canada	Montreal	
111. Rio Algom Mines Ltd.	Niagara, R.M.	Other Foreign	Toronto	
112. Spruce Falls Power and Paper Co. Ltd.	Kapus-kasing	U.S.A.	Toronto	Neena, Wis.
113. Swift Canadian Company Ltd.	Edmonton	U.S.A.	Toronto	Chicago, Ill.
114. Sydney Steel Corporation	Sydney	*	Sydney	
115. Telegram Publishing Co. Ltd.	Toronto	Canada	Toronto	
116. The Budd Automotive Co. of Canada	Kitchener	U.S.A.	Kitchener	Philadelphia, Penn.
117. The Dehavilland Aircraft of Canada Ltd.	Toronto	U.S.A.	Toronto	Philadelphia, Penn.
118. The E. B. Eddy Company	Hull	*	Hull	
119. The Globe and Mail Ltd.	Toronto	Canada	Toronto	
120. The Goodyear Tire and Rubber Co. of Canada Ltd.	Toronto	U.S.A.	Toronto	Akron, Ohio
121. The Montreal Star Co. Ltd.	Montreal	Canada	Montreal	
122. The Ontario Paper Co. Ltd.	Thorold	U.S.A.	Thorold	Chicago, Ill.
123. The Price Company Ltd.	Kenogami	Canada	Quebec City	

Continued

APPENDIX C continued

Company Name	Location	Country of Control	Canadian H.O. Location	U.S. Head Office Location
124. The Southam Printing Co. Ltd.	Toronto	Canada	Toronto	
125. The Steel Co. of Canada Ltd.	Hamilton	Canada	Toronto	
126. Thompson Products Limited	St. Catharines	U.S.A.	St. Catharines	Cleveland, Ohio
127. Toronto Star Limited	Toronto	Canada	Toronto	
128. Union Carbide Canada Ltd. (Welland)	Welland	U.S.A.	Toronto	New York City
129. Uniroyal Ltd. - Uniroyal Ltee	Kitchener	U.S.A.	Montreal	New York City
130. United Aircraft of Canada Ltd.	Longueuil	U.S.A.	Longueuil	Hartford, Conn.
131. Wabasso Limited	Trois Rivières	Canada	Montreal	
132. Westinghouse Canada Limited	Hamilton	U.S.A.	Hamilton	Pittsburgh, PA.
133. William Neilson Limited	Toronto	*	Toronto	

* 'Country of control' cannot be determined largely due to confidentiality restrictions.

See Appendix E for a listing of data sources.

APPENDIX D.

DATA SOURCES

VARIABLE	DATA SOURCE
I PRINCIPAL COMPONENTS ANALYSES: INPUT VARIABLES	
1. URB % 71	Canada. <u>Census of Canada, 1971.</u>
2. POPCH 517	Canada. <u>Census of Canada, 1951, 1971.</u>
3. MP 71	Canada. <u>Census of Canada, 1971; data provided by Ministry of State for Urban Affairs</u>
4. POPLGURG	Canada. <u>Census of Canada, 1971.</u>
5. POP 71	Canada. <u>Census of Canada, 1971.</u>
6. AVINC 71	Canada. <u>Census of Canada, 1971.</u>
7. MANULF %	Canada. <u>Statistics Canada. Manufacturing Industries of Canada: Geographical Distribution, 1971, Catalogue 31:209.</u>
8. FINANCE	Ray, D. M. (Ed.). <u>Canadian Urban Trends, 1976, Table A2.1.</u>
9. FORCONT	Ray, D. M. (Ed.). <u>Canadian Urban Trends, 1976, Table A3.1.</u>
10. DISTO	Data provided by Ministry of State for Urban Affairs
11. SPECIND	Ray, D. M. (Ed.). <u>Canadian Urban Trends, 1976, Table A2.3</u>
12. DISNEAIR	Canada. <u>Canadian Transport Commission, Directory of Canadian Commercial Air Services, Ottawa, 1976.</u>

VARIABLE	DATA SOURCE
13. DISINTER	Canada. Canadian Transport Commission, <u>Directory of Canadian Commercial Air Services</u> , Ottawa, 1976.
14. ADMIN %	Canada. Statistics Canada, <u>Manufacturing Industries of Canada: Geographical Distribution</u> , 1971, Catalogue 31:209.
II 'OTHER DATA' SOURCES	
15. Number of Large Manufacturing Establishments	Special Tabulation Provided by Manufacturing and Primary Industries Division, Statistics Canada
16. Total Number of Manufacturing Establishments	Canada. Statistics Canada, <u>Manufacturing Industries of Canada: Geographical Distribution</u> , 1971, Catalogue 31:209.
17. 'Country of Control' And	Canada. Statistics Canada. <u>Intercompany Ownership</u> , 1972, Catalogue 61:513, Occasional.
18. Inter-Firm Ownership Linkages	
19. Location of Constituent Establishments of Enterprises	Special Tabulation Provided by Labour Division, Statistics Canada.
20. Head Office Locations	Dun and Bradstreet of Canada, Ltd., <u>Canadian Key Business Directory</u> , 1972; <u>Moody's Industrials</u> , 1971; <u>Scott's Industrial Directory</u> , Ontario Section, 1970-71; <u>Scott's Industrial Directory</u> , Quebec Section, 1969-70.
21. Location of, and Employment in, Research and Development Facilities, Canada, 1972	Canada. Ministry of State for Science and Technology, <u>Directory of Research and Development Establishments in Canadian Industry</u> , Ottawa, 1973

VARIABLE	DATA SOURCE
22. Percentage Distribution of Employment, By Country of Control, for CMA's and Provinces, Canada, 1970	Canada. Statistics Canada, <u>Domestic and Foreign Control of Manufacturing Establishments in Canada, 1969-70</u> , Catalogue 31:401, Biennial, March, 1976.
23. Relative Seasonally Unadjusted Unemployment Rates, By Region, Canada, 1965-1975	Canada. Statistics Canada, <u>The Labour Force</u> , Catalogue 71:001, Monthly, 1965-1975.
24. Relative per Capital Income, by Region, Canada, 1926-1967	Economic Council of Canada, <u>Sixth Annual Review: Perspective 1975</u> , Ottawa: Information Canada, 1969, p.152.

APPENDIX E

DATA LISTINGS

APPENDIX E.1

Computed Variables

REPORT OF CERTAIN COMPUTED PERCENTAGES FROM CENSUS DATA

COUNTY	MURKIN-TOT POPULATION	ADMINISTRATIVE EMPLOYEES	DATE 12-05-77	COMPOSITE	LARGE-TOT EMPLOYEES
005	71.091	17.347	13.163	39.134	67.151
006	86.370	19.169	2.739	-10.478	122.757
203	78.231	20.642	14.600	399.000	58.681
208	78.474	28.485	6.745	25.401	45.279
302	23.968	20.777	19.241	-8.960	112.612
310	50.471	15.892	16.572	33.718	48.224
411	100.000	34.594	10.072	35.031	39.240
412	72.907	19.345	22.306	34.916	19.349
416	78.467	27.342	23.442	28.051	71.933
420	72.290	24.805	30.258	44.084	28.191
425	95.980	14.574	13.390	28.050	70.110
428	94.964	25.956	26.748	40.207	17.772
437	47.175	20.247	22.213	28.573	49.221
444	62.453	20.340	40.166	52.826	24.658
454	77.174	24.304	11.017	37.039	7.885
455	73.205	23.821	44.000	57.962	48.505
460	65.500	10.374	5.032	9.360	84.745
463	90.001	19.239	24.830	40.224	25.366
464	70.893	21.613	40.410	53.412	23.602
467	94.163	13.112	0.007	23.177	56.765
470	77.705	10.270	26.710	41.124	17.268
501	93.942	35.252	10.000	52.384	68.624
504	74.403	10.311	1.000	1.130	98.502
507	44.310	13.736	12.130	-194.207	266.746
508	51.247	19.347	6.348	45.173	38.167

REPORT OF CERTAIN COMPUTED PERCENTAGES FROM CENSUS DATA

COUNTY	URBAN-TOT POPULATION	ADMINISTRATIVE EMPLOYEES	MANU-FACTURING EMPLOYEES	DATE	COMPOSITE	LARGE-TOT EMPLOYEES
509	80.470	21.627	23.423	22.04.77	32.907	59.630
510	72.380	24.571	12.224		13.687	79.253
516	93.931	23.548	25.000		46.346	33.218
519	49.624	13.635	11.584		19.153	66.755
520	60.157	10.007	25.212		53.238	9.686
521	69.759	32.692	21.714		54.824	39.024
523	52.003	32.055	24.431		53.661	38.714
524	30.995	19.942	22.184		32.090	56.544
526	85.217	23.559	17.211		36.852	33.743
528	96.414	23.582	28.568		54.503	36.389
533	90.890	41.873	5.332		34.024	19.253
536	92.000	30.514	32.957		49.882	29.606
538	74.472	32.466	20.173		25.660	69.978
545	76.857	19.504	20.092		55.714	27.374
546	73.759	26.216	16.347		-53.231	138.867
547	86.770	19.022	14.528		65.007	16.130
549	99.999	30.138	23.333		41.520	15.084
551	87.693	22.440	39.431		56.001	27.307
553	89.049	22.742	35.270		39.693	45.538
620	97.793	25.202	15.730		39.635	2.704
811	89.451	28.414	0.144		12.644	4.577
901	72.020	11.510	27.774		49.700	57.412
909	57.883	13.935	14.264		46.104	38.111
915	94.823	24.663	17.390		32.320	3.600
916	64.636	26.525	26.035		49.692	64.814
917	72.827	22.791	24.800		55.361	95.704

REPORT OF CERTAIN COMPUTED PERCENTAGES FROM CENSUS DATA DATE = 22-04-77

COUNTY	URBAN-TOT POPULATION	ADMIN-EMP EMPLOYEES	MANU-TLE EMPLOYEES	COMPOSITE	LARGE-TOT EMPLOYEES
919	64.273	19.204	10.843	1.437	96.665
924	74.045	13.364	14.942	-47.523	176.651

106 CARDS READ

0 ERRORS ENCOUNTERED

APPENDIX E.2

Input Variables

(DBR)

