Plant Size, Nationality and Ownership Change

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Abstract

This paper examines the determinants of mergers across size classes by comparing domestic and foreign control changes in the Canadian manufacturing sector. It uses a sample consisting of all Canadian manufacturing plants from 1973 to 1999 and splits the sample into plant-size quartiles in each industry. The focus is on differences across size classes because of what it reveals about the importance of the underlying causes of this form of renewal in different sectors of industrial population—large as opposed to small producers and foreign as opposed to domestic firms.

The paper finds that those characteristics that provide the type of synergy upon which ownership changes rely are found to be important factors leading to plant ownership changes across most size classes. However, the magnitudes are different across plant size classes. Our plant-size proxy for general competencies matters across all size classes but is larger in magnitude in the smaller size classes. The non-production worker variable that captures specific knowledge based competencies is increasingly important as size increases.

The probability of mergers is higher for foreign controlled plants across all size classes. The differences are particularly large in the smaller size classes. These differences in the probability of takeover result partially from differences in plant characteristics (i.e. knowledge intensity) that make a foreign plant a more likely candidate for takeover and partially the result of the different propensity of these characteristics to impact on control changes in the foreign sector. Foreign controlled plants embed special knowledge capital and both their greater importance and their higher probability of control change emphasizes that the difference between small and large plants lies in the nature of synergies that stem from knowledge capital.

The analysis shows that the significance of the impact of the change in performance variables that represent measures of premerger success or failure is restricted to parts of the overall sample of producers and differs between foreign and domestic plants. For example, the change in performance variables, whether it is increases in market share for domestic plants or declines in wages for foreign plants, are larger and more significant in smaller plants. This emphasizes the importance of having comprehensive samples to explore the determinants of mergers.

JEL codes:

Keywords: plant size, ownership changes, mergers, foreign ownership

Executive Summary

This paper examines the determinants of mergers across size classes by comparing domestic and foreign control changes in the Canadian manufacturing sector. It uses a sample consisting of all Canadian manufacturing plants from 1973 to 1999 and splits the sample into plant-size quartiles in each industry.

The primary focus is on differences across size classes because of what it tells us about the importance of synergies or managerial discipline as factors affecting the likelihood of mergers. This paper examines the issue in more detail by asking two questions that enable us to determine whether these forces are at work equally in different parts of the plant-size distribution.

1) We start by asking whether the same forces are at work across all size classes or whether there is a discernible pattern that suggests systematic differences between large and small plants. We are interested in knowing whether the factors that have been postulated to provide the synergistic rationale for mergers operate across the entire size distribution.

The results show that the characteristics that are postulated to be behind synergies are equally important or of more importance as plant size gets larger.

Plant size itself has an impact that is about the same across the first three size classes, which means that as plant size increases within each of these size groups, the probability of takeover continues to increase monotonically as size increases. The increased competencies that are being captured by size are continuously at work to increase the probability of takeovers.

Size is not the only synergy that increases across size classes. The impact of knowledge workers also increases. Furthermore, contrary to the coefficient on plant size, the coefficient on the level of human capital increases continuously across plant-size groups. The specific competencies associated with knowledge workers are more important in larger plants.

Industry human capital intensity and industry profitability/capital intensity both provide additional synergy for plant takeovers, regardless of plant size groups and the importance of these characteristics often increases across size classes. Other industry level variables, such as average industry plant size and industry wage rate are more important signals for smaller plant size groups than for larger plant size classes. But in the latter case, the importance of the effect increases across the first three size classes. These variables capture aggregate signals. When they are being used by acquiring firms as a rough signal that plants provide the type of capacity that permits the transfer of knowledge, it is the larger plants that are being sought within these industries by the acquirers.

In addition to the factors related to synergies, several other characteristics that are less directly connected to synergistic knowledge capabilities reinforce the tendency for a higher probability of control changes in large producers. The first is the impact of being an unrelated plant which increases over size classes. This is less likely to be related to synergies and more to costs of experimentation that some firms undertake as they grow. Unrelated diversification is risky because firms doing so move into new markets and become exposed to new technologies—all of which leads to higher failure rates.

The second factor that is less obviously related to synergies that contributes to a higher probability of turnover is the impact of the number of producers—the competitive environment. Here, the impact of the number of producers on the probability of control change gets larger for larger plant-size groups. That is, the probability of a control change is larger for larger plants than smaller plants in industries with fewer producers. If control changes are more likely than greenfield plant construction as a form of entry in industries with fewer producers because of the competitive environment, it is done by acquiring larger plants.

2) We also ask whether there are systematic differences between domestic and foreign plants that suggest different forces are at work in the two populations.

The probability of takeover for foreign controlled plants is higher across all size classes. This difference is particularly large in the smallest size classes. These differences in the probability of takeover result partially from differences in plant characteristics (i.e. knowledge intensity) that make a foreign plant a more likely candidate for takeover and partially from the result of the different propensity of these characteristics to impact on control changes in the foreign sector.

There are significant differences in the way in which some characteristics affect control changes in the foreign population as opposed to the domestic population. Age has a positive and significant coefficient for foreign plants, whereas in domestic plants, the opposite occurs. Age therefore is more reflective of the buildup of general competencies in the multinational group.

Declines in market share and wages, lead to a greater probability of takeover in the foreign sector, but this is not so in the domestic sector—a finding that suggests that foreign operations are more likely to respond to managerial failure by being divested. The differences between the sectors are particularly significant in the smaller sectors that suggest multinationals are particularly vigilant about failure when they do not have a dominant position.

In contrast to this profile, domestic plants are more likely to be divested if they are younger and have had a growth spurt in sales. Divestiture here appears more to be related to a process that harvests success at an early stage of life by divesting plant. These impacts are particularly large in the smaller size classes.

1. Introduction

Our earlier paper (Baldwin et al. 2009) asked whether it was synergies or managerial discipline that operated to affect the likelihood of mergers for Canadian manufacturing plants. It found that both were important. This paper extends this work in order to determine whether these forces are at work equally in different parts of the plant-size distribution.

This paper examines the determinants of mergers across size classes by comparing domestic and foreign control changes in the Canadian manufacturing sector. The primary focus is on differences across size classes because of what it tells us about the importance of this form of renewal in industrial populations.

Renewal by control change is much more common in larger firms. By examining differences across size classes, this study asks whether the same forces are at work in all size classes, but attenuated in the smaller members of the population, or whether there is a very different process at work in the largest group of producers. Understanding differences in the determinants across size classes also helps us to understand differences in previous studies that differ in the sample of firms used to analyze the determinants of control changes.[1]

A second focus of this study is on differences between domestic and foreign plants, because of what this tells us about the impact of the characteristics that distinguish foreign and domestic plants and whether failing to account for these differences obscures the processes at work in takeovers. One explanation of mergers relies on the notion that they are the mechanism through which knowledge capital is transferred. Knowledge capital is often non-codifiable, subject to asymmetric information difficulties and not easily handled through arm's-length transactions. One theory of multinationals argues that knowledge transfers across national boundaries are accomplished through acquisition of complementary vehicles—that is in plants with synergistic characteristics that enable the knowledge that is transferred through control changes to be best exploited. This theory of multinational firms suggests these multinational plants will be different from other plants and that they are more likely to be candidates for control changes. Whether the difference increases across size classes depends upon whether the knowledge capital increases more rapidly in the foreign than the domestic sector as size class increases.

