JAPANESE MANUFACTURING GREENFIELDS: The Provincial Location Decision

by

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ABSTRACT

This paper examines why Japanese manufacturing greenfields locate in a particular Canadian province. We find that the location preference is based primarily on the present distribution of Japanese and Canadian firms. A secondary factor is market access, which includes the transportation costs of exporting the Canadian manufactured product to Japan. Other important factors are energy and labour costs. Having utilized quantitative methods to determine that the presence of Japanese and Canadian firms are the main reasons why new greenfields select the province they will locate in, we question the value of using tax dollars to attract investments to locations lacking substantial industry activity.

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1. INTRODUCTION

In recent years Canada has sought new Japanese manufacturing investments. (New investments are often referred to as greenfield investments). Public policy interest in greenfield investment arises in part because of the political benefits of job creation that are associated with them. Another reason that provinces are interested in attracting Japanese manufacturing greenfields is technology transfer. However, job creation tends to be the host province's main motivation in soliciting Japanese manufacturing greenfields. Regardless of the reason(s) why provinces may wish to attract Japanese manufacturing greenfields, in order to have better success in attracting such investments, it would be useful for the provinces to know what attracts Japanese manufacturing greenfields to a particular province. This thesis focuses on this issue by asking the question what provincial characteristics influenced the greenfields to locate in the particular province they selected?

It turns out that between 1980 and 1991, 84% of Japanese manufacturing greenfield investment locating in Canada established their new facilities in either Ontario (64%) or British Columbia (20%). Both these provinces attracted more greenfield investment than their national share of manufacturing. By using condition logit regression we discover that Japanese manufacturing greenfields prefer to locate in provinces with a concentration of Canadian firms in their industries, and in provinces with other Japanese manufacturing greenfields. Other important provincial characteristics in determining location preference include wage and energy

costs as well as geographic proximity to Japan. Past research on American state location decisions, which used similar statistical methodology as we employ, supports our findings in that state characteristics, similar to our provincial characteristics, are identified as reasons for manufacturing firms establishing new facilities in a particular location. However, our results may suggest evidence of pure agglomeration effects. That is, if the combination of our variable designed to measure geographic proximity to Japan and our variable that counts the number of already existing Canadian firms in the establishing greenfield's industry, capture the endowment effect, then the significance of our variable measuring the size of existing Japanese investment may be evidence of pure agglomeration effects.

Section 2 provides some background on Japanese investment. Section 3 reviews related research. Section 4 explains how the data for our variables was compiled. Section 5 describes our econometric model. Section 6 summarizes our results. Section 7 is our conclusion that includes a discussion on the limitation of our results, policy implications and research questions that follow naturally from this study.

2. JAPANESE MANUFACTURING INVESTMENT IN CANADA

The purpose of this section is to familiarize the reader with foreign investment so that an appreciation is gained for what we mean by a Japanese manufacturing greenfield. We point out some of the possible benefits that are associated with foreign direct investment. However, we are not saying that other forms of investment are any less interesting or beneficial, nor that our methodology would only work for Japanese investments. Our methodology could have been used to study, for example, the provincial location decision of German greenfields, but we elected to study Japanese greenfields and hence this why we provide an overview of Japanese manufacturing investment in Canada.

2.1. The Greenfield Component of Foreign Investment

Before addressing the issue of why we chose to measure the greenfield component of Japanese foreign direct investment (as opposed to, say, American direct investment) let us first distinguish between foreign portfolio investment (FPI) and foreign direct investment (FDI).

FDI is ownership (with control) of real domestic assets by a foreigner. Statistics Canada considers foreign ownership to exist when a foreigner owns more that 10% of the equity of an investment[1]. Usually, FDI is undertaken by corporations to take advantage of the

[1] As Appendix 1 shows the lowest level of Japanese ownership was 17%, with over half the greenfield investments being wholly owned subsidiaries.

comparative advantage that foreign production offers or to preserve access to markets in an environment where true global free trade does not exist (i.e., Japan exporting to Canada or the U.S., and for that matter, vice versa).

FDI typically involves the transfer of capital as well as technology, marketing and organizational skills. Management practises such as just-in-time (*kanban*) inventory control procedures lessen inventory carrying costs, quality circles (*kaizen*) reduce the number of defects, and consensus decision making (*nemawashi*) increase productivity, all originated in Japan. However, through technology transfer these management practises are no longer solely the property of Japanese transplants operating in Canada. They have also spread to Canadian owned manufacturing facilities, which now benefit from them. These examples of technology transfer, along with job creation, may motivate provinces to attract FDI, even though an increase in foreign ownership of this domestic industry will occur as ownership of these assets remaining with the foreign firm.

This ownership can take the form of acquisitions or the construction of new facilities (greenfields). Other forms of FDI involve the establishment of a wholly-owned subsidiary or the formation of joint ventures and strategic alliances between firms. (Although strategic alliances may not involve the transfer of capital they do tend to have the other benefits that are associated with FDI). The alternative type of business structure to be used in the host country is important as the choice of organizational form often has significant implications for the transfer of knowledge and other firm-specific skills.

Finally, as FDI involves the transfer relatively intangible resources, the corporations involved typically operate with a fairly long time horizon, making flows of FDI stable in comparison to flows of FPI. However, as we see from *Figure 2.1*, FDI is about one quarter of the stock of foreign investment in Canada as of 1990. FDI is represented by the black wedge in *Figure 2.1*, and the remaining pieces of the pie are collectively known as foreign portfolio investment. FPI occurs when foreigners own financial assets from another country. *Figure 2.1*[2] illustrates that in 1990 foreigners owned $329.6 billion worth of Canadian financial assets.

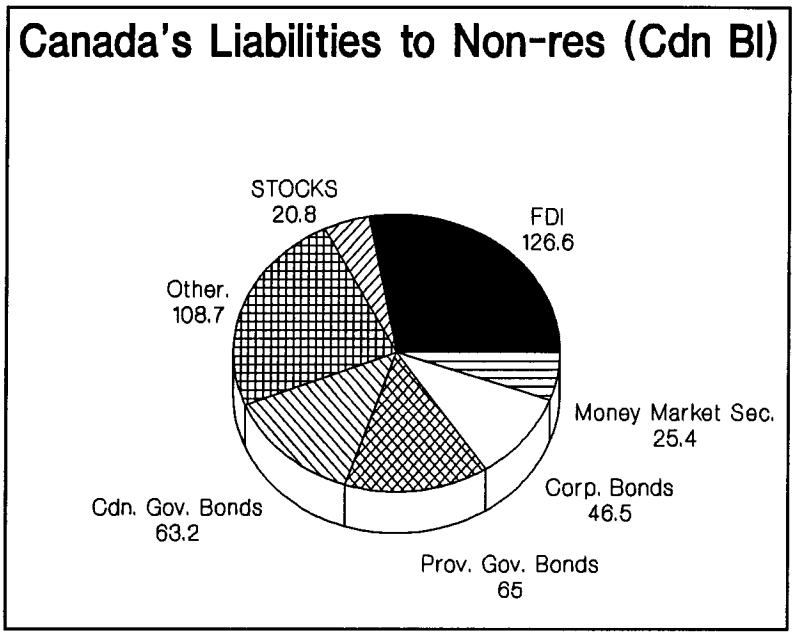

Figure 2.1 (Source: Statistics Canada, 1990).

FPI is undertaken mainly by individuals, institutional investors and governments (i.e. central banks). FPI involves transactions in the capital markets (e.g., stocks, bonds, loans or money market securities). Those involved in FPI have different objectives, risk preferences, and investment time horizons than those involved in FDI. The risk-adjusted real rates of return

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[2] The 108.7 of Other Liabilities to Non-residents includes SDRs (Special Drawing Rights) and other official government flows. Also theses stocks are at historical costs and if the FDI was made some time ago its market value may exceed its book value by a considerable margin. Thus, its is possible that if market figures were available that FDI would represent a bigger slice of the pie.

between assets in different countries is a major determinant of FPI flows. Thus, FPI flows are sensitive to changes in inflation, interest and exchange rates as well as portfolio diversification requirements. Accordingly, FPI tends to be in financial assets that are relatively liquid and mobile with fixed maturity dates.

Just as FDI and FPI are less than perfect substitutes, acquisitions and greenfields are different types of FDI, if only for the reason that the former does not involve the same location decision. The location of a new plant is clearly a choice; whereas, it could be argued that an acquisition did not involve a location analysis because the site already exists. When a company is acquired, it may be acquired despite of the location of its manufacturing facilities. That is, in an ideal situation the purchaser would prefer the manufacturing facilities to be elsewhere (perhaps in another province). Nevertheless, if the purchase takes place, because the overall investment makes sense, then this non-ideal location was not actually chosen. However, in a greenfield investment, the ideal location would be selected. Thus, we have included only Japanese greenfields in our study.

A secondary reason for only considering greenfields is unique to Canada: what we call "the FIRA (Foreign Investment Review Agency) effect." Prior to 1985 FIRA (a government organization designed to discourage foreign investment) may have inhibited acquisitions. Greenfields apparently did not offset the reduced level of acquisitions during the FIRA years (1974-1985). Presumably a Canadian greenfield was not the foreign firm's second choice after a Canadian acquisition and the direct investment simply went elsewhere.

In 1985 FIRA was replaced by Investment Canada, which is a government body with a mandate to promote foreign investment. The mid 80's were also a period of heightened merger and acquisition activity. We suspect that a combination of these factors explains the increase of acquisitions in 1985 (refer to *Figure 2.2*). Regardless of the reason, acquisitions dramatically increased in 1985. This imbalance of acquisition activity from the beginning of the decade to the end of the decade is another reason we have elected to study the greenfield component of FDI.

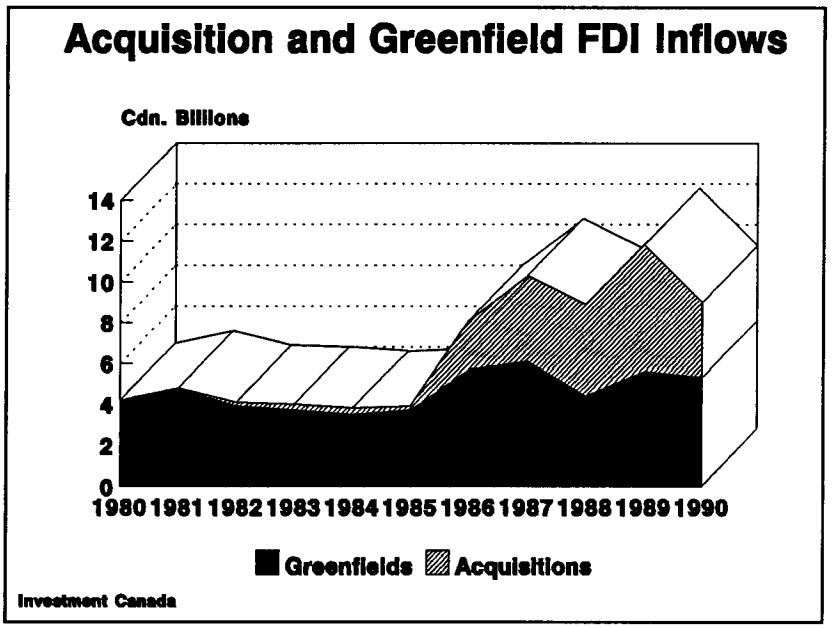

Figure 2.2

In summary, FDI and FPI cannot be treated as perfect or even close substitutes because they are motivated by different factors. We have elected to measure FDI rather than FPI. We selected the greenfield component of FDI to avoid the FIRA effect as well as any controversy over an acquisition being a "non-location choice."

2.2. Japanese FDI

Another reason that we are interested in Japanese greenfield FDI is Japan's recent dominance as an exporter of FDI. For example, *Figure 2.3* shows Japan was the leading exporter of FDI in 1989. With Japan being a prominent world exporter of FDI this is one reason to study Japanese FDI. Secondly, although American FDI into Canada is also significant, in future work we wish to objectively measure the effect of the Canada/U.S. Free Trade Agreement on FDI into this trade area. To do this we will need to measure the location decision of an outside party and by definition this excludes the U.S.