THESIS DATA K. E. MC MULLEN

DATE 2/28/77

COUNTY CODE	1971 POP	1971 UNEMP	AVINC 71	TOT LAR	FWCE	ADMIN L.F.
005	44873	31935	6742	13575		310
006	43049	34625	6750	12035		203
203	129075	101235	5720	42935		1196
302	261491	205130	7743	134035		2076
310	24428	3855	4535	3230		369
411	41284	24555	5622	12375		331
412	231570	231590	8257	84540		4443
416	111150	82495	6323	31225		1663
420	161348	123175	6672	43755		3661
425	63144	40370	5991	22765		1940
428	107746	105225	7311	41350		407
437	2137153	2184200	7473	365420		61495
437	12776	4725	6851	23545		1014
444	31953	21205	6657	12045		956
454	42162	411165	7940	157460		4424
455	47093	34475	7102	15035		1690
460	111272	72430	7705	37335		593
463	103369	97905	6579	31150		2427
464	62301	44210	5940	22805		2414
467	30266	24720	5736	12350		7671
470	139445	104745	6561	46370		2170
501	121937	102235	4146	46945		3096
504	95336	71325	7348	32435		3761
507	47434	31245	7006	19755		676
508	46608	34135	7197	32005		1470
509	386349	243503	8651	124340		7410
510	101642	73005	4003	43245		1502
516	199469	173720	10360	41615		4813
519	51230	26415	6944	12390		352
520	101119	60830	7334	41150		1972
521	114314	72745	4534	47160		3351
523	50059	26550	6553	21145		1656
524	24359	3790	4774	10385		446
526	242014	242325	4501	127000		6408
526	367329	334375	7641	142760		9618
533	471331	428845	7641	41270		5274
536	254472	234955	1231	114335		11549
536	87404	65340	7775	33375		3178
545	61302	47115	4160	23320		1197
545	143779	142155	5160	75440		4476
547	143390	126155	7115	3245		1614
549	2040017	2096015	6217	131035		71079
551	254037	262725	5519	112315		13132
553	401483	362245	4030	172460		13414
620	540262	424370	7760	243200		9733
811	552461	443130	6357	240000		6273
901	31747	27425	4593	13335		403
901	37445	27425	4593	13335		403
915	1221334	975115	5311	433610		15542
916	37225	26115	4201	14105		974
917	31304	26115	4201	14105		1024
919	43054	30305	7370	13510		393
924	113730	13715	7370	6910		174

THESIS DATA		K. E. MC MULLEN		DATE 22/08/77		DIST. TO TORONT.	
COUNTY CODE	TOT. MAN. EMP.	TOT. MAN. ESTAB.	TOT. LGEST 71	TOT. LGEST 71	TOT. LGEST 71	TOT. LGEST 71	TOT. LGEST 71
005	1787	16	1	1	1091	1091	1091
006	1059	24	1	1	1193	1193	1193
201	5734	158	1	1	982	982	982
302	1776	25	1	1	794	794	794
310	2034	33	1	1	612	612	612
411	12742	222	1	1	690	690	690
412	8269	192	1	1	394	394	394
414	11196	114	1	1	519	519	519
420	11041	131	2	2	341	341	341
425	3547	41	1	1	224	224	224
428	236876	4663	19	19	323	323	323
437	5008	9	1	1	465	465	465
444	4814	79	1	1	345	345	345
454	18115	452	1	1	463	463	463
455	7032	55	2	2	358	358	358
459	3068	52	2	2	667	667	667
463	12615	143	2	2	392	392	392
464	11270	141	1	1	353	353	353
467	4235	83	1	1	323	323	323
470	11532	234	1	1	498	498	498
501	12022	73	1	1	322	322	322
504	4609	52	2	2	350	350	350
507	6300	55	2	2	64	64	64
508	7578	100	1	1	120	120	120
509	36111	450	1	1	210	210	210
510	5278	82	2	2	159	159	159
516	20424	295	1	1	30	30	30
519	2247	40	1	1	439	439	439
520	10375	177	1	1	176	176	176
521	10220	116	2	2	168	168	168
523	3166	11	1	1	204	204	204
524	2437	14	1	1	134	134	134
526	21859	397	4	4	114	114	114
528	40734	480	0	0	47	47	47
533	12535	297	2	2	218	218	218
536	37847	950	5	5	30	30	30
538	3573	114	2	2	79	79	79
545	6137	61	2	2	250	250	250
546	12092	97	1	1	222	222	222
547	6411	112	2	2	584	584	584
548	237833	4211	1	1	10	10	10
551	45145	543	7	7	67	67	67
553	60428	66	7	7	46	46	46
570	38497	640	1	1	951	951	951
571	21527	140	1	1	1690	1690	1690
580	3501	32	1	1	2105	2105	2105
581	2637	44	1	1	2174	2174	2174
585	3017	1041	2	2	2090	2090	2090
586	3672	27	1	1	2303	2303	2303
587	4443	17	1	1	1877	1877	1877
588	2053	64	1	1	2145	2145	2145
589	1302	50	1	1	2100	2100	2100

THESE DATA K. E. MC MULLEN					5-18 2270977	
COUNTY CODE	DIS.NFAIR	DIS. INTER	PUPCH 51-71	PUPCH 51-71	LATITUDE	
005	21	90	33.90	26.103	48.97	
006	25	29	54.84	76.77	42.95	
203	16	16	7.23	71.12	45.15	
204	20	20	61.13	222.637	44.05	
302	71	109	2.70	44.45	46.15	
310	20	180	14.22	10.335	48.00	
411	20	20	127.17	274.320	45.53	
412	93	99	31.96	77.33	46.37	
416	125	237	40.23	133.73	48.42	
420	170	70	20.06	46.624	45.83	
425	20	20	18.79	60.210	45.43	
428	10	10	72.95	274.320	45.22	
437	18	18	43.70	44.030	40.82	
444	49	40	37.32	11.020	45.23	
454	43	43	67.13	43.352	46.42	
455	42	43	52.33	34.479	46.05	
460	50	410	100.41	24.220	49.22	
483	23	75	15.46	37.930	48.15	
464	52	52	42.58	19.127	45.40	
467	40	40	2.35	13.281	45.27	
470	39	30	107.50	274.320	48.43	
501	122	224	59.06	41.270	46.52	
504	104	362	14.20	41.473	48.47	
507	63	63	57.71	120.313	43.95	
508	23	23	19.24	230.011	42.78	
509	10	10	41.10	25.964	42.30	
510	71	71	53.43	85.77	44.23	
516	10	19	332.83	103.72	43.45	
519	275	275	35.75	103.72	42.40	
520	39	39	27.70	35.317	42.07	
521	39	39	52.50	74.44	44.58	
523	60	60	29.30	19.76	44.25	
524	88	88	45.10	46.34	42.03	
526	10	10	73.94	24.601	43.13	
529	10	19	63.37	30.429	45.25	
533	10	10	91.91	62.2510	43.03	
536	10	10	30.24	26.207	44.30	
539	103	103	44.44	53.31	45.03	
545	40	40	26.31	47.116	40.50	
546	73	267	40.75	15.424	42.14	
547	105	105	37.34	112.093	43.65	
549	13	15	33.07	20.304	43.25	
551	43	43	11.42	23.346	49.10	
553	10	10	51.04	41.423	43.25	
620	10	10	51.41	50.222	49.10	
901	10	10	134.00	46.700	53.35	
909	70	100	74.00	20.00	50.10	
915	51	130	122.44	71.52	49.27	
916	10	10	35.33	104.162	55.50	
917	40	540	106.04	3.01	50.15	
919	40	107	107.00	11.14	50.15	
924	44	100	71.00	1.700	50.34	

DATE 22/08/77

THESIS DATA K. F. MC NULLEN

(DBR)

COUNTY CODE	LONGITUDE	MARKET POT.
005	-57.97	30134
006	-55.67	24263
203	-60.18	42411
203	-63.60	64376
702	-17.57	53473
310	-26.67	51312
411	-73.52	614502
412	-72.52	145205
415	-71.27	30178
420	-72.50	129394
425	-75.72	154433
428	-73.57	462075
437	-71.14	175035
444	-72.99	135168
454	-71.22	137305
455	-73.12	167613
460	-68.17	56032
463	-72.55	147917
464	-72.72	141000
467	-72.15	109534
470	-71.87	83152
501	-64.33	55065
504	-81.33	33974
507	-74.30	130441
508	-81.20	111545
509	-33.02	45215
510	-70.50	97423
516	-79.68	244410
519	-94.48	35206
520	-82.17	31594
521	-82.38	33615
523	-75.08	101014
524	-70.95	97674
526	-81.23	122692
528	-70.22	177422
533	-76.62	145930
536	-75.77	237232
537	-78.32	114267
545	-74.73	114255
546	-91.00	75673
547	-92.23	44363
549	-74.30	402441
551	-90.98	100626
553	-79.65	200372
620	-37.17	32178
611	-113.57	41376
601	-124.57	47363
602	-123.57	32773
610	-123.17	130760
616	-126.31	50401
617	-116.50	31347
619	-113.50	76300
624	-123.70	36175

APPENDIX E.3

Transformed Variables

LG10 POP/CURB COUNTY CODE	SORT DISTO	THESIS DATA SORT DISNFAIR	K.F. MC MULLEN SORT. DISINTER	LG10 POP/1	LG10 LGESTAB	LG10 TOTESTAB
005	4.4201	33.0302	4.5825	9.4968	4.6520	1.2041
006	3.8851	34.5338	5.0000	5.0000	4.6037	1.3802
203	4.9558	31.0161	4.0000	4.0000	5.1108	0.8450
208	5.3475	28.1780	4.4721	4.4721	15.4174	2.1986
302	3.6853	24.7386	8.4261	10.3923	4.3873	1.4149
310	4.0143	26.2678	9.0990	13.4164	4.6158	1.5185
411	6.4382	18.0554	4.4721	4.4721	5.3647	2.3463
412	4.9909	19.8494	9.9498	9.9498	5.0530	2.2833
416	5.1261	22.7815	11.1803	15.3943	8.2131	2.0569
420	4.6676	19.5192	8.4666	8.3666	4.8071	2.1172
425	5.7799	15.0996	4.4721	4.4721	5.3401	1.7853
428	6.4382	17.9721	3.1022	3.1622	6.3395	3.6869
437	5.6816	21.5638	4.2426	4.2426	4.7977	1.9542
444	4.0762	19.5741	7.0000	7.0000	4.5309	1.8450
454	5.6816	21.5174	6.5574	6.5574	5.6205	2.6551
455	4.5375	18.9208	6.4807	6.4807	4.6724	1.8129
460	4.3859	23.8263	7.0710	20.2484	5.0403	1.7160
463	4.9909	19.7989	4.7458	4.6602	5.0348	2.1461
464	4.5944	18.9472	7.2111	7.2111	4.7449	2.2068
467	4.1232	19.5703	3.9442	8.9442	4.5594	1.9030
470	6.4382	22.3159	6.2449	6.2449	5.1437	2.3692
501	4.9095	17.9443	11.0453	15.0996	5.0401	1.8633
504	4.6177	18.8679	10.1980	18.7616	4.9410	1.7923
507	5.0803	8.2462	7.9372	7.9372	4.6700	1.7403
508	5.4563	10.9544	4.7958	4.7958	4.4230	2.0211
509	5.4127	14.6909	3.1622	3.1622	5.4402	2.6532
510	4.9338	12.6095	8.4261	8.4261	5.0072	1.9138