Assessing how different plant characteristics are associated with control changes is done here using a large and comprehensive administrative database that covers almost the entire Canadian manufacturing sector over a long period of time—1973 to 1999.

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[1] McGuckin and Nguyen (1995) suggest that the determinants of MA activity across size classes differ and that other studies (i.e., Lichtenberg, 1992) that rely on a subset of only large firms provide results that are particular only to this group.

2. Background

Plant-control change—the transfer of ownership of a plant from one owner to another affects a relatively large portion of production in the Canadian manufacturing sector. Between 1973 and 1999, 5.8% of manufacturing shipments are affected by control changes, annually. Plant-control changes occur in both foreign-owned and domestic-owned plants.[2] The rates in foreign-owned plants are higher than in Canadian-owned plants. Some 6.7% of plants undergo control changes in the foreign-controlled sector annually, compared to 1.7% in Canadian-controlled plants (Table 2).

Foreign ownership in the Canadian manufacturing sector is significant and has been relatively stable over the study period. Between 1973 and 1999, the percentage of shipments in the manufacturing sector controlled by foreign plants remained around 45%. While it dipped slightly in the middle of the period in response to a regulatory regime that placed more restrictions on foreign direct investment, it regained earlier levels by the end of the period (Baldwin and Gellatly, 2005). Foreign-controlled plants tend to be larger than average: foreign multinationals control 12% of total number of plants (Table 2), but they control about 44% of total manufacturing shipments (Table 1).

Plant-control changes are more likely to occur in large than small plants. From 1973 to 1999, 5.8% of manufacturing shipments (Table 1), but only 2.3% of plants are affected annually by plant-control changes (Table 2). When the sample is divided according to owning firms' nationality, plant-control changes affect about 6.5% of manufacturing shipments and 6.7% of plants annually in foreign-owned affiliates. In the Canadian-owned sector, plant-control changes affect 5.8% of manufacturing shipments, and 1.7% of plants. Plant-control changes occur in all plant size-classes, though more frequently in larger plant-size groups: ownership changes accounted for only .7% of total observations in the smallest plant size-class, while it climbed to 4.7% in the largest plant size-class (Table 2).

Foreign-controlled plants operate in all plant size-classes in Canada, but are more prevalent in larger plant size-classes: the percentage of foreign-controlled plants is only 4.0% in the smallest plant size class, and it reaches 23.8% in the largest plant size group. On average, foreign-owned plants are larger than Canadian-owned plants: foreign-owned plants control about 44% of manufacturing shipments in the smallest plant size group, with only 4.0% of plants. Similar differences are observed in all other plant-size classes.

While the incidence of control change increases across size classes, differences are larger for domestically-controlled plants. For Canadian-owned plants, the incidence of plant-control change is .5% in the smallest plant-size class and 3.9% in the largest plant size-class. For foreign-owned plants, it

[2] In this study, the terms domestic-owned and Canadian-owned are used interchangeably.

increases from 5.9% in the smallest plant-size class to 7.2% in the largest plant size-class. The numbers suggest that size class is positively related to the probability of control change, but nationality is even more important, indicating that size motivations for mergers across plant-size groups are different across ownership types of plants.

The literature has generally found that plant size significantly influences a plant's chances of ownership change (McGuckin and Nguyen, 1995, for example). Two themes are found in the merger literature that suggests a relationship between control changes and plant size. The first relates to the synergy hypothesis—that large plants are more likely to contain the type of capabilities that permit knowledge capital to be successfully transferred and exploited by the acquiring firm in a new market. The second is that entry into concentrated markets is more likely to be accomplished via entry by acquisition than by greenfield plant construction.

While size is therefore often noted as being related to control change, little is known about how the factors leading to plant-control changes vary between small and large plants, and between foreign- and Canadian-owned plants across size classes. This paper tries to fill that gap, especially regarding plant ownership types. Plant size can be viewed as a general proxy for plant capabilities. When plants get larger, they tend to have more non-production workers to coordinate increased needs of management, produce more products to take advantage of economy of scope, possess greater capital intensity, and use different types of technologies. As a result, it is reasonable to associate an increase in plant size with an increase in plant capability. Asking how measurable factors like knowledge intensity, number of products, age, etc., influence the probability of control change in different size classes allows us to assess whether these capabilities are equally important everywhere or only in the largest size classes. It is possible, for instance, that potential for growth synergies may be larger in the smallest or the intermediate size groups or it may be that the potential from synergies is exhausted before a plant becomes the largest in its industry, thereby leading to nonlinear effects of plant size on plant-control changes.

Other motivations leading to ownership changes, such as those related to the disciplinary hypothesis, might also be different across size classes (Matsusaka 1993a, 1993b; McGuckin et al. 1998). The disciplinary hypothesis suggests that failing firms are more likely to undergo control changes when markets experiment to see if there are other managers who can make better use of the assets of a failing firm. These factors might not operate with equal intensity across all size classes, if the difficulty of turning around a failing firm differs across firms of different size classes.

Even within each size-class, there are reasons to believe that motivations or factors leading to control changes in foreign- and Canadian-owned plants differ. Baldwin and Gu (2005) find that foreign-owned plants differ substantially from Canadian-owned plants: they tend to be more productive, pay higher wages, and be more innovative because of some special capabilities.[3] Foreign-owned affiliates, being part of foreign multinational enterprises, may enjoy significant advantages over many Canadian-owned plants—if they have greater access to more advanced technologies developed by their parent multinational firms, overseas financial markets, overseas markets for their products, or better management skills. These advantages come from the possession of intangible assets, which are not completely measured by the plant characteristics that will be used in this study. While size may be a good proxy for the general capabilities for Canadian-owned plants, it may not be closely related to the attraction offered by the intangible assets embedded in foreign-owned plants. Acquirers who target capable plants in order to develop synergies might favor foreign-owned plants simply because of what nationality reveals about competencies. Whether the difference between foreign and domestic plants varies across size classes reveals whether the unobserved capital in the foreign owned sector is greater in the smallest or the largest plants.

It should be noted that being foreign-owned may be a double-edged sword. Although foreign-owned plants may enjoy advantages in terms of intangible capital over domestic-owned plants, there are several reasons to suppose that they may have a higher "risk" of being divested due to poor performance, especially when the macroeconomic environment is unfavorable. First, they may be less likely to adapt to local volatility. The management team in foreign-owned affiliates might be less familiar with the local business culture; it might take them longer to get a stable customer base; there may be less favorable treatment in terms of R&D support from host governments. Second, the profit cutoff set by their parent firms might be much higher. Both of these factors have led some to hypothesize that foreign plants may have a higher probability of being divested because of failure and thus a higher turnover rate of ownership changes.[4] Thus, signals of failure might be more closely related to ownership changes in foreign-owned plants. Indeed, using earlier data, Baldwin and Caves (1991) find evidence to suggest that mergers involving foreign and Canadian plants are characterized by different results and may be caused by different factors.