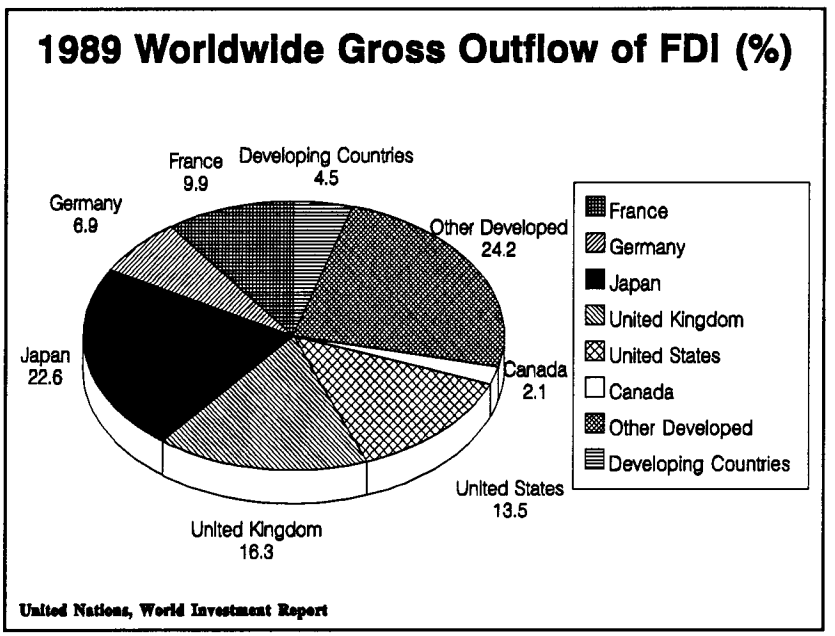

Figure 2.3

For these reasons we have chosen to analyze Japanese greenfield FDI. We have elected to look at manufacturing greenfields (as opposed to say distribution warehouses) for reasons such as the technology transfer and job creation benefits associated with these investments. The time frame of our study is 1980 to 1991. This time frame was selected because it has really only been the last decade that Japanese FDI has become such a noticeable factor in industrial host countries.

However, host countries are generally made up of regional political territories and in Canada these are called provinces. Often these provinces try to out bid each other (i.e., with tax holidays) for greenfield investments, possibly because of the job creation or technology transfer associated with these new manufacturing facilities. Regardless of the reason(s) why provinces seek to host FDI, to gain insight into how host provincial governments may be more successful in attracting Japanese manufacturing greenfields we will study the provincial location decision of these greenfields.

3. RELATED RESEARCH

Before we describe how the data was collected for this study, we will first discuss related research to this paper. These studies have aided us in selecting the variables that we will present in the next section and in designing the conditional logit econometric model that we will describe in Section 5. In this regard we note that logit regression was used by Bartik (1985), Carlton (1983), Coughlin, et. al. (1991), Head, Ries, and Swenson (1993), Luger and Shetty (1985), Schmenner, et. al. (1987), and Woodward (1992).

Bartik (1985) looked at the influence of state characteristics on new manufacturing plant location decisions, emphasizing unionization and taxation. The location data included the Fortune 500 companies' manufacturing plants from 1972-1978. He found a significantly large negative effect of a state's unionized rate, while wages had only a marginal negative significance. The corporate tax rate also had a negative effect on plant location. Bartik estimated a powerful effect of existing manufacturing activity on new business location, i.e., "a state with 10% greater existing manufacturing activity will have an 8% or 9% greater number of new plants" (Bartik, 1985).

Schmenner, et. al. (1987) also examined new plant openings by Fortune 500 firms between 1970-1980. Their innovations were to include plant-specific characteristics (data was derived from surveying managers of the firms) in magnifying or tempering the state-specific

effects. They argued that state characteristics such as wage rates would be more important to particular plants (i.e., wages will matter more to labour intensive plants). By interacting state and plant characteristics, Schmenner found that "Labor unionism, climate, population density, and building costs are prominent influences on location. . . Tax variables, on the other hand, make a weak showing" (Schmenner, et. al., 1987). Also the interaction terms were usually significant.

Carlton (1983) concentrated on a few industries that were selected to ensure equivalence (i.e., location choice is not hindered by local supply and demand factors). His results included: [the] "wage effect cannot be measured very precisely; energy [prices] have a large effect; taxes and state incentive programs do not seem to have major effects; [and] existing concentrations of employment matter a great deal with the effect being stronger for industries with smaller average plant size" (Carlton, 1983).

Insignificance of taxes was also evident in Luger & Shetty (1985), who measured the manufacturing activities of three specific industries. Their objective was to measure the elasticity of FDI in relation to a state's promotional programs, as well as the effect of agglomeration and urbanization economies, and labour market conditions. They concluded "that agglomeration economies and wage rates are the most important determinants of new plant location. . . [and] public policies do not have a uniform effect on industries" (Luger & Shetty, 1985). To represent agglomeration attraction a measure of total manufacturing activity was used; thus they did not provide evidence on industry-level agglomeration. Moreover, unmeasured state

endowments (forests, research universities, or other omitted state characteristics) might be reflected in the coefficient on manufacturing activity.

Like Luger & Shetty before them, Smith & Florida (1992) chose to explore a select industry (automobile-related) and the industry-specific relationships associated with it. They concluded that Japanese auto-related parts suppliers tend to locate near their assembly plant and have a preference for areas with greater aggregate manufacturing activity. Taxes had a marginal showing and unionization was not a factor, while wages had a positive relationship. This positive relationship could be due to the need for technical skills that might be reflected in wages. For similar reasons, education level also had a significant positive effect.

Coughlin's (1991) research data included all FDI transactions (acquisition, equity increase, joint venture, merger, new plant or plant extension). His results indicated that FDI located in states with higher per capita incomes and higher levels of manufacturing activity. Coughlin also found that FDI is attracted to areas with lower wages and higher unemployment rates, while higher taxes deterred FDI. Unionization had a marginal positive significance, which could be "because of the increased productive efficiency in manufacturing stemming from unionization" (Coughlin, et. al., 1991).

Woodward's (1992) study involved a measure of total manufacturing activity, rather than selecting certain industries. He analyzed Japanese-affiliated manufacturing investments in the U.S. between 1980-1989. The model worked on the assumption that

"Japanese firms, like all firms, seek branch locations with the highest expected profits" (Woodward, 1992). This relationship revealed a preference for strong markets and low unionization rates. In addition, "Japanese manufacturing plants are most likely to select counties characterized by manufacturing agglomeration, low unemployment and poverty rates, and concentrations of educated, productive workers" (Woodward, 1992).

Head, Ries, and Swenson (1993) found that Japanese firms tend to locate near both other Japanese firms and U.S. firms that were in the same specific industry. They were able to use industry-specific variables for both Japanese and American companies and found both to be significant. They also found that the attractiveness of a state is increased by the level of industrial activity on bordering states. They showed that the positive relationship between industry activity and location is partly due to agglomeration externalities, not simply an endowment effect.

As not all the research measured the same variables, it is difficult to generalize the findings of these studies. However, we are able to draw some conclusions from these papers. Intuitively, unionization, wages, and taxes should pay significant roles in the location decision. Bartik (1985), Schmenner (1987), and Woodward (1992) suggested unionization is negatively correlated with FDI, while Coughlin (1991) showed a marginal positive relationship. Luger & Shetty (1985) and Coughlin (1991) concluded a negative significance for wages, while Smith & Florida (1992) took the opposite view. The differences in these results may stem from industry-specific differences, in that capital intensive industry may be willing to "put up" with higher

wages and unionization in exchange for better trained and more productive workers. While labour intensive industries would place more importance on wages. Hence factor intensities could be the reason for the different findings.

Taxes are generally found to be insignificant or inconclusive, with the exception of Bartik (1985) who found taxes had a negative effect. While never quite defined the same, when a variable is used to measure the level of manufacturing activity the results are usually that "existing manufacturing" attracts new manufacturing. In our next section we build on this research to explain why Japanese manufacturing greenfields locate in the particular province that they do, once they have elected to enter the Canadian market.

4. COMPILING OUR DATA

4.1. Dependent Variable - Japanese Manufacturing Greenfields

Data collection for this study was itself a major task as this data is not readily available. Furthermore, data available on Japanese-owned manufacturing facilities in Canada do not always clearly distinguish greenfield operations from acquisitions.

To construct our detailed list we obtained much of our information from Japanese sources (Toyo, Jetro, Dodwell). At times these directories of Japanese companies in Canada provided conflicting information. Not one of them included all the companies that appear in Appendix 1. Furthermore, some information had to be verified by contacting the firms directly. This was often the case when Jetro claimed that a firm was a distribution manufacturing firm, but this firm was not listed in other manufacturing directories. It usually turned out that these firms were solely distribution companies. We found Toyo to be most reliable. We supplement the data from these three directories with information on Japanese companies in Ontario compiled by the Government of Ontario.

We compiled a comprehensive list of fifty-five Japanese manufacturing greenfields that had located in Canada since 1980 (see Appendix 1). These investments were spread over six provinces, but were mainly concentrated in British Columbia (BC) and Ontario. *Table 4.1*

portrays the distribution and growth of these firms in Canada during the period from 1980 to 1990. For example, we note that British Columbia received one investment in 1980 and two more Japanese greenfields located in the province in 1983; thus, from 1980 to 1983 three greenfields had located in this province.

TABLE 4.1
NUMBER OF JAPANESE MANUFACTURING GREENFIELDS IN CANADA
(Accumulated Totals Since 1980)

Province	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Alberta	0	0	0	0	0	0	0	0	0	0	1
BC	1	1	1	3	3	3	3	3	5	8	11
NB	1	1	1	1	1	1	1	1	1	2	2
Ontario	4	5	6	7	10	13	20	27	30	33	35
Quebec	0	0	0	0	0	0	2	2	2	4	4
Sask.	0	0	0	0	0	0	0	1	2	2	2
Canada	6	7	8	11	14	17	26	34	40	49	55

BC = British Columbia NB = New Brunswick Sask. = Saskatchewan

4.2. Independent Variables - Provincial Characteristics

With our dependent variable data collected we turned our attention to establishing and gathering factors (our independent variables) that may influence the selection of the province to locate in. To help determine what these factors may be we relied on recent work [Bartik (1985), Carlton (1983), Coughlin (1991), Head, Ries, and Swenson (1993), Luger and Shetty

(1985), Schmenner (1987), Smith & Florida (1992), and Woodward (1992)] that has looked at similar location decisions in the United States. These papers focused on state choices and thus were very applicable for our study on provincial location choices.

The following list represents independent variables for which we collected Canadian provincial data. A brief description of each is contained in this list. (For more detail and actual time series data see Appendix 2, with notes to this data in Appendix 3). With the exception of our *Ship Rank, Average Energy* and *MetGDP* variables (which are described in further detail in the next section) and our *Canadian Industries* and *Japanese Greenfields* variables (described in Section 4.4) the following variables are relatively self explanatory.

1. Provincial ***Population*** (Cansim[3]). This is a measure designed to capture the relative size of the provincial economy.

2. Percentage of population living in ***Metropolitan*** areas (Cansim). Although the population of the province may be larger than another province, if it is very spread out this tends to hamper economic activity. Thus, a measure of concentration of the province's population is useful. In Canada metropolitan areas include cities with over 100,000 people.

3. ***Crime*** rate, a probabilistic variable is a measure of reported offenses per 100,000 people (Cansim). This variable is included as a measure of quality of life, which is increasingly receiving more attention. Thus, we thought that it was appropriate to see if the quality of life decision effected the provincial location process of Japanese manufacturing greenfields.

4. ***Unemployment*** rate, which has both positive and negative attributes associated with it. For instances, high unemployment is positive in terms of available work force, but is a negative in terms purchasing power (Cansim). Nevertheless,

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[3] Computerized on-line database of Statistics Canada.

despite the mixed effects of this variable, it is a general economic indicator; thus, its inclusion in our study.

5. ***Unionization*** rate is for total provincial labour force; however, for the years we checked, the manufacturing unionization rate did not significantly differ (Statistics Canada, Advisory Services). Unionization is include in our model as manufactures often are said to avoid it. However, unionization may also be a measure of quality of the work force and as such capital intensive industries could see it as a desirable quality.

6. ***Area*** in square kilometres not including fresh water (Canada Year Book). We include this variable as a measure of room to grow and natural resources.

7. All production managers tend to be concerned with the cost of average manufacturing ***Wages*** (Manufacturing Industries of Canada). However, high *Wages* may also be associated with skilled productive workers and as such high *Wages* in themselves may not be a bad thing.

8. Provincial ***GDP*** (Cansim). This variable is included as a measure of market size.

9. ***Highway Kilometres*** per square kilometre (Roads and Transportation Association of Canada) is designed to measure the level of existing infrastructure, which is thought to be a factor in attracting new industry.

10. ***Average Energy*** is a weighted average cost of fuel in the province (Energy Statistics Hand Book). The weights are based on existing industrial use for 1992, of each fuel, in each province. The cost of energy is generally of concern to manufacturers and as such is included in our study.

11. ***Low Energy*** is a measure of the lowest priced form of energy in the provinces at the time the Japanese manufacturing greenfield was established (Energy Statistics Hand Book). The cost of energy is important to manufacturers and as such is included in our study.

12. ***Airports*** with control towers (Transport Canada) are thought to represent a measure of transportation infrastructure as well as the preferred choice of executive transportation. Hence its inclusion.