THESIS DATA K.E. MC MULLEN

LG10 POP/COUNTY CODE	LG10 DISTO	LG10 DISNEAIR	LG10 DISINTER	LG10 POP71	LG10 LGESTAB	LG10 TOTESTAB
516	5.4772	4.3588	4.3588	5.2799	0.0000	2.4698
519	28.9654	16.5831	16.5831	4.7261	0.0000	1.6020
520	13.2664	6.2449	6.2449	5.0048	0.0000	2.2479
521	12.9614	6.2449	6.2449	5.0580	0.3010	2.0644
523	14.2828	7.7459	7.7459	4.0997	0.0000	1.7781
524	11.7473	9.3808	9.3808	4.4525	0.0000	1.5314
526	10.6770	3.1622	3.1622	5.4502	0.6020	2.5987
528	6.8556	4.2426	4.2426	5.5407	0.7781	2.6830
533	14.7648	3.1622	3.1622	5.0735	0.3010	2.4756
536	5.4772	3.1622	3.1622	5.4139	0.6989	2.7403
538	8.8881	10.1488	10.1488	4.9435	0.3010	2.0569
545	16.0934	6.3245	6.3245	4.7874	0.0000	1.9084
546	14.8996	8.8317	16.9410	5.2968	0.3010	1.9867
547	24.1660	10.2469	10.2469	5.1625	0.0000	2.0492
549	3.1622	3.8729	3.8729	6.3193	1.2787	3.6886
551	8.1853	6.5574	6.5574	5.4348	0.8450	2.7730
553	6.7823	3.1622	3.1622	5.6040	0.8450	2.7497
620	30.8382	3.1622	3.1622	5.7326	0.0000	2.9758
811	41.1096	3.1622	3.1622	5.7423	0.0000	2.8075
901	46.8614	9.3666	10.0300	4.5017	0.3010	1.5051
909	46.6261	7.1414	11.4017	4.0752	0.0000	1.5797
915	45.7820	3.1622	3.1622	6.0121	0.3010	3.2743
916	48.0416	6.9742	23.2178	4.5720	0.0000	1.4313
917	43.5775	6.3245	14.0350	4.4764	0.0000	1.5682
919	48.3249	6.3245	7.0710	4.6312	0.0000	1.6901
924	45.8257	4.4721	7.4191	4.2583	0.0000	1.3424

END OF LISTING

APPENDIX F

PRINCIPAL COMPONENTS ANALYSES:
ROTATED COMPONENTS AND LOADINGS

APPENDIX F.1

Untransformed Variables

FACTORY ANALYSIS UNTRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

07/14/77

VARIABLE	MEAN	STANDARD DEV	CASES
URBX71	75.7569	17.0471	53
AVINC71	7532.8867	1139.1655	53
POPUGURB	453960.7500	832944.3750	53
POPCHS17	73.1550	74.5678	53
MANULFX	22.5251	10.0645	53
ADMINX	25.7926	22.5973	53
DISTO	631.6038	677.1008	53
DISNEAIR	43.6981	64.9793	53
DISINTER	82.1132	111.1520	53
MP71	121512.6250	1030.34375	53
SPECIND	5.3724	11.7562	53
FINANCE	3.8545	1.0867	53
FORCONT	3.0755	1.0867	53
POP71	238530.2500	420577.2500	53

FACTOR ANALYSIS UNTRANSFORMED (LARGE ESTABLISHMENTS).

FILE THESIS (CREATION DATE = 07/14/77)

CORRELATION COEFFICIENTS.

URB#71	AVINC#71	POPLGURB	POBCH517	MANULFX	ADMINX	DISTU	DISNEAIR	DISINTER	MP#7
1.00000	0.52710	0.51037	0.26815	-0.07812	0.03905	-0.04650	-0.43622	-0.32784	0.47276
0.52710	1.00000	0.46674	0.68746	-0.16299	-0.02236	-0.00214	-0.23857	-0.03889	0.28869
0.51037	0.46674	1.00000	0.55914	0.03942	-0.01537	-0.21944	-0.31950	-0.13118	0.74252
0.26815	0.68746	0.56914	1.00000	-0.03992	-0.05241	0.11473	-0.21528	0.14550	0.31851
-0.07812	0.16299	0.00942	0.03992	1.00000	-0.11632	-0.23423	0.3352	-0.11326	0.18903
0.03992	-0.00942	0.01537	-0.03241	0.11632	1.00000	-0.13116	0.34003	-0.05028	0.09600
-0.08650	-0.00214	-0.21944	-0.11473	-0.28423	-0.13216	1.00000	-0.37403	-0.25819	-0.41255
-0.00214	-0.21944	-0.21298	-0.11298	-0.03452	-0.04095	-0.00000	-0.34033	0.51349	-0.30078
-0.21298	-0.21298	-0.14550	-0.14550	-0.11020	-0.05935	-0.00214	0.81549	1.00000	-0.30328
-0.03889	0.03889	0.31651	0.31651	0.14903	0.03603	-0.00214	-0.30078	-0.38328	1.00000
0.47276	0.28869	0.74252	0.47252	-0.03603	0.03603	-0.00214	-0.30078	-0.38328	1.00000
0.17696	0.31954	0.09147	0.24730	-0.09255	0.09448	-0.00214	-0.30078	-0.38328	1.00000
0.61943	0.01943	0.61943	0.02441	-0.11474	-0.07167	-0.13116	-0.33115	-0.20814	0.06612
0.29650	0.29650	0.14331	0.10557	-0.11637	-0.07167	-0.13116	-0.33115	-0.20814	0.06612
0.33624	0.33624	0.00230	0.00568	-0.06517	-0.02284	-0.00214	-0.33115	-0.20814	0.06612
0.49320	0.49320	0.00230	0.00568	-0.06517	-0.02284	-0.00214	-0.33115	-0.20814	0.06612

	SPEEDING	FINANCE	FORCUNT	POPTZ1
BRBX71	0.17696	0.56935	0.20231	0.49320
AVINC71	0.31964	0.61578	0.29650	0.33621
TOPPLGUR8	0.09147	0.61983	0.14331	0.60330
OPCHSW7	0.34735	0.50241	0.10657	0.03068
MANULFX	0.19925	-0.11954	0.01667	-0.06177
DOMINX	0.00448	-0.07167	0.01567	0.02204
DIISTO	0.20411	-0.15630	-0.45230	-0.09301
DISINFAM	0.00329	-0.34115	0.01895	-0.23264
DISINTER	0.28414	-0.20593	-0.19695	-0.23606
DP71	0.08632	0.57045	0.24265	0.34374
SPEEDING	1.00000	0.06213	0.11533	0.03775
FINANCE	0.04213	1.00000	0.44082	0.51793
FORCUNT	0.11333	0.44082	1.00000	0.17490
POPTZ1	0.08779	0.51798	0.13490	1.00000

FACTOR ANALYSIS UNTRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

07/14/77

VARIABLE	EST COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
URBX71	1.00000	1	4.95104	32.3	32.3
AVINC71	1.00000	2	1.93362	13.8	46.1
POPPLGURH	1.00000	3	1.52795	10.0	56.0
POPCHS17	1.00000	4	1.16097	8.3	64.3
MANULFX	1.00000	5	1.16059	7.9	72.1
ADMINX	1.00000	6	0.84132	6.0	78.2
DISC	1.00000	7	0.77591	5.2	83.4
DISNEAIR	1.00000	8	0.61255	4.4	87.8
DISINTER	1.00000	9	0.41842	3.0	90.8
MP71	1.00000	10	0.33910	2.4	93.2
SPECIND	1.00000	11	0.29045	2.1	95.3
FINANCE	1.00000	12	0.21145	1.5	96.8
FORCONT	1.00000	13	0.19510	1.6	98.4
POP71	1.00000	14	0.07552	0.5	98.9

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FACTOR ANALYSIS UNTRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

FACTOR MATRIX USING PRINCIPAL FACTOR. NO ITERATIONS

G	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
F					
URBX71	0.74517	0.05470	-0.14240	0.03493	-0.25103
AVINC71	0.69294	0.49712	-0.15369	-0.05462	0.08438
POPLGURB	0.84056	0.00003	-0.06532	0.20785	0.15872
POPCHE17	0.55096	0.52402	0.03723	0.04476	0.56570
MANULFX	-0.00678	-0.57268	0.16025	0.10403	0.55557
ADMINX	-0.00939	-0.26563	0.00059	0.76302	-0.02181
DISTO	-0.28564	0.58274	-0.61211	-0.02704	0.10107
DISMEAIR	-0.52336	0.11629	-0.52421	0.12373	0.10667
DISINTER	-0.43115	0.61103	0.39154	0.23335	0.15137
MP71	0.76650	-0.31361	0.06906	0.23374	0.08994
SPECIND	0.18178	0.35210	0.53503	0.23480	-0.44451
FINANCE	0.83621	0.13461	0.02424	-0.13470	0.05007
FORCQNT	0.39961	-0.19613	0.54446	-0.50530	0.01517
POP71	0.67067	-0.07047	-0.15642	0.14601	-0.26613

VARIABLE	COMMUNALITY
URBX71	0.64278
AVINC71	0.76050
POPLGURB	0.77920
POPCHE17	0.90853
MANULFX	0.67328
ADMINX	0.65760
DISTO	0.80679
DISMEAIR	0.58811
DISINTER	0.79352
MP71	0.74862
SPECIND	0.74683
FINANCE	0.75569
FORCQNT	0.73592
POP71	0.58245

FACTOR ANALYSIS UNTRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

S VARIMAX ROTATED FACTOR MATRIX

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	Factor	Eigenvalue	Pct. of Var.	Cum. Pct.
URBX71	0.67891	0.33104	0.07816	0.25687	0.01334	1	3.05	21.79	21.79
AVINC71	0.24172	0.75191	0.06679	0.32032	-0.17215	2	2.64	18.86	40.65
POPUGURB	0.56809	0.62031	0.16526	-0.00931	-0.21573	3	1.90	13.59	54.24
POPCHSE17	0.00820	0.94534	-0.10555	-0.05759	0.01834	4	1.33	9.41	63.65
MANULFX	-0.11907	0.04149	0.41156	-0.63804	0.28443	5	1.22	8.70	72.35
ADMINX	0.03033	-0.07212	0.00777	0.03934	-0.50704				
DESG	-0.10547	0.08890	-0.80495	-0.03034	-0.19075				
DISNFAIR	-0.72403	-0.10992	0.16224	0.12912	0.09301				
DISINTER	-0.76061	0.22410	-0.21004	0.33552	0.05048				
NP71	0.56347	0.39434	0.41268	-0.07841	0.31490				
SPECIND	-0.08968	0.13376	0.23124	0.05475	0.14067				
FINANCE	0.54191	0.69858	0.22464	0.10497	-0.20105				
FORCCNT	0.07783	0.08528	0.76203	0.05501	-0.41451				
POP71	0.67574	0.21015	0.09129	0.22374	0.15132				