Separating plants into foreign- and Canadian-owned across plant size-classes offers the opportunity to disentangle the potential differences in ownership changes arising from plant size and ownership differences. Canadian data provide us with the opportunity to examine the issue, as Canada

[3] Similar results have been reported for the U.S. (Doms and Jensen, 1998), for the U.K. (Conyon et al., 2002), and for Indonesia (Takii, 2004).
[4] See Caves (1996).

is a small open economy. Foreign-owned affiliates have a large presence in Canada, and operate in all manufacturing industries.

This paper relates to a larger literature on causes of plant-control changes, which has offered several different frameworks that inform our empirical investigation. The *managerial-discipline* approach (Meade, 1968) treats takeovers and mergers as a form of natural selection, resulting in the replacement of mediocre management. Takeover targets will, because of entrenched management control or unforeseen events, be among the less efficient. Lichtenberg and Siegel (1987, 1990) develop a variant of this framework and propose a *matching theory* hypothesis, arguing that changes in ownership are driven by enterprises looking for a better "match" so as to improve their performance. They suggest that plants with sub par performance are likely to be candidates for takeover.

The literature does not restrict itself to the argument that all ownership changes are driven by the managerial-discipline motivations. Firms are also seen to merge in order to create a new hierarchical group whose value is greater than the sum of the values of the independent firms because of synergies—McGuckin and Nguyen (1995), McGuckin et al. (1998) and Nguyen and Ollinger (2006). Central to discussions in this area is the assumption that the difference in the characteristics of a plant and some "average" value across the entire distribution provides a signal of the degree of "inefficiency" or "synergy" available to be corrected or exploited via a control change. The notion that takeover targets are likely to possess certain assets that facilitate knowledge transfer is relevant to both foreign and domestic firms.

The remainder of the paper is organized as follows. Section 3 discusses the analytical framework used to investigate the factors related to control changes. Section 4 describes the data used. Section 5 reports the results. Section 6 concludes the paper.

3. The Analytical Framework

3.1. The Basic Framework

Our objective is to examine the characteristics of divested or acquired plants in order to shed light on the underlying causes of plants' control changes. Acquirers are assumed to search for potential targets based on some metric (profits, increase in product line, etc)—here we use a composite term referred to as value v. Suppose that a plant's value is determined by a combination of plant characteristics and industry-level metrics. Let the value of plant i at time t be defined as:

$$v_{it} = \beta X_{1,it} + \gamma X_{2,jt} + \varepsilon_{it} \ , \qquad (1)$$

where X_1 is a vector of plant-specific attributes of plant *i* at time t, X_2 is a vector containing industry characteristics where the plant operates (indexed by *j*), and ε is a random error term capturing unobserved influences. Acquirers choose to acquire plant *i* at a given point in time if the expected value is greater than a critical level, say, ϖ_{it}. The probability that a plant is acquired is defined as the probability that $v_{it} \geq \varpi_{it}$.

$$\Pr(OC = 1) = \Pr(\beta X_{1,it} + \gamma X_{2,jt} + \varepsilon_{it} \geq \varpi_{it}), \tag{2}$$

where OC=1 denotes an ownership change, and 0 otherwise. Rewriting (2) leads to,

$$\Pr(OC = 1) = \Pr ob(\beta X_{1,it} + \gamma X_{2,jt} \geq \varpi_{it} - \varepsilon_{it}), \tag{3}$$

Assume that $(\varpi_{it} - \varepsilon_{it}) \sim N(\mu_t, \sigma^2)$, then equation (3) can be re-written as:

$$\Pr(OC = 1) = \Pr(\varpi_{it} - \varepsilon_{it} \leq \beta X_{1,it} + \gamma X_{2,jt}) = \Phi\left(\frac{\beta X_{1,it} + \gamma X_{2,jt} - \mu_t}{\sigma}\right), \tag{4}$$

where β and λ are constants, and μ_t is year specific constant, such as the year dummy, and Φ is the cumulative normal distribution. Equation (4) can be estimated using a probit model. The variables used in the estimation are outlined below. In particular, plant-specific variables X can be split into two groups—a plant's longer-run performance (variables in levels) and its short-run performance just prior to the ownership change (variables in changes).

3.2 The Variables

The set of variables used here are taken from Baldwin et al. (2009) and are summarized here.

The first set of variables relates to the *level* of certain plant characteristics. These variables capture the extent to which it is certain types of assets that are being chosen for synergy.

Rel_L: a plant's size in terms of total employment relative to its SIC 4-digit industry mean, averaged over the previous three years. *Rel* stands for *relative*.[5] The three-year average is used to smooth out annual fluctuations in a plant's relative performance. Relative plant size is a general proxy for the types of competencies that allow some plants to grow larger.

Rel_NL: a plant's ratio of non-production workers to total workers, relative to its SIC 4-digit industry mean, averaged over three years (a proxy of a plant's knowledge intensity).

[5] We make use of our variables in relative form to deal with the lack of special price data for each plant. A similar methodology is employed in Christensen et al. (1981), Olley and Pakes (1992), Dhrymes and Bartlesman (1992), Baily et al. (1992), Baldwin (1992). McGuckin and Nguyen (1995).

Product: number of products produced—a measure of a plant's product diversification, which is derived from a Herfindahl measure of a plant's diversification.[6] This variable captures the potential for scope economies at the plant level.

Age: as older plants have built up experience and knowledge from cumulative production experience, *age* is expected to have a positive sign.

Plant1961: approximate age for those plants built before or in 1961. Due to the lack of information on their actual birth year, we take year 1961 as their starting year.

Unrelated: a binary variable to capture related or unrelated merger/acquisition. It takes on the value of 1 if the acquired plant is owned by a firm whose primary activity is in another 4-digit industry and 0 otherwise. Firms often expand across industry boundaries—as part of a diversification process. These mergers tend to be the least successful (Lecraw 1984).

Foreign: a binary variable taking on the value of 1 if a plant is foreign-owned and 0 otherwise. Ceteris paribus, a foreign-owned plant is more likely to contain the type of knowledge capabilities that allow for transfer of new knowledge via takeovers.

The second set of variables captures plants' short-run performance and is meant to allow us to assess the importance of factors related to managerial discipline across size classes. Each of these change variables is measured relative to the 4-digit industry mean of the industry where the plant is located, and is defined as the difference between the performance in the present period and in one year before.

Δ*Rel_NL*: change in a plant's ratio of non-production to total workers—a measure of change in the knowledge capabilities of the plant.

Δ*Rel_L*: change in a plant's employment size—a measure of the change in market share. Reductions in relative plant size are an indication of a loss in market share.