13. Provincial corporate ***Tax*** rate (Canadian Tax Reporter). As businesses are usually established to make profits, the tax rate that they will face is an important factor and possibly may determine the manufacturing facility's provincial location. However, high taxes in themselves are not necessarily bad. It depends on what the tax dollars are spent on, and how efficiently this process is carried out. For

example, if tax dollars are spent effectively on improving needed infrastructure, then this may be seen as a positive.

14. Percentage of ***Provincial Labour Force in Manufacturing*** is a measure of provincial manufacturing activity (Cansim). It has been included in our study as a possible reason for plant location because Japanese manufacturing greenfields may only be attract to the relatively more industrial provinces.

15. The percentage of ***Canadian Manufacturing Labour Force*** that resides in the province is a measure of manufacturing activity (Cansim). It has been included in our study as a possible reason for plant location because Japanese manufacturing greenfields may only be attracted to the relatively more industrial provinces.

16. Agglomeration of specific ***Canadian Industries*** in each province is a measure of industry-specific manufacturing activity (Manufacturing Industries of Canada) in each province. This variable is included as firms in the same industry may be attracted to each other.

17. Agglomeration of ***Japanese Greenfields*** in each province is a measure of Japanese manufacturing activity (Toyo, Jetro, Dodwell). We have included the data in *Table 4.1*, as we wish to test if Japanese manufacturing greenfields are attracted to provinces that already have a base of such firms.

18. ***Ship Rank*** is a measure of ease of water access to Japan and is important when the Japanese-owned firm is shipping the manufactured product back to Japan. This variable could also be of some important when parts are being shipped to Canada to be assembled (although closeness to the market may be more important).

4.3. Ship Rank, Energy and MetGDP

Our *Ship Rank* variable is a combination of geographic location and port facilities and is a measures of ease of water access to Japan. This is important not only for shipping over parts to be assembled in Canada, but also to ship back finished goods to Japan, such as lumber from Japanese-owned sawmills in British Columbia.

British Columbia is ranked highest because it has deep water ports and the closest access to Japan. New Brunswick, with a deep water port, but requiring ships bound for Japan to utilize the Panama Canal, is second. Quebec, which requires a trip up the St. Lawrence Seaway, is third. Ontario fairs worse than Quebec, due to the canal that must be travelled to enter the Great Lakes from Montreal. The remaining two provinces hosting Japanese manufacturing, are the only two land locked provinces in the country; thus, Alberta and Saskatchewan score worse in this category (Appendix 2 presents a *Ship Rank* for all provinces).

Apart from water transportation, manufacturing goods are commonly moved by both rail and truck. However, comparing the length of rail tracks in each province is less favourable than comparing the total paved highway kilometres, because of the history of Canadian rail development. Rail development was more prominent in the east during the earlier years of Canadian industrialization; whereas, road transportation developed later and as such lacks the eastern bias associated with rail development. Thus, we have elected to concentrate on highway, rather than rail kilometres.

Along with our shipping variable we also devised our own method for measuring energy costs. Our *Low Energy* variable is a measure of the lowest priced fuel (among crude oil, natural gas or electricity) that prevailed at the time the Japanese decided to establish the greenfield in Canada. The second variable we constructed (which was also calculated by converting fuel prices to dollars per million Btu's) was a weighted average cost variable. Our *Average Energy* variable was calculated utilizing weights based on existing industrial

consumption of fuel in each province. These two variables are displayed graphically in *Figure 4.1* and *Figure 4.2*.

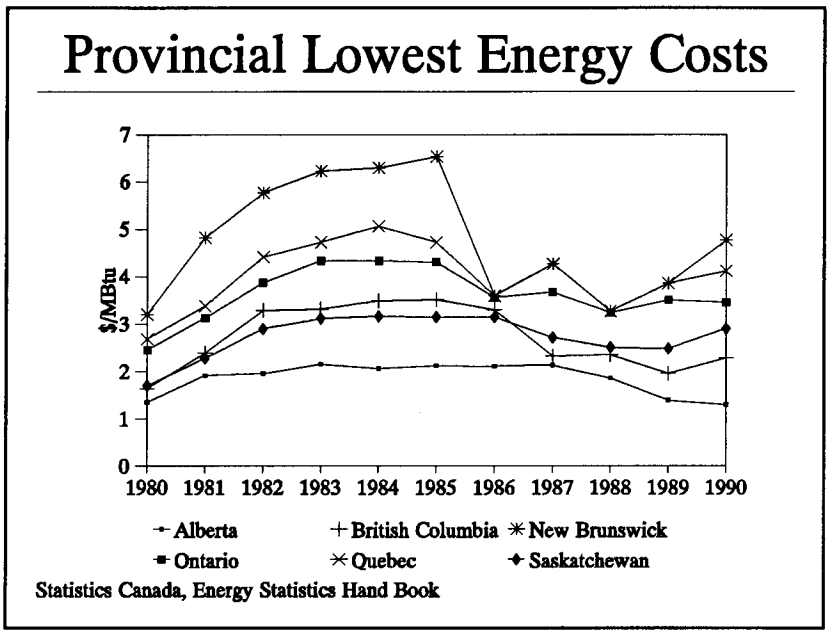

Figure 4.1

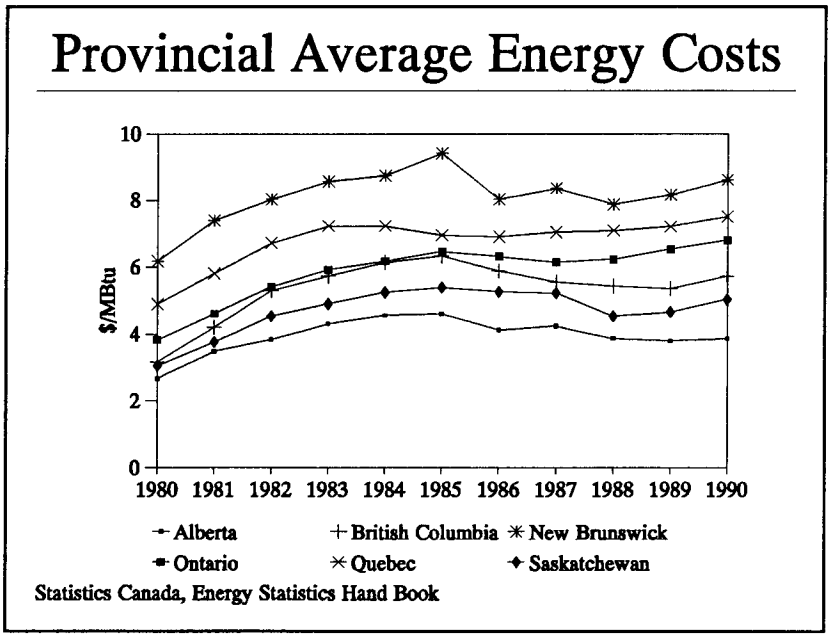

Figure 4.2

Finally, let us explain our *MetGDP* variable, which is designed to capture the characteristics of the provincial market, which is also important to foreign investors. In general, a strong market is found where there is a concentration of people with purchasing power. Thus, we would expect the combination of urban concentrations and gross domestic provincial product to be an influential factor. Urban concentration is represented by the percentage of the provincial population living in a city with a population greater than 100,000 people. To arrive at our single measure of market size (*MetGDP*) we multiplied *GDP* by *Metropolitan*.

4.4. Industry Agglomeration as a measure of Manufacturing Activity

Industry agglomeration in itself may attract additional industry. That is industry attracts industry. Krugman (1991) suggests that users and suppliers of intermediate inputs will locate around one another in an effort to minimize transportation costs and encourage economies of scale. Also, technological spillovers may cause firms in the same industry to locate in proximity to each other. Smith & Florida (1992) point out that Japanese auto part suppliers tend to locate near Japanese auto manufacturers. Bartik (1985) attributes "existing manufacturing activity" as the reason for other manufactures locating there. Our study addresses this issue of whether the existence of manufacturing attracts new different kind of manufacturing to the area. If so, we would expect our variables measuring manufacturing intensity (i.e., variables 14 and 15 in Section 4.2) to be reasons for Japanese greenfields locating in the province that they do.

If however, the level of provincial overall manufacturing activity is not as good a measure as industry-specific clusters are of provincial location choice, then we would expect our *Canadian Industries* and *Japanese Greenfields* variables to be more significant. Building on the work of Head, Ries, and Swenson (1993), our *Canadian Industries* and *Japanese Greenfields* variables are counts of establishments in specific industries, accumulated at the provincial level. To determine *Canadian Industries* we utilised SIC classifications (based on 4, or in some cases 3, digits). That is, on a provincial basis we counted all Canadian industries that had the same SIC classification as the entering Japanese greenfield. Appendix 4 contains the industry-specific counts on a provincial basis for the greenfields, with Appendix 5 providing the national counts.

We also used the notion that Japanese firms are attracted to locate in proximity to other Japanese manufacturing facilities. Unfortunately, the industry-specific data (based on SIC classifications) that was collected for Japanese manufacturing facilities already in Canada, was of little use, because of the small number of industry-specific Japanese firms present in each province at time of entry. Therefore, rather than use a Japanese count of existing firms in the same industry we utilized our data presented in *Table 4.1*[4], which provided a count of Japanese manufacturing greenfields that existed in the province prior to the new Japanese entrant.

While there is a possibility that the general level of manufacturing will in itself attract additional manufacturing facilities to locate there, we suspect that location choice is driven by industry-specific establishment counts. However, as Head, Ries, and Swenson (1993) point out, the location of like industry, an agglomeration effect, should not be confused with endowment effects. For example, if a new pulp mill locates in a less industrial province (say, British Columbia rather than, say, Ontario) then it may have done so for either industry-specific reasons (most Canadian pulp mills are in B.C.) or endowment effects (most trees close to the Pacific Ocean are in B.C.). In general, it is difficult to distinguish between agglomeration and endowment effects.

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[4] For a true measure of Japanese greenfields we also included greenfields established prior to 1980. Accordingly, this increased the accumulated totals in *Table 1*. Alberta had one; British Columbia had two; Ontario had two; Quebec had four; and Saskatchewan and New Brunswick had no Japanese manufacturing greenfields locate in the province prior to 1980.

4.5. Data Collection Summary

We were able to collect Canadian data for all the variables listed in Section 4.2. We summarize our variables in *Table 4.2*. In this table each provincial variable is ranked for the years 1989 and 1980. The 1980 ranking only appears in brackets if the ranking actually changed. We observe that approximately one third of the rankings do change. Generally, these changes are minor rearrangements. Only 3% of the rankings actually changed more than three places and apart from the Ontario's unemployment rate becoming the lowest in Canada in 1989, and New Brunswick becoming more unionized in 1989, all other major changes in provincial rankings occurred in the area of provincial corporate tax rates.

TABLE 4.2
1989 (1980) PROVINCIAL RANKING

Prov	Rank	Pop	Met	Crime	UI	Union	Area	Wage	GDP	Hw	Engy	Air	Tax	P-m	C-m	Ship
ON	1	1	1	6	1(4)	3(5)	3	9(8)	1	6	5(4)	2	7(6)	1	1	6
PQ	2	2	2	1(2)	6(7)	9(8)	1	7(6)	2	8	6	3	1(4)	2	2	5
BC	3	3	5	10(8)	5	7(9)	2	10	3(4)	9	3	1	2(10)	5(3)	3	1
AB	4	4	3	8(10)	2(1)	1(2)	4	8(9)	4(3)	5	1	4	4(2)	8	4	9
MN	5	5	4	7	4(3)	8(7)	6	3(2)	5(6)	7	4(5)	7	10(8)	4	5	7
NS	6	7	7	5	7(6)	2(4)	9	4	7	2	9(8)	9	6(5)	6	6	3
SK	7	6	6	9	3(2)	5(1)	5	6(7)	6(5)	3	2	6	5(7)	10	8	10
NB	8	8	9	3	8(9)	6(3)	8	5	8	4	8(7)	8	8(3)	3(5)	7	2
PE	9	10	10	4	9(8)	4(6)	10	1	10	1	7(9)	10	3(1)	9	10	8
NF	10	9	8	2(1)	10	10	7	2(3)	9	10	10	5	9	7	9	4

Population	1 = Highest
% of Population living in Metropolitan Area	1 = Highest
Crime Rate	1 = Lowest
Unemployment Rate	1 = Lowest (+ economic indicator)
Unionization Rate	1 = Lowest
Area in Square Km	1 = Biggest
Average Manufacturing Wages	1 = Lowest
Provincial GDP	1 = Highest
Highway Km per Square Km	1 = Highest
Average Energy	1 = Lowest
Airports with Control Towers	1 = Most
Provincial Corporate Tax Rate	1 = Lowest
% of Provincial Labour Force in Manufacturing	1 = Highest
% of Cdn Manufact. Labour Force in Province	1 = Highest
Shipping - ease of water access to Japan	1 = Easiest

PROVINCE	TOTAL SCORES
1. Ontario	53
2. Quebec	57
3. British Columbia	69
4. Alberta	69
5. Manitoba	86
6. Nova Scotia	89
7. Saskatchewan	90
8. New Brunswick	95
9. Prince Edward Island	106
10. Newfoundland	111

NOTES:

31% of Rankings changed.