N TRANSFORMATION MATRIX

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
FACTOR 1	0.70833	0.61726	0.29930	0.11520	0.01224
FACTOR 2	-0.30353	0.52312	-0.53907	0.51920	-0.27212
FACTOR 3	-0.50824	0.15179	0.76788	0.35853	-0.02164
FACTOR 4	-0.06671	0.11058	-0.17370	0.17278	0.96087
FACTOR 5	-0.35932	0.55634	-0.00016	-0.74759	0.04535

APPENDIX F.2

Transformed Variables

FACTOR ANALYSIS TRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

07/14/77

VARIABLE	MEAN	STANDARD DEV	CASES
URBRT4	75.7569	17.0471	53
AVINCT1	7532.8867	1139.1655	53
POPCHS17	4.9016	1.0904	53
MANOLF2	73.1550	14.5078	53
ADMIN2	22.5251	10.0645	53
DISTO	25.7996	22.5993	53
DISFAIR	21.9441	12.3670	53
DISINTER	6.4228	2.7563	53
MDT1	4.1235	4.4343	53
SPECIND	12512.0250	103043.8375	53
FINANC1	5.3724	8.0941	53
FURCONJ	3.8545	1.7542	53
POP71	3.0755	1.6967	53
	5.0637	0.4770	53

FACTOR ANALYSIS TRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

CORRELATION COEFFICIENTS..

	URBX71	AVINC71	POPLGURB	POPCHS17	MANULFX	ADMINX	DISNUFAIR	DISINTER	MP71
URBX71	1.00000	0.52710	0.56659	0.20315	-0.07812	0.03995	-0.51971	-0.43781	0.47276
AVINC71	0.52710	1.00000	0.36535	0.63746	-0.16299	-0.08230	-0.50871	-0.43304	0.28668
POPLGURB	0.56659	0.36535	1.00000	0.20283	-0.02096	0.01234	-0.31320	-0.44563	0.55494
POPCHS17	0.20315	0.63746	0.20283	1.00000	-0.03992	-0.05241	-0.74072	0.01939	0.31651
MANULFX	-0.07812	-0.16299	-0.02096	-0.03992	1.00000	0.11632	0.03629	-0.06355	0.18903
ADMINX	0.03995	-0.08230	0.01234	-0.05241	0.11632	1.00000	0.00121	-0.04100	0.09600
DISNUFAIR	-0.51971	-0.74072	-0.44563	-0.03629	-0.03629	-0.00121	1.00000	0.26946	-0.46488
DISINTER	-0.43781	-0.43304	-0.44563	0.01816	-0.06355	-0.04120	0.26946	1.00000	-0.34352
MP71	0.47276	0.28668	0.55494	0.31651	0.18903	0.09600	-0.34352	-0.44171	1.00000
SPECINO	0.17696	0.31964	0.20942	0.08736	-0.17925	0.02444	-0.31616	0.23197	0.08632
FINANCE	0.56935	0.61578	0.69817	0.50241	-0.17925	-0.07167	-0.49214	-0.41525	0.52095
FORCCNT	0.20231	0.29650	0.44040	0.19547	0.17925	-0.14105	-0.43960	-0.22450	0.24265
POP71	0.72452	0.54511	0.75170	0.21315	-0.17925	-0.06246	-0.45354	-0.45042	0.50917

	SPECINO	FINANCE	FORCCNT	POP71
URBX71	0.17696	0.56935	0.20231	0.72452
AVINC71	0.31964	0.61578	0.29650	0.54511
POPLGURB	0.20942	0.69817	0.44040	0.75170
POPCHS17	0.08736	0.50241	0.19547	0.21315
MANULFX	-0.17925	-0.17925	0.17925	-0.17925
ADMINX	0.02444	-0.07167	-0.14105	-0.06246
DISNUFAIR	-0.19629	-0.24267	-0.43960	-0.45354
DISINTER	0.01016	-0.49214	-0.43960	-0.45354
MP71	0.23197	-0.41525	-0.22450	-0.45042
SPECINO	1.00000	0.06213	0.11533	0.22241
FINANCE	0.06213	1.00000	0.44040	0.62317
FORCCNT	0.14333	0.44040	1.00000	0.37635
POP71	0.22241	0.62317	0.37635	1.00000

FACTOR ANALYSIS TRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

07/14/77

* VARIABLE	EST COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
URBX71	1.00000	1	5.10665	36.5	36.5
AVINC71	1.00000	2	1.82278	13.0	49.5
POPPLGUA8	1.00000	3	1.54952	11.1	60.6
POPCHS17	1.00000	4	1.14065	8.1	68.7
MANULFX	1.00000	5	1.11259	7.9	76.7
ADMINX	1.00000	6	0.74255	5.3	82.0
DISTC	1.00000	7	0.56944	4.2	86.2
DISNEAIR	1.00000	8	0.54948	3.9	90.1
DISINTER	1.00000	9	0.35669	2.5	92.6
MP71	1.00000	10	0.34697	2.5	95.1
SPECIND	1.00000	11	0.22629	1.6	96.7
FINANCE	1.00000	12	0.20505	1.5	98.2
FORCONT	1.00000	13	0.17490	1.2	99.5
POP71	1.00000	14	0.07634	0.5	100.0

FACTOR ANALYSIS TRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

3 FACTOR MATRIX USING PRINCIPAL FACTOR, NO ITERATIONS

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
URBX71	0.76746	0.15116	0.18804	-0.12651	0.19679
AVINC71	0.07538	0.43696	0.11957	0.25179	0.03143
POPLGURS	0.82333	-0.17808	0.11689	-0.22284	-0.01188
POPCHS17	0.45308	0.47864	0.13433	0.66874	0.06291
MANULFX	-0.03468	-0.56039	0.09991	-0.52759	0.02495
ADMINX	-0.01707	-0.27709	-0.01903	0.04601	0.04165
DISIO	-0.47777	0.61673	-0.46098	0.02135	0.00107
DISNEAIR	-0.60746	-0.05905	0.59426	-0.00919	0.00428
DISINTER	-0.60817	0.36864	0.55444	0.10612	0.09750
MP71	0.89523	-0.29015	0.01629	0.14237	0.18844
SPECIND	0.21207	0.29679	0.59686	-0.37493	0.29610
FINANCE	0.83432	0.15396	-0.01825	0.11943	-0.12541
FORCONT	0.49500	-0.26187	0.44015	-0.04029	-0.46141
POP71	0.85631	0.06874	-0.00738	-0.28181	0.04299

COMMUNALITY

URBX71	0.69833
AVINC71	0.80587
POPLGURS	0.77304
POPCHS17	0.90359
MANULFX	0.72627
ADMINX	0.78748
DISIO	0.79387
DISNEAIR	0.72575
DISINTER	0.83393
MP71	0.64032
SPECIND	0.71754
FINANCE	0.78399
FORCONT	0.72284
POP71	0.81932

VARIABLE

URBX71	0.69833
AVINC71	0.80587
POPLGURS	0.77304
POPCHS17	0.90359
MANULFX	0.72627
ADMINX	0.78748
DISIO	0.79387
DISNEAIR	0.72575
DISINTER	0.83393
MP71	0.64032
SPECIND	0.71754
FINANCE	0.78399
FORCONT	0.72284
POP71	0.81932

FACTOR ANALYSIS TRANSFORMED (LARGE ESTABLISHMENTS)

FILE: THESIS (CREATION DATE = 07/14/77)

S VARIMAX ROTATED FACTOR MATRIX

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	Factor	Eigenvalue	Pct. of Var.	Cum. Pct.
URB71	0.73300	0.06955	0.29054	0.24923	0.09836	1	3.68	26.29	26.29
AVINC71	0.30793	0.10647	0.77116	0.30898	-0.09704	2	2.27	16.23	42.52
POPLGURB	0.33971	0.52350	0.13120	0.20888	-0.01595	3	2.08	14.84	57.36
POPCMS17	0.08137	-0.02034	0.94285	-0.04300	-0.00213	4	1.53	10.93	68.29
MANULEX	-0.17427	0.40314	0.03598	-0.01014	0.28132	5	1.17	8.39	76.68
ADMINX	-0.03120	-0.01514	-0.06173	-0.04110	0.88321				
DISISU	-0.12761	-0.86731	0.03780	0.03242	-0.15117				
DISSEAIN	-0.80685	0.14510	-0.10253	0.16283	0.02747				
DISINTER	-0.83681	-0.10806	0.13752	0.29398	0.01041				
W71	0.50720	0.48397	0.30028	-0.04039	0.26677				
SPECIND	-0.09204	0.19121	0.14052	0.79722	0.13073				
FINANCE	0.63201	0.27423	0.51700	0.11266	-0.17139				
ECRCONT	0.14589	0.78561	0.11514	0.09514	-0.39007				
POP71	0.73771	0.28929	-0.20797	0.39274	-0.04019				

N TRANSFORMATION MATRIX

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
FACTOR 1	0.77796	0.41851	0.42962	0.18501	-0.12870
FACTOR 2	-0.06154	-0.64803	0.51884	0.47571	-0.28427
FACTOR 3	-0.57268	0.60955	0.22749	0.49867	-0.01611
FACTOR 4	-0.24919	0.04408	0.09931	-0.65502	0.13370
FACTOR 5	0.03047	-0.17733	0.07377	0.24890	0.94931

APPENDIX G

MULTIPLE REGRESSION ANALYSES:

Y = NUMBER OF LARGE ESTABLISHMENTS

APPENDIX G.1

Untransformed Variables

REGRESSION ANALYSIS UNTRANSFORMED (LARGE ESTABLISHMENTS)

07/14/77

FILE THESIS (CREATION DATE = 07/14/77)

VARIABLE	MEAN	STANDARD DEV	CASES
LGEST71	2.5094	3.6670	53
FCIR1	0.0000	1.0000	53
FCIR2	0.0000	1.0000	53
FCIR3	0.0000	1.0000	53
FCIR4	-0.0000	1.0000	53
FCIR5	0.0000	1.0000	53

REGRESSION ANALYSIS UNTRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

CORRELATION COEFFICIENTS

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

	LGEST71	FCR1	FCR2	FCR3	FCR4	FCR5
LGEST71	1.00000	0.52725	0.20202	0.25041	0.09852	0.19629
FCR1	0.52725	1.00000	0.00001	0.00001	-0.00000	-0.00000
FCR2	0.20202	0.00001	1.00000	-0.00000	0.00002	-0.00004
FCR3	0.25041	0.00001	-0.00000	1.00000	0.00001	-0.00000
FCR4	0.09852	-0.00000	0.00002	0.00001	1.00000	-0.00001
FCR5	0.19629	-0.00000	-0.00001	-0.00000	-0.00001	1.00000

REGRESSION ANALYSIS UNTRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
REGRESSION LIST

DEPENDENT VARIABLE.. LGEST71 # OF LARGE EST. 1971

VARIABLE(S) ENTERED ON STEP NUMBER 1.. FCTR1

MULTIPLE R 0.52725
R SQUARE 0.27800
ADJUSTED R SQUARE 0.26384
STANDARD ERROR 3.14630

ANALYSIS OF VARIANCE OF
REGRESSION 1.
RESIDUAL 51.