Δ*Rel_WR*: change in a plant's wage rate—a measure of the change in a plant's ability to compete in labour markets. Reductions in relative average wage rates provide a signal that plants are losing their competitiveness.

Δ*Rel_PR*: change in a plant's profit rate (value added[7] minus wages and salaries divided by value added)—a measure of a change in the plant's profitability. Reductions in profits directly affect the well-being of shareholders.

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[6] See Baldwin et al. (2002) for a study of plant level diversification and a discussion of the Herfindahl measure of product diversification.

[7] Value added is the value of sales minus the value of purchases of intermediate goods and services.

The third set of variables are industry characteristics that control for the fact that some industries contain more of the types of plants that offer greater synergy possibilities when new knowledge emerges that offers gains from consolidation. The industry variables here are defined at the 4-digit SIC80 industry level. Baldwin and Caves (1991) argue that certain industries (science-based and scale-based) contain plants whose knowledge is embedded in the plant and where control change is the method by which new knowledge is best combined with old knowledge. These industries may therefore be more prone to control changes—in that they offer a signal that plants therein facilitate knowledge transfer.

We include industry characteristics such as relative industry plant size—*Indl_L*, relative industry non-production worker (knowledge) intensity—*Ind_NL*, relative industry wage rate—*Ind_WR*, and relative industry profit rate, which on a cross-sectional basis proxies capital intensity—*Ind_PR* (industry level value added minus wages and salaries divided by value added). In each case, the industry characteristic is measured relative to the manufacturing average.

In addition, we include an industry variable that captures the number of plants in an industry—*Ind_Plant*. This is meant to measure the intensity of competition in an industry—or the ease of entry through the alternate means of greenfield plant creation. The number of plants in an industry is inversely related to the difficulty of entry and expansion—via plant creation. Where there are few plants, entry is more likely to be accomplished via takeover than by greenfield expansion since the former has less of an effect on capacity and therefore less of a depressing effect on prices.

Finally, we recognize that there may still be some industry effects that are still not captured with the above industry characteristics and we include a set of industry binary variables. We inform our choice of sectors from previous research by dividing the four-digit industries into five major groups. They are: natural-resource based—*Ind1*, labour intensive—*Ind2*, scale-based—*Ind3*, product-differentiated—*Ind4*, and science-based industries—*Ind5*.[8] Each group is defined primarily on the basis of the factors influencing the process of competition.

With the variables defined, our baseline estimation equation is:

$$\Pr(OC_{it}=1)=\Phi(\alpha+\beta^{F}Foreign+X\beta)$$

$$\begin{aligned}\Pr(OC_{it}=1)=\alpha&+\beta^{F}Foreign_{it}+\beta^{NL}\,Rel\_NL_{it}+\beta^{L}\,Rel\_L_{it}+\beta^{Age}Age_{it}+\beta^{D}Plant1961_{it}\\&+\beta^{Prod}\,Product_{it}+\beta^{unrel}Unrelated_{it}+\beta^{\Delta NL}\Delta Rel\_NL_{it}+\beta^{\Delta L}\Delta Rel\_L_{it}\\&+\beta^{\Delta WR}\Delta Rel\_WR_{it}+\beta^{\Delta PR}\Delta Rel\_PR_{it}+\beta^{IndP}Ind\_Plant+\beta^{IndNL}Ind\_NL_{jt}\end{aligned}$$

[8] See Baldwin and Rafiquzzaman (1994) for a discussion of the methodology used to create these groupings.

$$+\beta^{IndL} Ind\_L_{jt} + \beta^{IndWR} Ind\_WR_{jt} + \beta^{IndPR} Ind\_PR_{jt} + \sum_{w=1} \lambda_w Ind_w + \sum_{y=1} \theta_y Year_y + \varepsilon_{it}, \qquad (5)$$

Since one of our central interests is to study whether causes leading to plant ownership changes differ systematically between foreign- and domestic-controlled plants, we introduce interaction terms between *Foreign* and all other major covariates. With the interactions terms, the estimation equation becomes:

$$\Pr(OC_{it} = 1) = \Phi(Z\eta) = \Phi(\alpha + \beta^F Foreign + X\beta + \ \delta\ Foreign * Y), \qquad (6)$$

where *Y* is a subset of *X* (can be a full set of *X* as well). If not written in the matrix form, for example, the coefficient, δ^{F_NL}, stands for the coefficient on the interaction term, *Foreign***Rel_NL*. That is, the first part of the superscript *F_* stands for the interaction of a particular variable with *Foreign*. The coefficients on interactions between *Foreign* and other variables are similarly coded.

3.3. Estimation Strategy

In order to compare the impact of different plant characteristics across size groups, we make use of estimates of marginal probability effects. In our case, estimation of the marginal effects requires the assessment of the impact of a dummy variable (*Foreign*) interacted with other continuous variables (such as *Rel_NL*). In the case of an interaction term involving one continuous variable and one dummy variable, the marginal effects for the interaction term is the discrete difference with respect to the dummy of the single derivative with respect to the continuous variable (Norton et al. 2004). We take the interaction term *Foreign***Rel_NL* to illustrate the point. Its marginal effects are defined as:

$$\frac{\Delta\left(\dfrac{\delta\Phi(Z\eta)}{\delta \mathrm{Re}l\_NL}\right)}{\Delta Foreign} = \frac{\delta\Phi(Z\eta)}{\delta \mathrm{Re}l\_NL}\Big|_{Foreign=1} - \frac{\delta\Phi(Z\eta)}{\delta \mathrm{Re}l\_NL}\Big|_{Foreign=0}, \qquad (7)$$

First, the derivative of $\Phi(Z\eta)$ with respect to *Rel_NL* is:

$$\frac{\delta\Phi(Z\eta)}{\delta \mathrm{Re}l\_NL} = \Phi^{'}(Z\eta) * (\beta^{NL} + \delta^{F\_NL} Foreign), \qquad (8)$$

The above derivative evaluated at Foreign=1 (the foreign-owned plants subgroup) is:

$$\frac{\delta\Phi(Z\eta)}{\delta \mathrm{Re}l\_NL}\Big|_{Foreign=1} = \Phi^{'}(\alpha + \beta^F + X\beta + \delta Y) * (\beta^{NL} + \delta^{F\_NL}), \qquad (9)$$

where the means of X and Y are taken from the population of foreign-owned plants ..

The derivative in equation (8) evaluated at Foreign=0 (Canadian-owned plants subgroup) is:

$$\frac{\delta\Phi(Z\eta)}{\delta \mathrm{Re}l\_NL}|_{Foreign=0} = \Phi'(\alpha + X\beta) * \beta^{NL}, \qquad (10)$$

where the means of X are taken from the population of Canadian-owned plants.