3% of Rankings changed 3 or more places.

5. OUR CONDITION LOGIT ECONOMETRIC MODEL

Building on related research (Section 3) our model also seeks to explain the location selection process, by determining which factors (from our list in Section 4.2) were significant. That is, why did a Japanese manufacturing greenfield select one province over another, after having made the decision to locate in Canada? The structure of our model enables us to analyze the fifty-five Japanese manufacturing greenfields that have located in Canada during 1980 to 1991.

While in theory these firms could have selected any one of ten provinces and two territories, as we know from *Table 4.1* and Appendix 1, these investments only involved a total of six provinces. Recall that almost two thirds of the new investment went to Ontario (35 investments), with British Columbia (11 investments) accounting for a fifth. This leaves Alberta with one investment, Saskatchewan with two investments, Quebec with four investments and New Brunswick with two investments.

Based on this it is not realistic to say that the whole of Canada represented a choice set, accordingly, we limited our choice set to only the provinces that had been picked in the last decade. (However, for comparative purposes, *Table 4.2* and Appendix 2 contain provincial data on all ten provinces). Thus, there are 330 (6 X 55) dichotomous choices that stem from our 55 dependent variables. While there is no hard and fast rule on sample size, our

small sample size may be problematic; however, we have relied on McFadden (1974), who suggests that logit regression is suitable for sample sizes over 50.

We assume that a Japanese manufacturing greenfield will choose to invest in a particular province if and only if it will maximize profit. Formally, the j^{th} province is chosen by the i^{th} firm, if and only if

$$\Pi_{ij} = \max \{\Pi_{im}; m = 1,\ldots,6\} \qquad (1)$$

where Π_{ij} denotes the profit of the i^{th} firm given that it locates in the j^{th} province (for j = 1,...,6). Following Carlton (1983) and Coughlin (1991), we assume that

$$\Pi_{ij} = c + X_j\beta + \in_{ij} \qquad (2)$$

where c is the constant term; X_j is a vector of observable characteristics for the j^{th} province; β is a vector of unknown coefficients to be estimated; and $\in_{ij}$ is the random term. If the error term is independent and has a Weibull distribution, McFadden (1974) shows that

$$P_j = \exp \{X_j\beta\} / \Sigma \exp \{X_k\beta\} \qquad (\text{for } k = 1,\ldots,6) \qquad (3)$$

where β is obtained by maximum likelihood estimation; and P_j denotes the probability a Japanese manufacturing greenfield locating in province j. This decision depends on the level of the

province's characteristics that affect profits relative to the other provinces. In general, the explanatory variables are provincial characteristics which are independent of the investment.

Canadian Industries, *Japanese Greenfields*, *Labor* and *Energy*, however, contain provincial characteristics that are specific to each investment, and the variation is due to industry differences.The first two variables were introduced in Section 4. *Labor* and *Energy* are two additional variables we use to measure factor intensities. We personalize the data for each Japanese establishment (based on work by Schmenner, 1987) by interacting industry labour (energy) intensity and wages (energy) costs in each province. *Table 5.1* illustrate the calculation use to arrive at our *Energy* variable. The Energy Intensity column for firm 10 is pulp industry fuel costs divided by pulp industry sales. To determine *Energy*, Energy Intensity is multiplied by the *Average Energy* price in each province prevailing at the time the greenfield is established. The calculation to arrive at our variable to measure labour intensity (*Labor*) uses the same methodology. To calculate *Labor*, Wage Intensity is multiplied by *Wages* prevailing at time of entry in each province.

Table 5.1 also shows the variation in our data. For example, we see that energy prices vary among provinces (i.e. Alberta's *Average Energy* cost in 1990 was half of Quebec's 1990 *Average Energy* cost). Variation also occurs over time (i.e. from 1986 to 1990 Quebec's *Average Energy* cost increased by $.61 per 1,000,000 Btu's, whereas the *Average Energy* cost in Alberta decreased by $.26). In addition to these time and provincial variations that are occurring throughout our model, we also experience industry variation amongst *Canadian*

Industries, *Japanese Greenfields*, *Labor* and *Energy*. In this regard *Table 5.1* points out the number of pulp mills in British Columbia is greater than the number in Ontario. This is an example of industry-specific variation.

TABLE 5.1
ENERGY INTENSITY
(In Thousands)

Firm #	SIC #	Energy Intensity	Province	Avg. Energy $/MBtu	Energy	Cdn Indust. Count
			Alberta	3.87	0.2362	2
10	2711	355/5817	B.C.	5.74	0.3503	16
			N.B.	8.61	0.5255	6
Mitsubishi	Pulp	=0.06103	Ontario	6.81	0.4156	5
1990			Quebec	7.51	0.4583	8
			Sask.	5.05	0.3082	1
			Alberta	4.13	0.0106	0
28	3231	100/39093	B.C.	5.89	0.0151	3
			N.B.	8.04	0.0206	0
Honda	Auto	=0.00256	Ontario	6.32	0.0162	15
1986			Quebec	6.90	0.0177	5
			Sask.	5.28	0.0135	1

Finally *Table 5.1* shows how our model works. Mitsubishi can chose from six locations, and while Honda will also chose from the same six provinces, between the two investments there are a total of twelve alternatives. Honda and Mitsubishi face different location choices because of different investment times and the investments being in different industries. In our next section we reveal which provincial characteristics influenced the provincial location decision of the Japanese manufacturing greenfields.

6. RESULTS

The following final results were obtained by estimating equation (3).

TABLE 6.1
FINAL RESULTS

LOG OF LIKELIHOOD FUNCTION	:	-55.0821
NUMBER OF CASES	:	55
NUMBER OF CHOICES	:	330

Parameter	Estimate	Standard Error	t-statistic
Manufacturing Wages	-8.35985	5.35172	-1.56209
Average Energy	-7.11482	2.83188	-2.51241 *[5]
Ship Rank	-.350917	.204142	-1.71898
Canadian Industries	.657384	.281352	2.33652 *
Japanese Greenfields	2.16394	.612262	3.53434 *
Provincial MetGDP	-.880592	.340797	-2.58392 *

The log of each variable was taken, with exception of the *Ship Rank* variable. Testing the theoretical relationships presented in the previous section was severely constrained by the limited sample size. The variables presented in *Table 6.1* are those that had consistent effects across various specifications. To narrow down our list of twenty independent variables to the model above, the variable's significance was measured in terms of its coefficient and t-statistic (10% significance level). For example, recall that as a measure of transportation services we had collected provincial data on *Highway Kilometres*, *Airports*, and *Ship Rank* variable. We selected *Ship Rank* because throughout our testing it remained generally significant, while the other two were not significant.

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[5] Asterisked variables are statistically significant.

To a manager both the lowest available energy cost and the average energy costs are important. The choice between the two measures of energy cost was not intuitively obvious because both could be a guiding force for new plant location. To select the most appropriate measure of energy costs it was necessary to independently test both of our energy cost measures. As *Table 6.2* illustrates, when *Low Energy* replaced *Average Energy*, the model was not improved. Thus, average energy prices are more influential in a location decision than the price of the lowest available energy source.

TABLE 6.2
SUBSTITUTING LOW ENERGY PRICE

LOG OF LIKELIHOOD FUNCTION	:	-55.9915
NUMBER OF CASES	:	55
NUMBER OF CHOICES	:	330

Parameter	Estimate	Standard Error	t-statistic
Manufacturing Wages	-3.58545	4.25787	-.842076
Low Energy	-3.14202	1.48912	-2.10999 *
Ship Rank	-.068488	.135675	-.504793
Provincial MetGDP	-.750461	.324385	-2.31349 *
Canadian Industries	.710716	.272957	2.60377 *
Japanese Greenfields	1.92872	.592186	3.25695 *

Recall *Table 4.2* where we found that the variables that changed the most in provincial ranking from 1980 to 1989 were *Tax*, *Unionization*, and *Unemployment*. We did not examine the influence of unemployment, given the previously discussed ambiguity of high unemployment as a location factor (i.e., being a drawing card for some, yet a deterrent to others). However, we decided to test the provincial crime rate, as safety is considered to be important to the Japanese. Our *Crime* variable was offenses per 100,000 divided by provincial population.

TABLE 6.3
TESTING UNIONIZATION, TAX & CRIME RATES

LOG OF LIKELIHOOD FUNCTION	:	-54.1813
NUMBER OF CASES	:	55
NUMBER OF CHOICES	:	330

Parameter	Estimate	Standard Error	t-statistic
Manufacturing Wages	-11.2525	6.69886	-1.67977
Average Energy	-8.59998	3.25604	-2.64124 *
Ship Rank	-.360553	.397184	-.907774
Canadian Industries	.651787	.289458	2.25175 *
Japanese Greenfields	2.18708	.806161	2.71296 *
Provincial MetGDP	-1.27346	1.39549	-.912557
Unionization	.033940	.089459	.379387
Tax	.179514	.165387	1.08542
Crime	-14.3812	31.7353	-.453161

Unlike Bartik (1985), who found tax and unionization to be significant in the United States, as *Table 6.3* illustrates, we did not find this result. Nor did *Crime* have any influence in the location decision of Japanese manufacturing greenfields. Thus, we could not support the stereotype that high rates of unionization, crime and taxes drive business away.

However, our results show that *Wages* and *Average Energy* are negative and fairly significant throughout our testing. At first this may appear to contradict our findings in *Table 4.2.* In *Table 4.2* we see that Ontario and British Columbia have the highest wages and neither has the lowest energy prices, yet they account for 84% of new Japanese manufacturing investment in Canada in the last decade. This is not a contradiction, because while Japanese greenfields prefer to avoid high wages and energy costs, they have an even stronger preference for like industries and presence of other Japanese greenfields. Thus, they are willing to pay the higher price for inputs in order to be in areas of industry specific concentration.

Next we tested to see whether labour intensive industries were more concerned about the level of wages, and energy intensive industries were more concerned about energy costs. As portrayed in *Table 6.4* inconsistent results were found in that neither the *Labor* or *Energy* variable were significant. In our sample, it appears that firms in labour or energy intensive industries tended to choose Ontario or British Columbia in spite of high wages and mid-priced energy costs.

TABLE 6.4
TESTING FACTOR INTENSITIES

LOG OF LIKELIHOOD FUNCTION	:	-59.0074
NUMBER OF CASES	:	55
NUMBER OF CHOICES	:	330

Parameter	Estimate	Standard Error	t-statistic
Labor	12.47260	12.5914	.990568
Energy	-3.207280	30.5082	-.105128
Ship Rank	.025374	.129654	.195703
Provincial MetGDP	-.500709	.288151	-1.73766
Canadian Industries	.690563	.270134	2.55637 *
Japanese Greenfields	1.15395	.401528	2.87389 *

In our section on independent variables we explained how we calculated *MetGDP*. We theorized that Japanese investors prefer large, concentrated markets, so we created this variable by multiplying the percentage of provincial population living in a city with provincial *GDP*. As *Table 6.1* illustrated the coefficient for *MetGDP* is negative and this counter-intuitive relationship also occurs for *GDP* (see Appendix 6).

Re-examining the data suggested that Quebec might be unduly influencing the model since it has the second highest *GDP* and *Metropolitan* population (see *Table 4.2* and

Figure 6.1) yet has only had four Japanese greenfield investments in the last decade. To explore this, we created a *Quebec* dummy variable. The results in *Table 6.5* were inconclusive in that when *Quebec* replaced the *MetGDP* variable it too was negative and significant; however, when both the *Quebec* dummy variable and the *MetGDP* variable were included in the model, as illustrated by *Table 6.6*, neither was significant.