MEAN SQUARE
194.38729
9.89918

F 19.63671

VARIABLES IN THE EQUATION

VARIABLE	B	BETA	STD ERROR B	F
FCTR1	1.933437	0.52725	0.43631	19.637
(CONSTANT)	2.509433			

VARIABLE
FCTR2
FCTR3
FCTR4
FCTR5

BETA IN
0.20201
0.25041
0.09852
0.19629

PARTIAL
0.23774
0.27470
0.11595
0.23101

TOLERANCE
1.00000
1.00000
1.00000
1.00000

F
2.995
4.755
0.681
2.819

VARIABLE(S) ENTERED ON STEP NUMBER 2.. FCTR3

MULTIPLE R 0.58369
R SQUARE 0.34070
ADJUSTED R SQUARE 0.31433
STANDARD ERROR 3.03649

ANALYSIS OF VARIANCE OF
REGRESSION 2.
RESIDUAL 50.

MEAN SQUARE
119.11627
9.22025

F 12.91898

VARIABLES IN THE EQUATION

VARIABLE	B	BETA	STD ERROR B	F
FCTR1	1.933429	0.52725	0.42108	21.5082
FCTR3	0.942414	0.25041	0.42108	4.755
(CONSTANT)	2.509430			

VARIABLE
FCTR2
FCTR4
FCTR5

BETA IN
0.20201
0.09852
0.19610

PARTIAL
0.24879
0.12134
0.24175

TOLERANCE
1.00000
1.00000
1.00000

F
3.233
0.732
3.042

REGRESSION ANALYSIS UNTRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

DEPENDENT VARIABLE: LGESF71; # OF LARGE EST. 1971

VARIABLE(S) ENTERED ON STEP NUMBER 3: FCIR2

MULTIPLE R 0.61766
R SQUARE 0.38151
ADJUSTED R SQUARE 0.34304
STANDARD ERROR 2.97087

ANALYSIS OF VARIANCE
REGRESSION 22.024
RESIDUAL 4.968
TOTAL 3.233

SUM OF SQUARES
REGRESSION 366.76845
RESIDUAL 432.47694
TOTAL 809.24539

MEAN SQUARE
REGRESSION 18.92282
RESIDUAL 9.82666
TOTAL 18.92282

VARIABLE LIST 1
REGRESSION LIST 1

VARIABLES IN THE EQUATION

VARIABLE	B	BETA	STD. ERROR B	F
FCIR1	1.933422	0.52725	0.41198	22.024
FCIR3	0.9182442	0.25041	0.41198	4.968
FCIR2	0.7407748	0.20201	0.41198	3.233
(CONSTANT)	2.509428			

VARIABLES NOT IN THE EQUATION

VARIABLE	BETA IN	PARTIAL	TOLERANCE
FCIR4	0.09452	0.12527	1.00000
FCIR5	0.19630	0.24960	1.00000

VARIABLE(S) ENTERED ON STEP NUMBER 4: FCIR5

MULTIPLE R 0.64811
R SQUARE 0.42004
ADJUSTED R SQUARE 0.37171
STANDARD ERROR 2.90665

ANALYSIS OF VARIANCE
REGRESSION 23.008
RESIDUAL 5.190
TOTAL 3.378

SUM OF SQUARES
REGRESSION 293.71236
RESIDUAL 405.53293
TOTAL 699.24529

MEAN SQUARE
REGRESSION 73.42409
RESIDUAL 8.44660
TOTAL 73.42409

VARIABLE LIST 1
REGRESSION LIST 1

VARIABLES IN THE EQUATION

VARIABLE	B	BETA	STD. ERROR B	F
FCIR1	1.933422	0.52725	0.40308	23.008
FCIR3	0.9182442	0.25041	0.40308	5.190
FCIR2	0.7407748	0.20202	0.40308	3.378
FCIR5	0.7138208	0.19650	0.40308	3.129
(CONSTANT)	2.509428			

VARIABLES NOT IN THE EQUATION

VARIABLE	BETA IN	PARTIAL	TOLERANCE
FCIR4	0.09452	0.12937	1.00000

REGRESSION ANALYSIS UNTRANSFORMED (LARGE ESTABLISHMENTS)

07/16/77

FILE THESIS (CREATION DATE = 07/16/77)

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
 DEPENDENT VARIABLE.. LGEST71 # OF LARGE EST. 1971 REGRESSION LIST 1

VARIABLE(S) ENTERED ON STEP NUMBER 5.. PCTR4

MULTIPLE R 0.6555
 R SQUARE 0.42975
 ADJUSTED R SQUARE 0.36908
 STANDARD ERROR 2.91272

ANALYSIS OF VARIANCE
 REGRESSION 5.
 RESIDUAL 47.

SUM OF SQUARES
 300.49220
 398.74609

MEAN SQUARE
 60.09984
 8.48396

F 7.08394

VARIABLES IN THE EQUATION

VARIABLE	B	BETA	STD ERROR B	F
PCTR1	1.933426	0.52725	0.40392	22.912
PCTR2	0.9182454	0.25041	0.40392	5.168
PCTR3	0.7407723	0.20201	0.40391	3.363
PCTR5	0.7132229	0.19630	0.40392	3.176
PCTR4	0.3612659	0.09852	0.40392	0.800
CONSTANT	2.509425			

VARIABLES NOT IN THE EQUATION

VARIABLE	BETA IN	PARTIAL	TOLERANCE	F
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MAXIMUM STEP REACHED

REGRESSION ANALYSIS UNTRANSFORMED (LARGE ESTABLISHMENTS)

FILE, THESIS (CREATION DATE = 07/14/77)

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
REGRESSION LIST 1

DEPENDENT VARIABLE.. LGFST71 # OF LARGE EST. 1971

SUMMARY TABLE

VARIABLE	MULTIPLE R	R SQUARE	HSD CHANGE	SIMPLE R	n	BETA
FCTR1	0.52725	0.27800	0.27800	0.52725	1.933426	0.52725
FCTR2	0.58309	0.34070	0.06270	0.25041	0.9152454	0.25041
FCTR3	0.61760	0.34131	0.04931	0.20202	0.7407723	0.20201
FCTR4	0.67311	0.42004	0.03903	0.14629	0.7139229	0.19630
(CONSTANT)	0.65555	0.42975	0.00071	0.09852	0.3612659	0.09852
					2.5504425	

REGRESSION ANALYSIS UNTRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

DEPENDENT VARIABLE: LGFST71 FROM PREDICTED LGFST71 RESIDUAL

SECONUM	OBSERVED LGFST71	PREDICTED LGFST71	RESIDUAL
1	1.000000	0.8208442	0.1791557
2	1.000000	1.454987	-0.454987
3	1.000000	1.947335	-0.947335
4	1.000000	2.841172	-1.841172
5	1.000000	0.949305	1.049305
6	1.000000	0.6104757	0.3895243
7	1.000000	0.993363	0.006637
8	1.000000	1.639397	-0.639397
9	1.000000	0.9641514	1.035849
10	1.000000	1.824908	-0.824908
11	1.000000	4.313031	-3.313031
12	1.000000	9.346838	-8.346838
13	1.000000	3.387339	-2.387339
14	1.000000	1.725185	-0.725185
15	1.000000	3.812014	-2.812014
16	1.000000	2.233438	-1.233438
17	1.000000	0.2946513	0.7053487
18	1.000000	2.743066	-1.743066
19	1.000000	1.933481	-0.933481
20	1.000000	4.474058	-3.474058
21	1.000000	3.255808	-2.255808
22	1.000000	0.9912624	0.0087376
23	1.000000	1.066467	-0.066467
24	1.000000	1.187003	-0.187003
25	1.000000	2.372252	-1.372252
26	1.000000	3.271109	-2.271109
27	1.000000	2.142502	-1.142502
28	1.000000	5.743147	-4.743147
29	1.000000	1.710869	-0.710869
30	1.000000	1.727560	-0.727560
31	1.000000	2.539237	-1.539237
32	1.000000	1.497388	-0.497388
33	1.000000	0.2023379	0.7976621
34	1.000000	3.990186	-2.990186
35	1.000000	4.118319	-3.118319
36	1.000000	5.317366	-4.317366
37	1.000000	5.901778	-4.901778
38	1.000000	2.079939	-1.079939
39	1.000000	2.167775	-1.167775
40	1.000000	3.146046	-2.146046
41	1.000000	1.459543	-0.459543
42	1.000000	9.816434	-8.816434
43	1.000000	3.553122	-2.553122
44	1.000000	4.482408	-3.482408
45	1.000000	3.898531	-2.898531

0.0 1.0 2.0

-2.0 -1.0

0.0 1.0 2.0

0.0 1.0 2.0

0.0 1.0 2.0

0.0 1.0 2.0

0.0 1.0 2.0

REGRESSION ANALYSIS UNTRANSFORMED (LARGE ESTABLISHMENTS)

07/14/77

46	1.000000	3.028541	-2.028541
47	2.000000	-0.1689225	-2.168922
48	1.000000	-0.4075032	1.407503
49	2.000000	4.411840	-2.411840
50	1.000000	-1.721268	2.721269
51	1.000000	0.1840109	0.8139891
52	1.000000	0.4495416	0.5504586
53	1.000000	-0.4149001E-01	1.041490

DURBIN-WATSON TEST OF RESIDUAL DIFFERENCES COMPARED BY CASE ORDER (SEQUENCE).