Thus, the marginal effect of the interaction term, *Foreign*Rel_NL* is the difference between equations (9) and (10):

$$\frac{\Delta\left(\frac{\delta\Phi(Z\eta)}{\delta \mathrm{Re}l\_NL}\right)}{\Delta Foreign} = \Phi'(\alpha + \beta^F + X\beta + \delta Y) * (\beta^{NL} + \delta^{F-NL}) - \Phi'(\alpha + X\beta) * \beta^{NL}$$

$$= \Phi'(\alpha + \beta^F + X\beta + \delta Y) * \delta^{F-NL} + (\Phi'(\alpha + \beta^F + X\beta + \delta Y) - \Phi'(\alpha + X\beta)) * \beta^{NL}, \quad (11)$$

It is evident that even if the probit coefficient on the interaction term, δ^{F-NL}, is zero, we can still have a non-zero marginal effect as long as the difference $\{\Phi'(\alpha + \beta^F + X\beta + \delta Y) - \Phi'(\alpha + X\beta)\}$ or β^{NL} is not zero. Similarly, the significance level of the marginal effects also depends on β^{NL}, and it is possible that even if δ^{F-NL} is significant, the associated marginal effects may not be.

The marginal probability effects of the interaction terms between *Foreign* and other continuous variables, and the marginal effects of other continuous variables for Canadian-owned plants (base results) are similarly derived. In the case of a product involving two dummy variables, like *Foreign*Unrelated*, the marginal effects of the interaction term is the discrete double difference (Norton et al. 2004):

$$\frac{\Delta\Phi(Z\eta)}{\Delta Foreign\ \Delta Unrelated} = \frac{\Delta\{\Phi(Z\eta)|_{Foreign=1} - \Phi(Z\eta)|_{Foreign=0}\}}{\Delta Unrelated}$$

$$= \{\Phi(Z\eta)|_{Foreign=1} - \Phi(Z\eta)|_{Foreign=0}\}|_{Unrelated=1}$$

$$- \{\Phi(Z\eta)|_{Foreign=1} - \Phi(Z\eta)|_{Foreign=0}\}|_{Unrelated=0},$$

$$= \{\Phi(Z\eta)|_{Foreign=1,\,Unrelated=1} - \Phi(Z\eta)|_{Foreign=1,\,Unrelated=0}\}$$

$$- \{\Phi(Z\eta)|_{Foreign=0,\,Unrelated=1} - \Phi(Z\eta)|_{Foreign=0,\,Unrelated=0}\}, \qquad (12)$$

The first difference in equation (12) is the discrete change of the probability for *Unrelated* from 0 to 1 for foreign-owned plants, $\{\Phi(Z\eta)|_{Foreign=1,\,Unrelated=1} - \Phi(Z\eta)|_{Foreign=1,\,Unrelated=0}\}$, and the second term is the discrete change of the probability for *Unrelated* from 0 to 1 for Canadian-owned plants, $\{\Phi(Z\eta)|_{Foreign=0,\,Unrelated=1} - \Phi(Z\eta)|_{Foreign=0,\,Unrelated=0}\}$, which is the base marginal effects.

To estimate the marginal effects for the base (Canadian-owned plants) and the interaction terms for additional marginal effects for foreign-owned plants, we first estimate a probit model, and then, according to the formulae developed above, use "nlcom" to calculate the coefficient and the associated standard error of the marginal effects of the base terms and the interaction terms.

We first estimate the results for the pooled sample to obtain an overview of the differences in the factors leading to plant control changes between foreign- and Canadian-owned plants. But as one of our objectives is to explore how the factors behind plant control changes vary with plant size classes, we then split the sample into four quartiles. That is, for each industry-year, we group those plants with plant size (based on employment) less than the 25th quartile, those between 25th and 50th, those between 50th and 75th, and those between 75th and 100th into four separate sub-samples. Then, we pool all the sub-samples for all industry-year pairs.

4. Data Description

The dataset is the same as Baldwin et al. (2009). Our data are unique in terms of the comprehensiveness of coverage of a population, the length of time covered and the nature and accuracy of firm identifiers that are used to measure control changes. The data come from the Annual Census (now Survey) of Manufacturing (ASM) conducted and maintained by Statistics Canada.[9] The 1973-99 file has a constant industry classification over this period, which allows us to study the impact of industry characteristics on a consistent basis.[10]

A longitudinal data base has been created from the annual data with plant and firm identifiers that allow for detailed studies of population dynamics. We exclude those plants in the groups at the bottom or the top 1% of the population for each of the change in relative plant size and wage rate variables, and the top and bottom 2 % for the changes in relative profitability. We also exclude some control changes where there was a data gap in the file between the divestiture and the acquisition, because of the likelihood that this involved simply a lag in data collection during the time of ownership transition. After doing so, we are left with 416,449 usable observations on the entire set of the variables. Some 12% of observations are foreign-controlled (49,912), versus 88% Canadian-controlled plants (366,537).

There are 9,439 control changes in the sample, and these control changes occur more frequently for domestic-owned plants (6,118 ownership changes) than for foreign-owned plants (3,321). The

[9] During the period, the file was essentially a census of all plants—with the smallest plants being covered with administrative tax files. It is only post 2003 that the file has become a sample survey. In the survey, plants are asked the following information: value added, shipments, production workers, non-production workers, nationality of owners, cost of materials, cost of heat and energy, among others.

[10] For further descriptions of the file, see Baldwin (1995), Baldwin et al. (2002).

incidence of ownership changes is 2.3% for the whole sample, while it is 6.7% for foreign-controlled plants, and 1.7% for domestic-controlled plants. Foreign-owned plants are close to four times more likely to change control as Canadian-owned plants. The incidence of plant-control changes increases dramatically across size groups—from .7% in the first quartile to 4.7% in the fourth quartile--over a 6-fold increase. This is largely driven by the increase in the domestic sector (Table 2).

Foreign-owned plants are significantly different from Canadian-owned ones, even within each plant-size class. Foreign-owned plants are larger, with a higher percentage of non-production workers, and producing more products in each plant (Table 3)

Domestic-controlled plants with ownership changes are significantly larger, have a higher and increasing human capital intensity, produce more product lines, are older, are more likely to be found in a different 4-digit industry than their parents and are losing their competitiveness in the labor markets in terms of decreasing wage rates (Table 4). In addition, those plants with ownership changes are more likely to be found operating in the 4-digit industries with larger plant size, higher human capital intensity, paying higher wages and having higher profitability/capital intensity.

Similar differences regarding plant-level variables are found in foreign-controlled plants. For plant-change variables prior to takeover, foreign-controlled plants with ownership changes are found to be increasing their human capital intensity, but deceasing their plant size, wage rate and profitability. For the industry level variables, foreign-plants with control changes are generally found in industries with a lower wage rate and lower capital intensity than those without ownership changes.

5. Regression Results

We proceed in two steps. At the first stage, we include only a single intercept binary variable for foreign controlled plants to allow for differences in the impact of nationality and estimate a probit model for all observations and for those in each plant-size quartile—baseline results.[11] The impact of all variables besides the nationality binary variable is assumed to be similar between the domestic and foreign populations. In the second step, we allow all the independent variables to vary between domestic and foreign controlled plants so as to examine whether the correlates that are associated with the probability of mergers (such as knowledge intensity) have a different sign or magnitude for plants under foreign than domestic control across size classes.