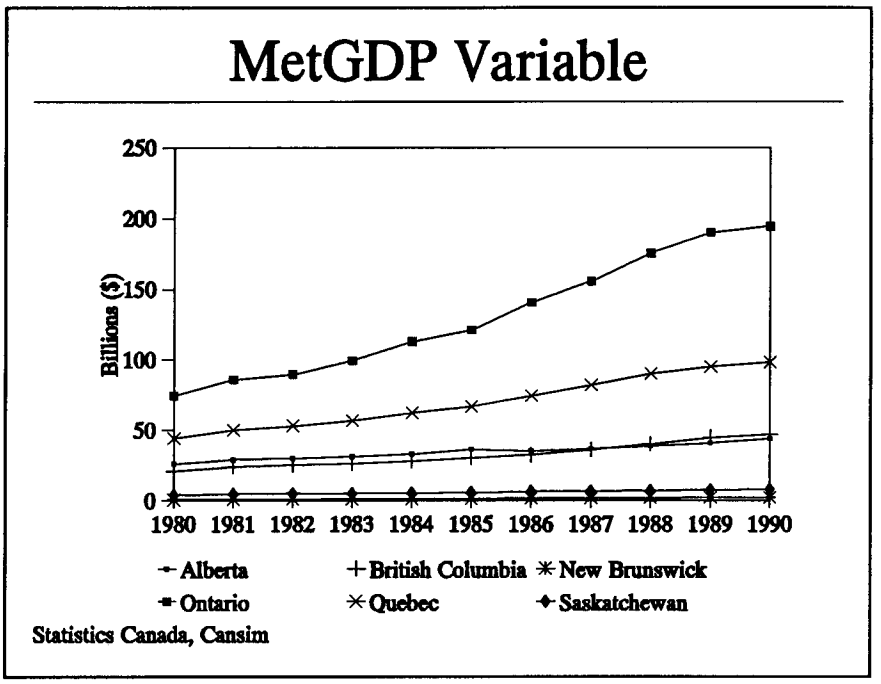

Figure 6.1

TABLE 6.5
REPLACING MetGDP WITH QUEBEC DUMMY

LOG OF LIKELIHOOD FUNCTION	:	-56.1173
NUMBER OF CASES	:	55
NUMBER OF CHOICES	:	330

Parameter	Estimate	Standard Error	t-statistic
Average Energy	-5.12543	2.6080	-1.96527
Manufacturing Wages	-10.5204	5.71940	-1.83942
Canadian Industries	.523389	.271664	1.92660
Japanese Greenfields	1.10012	.424306	2.59274 *
Ship Rank	-.485113	.217339	-2.23206 *
Quebec Dummy	-1.42687	.677821	-2.10509 *

TABLE 6.6
ADDING A QUEBEC DUMMY VARIABLE

LOG OF LIKELIHOOD FUNCTION	:	-55.0720
NUMBER OF CASES	:	55
NUMBER OF CHOICES	:	330

Parameter	Estimate	Standard Error	t-statistic
Manufacturing Wages	-8.71039	5.89270	-1.47817
Average Energy	-7.00878	2.92989	-2.39216 *
Ship Rank	-.366620	.232202	-1.57889
Canadian Industries	.648374	.28773	2.25341 *
Japanese Greenfields	2.08530	.822973	2.53387 *
Quebec Dummy	-.157868	1.10961	-.142273
Provincial MetGDP	-.816484	.564654	-1.445990

Intuitively the explanation is that the Japanese are merely following a Canadian trend of avoiding Quebec due to government intervention into areas such as language legislation. Furthermore, one would suspect that a Japanese greenfield may be even more concerned about the separation issue than a Canadian firm. This would be particularly true if the Japanese FDI is made in order to tariff jump. Locating in the "Country of Quebec" may not automatically mean that the industry can benefit from existing free trade agreements within North America. While we can not confirm this, we can confirm that Japanese manufacturing greenfields have located in Ontario, which is close to Quebec's wealthy urban population, yet out of its jurisdiction.

7. CONCLUSION

In this section we summarize our results and identify the main weaknesses of our analysis. Then we discuss policy ramifications and research questions that stem naturally from our results.

7.1. Factors Influencing Japanese Manufacturing Greenfield's Location Decision

We found that new Japanese manufacturing facilities locate next to similar Canadian industry-specific firms and other Japanese firms. Ontario and British Columbia attract a greater proportion of Japanese manufacturing than their national share of manufacturing would suggest. In this regard our data shows that Ontario has approximately half of Canadian manufacturing, yet they have attracted 64% (35/55) of Japanese greenfields. The case in British Columbia is even more profound. The number of new Japanese manufacturing greenfields (11/55 or 20%) is double British Columbia's share of national manufacturing. Thus, we conclude that industry-specific establishment counts are a more important determinant of a Japanese manufacturing greenfield's location than the general level of provincial manufacturing.

Industrial distribution of Canadian firms is not the only factor underlying the location choice. Our results show that Japanese firms prefer provinces where there are relatively more Japanese manufacturing greenfields. That is to attract Japanese industry the presence of

similar Canadian industry (i.e., with the same SIC classification) is necessary and once Japanese industry is attracted then this in itself is a factor in attracting other industries from Japan. Furthermore, if two provinces share similar levels of industry-specific Canadian firms then geographic proximity to Japan may be important. To summarize, *Canadian Industries* and *Japanese Greenfields* were always significant, with *Ship Rank* generally being significant. Apart from these three variables, *Average Energy*, *Wages*, and *MetGDP* were also part of the equation; however, their importance is minor in determining where Japanese manufacturing greenfields will locate in Canada.

This brings us to the question of whether the positive coefficient on the *Canadian Industries* variable reflects an agglomeration effect or an endowment effect. Greenfields in Ontario tend to be in the automotive sector, which follows a traditional Canadian pattern. However, while both British Columbia and Ontario have high counts of forestry specific industries the Japanese have elected to locate mostly in British Columbia presumably due to its easier access to the Japanese market. In short, it is the only province with trees across the water from Japan. This ease of transportation is captured by the significance of our *Ship Rank* variable, which measures the province's water access to Japan. Referring back to *Table 4.2* we see that British Columbia's geographic position gives it the comparative advantage over Ontario's geographic position. Head, Ries, and Swenson (1993) suggested that the concentration of Japanese wood product firms in Washington State[6] is the result of the state's forests and

[6] Washington State is British Columbia's southern neighbour, and both are bounded by the Pacific Ocean on the west.

Washington's geographic proximity to Japan. Thus, endowments--British Columbia's forests and proximity to Japan--may explain the concentration of Japanese forestry investment in British Columbia.

It is difficult to distinguish if clustering is due to agglomeration or endowment. That is, are Japanese pulp mills in British Columbia because it is the only province with trees across the water from Japan (an endowment effect) or because the province of British Columbia has more pulp mills than any other Canadian province (which could be due to agglomeration or an endowment effect)? While the answer is not intuitively obvious, our results may suggest evidence of pure agglomeration effects. That is, if all endowment effects are captured by the combination of the *Canadian Industries* and *Ship Rank* variables, then the positive coefficient on the significant *Japanese Greenfields* variable may be evidence of pure agglomeration effects.

7.2. Limitations of Our Results

The small number of Japanese manufacturing greenfields that have entered the Canadian economy in the last decade limits our ability to assess the determinants of investment. The many possible explanatory variables and little information to distinguish among them (especially in the presence of multicollinearity) adds further to the difficulties in determining actual location factors that attract Japanese manufacturing greenfields.

The possibility of omitted explanatory variables exists. Utilizing past research we identified and then tested the vast majority of factors that could influence the location decision. However, it is possible that our error term includes an independent variable that we were not able to identify and test for its significance. If we have omitted variables that are correlated with other independent variables, the estimated coefficients for those variables will be biased.

Another possible problem with our model may be lack of variation amongst non industry-specific provincial characteristics. *Table 4.2* illustrates that there is variation among these characteristics. However, the range of variation between these characteristics is not always, from a statistical point of view, as great as we would like it to be. This limited variation of non industry-specific provincial characteristics constrains our ability to distinguish the individual effects of each variable.

With the combination of Ontario (64%) and British Columbia (20%) receiving 84% of Japanese greenfield investment our distribution is skewed. This skewed distribution compounds the problem of our limited variation. Furthermore, this distribution also gives rise to the possibility that a unique omitted feature of either Ontario or British Columbia could be driving the results. Nevertheless, by measuring variation in both non industry-specific provincial characteristics and industry-specific characteristics, despite our small skewed sample size, we feel that our study still provides results that provincial policy makers may find useful.

7.3. Policy Ramifications for Provinces Seeking FDI

Regardless of whether we think foreign investment is good or bad for Canada it has become somewhat of a necessity given our desire to spend more than we earn. Accordingly, we find ourselves in the position of needing to attract foreign investment. Because of possible job creation and potential spillovers of management expertise, FDI has been highly sought after in North America. In the U.S. large subsidies have been paid by the individual states trying to attract Japanese greenfield investments.

However, our study suggests that unless Japanese manufacturing greenfields and industry-specific Canadian firms are already in the province, and that the province provides market accessability, the province is unlikely to attract much Japanese investment. Hence, increasing schemes directed at attracting FDI will not have a significant effect if the industry-specific base of firms does not already exist.

If the investment is to export products to Japan, then market access to Japan is determined by geography (a factor not easily modified). For example, although both Ontario and British Columbia have a forest industry, because the products being produced are for Japanese consumption, Japanese-owned plants tend to locate in British Columbia. If the market is Canada (or North America) then location is in Ontario with its central location and substantial industrial activity.

Our results indicate that it is difficult for a province to try to attract Japanese greenfield FDI without a market for the product, or without an existing industrial base. For a province to try to attract this type of FDI with neither, it is near impossible, unless governments intervene. However, even government intervention may do little to encourage location preferences. Our study suggests that corporate tax rates and unionization were not significant. Therefore, rather than offer subsidies or direct government resources to reducing unionization, perhaps tax dollars would be better spent on developing an industrial strategy to encourage clustering of industry.

If tax dollars are efficiently spent on needed infrastructure that creates a competitive advantage, then this may encourage clustering of firms that benefit from this infrastructure. Should Canadian industries cluster, then Japanese manufacturing greenfields in the same industry are more likely to be attracted to this area. With a base of Japanese manufacturing greenfields, more Japanese manufacturing greenfields are likely to be attracted. This possible Japanese agglomeration effect could then create industry diversification.

7.4. Further Study and Extensions

This study questions government efforts to attract Japanese greenfield investments to areas that do not already have a base of firms in similar industries or Japanese manufacturing greenfields. Our study also drew our attention to a possible free trade effect, in that we noticed that 75% of greenfields locating in B.C. during the last decade did so after free trade. Contrary

to British Columbia, only 25% of Ontario's Japanese manufacturing greenfields located in Ontario after free trade. While this may be a free trade effect, Ontario's relative fewer investments could reflect the change in business climate due to the more socialist government being elected in 1990. We feel it is also worth studying why the majority of Japanese manufacturing greenfields locate in Ontario, which is close to Quebec's wealthy urban population, yet out of its jurisdiction. This too may be a free trade effect in that the Japanese manufacturing greenfields wish to have access to North American free trade, which is something that is not guaranteed if Quebec should separate from Canada. Alternatively, the possible avoidance of Quebec could be a language preference.

Future work will take into account non-free trade issues such as language or changing political climates so that we may study whether the Canada/U.S. Free Trade Agreement has shifted FDI amongst the provinces and/or away from Canada to the U.S. We plan to study this by comparing Japanese manufacturing greenfields locating in Canada to those locating in the U.S. We will seek to not only determine whether one country has attracted relatively more Japanese manufacturing greenfields than the other, but also to determine if industry location is due to comparative advantage as FDI for tariff jumping is no longer required within the new North American trade zone.

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APPENDIX 1
FIFTY-FIVE JAPANESE MANUFACTURING GREENFIELDS IN CANADA
(Dependent Variable)

PROV	YEAR	FIRM #	CANADIAN COMPANY	JAPANESE INVESTOR	OWNER-SHIP	SIC CODE	#CDN FIRM IN SIC	PRODUCT DESCRIPTION
AB	1990	1	Tomen Alberta Timber Industries	Toyo Menka Kaisha	100.0	2512	1093	Lumber
BC	1989	2	Advanced Energy Technology	NTT	45.0	3391	27	R&D rechargeable batteries
BC	1989	3	Atsugi Nylon Canada Inc	Atsugi Nylon	24.0	1811	31	Nylon
BC	1991	4	Campbell River Fibre Ltd	C Itoh and Co Ltd	90.0	2512	1093	Woodchips
BC	1983	5	Canadian Autoparts Toyota Inc	Toyota Motor Corp	100.0	3255	47	Aluminum wheels
BC	1988	6	Canadian Chopstick Mfg Co Ltd	Mitsubishi Corp	100.0	2599	272	Chopsticks
BC	1980	7	Daiwa (Canada) Ltd	Daiwa Seiko Inc		3931	209	Golf clubs
BC	1983	8	Dominion Malting Ltd	Sumitomo Corp	35.0	1131	48	Liquor malt
BC	1991	9	I.S. Forest Products	Inland Kogyo	17.0	2512	1093	Forest product
BC	1990	10	M.C. Forest Investment	Mitsubishi Corp	100.0	2711	39	Pulp
BC	1988	11	Primex Fibre Ltd	Sanyang Pulp	50.0	2711	39	Pulp, chips
BC	1989	12	S.M. Cyclo of Canada	Sumitomo Heavy Ind.		3199	772	Speed reducers & variators, motors
NB	1989	13	Ampal Pallets Inc	Mitsui & Co Ltd	57.9	3099	463	Steel pallets
NB	1980	14	NBIP Forest Products Inc	Oji Paper Co/Mitsui & Co	33.0	2712		Newsprint
ON	1987	15	ABC Nishikawa Industries	Nishikawa Kasei Co Ltd	49.0	3256	96	Plastic autoparts & armrests
ON-OP	1988	16	Bellemar Parts Ind. Canada	Honda Motor Co Ltd	100.0	3259	190	Seats for vehicles & tire assembly
ON	1986	17	CAMI Automotive Inc	Suzuki Motor Co Ltd	50.0	3231	27	Vehicles