VARIABLE LIST 1. REGRESSION LIST 1. DURBIN-WATSON TEST 2.11682

APPENDIX G.2

Transformed Variables

REGRESSION ANALYSTS TRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

07/14/77

VARIABLE	MEAN	STANDARD DEV	CASES
LGEST71	0.2148	0.3308	53
FCIR1	-0.0000	1.0000	53
FCIR2	0.0000	1.0000	53
FCIR3	0.0000	1.0000	53
FCIR4	0.0000	1.0000	53
FCIR5	0.0000	1.0000	53

REGRESSION ANALYSIS (TRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

CORRELATION COEFFICIENTS

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

	LGEST71	FCTR1	FCTR2	FCTR3	FCTR4	FCTR5
LGEST71	1.00000	0.39545	0.40623	0.13700	0.10354	0.07096
FCTR1	0.39545	1.00000	0.00001	0.00004	0.00001	0.00030
FCTR2	0.40623	0.00001	1.00000	-0.00000	-0.00002	0.00000
FCTR3	0.13700	0.00004	-0.00000	1.00000	0.00003	-0.00001
FCTR4	0.10354	0.00001	-0.00002	0.00003	1.00000	-0.00001
FCTR5	0.07096	0.00000	0.00000	-0.00001	-0.00001	1.00000

REGRESSION ANALYSIS TRANSFORMED (LARGE ESTABLISHMENTS)

FILE: THESIS (CREATION DATE: 07/14/77)

DEPENDENT VARIABLE: LOGEST71 LOG OF # OF LRG ESTAB 1971

VARIABLE(S) ENTERED ON STEP NUMBER 1.. FCTR2

MULTIPLE R 0.40623
R SQUARE 0.16502
ADJUSTED R SQUARE 0.14855
STANDARD ERROR 0.30927

ANALYSIS OF VARIANCE
REGRESSION 1.
RESIDUAL 51.

MEAN SQUARE
0.93930
0.09319

SUM OF SQUARES
0.93930
4.75269

F 10.079

VARIABLES IN THE EQUATION

VARIABLE	B	BETA	STD ERROR B	F
FCTR2	0.1343993	0.40623	0.04233	10.079
(CONSTANT)	0.2148370			

VARIABLES NOT IN THE EQUATION

VARIABLE	BETA IN	PARTIAL	TOLERANCE
FCTR1	0.30545	0.43270	1.00000
FCTR3	0.19700	0.20465	1.00000
FCTR4	0.10354	0.11331	1.00000
FCTR5	0.07709	0.07766	1.00000

VARIABLE(S) ENTERED ON STEP NUMBER 2.. FCTR1

MULTIPLE R 0.56692
R SQUARE 0.32140
ADJUSTED R SQUARE 0.29425
STANDARD ERROR 0.27794

ANALYSIS OF VARIANCE
REGRESSION 2.
RESIDUAL 50.

MEAN SQUARE
0.91470
0.07725

SUM OF SQUARES
1.92940
3.90739

F 11.840

VARIABLES IN THE EQUATION

VARIABLE	B	BETA	STD ERROR B	F
FCTR2	0.1343976	0.40622	0.03854	12.159
FCTR1	0.1368306	0.39545	0.03854	11.522
(CONSTANT)	0.2148372			

VARIABLES NOT IN THE EQUATION

VARIABLE	BETA IN	PARTIAL	TOLERANCE
FCTR3	0.18498	0.22699	1.00000
FCTR4	0.10134	0.12509	1.00000
FCTR5	0.07009	0.08614	1.00000

F 24.66
0.78
0.36

REGRESSION ANALYSIS TRANSFORMED (LARGE ESTABLISHMENTS)

FILE - THESIS (CREATION DATE = 07/14/77)

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
REGRESSION LIST 1

DEPENDENT VARIABLE.. LGEST71 LOG OF # OF LMG ESTAB 1971

VARIABLE(S) ENTERED ON STEP NUMBER 3.. FCTR3

MULTIPLE R 0.59696
R SQUARE 0.35636
ADJUSTED R SQUARE 0.31696
STANDARD ERROR 0.27344

ANALYSIS OF VARIANCE
REGRESSION 3.
RESIDUAL 40.

SUM OF SQUARES
2.02841
3.06354

MEAN SQUARE
0.67614
0.07477

F 9.04325

VARIABLES IN THE EQUATION

VARIABLE	B	BETA	STD ERROR B	F
FCTR2	0.1343978	0.40622	0.03792	12.563
FCTR1	0.1308284	0.39544	0.03792	11.905
FCTR3	0.61863240-01	0.18698	0.03792	2.662
(CONSTANT)	0.2148370			

VARIABLES NOT IN THE EQUATION

VARIABLE	BETA IN	PARTIAL	TOLERANCE	F
FCTR4	0.10353	0.12905	1.00000	0.813
FCTR5	0.07096	0.01443	1.00000	0.379

VARIABLE(S) ENTERED ON STEP NUMBER 4.. FCTR4

MULTIPLE R 0.60587
R SQUARE 0.36708
ADJUSTED R SQUARE 0.31434
STANDARD ERROR 0.27396

ANALYSIS OF VARIANCE
REGRESSION 4.
RESIDUAL 46.

SUM OF SQUARES
2.03942
3.60256

MEAN SQUARE
0.52235
0.07505

F 6.95977

VARIABLES IN THE EQUATION

VARIABLE	B	BETA	STD ERROR B	F
FCTR2	0.1343983	0.40622	0.03799	12.515
FCTR1	0.1309280	0.39544	0.03799	11.859
FCTR3	0.61862300-01	0.18698	0.03799	2.652
FCTR4	0.2254310-01	0.10353	0.03799	0.813
(CONSTANT)	0.2148366			

VARIABLES NOT IN THE EQUATION

VARIABLE	BETA IN	PARTIAL	TOLERANCE	F
FCTR5	0.07096	0.08920	1.00000	0.377

REGRESSION ANALYSIS TRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

***** MULTIPLE REGRESSION *****

DEPENDENT VARIABLE.. LGEST71 LOG OF # OF LRG ESTAB 1971

VARIABLE(S) ENTERED ON STEP NUMBER 5.. FCTR5

MULTIPLE R 0.61001
R SQUARE 0.37212
ADJUSTED R SQUARE 0.30532
STANDARD ERROR 0.27575

ANALYSIS OF VARIANCE
REGRESSION 5.
RESIDUAL 47.

SUM OF SQUARES
2.11808
3.57300

MEAN SQUARE
0.42362
0.07604

VARIABLE LIST 1
REGRESSION LIST 1

F 5.57094

VARIABLES IN THE EQUATION

VARIABLE	B	BETA	STD. ERROR B	F
FCTR2	0.1343983	0.40622	0.03924	12.352
FCTR1	0.1308280	0.39544	0.03824	11.705
FCTR3	0.61862460-01	0.18698	0.03824	2.617
FCTR4	0.74254550-01	0.10353	0.03824	0.802
FCTR5	0.23476180-01	0.07096	0.03824	0.377
(CONSTANT)	0.2148365			

VARIABLES NOT IN THE EQUATION

VARIABLE	BETA IN	PARTIAL	TOLERANCE
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MAXIMUM STEP REACHED

REGRESSION ANALYSIS TRANSPORTED (LARGE ESTABLISHMENTS)

FILE JTHESIS (CREATION DATE 07/14/77)

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
REGRESSION LIST 1

DEPENDENT VARIABLE.. LGEST71 LOG OF # OF LRG ESTAB 1971

SUMMARY TABLE

VARIABLE	MULTIPLE R	R SQUARE	WSD CHANGE	SIMPLE R	BETA
FCTR2	0.40623	0.16502	0.16502	0.40623	0.40622
FCTR1	0.36492	0.13214	0.15634	0.39545	0.39544
FCTR3	0.59096	0.35636	0.03496	0.17700	0.18668
FCTR4	0.60547	0.35709	0.01072	0.10354	0.10353
FCTR5	0.61001	0.37212	0.00504	0.07096	0.07096
(CONSTANT)					0.2144365

4

0.1347093
0.1308280
0.61362460-01
0.34254550-01
0.23478190-01
0.2144365

07/14/77

REGRESSION ANALYSIS TRANSFORMED (LARGE ESTABLISHMENTS)

READ INPUT DATA

***** REGRESSION PROBLEM REQUIRES 2352 BYTES WORKSPACE INCLUDING RESIDUALS *****

REGRESSION ANALYSIS TRANSFORMED (LARGE ESTABLISHMENTS)

FILE JTHESIS (CREATION DATE = 07/14/77)

***** MULTIPLE REGRESSION *****

DEPENDENT VARIABLE: LGEST71 FROM VARIABLE LIST 1
REGRESSION LIST 1

07/14/77

PLOT OF STANDARDIZED RESIDUAL

-2.0

0.0

1.0

2.0

3.0

4.0

5.0

6.0

7.0

8.0

9.0

10.0

11.0

12.0

13.0

14.0

15.0

16.0

17.0

18.0

19.0

20.0

21.0

22.0

23.0

24.0

25.0

26.0

27.0

28.0

29.0

30.0

31.0

32.0

33.0

34.0

35.0

36.0

37.0

38.0

39.0

40.0

41.0

42.0

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47.0

48.0

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50.0

51.0

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56.0

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73.0

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98.0

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121.0

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124.0

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126.0

127.0

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130.0

131.0

132.0

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135.0

136.0

137.0

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139.0

140.0

141.0

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146.0

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151.0

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171.0

172.0

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262.0

263.0

264.0

265.0

266.0

267.0

268.0

269.0

270.0

271.0

272.0

46 0.450478 0.4404141 0.404833 07/14/77
 45 0.0 0.3004246 -0.3009216
 REGRESSION ANALYSIS TRANSFORMED (LARGE ESTABLISHMENTS)
 46 0.0 0.2595402 -0.2595402
 47 0.3010300 -0.50120505-01 0.3511504
 48 0.0 -0.3232212F-01 0.3232212F-01
 49 0.3010300 0.3104891 -0.9459067E-02
 50 0.0 -0.6848025E-01 0.5848025E-01
 51 0.0 -0.4957605E-01 0.4957605E-01
 52 0.0 -0.4820314E-02 0.0420314E-02
 53 0.0 -0.2608555 0.2608555

DURBIN-WATSON TEST OF RESIDUAL DIFFERENCES COMPARED BY CASE ORDER (SEQUENCE).