5.1. Baseline Results

[11] Quartiles are defined by industry.

Baseline results are estimated assuming the differences between foreign and domestic plants leading to plant control changes can be summarized with just an intercept. The estimates are reported for each of the four plant size-classes in the first four columns of Table 4. The fifth column contains the results for all plants. Hausman tests are performed on each pair of the results across the different size classes. They indicated that the results in each quartile were significantly different from the others.

5.1.1 Nationality

Overall, the probability of takeover for foreign controlled plants is 1.3 percentage points higher than for domestic plants (last column), which accords with the view that there are inherent capabilities embedded in plants owned by foreign controlled plants that enhance their desirability as takeover targets. The higher probability can be found across all size classes, indicating that even smaller multinational plants have access to embedded knowledge of their parents. More importantly, the differential probability of takeover in foreign controlled plants increases as size gets larger, which accords with the view that the unmeasured capabilities in foreign controlled plants increase with size.

5.1.2 Plant level characteristics

Larger plants are more likely to be taken over, as was expected if the size variable captures unmeasured competencies that make a plant more likely to provide complementary knowledge capabilities that provide fertile ground for the incorporation of new knowledge via a takeover. That the effects of plant size are positive in each size class suggest that these competencies monotonically increase across plant sizes—that plants grow larger not only by increasing physical capital but also by developing the type of competencies that are necessary for incorporating the embedded knowledge transferred via mergers. But it is significant that the effect of plant size does not increase across the plant-size groups; rather, they are smallest in the largest plant-size class.

Human capital as measured by nonproduction-worker intensity is found to be an important signal of the likelihood of control changes for the overall population. Plants with a larger proportion of non-production workers (*Rel_NL*) and increasing in that capacity (Δ*Rel_NL*) are more likely to experience a change in control. Furthermore, contrary to the coefficient on plant size, the coefficient on the level of human capital increases continuously across plant size groups. Knowledge capital is an important prerequisite of a synergistic takeover. Plants involved in these takeovers provide the foundation in which the new knowledge from the acquirer is embedded in new or transformed products. These results suggest that its importance is higher in larger plants. In the largest plants, it is not size in general, but specific competencies related to the nonproduction work complement that matter for synergies.

Age too is often regarded as a proxy for general competencies that a firm accumulates over time. And in keeping with this theme, age for all plants built after 1961 has a positive and significant coefficient for the pooled sample. But this relationship is not found in any of the three smaller size classes. In fact, it is negative and significant in the small size classes, thereby suggesting that it is the youngest smaller plants that are more likely to be acquired. This is more suggestive of a life path explanation for mergers—younger small plants are actually more likely to undergo control changes and the relationship to age changes as they get larger. The age variable for plants built before 1961 is also negative in the 1st quartile, but positive and significant in the largest size classes.

In the pooled sample, plants that are not core to their parents' major business are more likely to be divested, a finding consistent with Lecraw's (1984) finding of poor performance in unrelated diversifiers. Some firms expand to new industries as part of the experimental process associated with dynamics. These experiments are more likely to fail and to be divested. The likelihood of an unrelated plant being divested gets larger for larger plant size groups. The experimentation errors associated with unrelated diversification in larger plants are more costly and the needs for correction are higher. Ceteris paribus, for a representative plant, not being core to its parent firm's business increases its probability of divesture by .9 percentage points in the 1st quartile, and 3.1 percentage points in the 4th quartile.

The number of products is positively and significantly related to the probability of a control change in the overall sample in accordance with the economy of scope theme. But there is very little difference in the coefficients across the first, the second and the third quartiles, where the coefficient is significant. The economy of scope incentive does not appear to be related to the size class of the plant, suggesting that scope and scale incentives are unrelated.

5.1.3. Plant-Change Variables

Overall, increases in plant size in the previous year are related to an increased probability of divestiture, acting as a signal of synergistic possibilities—but it is not significant in the overall sample. This signal is strongest and most significant for smaller plants. This is to be expected in a world where entry is regarded as the purchase of an option (Caves, 1998). Only those who discover that their skills are superior will invest and grow. And thus growth serves as an important signal to potential buyers that those plants are good targets.

Declining wages also serve as a weak signal for takeover for the entire sample. Here, however, the signal is strongest in the second quartile—both in terms of size of coefficient and significance. Losing competitiveness in the labour market is a significant signal that also is restricted to smaller plants, perhaps because performance turnaround is most likely to be achieved in smaller plants. On the other hand, a decline in profitability is negative and weakly significant in the largest plant size class, implying that for largest plants, losing profitability is an important signal that leads to control changes.

5.1.4 Industry characteristics

The number of plants in an industry is found to be negative and significant. However, the increase in the probability of takeover, where there are fewer producers, is much higher in the larger plant-size classes. Control changes are more likely to bring in new participants in industries that are more concentrated; but they are more likely affect the identity of the largest participants in these industries.

Industry level covariates related to knowledge intensity (proportion of nonproduction workers), industry human capital intensity (wage rates) and industry capital intensity (profitability) both provide additional synergy for plant takeovers across a number of the plant-size groups. The importance of these characteristics generally increases across size classes. These variables capture signals about members of a population from the population's average characteristics. When they are used by acquiring firms as a signal that some plants within the distribution provide the type of capacity that permits the transfer of knowledge, it is the largest producers that are more affected. This suggests that the value of this signal increases across size classes.

5.2. Differences in Factors Leading to Ownership Changes between Foreign- and Canadian-owned Plants

This subsection examines whether the factors leading to plant ownership changes provide similar or different signals for foreign-owned plants because it allows us to delve more deeply into the causes behind control changes. In this paper, we use size of plant as a proxy for size of owning firm because of the connection between size and basic competencies in the firm; however, on average, the size of a foreign plant is probably a less perfect measure of the overall firm size for foreign controlled plants than for domestic plants because of the foreign operations of a multinational. By separating out foreign plants, we potentially remove this problem. This also allows us to examine how foreign plants differ across different parts of the size spectrum so as to understand where advantages of the former are particularly large—and to understand the differences between foreign and domestic plants.

To examine the differences in the marginal effects of our explanatory variables in foreign-controlled plants, we add interaction terms between *Foreign* and all other major variables and calculate the marginal effects for the domestic population as a whole at their mean values[12] and the additional

[12] The mean is calculated for the sample as a whole with the exception of the foreign binary variable, which is set equal to zero.

marginal effects for foreign plants at their mean. The overall results are reported in Table 5 and the results across size classes in Tables 6 and 7. In these tables, we report both probit coefficients and marginal effects. In our exposition, we concentrate on the latter, as we pointed out in Section 3, there can be significant differences in the significance levels between the probit coefficients and the marginal effects for interaction terms.

We perform Hausman tests on probit coefficients across different quartiles and the pooled sample. The test results show that the coefficients in each quartile are significantly different from one another, and significantly different from the pooled ones. In what follows, we will focus our comparisons on the marginal effects. We first compare the differences in factors between foreign- and the domestic population within each plant size group, and then across plant size groups.