ON-OP	1989	18	Canada Mold Technology Inc	Nagase Ltd	100.0	3062	539	Prototype molds
ON-OP	1990	19	Cangel Inc	Nitta Gelatin Inc	100.0	1011	526	Gelatin & lard
ON	1987	20	Copar International	Toyo Radiator Co Ltd	46.0	3251	50	Radiator & oil coolers
ON	1988	21	DDM Plastics Inc	Daikyo/Suzuki/Mitsui	100.0	3256	96	Automotive plastics
ON-OP	1985	22	Denon Canada Inc	Nippon Columbia Co Ltd	95.0	3341	25	Car stereo, cassette & CD software
ON	1990	23	DNN Galvanizing Corp	Nippon Kokan (NKK)	40.0	2912	26	Hot dip galvanizing steel sheets
ON	1981	24	Epson Canada Ltd	Seiko Epson Corp	19.0	3361	147	Computers, printers, software products
ON	1980	25	Epson Manufacturing Ltd	Seiko Epson Corp		3361	147	Printers, ribbons & technical products
ON	1980	26	F&P Mfg Inc	F. Tech Inc	55.0	3257	20	Auto part, pedal bracket
ON	1987	27	General Seating of Canada Ltd	NHK Spring Co	65.0	3259	190	Seats for automobiles
ON	1986	28	Honda of Canada Mfg Inc	Honda Motor Co Ltd	100.0	3231	27	Automobiles
ON	1988	29	Inoac Canada Ltd	Inoue MTP Co	50.0	3257	20	Automotive interior panels & armrests
ON	1990	30	JDS Fitel Inc	Furukawa Electric Co Ltd	50.0	3562	153	Passive fibre optic components
ON	1986	31	Kao-Didak Ltd	Kao Corporation	93.0	3399	72	Floppy disks
ON	1984	32	Kuriyama Canada Ltd	Kuriyama Corp	100.0	1621	77	Industrial plastic hose & plumbing
ON	1983	33	Mitsubishi Electronic Ind	Mitsubishi Electric Corp	100.0	3341	25	Colour cathode ray tubes
ON	1987	34	Miura Boiler Co	Miura Boiler Co	99.3	3011	43	High pressure steam boiler
ON	1980	35	Murata Erie North America Ltd	Murata Mfg Co Ltd	100.0	351	90	Ceramic capacitors
ON-OP	1987	36	Nichirin Inc	Nichirin Co Ltd	100.0	3259	190	Hydraulic hoses for autos & motorcycles
ON	1985	37	NKC of Canada Inc	Nakanishi Metal Works	100.0	3192	533	Conveyor systems
ON	1986	38	Quality Safety Systems Co	Tokai Rika Co Ltd	40.0	3259	190	Seat belts & auto components
ON	1986	39	Rockwell Int'l Suspension Syst	Mitsubishi Corp	40.0	3254	35	Coil springs & torsion bars
ON	1982	40	Sanyo Cdn Machine Works Inc	Sanyo Machine Works Inc	100.0	3081	1464	Automatic assembly & welding machine

ON-OP	1985	41	SM Yttrium Canada Ltd	Shin-Etsu Chemical Co	100.0	3731	94	Silicon
ON	1987	42	SMC Pneumatics Canada Inc	SMC Corporations		3092	44	Cylinders & valves
ON	1986	43	Toyota Motor Mfg Canada Inc	Toyota Motor Corp	100.0	3231	27	Automobiles
ON	1985	44	Trutech Canada Inc	Nihon Parkerizing Co		3041	288	Paint finishing system, rolling oil conc
ON	1989	45	UCAR Carbon Canada Inc	Mitsubishi Corp	50.0	3399	72	Artificial graphic electrodes
ON	1980	46	UNIC International Corp			319	1601	Sandblasting equipment
ON	1987	47	Vdo-Yazaki Ltd	Yazaki Corporation	50.0	391	603	Meters
ON	1985	48	Woodbridge Inoac Inc	Inoue MTP Co	50.0	3257	20	Automotive interior trims
ON	1989	49	Yachiyo of Ontario Mfg Inc	Yachiyo Industries	100.0	3259	190	Fuel tanks
PQ	1986	50	Cree Yamaha Enterprise Ltd	Yamaha Motors	40.0	3281	327	FRP boats
PQ	1986	51	H Aida Enterprise Inc	Tokia	100.0	1021	414	Processing seafood
PQ	1989	52	Kobe Aluminium Canada	Kobe Steel Ltd	100.0	2961	71	Aluminium
PQ	1989	53	Miura Boiler Company	Miura Company		3011	43	Boilers
SK	1988	54	Hitachi Canadian Ind Ltd	Hitachi Ltd	100.0	337	281	Electric power equipment
SK	1987	55	SK Turbine Ltd	Marubeni Corporation	100.0	3194	116	Turbines

NOTE: "-OP" signifies that this is the year of operation, rather than year of establishment.

APPENDIX 2
PROVINCIAL CHARACTERISTICS
(Independent Variables)

COLUMN	INDEPENDENT VARIABLE
POP	Population in 1000's
% Metro	Percentage of Population Living in Metropolitan Areas
Crime	Reported Offenses per 100,000 People
UI	Unemployment Rate
Union %	Unionization Rates
Area	Land Area (excluding fresh water) Square KM (constant 1980-90)
MAN$/CAP	Average Annual Manufacturing Pay per Worker
GDP/CAP	Provincial GDP per Capita
Highway KM/SQ.KM	Highway Kilometres per Square Kilometre of Area (Constant 1980-90)
AVG NRG $/MBtu	Weighted Average Cost of Crude Oil, Natural Gas, and Electricity Prices per Million Btu's
Low NRG $/MBtu	Lowest Cost of Either Crude Oil, Natural Gas, or Electricity Prices per Million Btu's
AIRPORT	Number of Airports with Control Towers
TAX	Provincial Corporate Tax Rate
% PROV LAB in MFG	Percentage of Work Force in Manufacturing (Manufacturing Labour Force/Total Labour Force)
% CDN MFG LAB/PROV	Percentage of Canadian Manufacturing Work Force in the Province (Provincial Manufacturing Labour Force/Total Canadian Manufacturing Labour Force)
Ship Rank	Shipping 1=BC (yearly deep water; no canal) 2=NS, NB, NFL (yearly deep water) 3=Que (mostly open deep water) 4=Ont (mostly open shallow water) 5=Man (partly open deep water) 6=PEI (deep water but no port facilities) 7=Ab, Sask (no water access)

APPENDIX 2 CONT'D

PROV	YEAR	POP 000's	%METRO	CRIME RATE	UI %	UNION %	AREA SQ.KM	MAN$/CAP	GDP/CAP	HIGHWAY KM/SQ.KM	AVG NRG $/MBtu	LOW NRG $/MBtu	AIRPORT #	TAX %	%PROVLAB IN MFG	%CDN MFG LAB/PROV	SHIP RANK
BC	1980	2666.0	54.4	141.77	6.8	39.2	929730	22231	14343.21	0.071	3.17	1.64	26	15.0	12.30	8.65	1
BC	1981	2744.2	54.0	150.63	6.7	40.0	929730	24388	16285.62	0.071	4.20	2.39	26	16.0	11.69	8.58	1
BC	1982	2787.7	54.5	161.03	12.1	40.0	929730	27059	16542.31	0.071	5.32	3.29	26	16.0	10.25	8.24	1
BC	1983	2813.8	54.8	156.34	13.8	40.4	929730	29242	17112.45	0.071	5.73	3.31	26	16.0	9.65	7.97	1
BC	1984	2847.7	55.2	155.39	14.7	38.3	929730	29905	17950.98	0.071	6.14	3.49	26	16.0	9.45	8.00	1
BC	1985	2870.1	55.5	154.99	14.1	36.9	929730	31389	18988.54	0.071	6.33	3.52	26	16.0	9.49	7.63	1
BC	1986	2889.0	56.7	161.88	12.5	41.2	929730	31895	19848.39	0.071	5.89	3.31	26	16.0	9.19	7.38	1
BC	1987	2925.0	57.2	165.63	11.9	37.5	929730	32375	21496.07	0.071	5.56	2.33	26	15.0	9.59	7.62	1
BC	1988	2980.2	57.8	160.57	10.3	38.1	929730	33542	23325.28	0.071	5.44	2.36	26	14.0	10.06	7.82	1
BC	1989	3048.3	58.3	166.60	9.1	36.4	929730	34841	25234.06	0.071	5.37	1.97	26	14.0	10.07	8.07	1
BC	1990	3132.5	58.3	177.51	8.3	38.0	929730	35000	25764.09	0.071	5.74	2.28	26	14.0	10.08	8.10	1
AB	1980	2140.6	60.7	153.14	3.7	22.0	644390	19003	20156.97	0.265	2.67	1.36	7	11.0	7.25	4.39	7
AB	1981	2237.3	58.1	157.16	3.8	23.3	644390	21466	22318.87	0.265	3.48	1.92	7	11.0	7.21	4.66	7
AB	1982	2314.5	56.4	149.12	7.7	22.7	644390	24248	22854.18	0.265	3.84	1.96	7	11.0	6.47	4.64	7
AB	1983	2338.7	56.1	145.16	10.6	23.9	644390	25989	23682.39	0.265	4.31	2.16	7	11.0	5.86	4.33	7
AB	1984	2338.5	55.9	129.87	11.1	23.6	644390	27241	25204.62	0.265	4.56	2.07	7	11.0	5.76	4.33	7
AB	1985	2348.5	55.7	128.19	10.0	22.7	644390	27864	27826.70	0.265	4.61	2.13	7	11.0	5.98	4.23	7
AB	1986	2375.1	61.4	134.52	9.8	26.4	644390	29027	24132.46	0.265	4.13	2.12	7	11.0	6.03	4.22	7
AB	1987	2377.7	61.7	145.05	9.6	24.8	644390	29132	25051.52	0.265	4.24	2.14	7	15.0	6.17	4.20	7
AB	1988	2388.7	62.1	148.41	8.0	26.1	644390	29453	26059.36	0.265	3.87	1.86	7	15.0	6.72	4.46	7
AB	1989	2425.9	62.3	143.24	7.2	25.8	644390	30638	27059.24	0.265	3.79	1.40	7	15.0	7.02	4.66	7
AB	1990	2473.1	62.6	145.49	7.0	26.6	644390	31000	28533.02	0.265	3.87	1.30	7	15.0	7.10	4.69	7
SK	1980	959.4	32.5	142.96	4.4	18.8	570700	17526	12924.74	0.341	3.05	1.70	5	14.0	4.85	1.15	7
SK	1981	968.3	32.8	152.39	4.6	28.9	570700	19690	14808.43	0.341	3.76	2.28	5	14.0	4.82	1.16	7
SK	1982	977.0	33.3	139.13	6.1	28.3	570700	21926	15107.47	0.341	4.54	2.90	5	14.0	4.37	1.17	7
SK	1983	989.3	33.7	135.83	7.3	28.2	570700	23495	15399.78	0.341	4.91	3.12	5	14.0	4.03	1.13	7
SK	1984	1000.5	33.8	139.08	8.0	28.4	570700	25385	16381.81	0.341	5.26	3.17	5	16.0	3.98	1.14	7
SK	1985	1008.4	34.2	144.83	8.1	27.1	570700	25272	17290.76	0.341	5.40	3.15	5	16.0	3.97	1.09	7
SK	1986	1010.2	38.3	153.95	7.7	32.7	570700	25356	16971.89	0.341	5.28	3.15	5	17.0	3.95	1.07	7
SK	1987	1015.8	38.6	155.71	7.4	30.5	570700	26141	16954.12	0.341	5.23	2.72	5	17.0	4.04	1.06	7
SK	1988	1013.5	39.0	152.73	7.5	31.1	570700	27557	17945.73	0.341	4.54	2.52	5	17.0	4.19	1.05	7
SK	1989	1006.7	39.2	148.37	7.4	32.2	570700	28379	19326.51	0.341	4.66	2.49	5	15.0	4.43	1.08	7
SK	1990	997.1	39.7	145.92	7.0	32.3	570700	29000	20332.97	0.341	5.05	2.90	5	15.0	4.50	1.07	7
MN	1980	1024.9	56.8	116.36	5.5	30.7	548360	15637	10916.19	0.154	4.22	2.25	4	15.0	12.00	3.14	5
MN	1981	1026.2	57.2	124.75	5.9	30.2	548360	17546	12824.01	0.154	4.62	2.81	4	15.0	11.67	3.08	5
MN	1982	1033.3	57.3	131.48	8.5	30.0	548360	19460	13562.37	0.154	5.03	3.48	4	15.0	10.78	3.13	5
MN	1983	1045.6	57.4	133.19	9.4	26.6	548360	20393	14260.71	0.154	5.37	3.67	4	16.0	10.13	3.07	5
MN	1984	1055.1	57.2	130.40	8.4	28.2	548360	21325	15657.28	0.154	5.65	3.69	4	16.0	10.00	3.11	5
MN	1985	1064.0	57.5	132.60	8.2	28.7	548360	22157	16598.68	0.154	5.87	3.63	4	16.0	9.93	2.91	5
MN	1986	1071.2	58.4	139.29	7.7	35.5	548360	23009	17196.60	0.154	5.49	3.40	4	17.0	10.05	2.92	5
MN	1987	1079.0	58.6	143.43	7.4	35.4	548360	23775	18064.87	0.154	5.86	3.26	4	17.0	10.18	2.90	5
MN	1988	1084.1	58.9	124.06	7.8	35.3	548360	24653	19895.77	0.154	5.88	2.94	4	17.0	10.70	2.94	5
MN	1989	1086.3	59.0	115.93	7.5	36.7	548360	25926	21135.05	0.154	6.22	2.84	4	17.0	10.55	2.88	5
MN	1990	1089.0	59.4	121.84	7.2	36.8	548360	27000	21769.51	0.154	6.85	2.76	4	17.0	10.40	2.91	5
ON	1980	8569.7	64.8	116.24	6.8	29.7	891190	18083	13418.67	0.187	3.83	2.45	16	14.0	20.92	49.19	4
ON	1981	8624.7	65.2	120.10	6.6	29.5	891190	20251	15285.29	0.187	4.61	3.13	16	14.0	20.44	49.20	4
ON	1982	8702.5	65.4	116.39	9.7	30.2	891190	22375	15778.22	0.187	5.42	3.87	16	14.0	18.81	49.75	4
ON	1983	8798.0	65.6	111.40	10.3	32.5	891190	24179	17270.40	0.187	5.92	4.33	16	15.0	18.39	50.20	4
ON	1984	8901.7	65.8	109.71	9.0	32.1	891190	27996	19265.87	0.187	6.18	4.33	16	15.0	17.38	49.03	4
ON	1985	9006.4	66.1	106.13	8.0	31.8	891190	27009	20381.17	0.187	6.46	4.31	16	15.0	19.16	51.60	4
ON	1986	9113.0	69.4	111.70	7.0	31.6	891190	27870	22244.05	0.187	6.32	3.56	16	15.5	19.23	51.70	4
ON	1987	9265.0	69.6	113.75	6.1	30.9	891190	28743	24162.12	0.187	6.15	3.68	16	15.5	19.18	51.36	4
ON	1988	9431.1	69.7	113.42	5.0	31.1	891190	30303	26758.07	0.187	6.23	3.24	16	15.5	19.41	51.04	4
ON	1989	9589.6	69.9	112.68	5.1	31.1	891190	31559	28380.85	0.187	6.54	3.51	16	15.5	19.53	51.69	4
ON	1990	9749.6	70.2	116.12	6.3	31.7	891190	32500	28420.14	0.187	6.81	3.46	16	15.5	19.70	51.34	4