VARIABLE LIST IN REGRESSION LIST 1. DURBIN-WATSON TEST 1.94413

APPENDIX H

MULTIPLE REGRESSION ANALYSES: $Y =$
TOTAL NUMBER OF MANUFACTURING ESTABLISHMENTS

APPENDIX H.1

Untransformed Variables

REGRESSION ANALYSIS UNTRANSFORMED (LARGE ESTIMATES)

07/14/77

FILE THESIS (CREATION DATE = 07/14/77)

VARIABLE	MEAN	STANDARD DEV	CASES
NDEST71	348.3774	947.5757	53
PCIR1	0.0000	1.0000	53
PCIR2	0.0000	1.0000	53
PCIR3	0.0000	1.0000	53
PCIR4	-0.0000	1.0000	53
PCIR5	0.0000	1.0000	53

REGRESSION ANALYSIS UNTRANSFORMED (LARGE ESTABLISHMENTS)

07/14/77

FILE THESIS (CREATION DATE = 07/14/77)

CORRELATION COEFFICIENTS

A VALUE OF 99.0000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

	NDEST71	FCTR1	FCTR2	FCTR3	FCTR4	FCTR5
NDEST71	1.00000	0.62950	0.20347	0.10553	0.13234	0.18799
FCTR1	0.62950	1.00000	0.00001	0.00001	-0.00000	-0.00000
FCTR2	0.20347	0.00001	1.00000	-0.00000	0.00002	-0.00001
FCTR3	0.10553	0.00001	-0.00000	1.00000	0.00001	-0.00000
FCTR4	0.13234	-0.00000	0.00002	0.00001	1.00000	-0.00001
FCTR5	0.18799	-0.00000	-0.00001	-0.00000	-0.00001	1.00000

REGRESSION ANALYSIS UNTRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

***** MULTIPLE REGRESSION ***** VARIABLE LIST
DEPENDENT VARIABLE.. NOEST71 # OF ESTABLISHMENTS 1971 REGRESSION LIST

VARIABLE(S) ENTERED ON STEP NUMBER 1.. FCTR1

MULTIPLE R 0.62950
R SQUARE 0.39626
ADJUSTED R SQUARE 0.38443
STANDARD ERROR 743.45354

ANALYSIS OF VARIANCE
REGRESSION 33.474
RESIDUAL

SUM OF SQUARES
18501905.24518
28188891.20763

MEAN SQUARE
18501905.24518
552723.16093

F 33.474

VARIABLES IN THE EQUATION

VARIABLE	B	BETA	STD ERROR B	F
FCTR1 (CONSTANT)	596.4915 388.3772	0.62950	103.09791	33.474

VARIABLES NOT IN THE EQUATION

VARIABLE	BETA IN	PARTIAL	TOLERANCE	F
FCTR2	0.20346	0.26186	1.00000	3.6
FCTR3	0.10553	0.13581	1.00000	0.9
FCTR4	0.13234	0.17058	1.00000	1.4
FCTR5	0.13000	0.24452	1.00000	3.1

VARIABLE(S) ENTERED ON STEP NUMBER 2.. FCTR2

MULTIPLE R 0.66156
R SQUARE 0.43766
ADJUSTED R SQUARE 0.41517
STANDARD ERROR 724.65171

ANALYSIS OF VARIANCE
REGRESSION 50.0
RESIDUAL

SUM OF SQUARES
20434741.54149
2625004.91135

MEAN SQUARE
10217370.77074
525120.09823

F 19.452

VARIABLES IN THE EQUATION

VARIABLE	B	BETA	STD ERROR B	F
FCTR1	596.4898	0.62949	100.49038	33.233
FCTR2 (CONSTANT)	192.7936 388.3766	0.20346	100.43933	3.681

VARIABLES NOT IN THE EQUATION

VARIABLE	BETA IN	PARTIAL	TOLERANCE	F
FCTR3	0.10553	0.14072	1.00000	0.9
FCTR4	0.13234	0.17674	1.00000	1.3
FCTR5	0.13000	0.25337	1.00000	3.3

REGRESSION ANALYSIS UNTRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

07/14/77

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
 DEPENDENT VARIABLE.. NOEST71 * OF ESTABLISHMENTS 1971
 VARIABLE(S) ENTERED ON STEP NUMBER 3.0 FCIRS

MULTIPLE R 0.68830
 R SQUARE 0.47376
 ADJUSTED R SQUARE 0.44154
 STANDARD ERROR 708.12338

ANALYSIS OF VARIANCE
 REGRESSION 36.898
 RESIDUAL 3.855
 TOTAL 40.753

MEAN SQUARE
 7373429.77851
 501488.71608

F 14.70455

VARIABLES IN THE EQUATION

VARIABLE	B	BETA	STD ERROR B	F
FCIR1	596.4905	0.62949	98.19853	36.898
FCIR2	192.7952	0.20346	98.19710	3.855
FCIR5	180.0368	0.19000	98.19839	3.361
(CONSTANT)	388.3757			

VARIABLES NOT IN THE EQUATION

VARIABLE	BETA IN	PARTIAL	TOLERANCE	F
FCIR3	0.10553	0.14547	1.00000	1.038
FCIR4	0.13254	0.18260	1.00000	1.658

VARIABLE(S) ENTERED ON STEP NUMBER 4...

FCIR4

MULTIPLE R 0.70095
 R SQUARE 0.49133
 ADJUSTED R SQUARE 0.44894
 STANDARD ERROR 703.41898

ANALYSIS OF VARIANCE
 REGRESSION 37.393
 RESIDUAL 3.906
 TOTAL 41.299

MEAN SQUARE
 5735117.54054
 494798.25550

F 11.59082

VARIABLES IN THE EQUATION

VARIABLE	B	BETA	STD ERROR B	F
FCIR1	596.4907	0.62949	97.54615	37.393
FCIR2	192.7921	0.20346	97.54473	3.906
FCIR5	180.0368	0.19000	97.54571	3.406
FCIR4	125.5880	0.13254	97.54542	1.658
(CONSTANT)	388.3760			

VARIABLES NOT IN THE EQUATION

VARIABLE	BETA IN	PARTIAL	TOLERANCE	F
FCIR3	0.10553	0.14790	1.00000	1.052

REGRESSION ANALYSIS UNTRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

07/14/77

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
 DEPENDENT VARIABLE: NUEST71 # OF ESTABLISHMENTS 1971 REGRESSION LIST 1
 VARIABLE(S) ENTERED ON STEP NUMBER 5.. FCIR3

MULTIPLE R 0.70845
 R SQUARE 0.50246
 ADJUSTED R SQUARE 0.44953
 STANDARD ERROR 703.03869

ANALYSIS OF VARIANCE
 REGRESSION
 RESIDUAL

SUM OF SQUARES
 23460406.38560
 23230380.06723

MEAN SQUARE
 4692081.27712
 474263.40569

F
 9.49308

VARIABLES IN THE EQUATION

VARIABLE	B	BETA	STD ERROR	F
FCIR1	596.4898	0.62949	97.49341	37.433
FCIR2	192.7025	0.20346	97.49220	3.911
FCIR5	180.0372	0.19000	97.49297	3.410
FCIR4	125.5875	0.13254	97.49279	1.659
FCIR3	99.99328	0.10553	97.49328	1.052
(CONSTANT)	388.3756			

VARIABLES NOT IN THE EQUATION

VARIABLE	BETA IN	PARTIAL	TOLERANCE	F
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MAXIMUM STEP REACHED

REGRESSION ANALYSIS UNTRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

***** MULTIPLE REGRESSION ***** VARIABLE LIST
REGRESSION LIST

DEPENDENT VARIABLE.. NOEST71 # OF ESTABLISHMENTS 1971

SUMMARY TABLE

VARIABLE	MULTIPLE R	R SQUARE	MSQ CHANGE	SIMPLE R	B	BETA
FCR1	0.62950	0.39626	0.19526	0.62950	506.4898	0.6294
FCR2	0.66150	0.43766	0.04140	0.20347	192.7925	0.2034
FCR3	0.68930	0.47376	0.03610	0.18949	190.0372	0.1900
FCR4	0.70095	0.49133	0.01757	0.11324	125.5875	0.1325
FCR5	0.70885	0.50246	0.01114	0.10553	99.99320	0.1055
(CONST)					348.3756	

07/14/77

D

REGRESSION ANALYSIS UNTRANSFORMED LARGE ESTABLISHMENTS

FILE: THESTS (CREATION DATE = 07/14/77)

07/14/77

DEPENDENT VARIABLE: NOEST71 FROM MULTIPLE REGRESSION
VARIABLE LIST 1
REGRESSION LIST 1

PLOT OF STANDARDIZED RESIDUAL

RESIDUAL

PREDICTED
NOEST71

OBSERVED
NOEST71

1	16.00000	-3.447592	19.44762
2	18.00000	4.343660	7.103660
3	17.00000	484.5674	-457.6674
4	1983.000	616.9182	-458.9182
5	26.00000	-511.6042	537.6042
6	13.00000	32.10211	0.8978941
7	22.00000	1864.517	-1642.514
8	108.0000	24.47015	167.5299
9	11.00000	-170.5785	233.5731
10	13.00000	-8.055782	149.0424
11	12.00000	963.4520	-132.4520
12	2863.000	2364.631	249.3368
13	90.00000	641.6128	-571.6128
14	70.00000	60.52660	60.47943
15	452.0000	855.9065	-403.9067
16	45.00000	106.8052	-43.19522
17	32.00000	-142.3193	184.3193
18	140.0000	363.6948	-223.6949
19	181.0000	401.57782	120.4282
20	88.00000	834.6159	-409.6150
21	234.0000	593.9301	-359.9561
22	73.00000	-113.7732	148.7732
23	62.00000	-20.51277	82.11242
24	15.00000	-246.5309	301.5309
25	105.0000	341.0125	-125.9125
26	129.0000	585.1997	-175.3997
27	82.00000	149.4293	-117.4293
28	22.00000	1366.001	-871.0007
29	40.00000	1091.162	1091.162
30	179.0000	361.17363	140.4264
31	116.0000	288.0060	-172.9062
32	0.00000	-62.14465	137.1442
33	4.00000	-393.2903	427.2903
34	197.0000	807.0101	-410.0101
35	42.00000	727.5823	-245.5824
36	299.0000	1239.950	340.9502
37	350.0000	1160.263	-619.2634
38	114.0000	47.10634	88.39367
39	41.00000	220.3165	-139.3163
40	97.00000	348.1370	-50.1371
41	112.0000	142.5777	-50.17771
42	883.000	2414.477	2403.572
43	591.0000	499.0177	93.08212
44	542.0000	861.9438	-279.9438
45	946.0000	963.1563	-17.15643

REGRESSION ANALYSIS-UNTRANSFORMED (LARGE ESTABLISHMENTS)

26	622.2000	793.4612	-151.4612
27	32.00000	-104.5543	135.5544
28	38.00000	-219.0443	257.0442
29	4841.000	1260.814	920.1653
30	27.00000	-700.1912	727.1912
31	37.00000	-63.48465	100.4847
32	49.00000	134.1093	-785.10925
33	22.00000	45.02782	-23.02780

3771A777

DURBIN-WATSON TEST OF RESIDUAL DIFFERENCES COMPARED BY CASE ORDER (SEQUENCE)

VARIABLE LIST 1. REGRESSION LIST 1. DURBIN-WATSON TEST 2.24174

APPENDIX.H:2

Transformed Variables

REGRESSION ANALYSIS TRANSFORMED (LARG ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

VARIABLE	MEAN	STANDARD DEV	CASES
NUST1	2.0000	0.5379	53
FCTR1	-0.0000	1.0000	53
FCTR2	0.0000	1.0000	53
FCTR3	0.0000	1.0000	53
FCTR4	0.0000	1.0000	53
FCTR5	0.0000	1.0000	53

REGRESSION ANALYSIS TRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

CORRELATION COEFFICIENTS

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

	NOEST71	FCIR1	FCIR2	FCIR3	FCIR4	FCIR5
NOEST71	1.00000	0.87600	0.40837	0.23759	0.09715	0.05973
FCIR1	0.87600	1.00000	0.00001	0.00004	0.00001	0.00000
FCIR2	0.40837	0.00001	1.00000	-0.00000	-0.00002	0.00000
FCIR3	0.23759	0.00004	-0.00000	1.00000	0.00003	-0.00001
FCIR4	0.09715	0.00001	-0.00002	0.00003	1.00000	-0.00001
FCIR5	0.05973	0.00000	0.00000	-0.00001	-0.00001	1.00000

REGRESSION ANALYSIS TRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
 DEPENDENT VARIABLE.. NOEST71 LOG OF ESTAB 71
 VARIABLE(S) ENTERED ON STEP NUMBER 1.. FCTR1

MULTIPLE R 0.67600
 R SQUARE 0.45698
 ADJUSTED R SQUARE 0.44673
 STANDARD ERROR 0.43744

ANALYSIS OF VARIANCE
 REGRESSION
 RESIDUAL

SUM OF SQUARES
 8.21258
 9.75895

MEAN SQUARE
 0.21258
 0.19135

DF
 1.
 51.