Size (*Rel_L*)—When foreign plants are considered separately (Table 5), the impact of size for domestic plants, is positive and significant, while the net impact of foreign plants is not significantly different from zero. Therefore, it is in the domestic sector that this variable better reflects differences in competencies being sought in mergers—probably because the size of the multinational plant is less correlated with the overall size of the parent firm.

For Canadian-owned plants, size effects are larger in the three smaller plant size classes than in the largest plant size class. For foreign-owned plants, the size effects are generally positive in the small and medium size classes, but are not significantly different from zero in the largest class. The value of size as a proxy for the competencies needed to transfer knowledge eventually dissipates in both domestic and foreign plants. The pattern in the foreign group suggests that size becomes less important earlier. The differences between the two groups accords with the argument that the size of the multinational plant in Canada is less perfect predictor of capabilities because a small multinational is more likely to have a large parent than a small domestic plant.

Knowledge intensity (*Rel_NL*)—Overall, there is no significant difference between foreign plants and Canadian-owned plants with respect to the impact of knowledge intensity (Table 5). However, for Canadian-owned plants, the effects become larger with increases in plant size classes and the relationship is the reverse for foreign-owned plants.

Age (*Age and Plant1961*)—For the pooled sample, age has a positive impact both for Canadian plants and for foreign plants, though the age effects are larger for the latter (Table 5). Estimating the impact of age by nationality *and* size class (Tables 6 and 7), we find that younger Canadian plants in the three smallest size classes are more likely to be taken over. This implies that if a plant is domestic and remains small as it ages, the probability that it will be seen to have the capability to be a candidate to act as a conduit for new ideas via a merger diminishes. On the other hand, there is a greater tendency for older foreign plants in two of the three smaller size classes to be taken over. It is here that age signifies maturity and capability. In the largest size classes, age of plants born before 1961 has a weak positive impact for both Canadian- and foreign-owned plants. Our results thus demonstrate that there are two separate processes at work in the domestic and foreign populations.

Product—Overall, when the sample is pooled, plants with more products are more likely to be taken over and there is no significant difference between foreign- and Canadian-owned plants (Table 5). However, when the relationship is examined for the four plant size classes, significant positive scope effects are found to be present for Canadian-owned plants for the first and the second quartiles, but not for the larger size classes. In contrast, it is significantly negative for foreign-owned plants in the smallest plant size class, but positive for the remaining size classes, but only significant in the second plant-size class. Scope economies then operate to complement scale economies in the smaller size classes for Canadian-owned plants.

Unrelated—There is no significant difference on the effects of *unrelated* between foreign and Canadian-owned plants for the pooled sample (Table 5). When broken down by nationality and plant size, the impact on the probability of a control change of being in an industry different from a parent firm increases across size class for domestic plants. The impact for foreign-owned plants is generally less than that for Canadian-owned plants and there is not much of an increase in the marginal effect across size classes. An increasing size of plant magnifies the costs of experimentation failure associated with unrelated diversification—but more so in the domestic sector.

Change in size (ΔRel_L)—On its own, when the sample is pooled, this variable is not significant (Table 4). When foreign is separated out (Table 5), the marginal effect for domestic plants becomes significantly positive and for foreign plants, significantly negative. For Canadian plants, the marginal effect of change in size increases across the first three quartiles but becomes insignificant in the largest size class. The smaller domestic plants then are more likely to be acquired after they have shown a growth spurt in terms of market share. In contrast, the marginal effect of a change in size is negative for foreign plants, thereby indicating that this group better accords with the disciplinary or management-failure model of mergers.

Change in knowledge intensity (ΔRel_NL)—Pooled together, increases in knowledge intensity significantly increases the probability of ownership changes for both Canadian and foreign plants (Table 5). It says that knowledge intensity is an important asset which leads to control changes. However, the marginal effects are largest for small Canadian plants, but for largest foreign plants.

Change in wages (ΔRel_WR) —In the overall pooled sample, the change in wages is negative and weakly significant (Table 4). When we separate out foreign plants (Table 5), this disciplinary explanation is much more significant in the foreign sector. When the interactions are estimated across size classes (Table 6 and 7), the impact is seen to exist for all foreign size classes, but to be larger and particularly significant in the first and second classes.

Industry wage and profitability (capital intensity)(Ind_Rel_WR and *Ind_Rel_PR)*—The positive impact in the pooled sample of these characteristics that are industry signals of knowledge intensity of industry participants comes mainly from the domestic sector, when interaction terms are added (Table 5). For this group, the probability of takeover increases across size classes. Thus, the signal arising from these industry characteristics (high wage and capital intensity) increases for larger domestic plants. Exactly, the opposite occurs for the foreign plants. Industry signals then matter more for larger domestic plants, while they do not for the foreign sector.

Foreign Effect--The impact of being foreign on the probability of a merger was previously shown (Table 4) to be positive and increasing across size classes. That conclusion came from assuming similarity in all marginal effects of the continuous variables. In the formulations presented in tables 5, 6 and 7, inferences about differences need to consider both the intercept and all of the interaction terms (evaluated at the mean). We report the net effect of being a foreign plant for each size group calculated after taking into account differences in all other characteristics. Overall, the net effect of being foreign is 4.7% (Table 5), much larger than was the case when the impact of nationality was being calculated only as an intercept term (Table 4). The net marginal effect for being foreign owned is 4.1% in the first quartile, 3.8% in the second quartile, 3.4% in the third and 3.2 % in the largest plant size class. The latter two results are not significantly different from one another. These predicted differences between the intensity of foreign and domestic plant control changes are close to the actual differences (row 1, Table 8). After controlling for differences in the other covariates, being foreign-owned captures the largest part of differences in the probability of plant control changes between foreign and domestic populations. For instance, in the smallest plant size class, the incidence of plant control changes for Canadian-owned plants is .5%, and for foreign-owned plants, 5.9% (5.4 percentage points higher). After taking into account the characteristics differences between Canadian- and foreign-owned plants and the difference in the effect of continuous variables, being foreign-owned increases the probability of takeover by 4.1 percentage points, an increase that accounts for the majority of difference in the probability of control changes between foreign- and Canadian-owned plants. A similar result is found for other plant size classes. These are all considerably different than the impact of nationality that arises from the assumption that nationality only affects the probability of a control change through an intercept shift (row 2, Table 8). Most of the differences in the intensity of a control change occur because of the difference in the determinants of control change across the two types of plants and the differences in the characteristics of the two groups of plants, foreign plants differ considerably from domestic plants across all four size classes in terms of the characteristics that capture potential synergies (Table 3).

6. Conclusion

Our earlier paper (Baldwin et al. 2009) asked whether it was synergies or managerial discipline that operated to affect the likelihood of mergers. It found that both were important. This paper examines the issue in more detail by asking two questions that enable us to determine whether these forces are at work equally in different parts of the firm distribution. or whether there is a discernible pattern that suggests systematic differences between large and small size classes that sheds light on the fact that the probability of control changes is higher in larger firms.