PQ	1980	6386.1	61.5	77.80	9.8	35.9	1356790	16720	11308.94	0.080	4.91	2.69	15	13.0	17.67	28.54	3
PQ	1981	6438.2	61.3	81.52	10.3	37.9	1356790	18720	12660.84	0.080	5.81	3.38	15	13.0	17.31	28.37	3
PQ	1982	6462.2	61.4	78.66	13.8	36.5	1356790	20586	13343.44	0.080	6.73	4.41	15	8.0	16.09	28.22	3
PQ	1983	6474.9	61.7	73.88	13.9	38.2	1356790	21859	14251.03	0.080	7.23	4.73	15	5.5	15.63	28.42	3
PQ	1984	6492.0	61.8	74.29	12.8	38.7	1356790	23054	15556.22	0.080	7.23	5.06	15	5.5	15.70	29.39	3
PQ	1985	6514.2	61.9	77.42	11.8	38.7	1356790	24040	16570.57	0.080	6.95	4.73	15	5.5	15.63	27.78	3
PQ	1986	6540.2	63.4	78.23	11.0	38.5	1356790	24833	17964.74	0.080	6.90	3.60	15	13.0	15.86	27.84	3
PQ	1987	6592.6	63.4	79.77	10.3	37.9	1356790	25830	19683.13	0.080	7.05	4.26	15	13.0	16.00	27.92	3
PQ	1988	6640.8	63.6	78.93	9.4	37.8	1356790	27133	21372.73	0.080	7.09	3.28	15	13.0	16.28	27.69	3
PQ	1989	6698.2	63.7	78.50	9.3	40.2	1356790	28810	22342.12	0.080	7.21	3.86	15	13.0	15.68	26.60	3
PQ	1990	6768.2	63.9	85.18	10.1	40.0	1356790	30000	22763.22	0.080	7.51	4.11	15	13.0	16.00	26.83	3
NB	1980	695.4	16.4	88.41	11.0	26.8	72090	16353	7217.43	0.284	6.18	3.21	4	12.0	11.51	1.74	2
NB	1981	696.4	16.4	89.37	11.5	32.3	72090	18081	8548.25	0.284	7.39	4.82	4	13.0	11.02	1.70	2
NB	1982	696.6	16.5	91.22	14.1	34.8	72090	19690	9369.80	0.284	8.02	5.77	4	14.0	10.11	1.67	2
NB	1983	703.2	16.4	89.14	14.8	37.5	72090	20878	10655.57	0.284	8.57	6.22	4	14.0	9.87	1.70	2
NB	1984	707.9	16.3	85.79	14.8	31.8	72090	22128	11830.77	0.284	8.74	6.29	4	15.0	9.84	1.73	2
NB	1985	709.9	16.5	87.10	15.1	29.3	72090	23494	12687.70	0.284	9.42	6.54	4	15.0	9.82	1.67	2
NB	1986	710.4	17.1	90.53	14.3	30.0	72090	24026	14187.78	0.284	8.04	3.60	4	15.0	10.39	1.76	2
NB	1987	712.3	17.1	90.59	13.1	34.6	72090	25856	15274.46	0.284	8.37	4.26	4	15.0	10.36	1.74	2
NB	1988	714.3	17.2	89.99	12.0	34.1	72090	26997	16470.67	0.284	7.88	3.28	4	16.0	10.85	1.77	2
NB	1989	717.8	17.1	89.00	12.5	35.3	72090	27517	17617.72	0.284	8.17	3.86	4	16.0	11.12	1.83	2
NB	1990	722.4	17.2	96.51	12.1	36.9	72090	28000	18403.93	0.284	8.61	4.76	4	16.0	11.30	1.86	2
NS	1980	845.1	32.4	115.07	9.7	27.0	52840	16069	7445.27	0.486	6.62	3.21	3	13.0	10.94	2.11	2
NS	1981	847.4	32.7	119.89	10.1	29.5	52840	17829	8667.69	0.486	7.40	4.82	3	13.0	10.81	2.09	2
NS	1982	849.5	32.9	123.32	13.1	30.4	52840	19437	9961.15	0.486	7.86	5.77	3	15.0	9.57	2.02	2
NS	1983	857.0	32.9	105.88	13.2	29.5	52840	20747	11235.71	0.486	9.29	6.22	3	15.0	9.30	2.05	2
NS	1984	864.4	33.1	99.58	13.0	28.0	52840	22170	12379.69	0.486	9.58	6.29	3	15.0	9.10	2.12	2
NS	1985	871.0	33.4	100.24	13.6	28.3	52840	22039	13701.49	0.486	9.70	6.54	3	15.0	9.13	1.99	2
NS	1986	873.2	33.9	103.41	13.1	27.8	52840	23206	14923.27	0.486	8.79	3.60	3	15.0	9.10	1.97	2
NS	1987	878.0	34.2	103.97	12.3	30.9	52840	23981	15897.49	0.486	9.28	4.26	3	15.0	9.43	2.02	2
NS	1988	881.9	34.2	103.86	10.2	30.5	52840	24688	17084.70	0.486	8.81	3.28	3	15.0	9.75	2.04	2
NS	1989	888.3	34.5	106.62	10.3	30.8	52840	26413	18089.61	0.486	9.37	3.86	3	15.0	9.73	2.04	2
NS	1990	895.1	34.9	116.69	10.5	30.4	52840	27100	19011.28	0.486	10.11	4.76	3	16.0	9.70	2.07	2
PE	1980	122.8	0.0	92.39	10.6	30.0	5660	13003	6889.25	0.919	6.63	3.21	1	10.0	5.62	0.16	6
PE	1981	122.5	0.0	93.51	11.2	30.1	5660	14074	8236.73	0.919	9.43	4.82	1	10.0	5.74	0.16	6
PE	1982	122.4	0.0	97.04	12.9	26.4	5660	14964	8586.60	0.919	11.35	5.77	1	10.0	5.47	0.17	6
PE	1983	123.7	0.0	98.42	12.2	31.2	5660	16226	9417.95	0.919	11.66	6.22	1	10.0	5.57	0.18	6
PE	1984	125.1	0.0	101.78	12.8	22.9	5660	16766	10367.71	0.919	12.30	6.29	1	10.0	5.29	0.18	6
PE	1985	126.0	0.0	100.87	13.3	21.6	5660	16966	10476.19	0.919	12.89	6.54	1	10.0	5.84	0.19	6
PE	1986	126.6	0.0	96.47	13.4	23.0	5660	16975	11832.54	0.919	8.33	3.60	1	10.0	5.79	0.19	6
PE	1987	127.3	0.0	88.66	13.2	29.0	5660	17195	12482.33	0.919	7.44	4.26	1	15.0	5.88	0.19	6
PE	1988	128.5	0.0	100.71	13.0	29.5	5660	18855	13859.92	0.919	7.25	3.28	1	15.0	6.06	0.19	6
PE	1989	129.9	0.0	104.26	14.1	31.3	5660	19375	14603.54	0.919	7.51	3.86	1	15.0	5.94	0.19	6
PE	1990	130.7	0.0	107.74	14.9	33.7	5660	20000	15233.36	0.919	8.69	4.76	1	15.0	5.90	0.19	6
NF	1980	565.6	27.1	71.96	13.2	43.7	371690	15645	7240.10	0.032	6.81	3.21	7	15.0	8.54	0.95	2
NF	1981	567.7	27.1	79.74	13.8	49.2	371690	17631	8178.62	0.032	7.99	4.82	7	15.0	8.75	0.98	2
NF	1982	566.2	27.6	80.13	17.3	49.4	371690	19707	8935.01	0.032	9.60	5.77	7	16.0	8.10	0.99	2
NF	1983	571.4	27.7	78.19	19.2	51.9	371690	20605	9599.23	0.032	10.19	6.22	7	16.0	7.47	0.95	2
NF	1984	572.4	28.0	77.98	20.6	47.5	371690	20308	10389.59	0.032	10.55	6.29	7	16.0	7.30	0.96	2
NF	1985	571.5	28.1	74.60	20.9	40.3	371690	20125	11142.61	0.032	13.10	6.54	7	16.0	7.36	0.92	2
NF	1986	568.3	28.5	76.99	18.7	45.6	371690	20723	11933.84	0.032	12.20	3.60	7	16.0	7.82	0.96	2
NF	1987	568.1	28.6	77.37	16.8	48.8	371690	21336	12997.71	0.032	11.26	4.26	7	16.0	8.35	1.00	2
NF	1988	568.8	28.5	75.74	15.2	51.8	371690	22835	13990.86	0.032	11.94	3.28	7	16.0	8.30	0.99	2
NF	1989	571.1	28.6	82.30	15.4	52.0	371690	24252	14841.53	0.032	11.13	3.86	7	16.5	7.83	0.95	2
NF	1990	572.7	28.6	82.93	17.1	55.1	371690	25200	15343.11	0.032	11.02	4.76	7	17.0	8.00	0.99	2

APPENDIX 3
NOTES TO JAPANESE MANUFACTURING GREENFIELDS AND PROVINCIAL DATA

1. If the year of establishment was 1991 then for our purposes we classified this establishment as being in 1990, because data on provincial variables was incomplete for 1991.

2. If the year of establishment was actually the year of operation, then to approximate the year of establishment we subtracted one year.

3. Highway miles were assumed to remain constant over the eleven year period. Provincial figures for 1988 were used.

4. Crude oil prices were not available from Statistics Canada for New Brunswick and were incomplete for Quebec. However, given the national energy policy and data that was available these missing figures were estimated. The Alberta amount plus $10.00 was substituted for Quebec and New Brunswick was assumed to face the same oil prices as Quebec.