F
 42.91870

VARIABLES IN THE EQUATION

VARIABLE B BETA % STD ERROR R F
 FCTR1 0.3974019 -0.67600 0.06066 42.919
 (CONSTANT) 2.094532

VARIABLES NOT IN THE EQUATION

VARIABLE BETA IN PARTIAL TOLERANCE
 FCTR2 0.40836 0.55415 1.00000
 FCTR3 0.24758 0.32234 1.00000
 FCTR4 0.09713 0.13143 1.00000
 FCTR5 0.05953 0.08078 1.00000

VARIABLE(S) ENTERED ON STEP NUMBER 2.. FCTR2

MULTIPLE R 0.78977
 R SQUARE 0.62373
 ADJUSTED R SQUARE 0.60868
 STANDARD ERROR 0.36775

ANALYSIS OF VARIANCE
 REGRESSION
 RESIDUAL

SUM OF SQUARES
 11.20941
 6.76211

MEAN SQUARE
 5.60471
 0.13524

DF
 2.
 50.

F
 41.44198

VARIABLES IN THE EQUATION

VARIABLE B BETA % STD ERROR R F
 FCTR1 0.3973987 0.67600 0.05140 90.724
 FCTR2 0.2800640 0.40836 0.05100 22.159
 (CONSTANT) 2.094531

VARIABLES NOT IN THE EQUATION

VARIABLE BETA IN PARTIAL TOLERANCE
 FCTR3 0.23757 0.434729 1.00000
 FCTR4 0.09715 0.15838 1.00000
 FCTR5 0.05953 0.09704 1.00000

F
 8.647
 1.261
 0.466

REGRESSION ANALYSIS TRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

DEPENDENT VARIABLE.. NOEST71 LOG OF ESTAB 71

VARIABLE(S) ENTERED ON STEP NUMBER 3.. FCTR3

MULTIPLE R 0.82472
R SQUARE 0.68017
ADJUSTED R SQUARE 0.66059
STANDARD ERROR 0.34250

ANALYSIS OF VARIANCE
REGRESSION 70.009
RESIDUAL 20.543
TOTAL 90.552

SUM OF SQUARES
12.22308
5.74785

MEAN SQUARE
4.07456
0.11730

VARIABLE LIST 1
REGRESSION LIST 1

F 34.7353

VARIABLES IN THE EQUATION

VARIABLE B BETA STD ERROR P F

FCTR1 0.3973937 0.67599 0.04749 70.009
FCTR2 0.2400645 0.40436 0.04720 20.543
FCTR3 0.1316595 0.23757 0.04750 4.047
(CONSTANT) 2.094530

VARIABLE PARTIAL TOLERANCE
FCTR1 0.09715 0.17178
FCTR2 0.05053 0.10526

VARIABLES NOT IN THE EQUATION

VARIABLE(S) ENTERED ON STEP NUMBER 4.. FCTR4

MULTIPLE R 0.83043
R SQUARE 0.68961
ADJUSTED R SQUARE 0.66374
STANDARD ERROR 0.34090

ANALYSIS OF VARIANCE
REGRESSION 70.005
RESIDUAL 20.548
TOTAL 90.553

SUM OF SQUARES
12.19329
5.57824

MEAN SQUARE
3.09832
0.11621

F 26.6606

VARIABLES IN THE EQUATION

VARIABLE B BETA STD ERROR P F

FCTR1 0.3973931 0.67599 0.04727 70.005
FCTR2 0.2400634 0.40436 0.04727 20.548
FCTR3 0.1316579 0.23756 0.04727 8.727
(CONSTANT) 2.094530

VARIABLE PARTIAL TOLERANCE
FCTR1 0.05053 0.10645
FCTR2 0.05053 0.10645

VARIABLES NOT IN THE EQUATION

REGRESSION ANALYSIS TRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1

DEPENDENT VARIABLE... NOEST71 LQG OF ESTAB 71

VARIABLE(S) ENTERED ON STEP NUMBER 5.. FCTR5

MULTIPLE R 0.82556
R SQUARE 0.68135
ADJUSTED R SQUARE 0.66031
STANDARD ERROR 0.34254

ANALYSIS OF VARIANCE
REGRESSION 47.
RESIDUAL 47.
SUM OF SQUARES 12.45698
MEAN SQUARE 0.11733

F 21.23393

VARIABLES IN THE EQUATION

VARIABLE	B	BETA	STD. ERROR B	F
FCTR1	0.3973931	0.67899	0.04750	69.992
FCTR2	0.2400653	0.40836	0.04750	25.542
FCTR3	0.1396581	0.23756	0.04750	9.644
FCTR4	0.57112475-01	0.09715	0.04750	1.446
FCTR5	0.34996450-01	0.05953	0.04750	0.543
(CONSTANT)	2.094530			

VARIABLES NOT IN THE EQUATION

VARIABLE	BETA IN	PARTIAL	TOLERANCE
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MAXIMUM STEP REACHED

REGRESSION ANALYSIS TRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

DEPENDENT VARIABLE.. NOEST71 LOG OF ESTAB 71

MULTIPLE REGRESSION

VARIABLE

FCTR1
FCTR2
FCTR3
FCTR4
FCTRS
(CONSTANT)

SUMMARY TABLE

MULTIPLE R	R SQUARE	MS CHANGE	SIMPLE R
0.67400	0.45608	0.45608	0.57000
0.78077	0.62373	0.16675	0.40837
0.82472	0.68117	0.05644	0.23759
0.91043	0.84791	0.00044	0.20715
0.83259	0.69313	0.00354	0.05933

H	F FTA
0.3973931	0.37591
0.2400053	0.40837
0.1346594	0.23759
0.37112473-01	0.20715
0.3490450-01	0.05933
2.094510	

VARIABLE LIST
REGRESSION LIST

REGRESSION ANALYSIS TRANSFORMED (LARGE ESTABLISHMENTS)

FILE THESIS (CREATION DATE = 07/14/77)

DEPENDENT VARIABLE: NOEST71 FROM VARIABLE LIST 1
REGRESSION LIST 1

SEGNUM	OBSERVED NOEST71	PREDICTED NOEST71	RESIDUAL	STANDARDIZED RESIDUAL
1	1.204120	1.785424	-0.5813049	-1.0
2	1.382211	1.751824	-0.3716141	-0.7
3	0.445978	1.956033	-1.5110935	-2.7
4	2.198657	2.295979	-0.09732103E-01	-0.2
5	1.414973	1.165711	0.2472612	0.4
6	1.518514	1.557870	-0.0393291E-01	-0.7
7	2.140353	3.013767	-0.8734152	-1.5
8	2.283300	1.945097	0.3376029	0.6
9	2.056905	1.855423	0.2014815	0.4
10	2.117271	1.855423	0.2618482	0.5
11	1.785330	2.431094	-0.6457646	-1.1
12	3.686904	3.030444	0.6564594	1.2
13	1.954242	2.317464	-0.3632223	-0.7
14	1.845098	1.856175	0.0107630E-01	0.0
15	2.653138	2.403396	0.2517414	0.4
16	1.812913	2.043833	-0.2329201	-0.4
17	1.716002	1.619996	0.09600550E-01	0.2
18	2.146128	2.145689	0.000439	0.0
19	2.206926	2.000449	0.2063770	0.4
20	1.903090	1.855297	0.0477203E-01	0.1
21	2.363216	2.198497	0.1707198	0.3
22	1.563322	1.826469	0.3685271E-01	0.6
23	1.792362	1.638578	0.1538132	0.3
24	2.021189	1.973092	-0.0229540E-01	-0.0
25	2.653213	2.473349	0.1794633	0.3
26	1.913414	2.092333	-0.1795195	-0.3
27	2.469422	2.887672	-0.4178513	-0.8
28	1.602059	1.358137	0.243621	0.4
29	2.267772	2.022817	0.243621	0.4
30	2.064458	2.226182	-0.1617250	-0.3
31	1.778151	1.886061	-0.1079106	-0.2
32	1.531479	1.374618	0.1598605	0.3
33	2.593790	2.615499	-0.0167083E-01	-0.0
34	2.633047	2.590034	0.0431239E-01	0.0
35	2.475071	2.881145	-0.4060732	-0.8
36	2.740362	2.988134	-0.2479729	-0.4
37	2.056905	2.072040	-0.0160353E-01	-0.0
38	1.903444	2.041792	-0.1413041	-0.3
39	1.986772	2.072140	-0.0854757E-01	-0.0
40	2.092218	1.409469	0.6827486	1.2
41	3.686904	3.202752	0.4841518	0.9
42	2.717055	2.433998	0.2830565	0.5
43	2.740362	2.661575	-0.081213E-01	-0.0
44	2.978891	2.511810	0.4664074	0.8

22/5/10

2.420399	0.3871357
1.563319	-0.33169635-01
1.563643	0.1613975E-01
2.582602	0.6717273
1.359466	0.7139745E-01
1.517665	0.5053547E-01
1.722286	-0.5209113E-01
1.163940	0.1794815

DURBIN-WATSON TEST OF RESIDUAL DIFFERENCES COMPARED BY CASE ORDER (SEQNUM).
VARIABLE LIST J. REGRESSION LIST 1. DURBIN-WATSON TEST 1.84946

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