APPENDIX 4
JAPANESE MANUFACTURING GREENFIELDS
PROVINCIAL INDUSTRIAL LEVEL FOR 1987
WAGES, FUEL, and REVENUE (In Thousands)

SIC	Firm #	Prov	Estabs	Wages	Fuel	Revenue
2512	1	1	45	86281	12998	357328
		2	336	1158091	137610	5356553
		3	66	58145	8953	270520
		4	185	202220	31180	867672
		5	338	365629	53416	1794828
		6	10	15995	2303	66928
3391	2	1	0			
		2	4			
		3	0			
		4	16	45225	4347	345477
		5	5	7308	986	38924
		6	0			
1811	3	1	1			
		2	1			
		3	0			
		4	16	163922	33971	1004544
		5	12			
		6	0			
2512	4	1	45	86281	12998	357328
		2	336	1158091	137610	5356553
		3	66	58145	8953	270520
		4	185	202220	31180	867672
		5	338	365629	53416	1794828
		6	10	15995	2303	66928
3255	5	1	0			
		2	1			
		3	1			
		4	33	191871	14738	1006041
		5	10			
		6	0			
2599	6	1	14	3712	267	12342
		2	9		22	3462
		3	8			
		4	99			
		5	80	27802	2840	123278
		6	4	549	12	955
2512	7	1	45	86281	12998	357328
		2	336	1158091	137610	5356553
		3	66	58145	8953	270520
		4	185	202220	31180	867672
		5	338	365629	53416	1794828
		6	10	15995	2303	66928

1131	8	1	7	24954	2680	132941
		2	8	45047	3486	219923
		3	3			
		4	15	170444	14605	1180198
		5	4	194485	14208	679285
		6	3	11664	1199	61786
2512	9	1	45	86281	12998	357328
		2	336	1158091	137610	5356553
		3	66	58145	8953	270520
		4	185	202220	31180	867672
		5	338	365629	53416	1794828
		6	10	15995	2303	66928
2711	10	1	2			
		2	16	322950	149825	2629804
		3	6	125641	68704	892708
		4	5	125540	63380	944065
		5	8	94275	44371	716661
		6	1			
2711	11	1	2			
		2	16	322950	149825	2629804
		3	6	125641	68704	892708
		4	5	125540	63380	944065
		5	8	94275	44371	716661
		6	1			
3199	12	1	26	7903	314	31486
		2	62	30489	1057	112847
		3	7	3300	111	9812
		4	450	526267	25434	2681006
		5	191	207077	8114	771907
		6	7			
3099	13	1	39	13182	837	55700
		2	43	12532	832	45750
		3	2			
		4	249	205147	19611	902069
		5	103	52915	3613	217599
		6	10	1254	133	6365
2712	14	1	0			
		2	4	262219	171838	1719818
		3	3			
		4	9	348143	169559	1808450
		5	21	727865	401159	3679968
		6	0			
3256	15	1	2			
		2	6			
		3	0			
		4	75	244844	19772	1119061
		5	10	21581	2040	118368
		6	0			

3259	16	1	3			
		2	12			
		3	4			
		4	137	644112	37826	3300384
		5	23	20550	925	90632
		6	1			
3231	17	1	0			
		2	3			
		3	0			
		4	15	1849987	89923	36834766
		5	5			
		6	1			
3062	18	1	4	1284	44	2422
		2	14	2368	99	6907
		3	0			
		4	427	271055	9612	679773
		5	86	27339	982	62324
		6	0			
1011	19	1	64	119395	9747	2340450
		2	45	74661	5597	625625
		3	6			
		4	198	336150	28638	3237259
		5	138	183860	25182	2198977
		6	27	34637	3314	477239
3251	20	1	0			
		2	4			
		3	1			
		4	37	594076	51832	3407927
		5	5	544	53	2142
		6	0			
3256	21	1	2			
		2	6			
		3	0			
		4	75	244844	19772	1119061
		5	10	21581	2040	118368
		6	0			
3341	22	1	0			
		2	1			
		3	0			
		4	16			
		5	8			
		6	0			
2912	23	1	3			
		2	4			
		3	0			
		4	12			
		5	5			
		6	2			

3361	24	1	8	7716	77	18670
		2	17	33102	339	79239
		3	0			
		4	86	238360	6017	1380276
		5	29	60226	1370	261013
		6	1			
3361	25	1	8	7716	77	18670
		2	17	33102	339	79239
		3	0			
		4	86	238360	6017	1380276
		5	29	60226	1370	261013
		6	1			
3257	26	1	3	499	17	1866
		2	0			
		3	0			
		4	10	195106	3818	873087
		5	4	167	14	858
		6	2			
3259	27	1	3			
		2	12			
		3	4			
		4	137	644112	37826	3300384
		5	23	20550	925	90632
		6	1			
3231	28	1	0			
		2	3			
		3	0			
		4	15	1849987	89923	36834766
		5	5			
		6	1			
3257	29	1	3	499	17	1866
		2	0			
		3	0			
		4	10	195106	3818	873087
		5	4	167	14	858
		6	2			
3562	30	1	13	4372	325	24050
		2	17	7451	316	27461
		3	2			
		4	65	116417	12157	464558
		5	41	28854	1835	150520
		6	4			
3399	31	1	2			
		2	3			
		3	0			
		4	43	83529	9900	366685
		5	21	37673	6340	178511
		6	1			

1621	32	1	8	7149	1063	51757
		2	9	7794	616	39474
		3	3			
		4	36	44759	6299	366865
		5	15	23691	2564	312982
		6	3			
3341	33	1	0			
		2	1			
		3	0			
		4	16			
		5	8			
		6	0			
3011	34	1	4	6615	230	21898
		2	3			
		3	2			
		4	24	111223	3336	464761
		5	6	27561	1029	158376
		6	2			
351	35	1	10			
		2	5			
		3	5			
		4	45	64697	20306	289807
		5	14	21030	7955	69494
		6	3			
3259	36	1	3			
		2	12			
		3	4			
		4	137	644112	37826	3300384
		5	23	20550	925	90632
		6	1			
3192	37	1	117	127396	6455	539744
		2	68	57044	2224	247175
		3	7	7331	316	36916
		4	222	384532	14476	2115972
		5	88	73083	3165	363639
		6	13	5407	301	28464
3259	38	1	3			
		2	12			
		3	4			
		4	137	644112	37826	3300384
		5	23	20550	925	90632
		6	1			
3254	39	1	1			
		2	5	1265	139	5164
		3	0			
		4	23			
		5	6	4637	825	28465
		6	0			

3081	40	1	113	33221	1491	87487
		2	180	61610	2556	171660
		3	22	7846	418	22358
		4	652	212299	9074	556718
		5	369	84173	4073	241621
		6	45	12519	588	45003
3731	41	1	9	33247	11876	524571
		2	7	6225	685	71206
		3	0			
		4	52	154734	44597	1723356
		5	26	52056	18250	642122
		6	0			
3092	42	1	11			
		2	4	2185	46	8212
		3	1			
		4	22	26161	1062	165016
		5	5			
		6	0			
3231	43	1	0			
		2	3			
		3	0			
		4	15	1849987	89923	36834766
		5	5			
		6	1			
3041	44	1	20	11069	1527	43682
		2	24	7894	865	19699
		3	1			
		4	178	172338	24917	705846
		5	50	22309	2964	69130
		6	6	2190	287	5997
3399	45	1	2			
		2	3			
		3	0			
		4	43	83529	9900	366685
		5	21	37673	6340	178511
		6	1			
319	46	1	163			
		2	177			
		3	20			
		4	820	1134868	49033	5697737
		5	345	345967	14774	1383431
		6	22	11326	701	57585
391	47	1	51	26408	516	94609
		2	69			
		3	8			
		4	276	459214	15372	1985639
		5	139			
		6	19			

3257	48	1	3	499	17	1866
		2	0			
		3	0			
		4	10	195106	3818	873087
		5	4	167	14	858
		6	2			
3259	49	1	3			
		2	12			
		3	4			
		4	137	644112	37826	3300384
		5	23	20550	925	90632
		6	1			
3281	50	1	3	717	51	2079
		2	79	20594	841	90377
		3	18			
		4	101	31106	1823	149543
		5	65	26920	1122	141114
		6	0			
1021	51	1	1			
		2	48	100725	6435	1067023
		3	73	54517	5384	452911
		4	19			
		5	40	38372	4005	207321
		6	1			
2961	52	1	4			
		2	9			
		3	0			
		4	32	127082	19981	878524
		5	23	71529	11928	707052
		6	1			
3011	53	1	4	6615	230	21898
		2	3			
		3	2			
		4	24	111223	3336	464761
		5	6	27561	1029	158376
		6	2			
337	54	1	17			
		2	22	14877	481	56592
		3	2			
		4	154	479350	17245	1752783
		5	71	88879	3601	399546
		6	4	5267	934	23034
3194	55	1	3			
		2	10	8303	166	29236
		3	4	1175	84	3698
		4	63	139225	5218	493724
		5	33	36346	2311	167758
		6	1			

PROVINCE CODES

1 = Alberta
2 = British Columbia
3 = New Brunswick
4 = Ontario
5 = Quebec
6 = Saskatchewan

APPENDIX 5

JAPANESE MANUFACTURING GREENFIELDS
NATIONAL INDUSTRIAL LEVEL FOR 1987
WAGES, FUEL and SHIPMENTS (In Millions)

SIC	Establishments	Wages	Fuel	Shipments
319	1601	1851	79	8638
337	281	624	23	2390
351	90	107	33	413
391	603	591	18	2451
1011	526	851	82	9811
1021	414	530	43	4111
1131	48	502	42	2557
1621	77	89	11	801
1811	31	211	43	1199
2512	1093	1919	252	8862
2599	272	63	5	275
2711	39	757	355	5817
2712	43	1572	927	8537
2912	26	81	13	204
2961	71	215	33	1701
3011	43	148	4	652
3041	288	217	30	850
3062	539	303	10	753
3081	1464	436	19	1194
3092	44	71	2	274
3099	463	290	25	1257
3192	533	666	27	3387
3194	116	187	7	703
3199	772	802	36	3724
3231	27	2116	100	39093
3251	50	598	52	3430
3254	35	168	16	720

3255	47	209	16	1086
3256	96	270	22	1252
3257	20	196	3	877
3259	190	672	39	3429
3281	327	93	5	442
3341	25	83	1	822
3361	147	367	8	2006
3391	27	66	6	420
3399	72	122	16	552
3562	153	161	14	688
3731	94	246	75	2961
3931	209	144	8	788

APPENDIX 6
CONDITIONAL LOGIT REGRESSION RESULTS
VARIABLES & THEIR SOURCE

LW =	log of manufacturing wages as listed in Appendix 2.
LE =	log of weighted average energy prices as listed in Appendix 2.
LE2 =	log of low energy prices as listed in Appendix 2.
SHIPRANK =	as listed in Appendix 2.
LMETGDP =	log of (metropolitan times GDP per Capita times population, from Appendix 2).
LCAN =	log of the number of Provincial firms in like industry as listed in Appendix 4.
LJPN =	log of the number of Japanese manufacturing greenfields in the province as per Table 1.
QUEBEC =	A dummy variable to measure the effect of this large province with few Japanese greenfield investments.
LABOR =	Using data from Appendix 5 to estimate the labour. factor input coefficient for each specific industry for the Cobb - Douglas Production Function.
ENERGY =	Using data from Appendix 5 to estimate the energy factor input coefficient for each specific industry for the Cobb - Douglas Production Function.
UNION_P =	Unionization rate in the province as listed in Appendix 2.
TAX =	Provincial Corporate Tax Rate as listed in Appendix 2.
CRIME =	Provincial crime rate per 1000 divided by the provincial population. Both of these numbers are in Appendix 2.

55 Japanese Manufacturing Greenfields

CHOICE	FREQUENCY	PERCENT
1 (AB)	1	1.8182
2 (BC)	11	20.0000
3 (NB)	2	3.6364
4 (ON)	35	63.6364
5 (PQ)	4	7.2727
6 (SK)	2	3.6364

Without a Measure of Market Size (i.e. GDP)

LOG OF LIKELIHOOD FUNCTION	:	-58.3579
NUMBER OF CASES	:	55
NUMBER OF CHOICES	:	330

Parameter	Estimate	Standard Error	t-statistic
LCAN	.489813	.28027	1.74765
LJPN	1.21409	.435358	2.78872
SHIPRANK	-.324323	.196032	-1.65444
LW	-5.31907	4.93843	-1.07708
LV	-4.91472	2.68017	-1.83373

lw = log(avgmfgy), lv = log(avgengy)

A better fit is achieved with GDP

LOG OF LIKELIHOOD FUNCTION	:	-55.1337
NUMBER OF CASES	:	55
NUMBER OF CHOICES	:	330

Parameter	Estimate	Standard Error	t-statistic
LCAN	.677792	.285464	2.37435
LJPN	2.26426	.641879	3.52755
SHIPRANK	-.316939	.203115	-1.56039
LW	-8.23081	5.30678	-1.5510
LV	-6.42729	2.72486	-2.35876
LGDP	-1.29039	.501009	-2.57558