The first question we investigate is whether the variables capturing synergies only operate in some parts of the size distribution. Overall, our findings indicate that, regardless of plant size, those characteristics which provide the type of synergy upon which ownership changes rely are found to be important factors leading to plant ownership changes across most size classes. However, the magnitudes are different across plant size classes.

Plant size has an impact that is about the same across the smallest three quartiles. This means that as plant size increases within each of these size groups, the probability of takeover continues to increase monotonically. The second variable (the importance of knowledge workers) also increases continuously across all plant size groups. In both of these cases, the impact tends to increase across size classes more for domestic than for foreign plants. The specific competencies associated with knowledge workers are relatively more important generally in larger than the smaller domestic firms. The third variable (age) also increases in magnitude—having a negative impact in the smallest size groups to a positive one in the largest.

The majority of the industry level covariates that act as general signals indicating the presence of synergistic capabilities in industry participants that will allow acquired plants to ingest new knowledge from their acquirers are found to generate persistent effects across the four plant size classes. Industry knowledge capital, human capital intensity and industry profitability/capital intensity provide additional synergy for plant takeovers, regardless of plant size groups and the importance of these characteristics often increases across size classes. These variables provide only rough directional signals since they are provided for all firms within an industry. When they are being used by acquiring firms as to where plants may be found that provide the type of capacity that permits the successful transfer of knowledge, it is the larger plants that are being sought within these industries by acquirers.

In addition to the factors related to synergies, several other characteristics that are less directly connected to synergistic knowledge capabilities reinforce the tendency for a higher probability of control changes in large producers. The first is the impact of being an unrelated plant, which increases over size classes. This is less likely to be related to synergies and more to costs of experimentation that some firms undertake as they grow. Unrelated diversification is risky because firms doing so move into new markets and become exposed to new technologies—all of which leads to higher failure rates. It is, of course, possible that this factor too is related to knowledge intensity in an indirect manner. Unrelated diversification has informational requirements needed to adapt to different markets and technologies and larger firms have developed these capabilities because of their superior abilities to collect, assess and use information. This may lead larger firms to experiment more with unrelated diversification.

The second factor that is less obviously related to synergies that contribute to a higher probability of turnover is the impact of the number of producers—the competitive environment. Here, the impact of the number of producers on the probability of control change gets larger for larger plant-size groups. That is, the probability of a control change is higher for larger plants than smaller plants in industries with fewer producers. If control changes are more likely than greenfield plant construction to be used as a form of entry in industries with fewer producers because of the competitive environment, it is done by acquiring the larger plants in these industries. But even here, this may be related to the synergies available in larger plants in the form of technologies and plant size that enable the exploitation of scale or scope economies.

The second question that we pose in this paper is whether there are systematic differences between domestic and foreign plants suggesting that different forces are at work in the two populations. We find that foreign plants are more likely to be taken over in all size classes, which accords with the hypothesis that foreign owned plants contain more of the type of intangible assets that facilitate the transfer of knowledge. And the effective rates of control change differ much more in the small than the larger size classes—thereby suggesting that multinational plants contain relatively more of the type of intangible capital in these size classes that make them attractive vehicles for the transmission of new knowledge via takeover. This occurs because of significantly larger differences in the synergistic characteristics of smaller foreign and domestic plants.

There are also significant differences in the manner that some of the proxies for these synergies impact on the probability of a takeover between the foreign and domestic populations. Age has a negative coefficient for smaller domestic plants but positive for large plants whereas the opposite is true for foreign plants.

Unrelated plants that are not core to their parents' major business are more likely to be divested in domestic plants than in the foreign segment, but more so for the largest segment. This is due to the fact that the divestiture rate associated with being unrelated increases across size classes for domestic plants but not so for foreign. An increasing size of plant magnifies the costs of experimentation failure associated with unrelated diversification—but mainly so in the domestic sector.

Declines in market share and wages, particularly in the intermediate size classes are related to takeover in the foreign sector, but not in the domestic—a finding that suggests that foreign operations are more likely to respond to managerial failure by being divested.

In contrast to this profile, domestic plants are more likely to be divested if they are younger and have had a growth spurt in sales. Divestiture here appears more to be related to a process that harvests success at an early stage of life by divesting plant.

In conclusion, dividing up the population into different groups—by size class and by nationality serves two separate purposes. By showing the differences across size classes, it reinforces the interpretation that larger firms embody special characteristics that engender a higher propensity for takeovers. Second, it emphasizes the differences that arise between domestic and foreign population and that the higher probability of control changes in the latter population is related to differences in knowledge capital and differences in performance threshold values.

Breaking out the sample of foreign plants reveals that the impacts of some of the synergistic variables are even larger than the pooling of both domestic and foreign plants suggests—partially because they tend to come from one sector than another and pooling the two together dampens the overall results. This is particularly the case with the variables that measure the impact of changes in market share and wage rates.

Finally, these results also show that some of the impacts differ substantially across size classes (for example, age, and industry knowledge intensity signals), helping to explain why studies with different partial population samples may be expected to report results that are at variance with one another. The change variables that should be associated with a disciplinary impact operate more intensively in smaller size classes. This emphasizes the importance of having comprehensive samples to explore the determinants of mergers.

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Table 1: The Importance of Foreign Ownership and Control Changes by Plant Size-Class (%)

	size class	Value of shipments	Value-added	Production workers' wages	Non-production workers' wage
Foreign share	The 1st Quartile	44.19	43.21	34.38	42.78
	The 2nd Quartile	43.91	43.06	34.25	42.73
	The 3rd Quartile	44.01	43.14	34.29	42.73
	The 4th Quartile	44.00	43.13	34.29	42.73
	Total	44.01	43.16	34.17	42.58
Ownership changes in *total sample*	The 1st Quartile	5.62	5.47	5.30	5.73
	The 2nd Quartile	5.66	5.54	5.40	5.90
	The 3rd Quartile	5.74	5.63	5.49	5.97
	The 4th Quartile	5.84	5.74	5.57	6.10
	Total	5.77	5.66	5.50	6.01
Ownership changes in *foreign-owned plants*	The 1st Quartile	6.42	5.95	6.38	6.20
	The 2nd Quartile	6.59	6.26	6.70	6.59
	The 3rd Quartile	6.35	6.07	6.50	6.40
	The 4th Quartile	6.45	6.28	6.72	6.65
	Total	6.45	6.19	6.63	6.55
Ownership change in *Canadian-owned plants*	The 1st Quartile	5.55	5.41	4.99	5.62
	The 2nd Quartile	5.62	5.46	5.04	5.73
	The 3rd Quartile	5.80	5.67	5.24	5.92
	The 4th Quartile	5.91	5.77	5.31	6.03
	Total	5.81	5.66	5.22	5.92

Table 2: The Incidence (Observations) of Foreign-owned Plants by Plant Size-class

		The 1st Quartile	The 2nd Quartile	The 3rd Quartile	The 4th Quartile	Total
Ownership	**Domestic**	**103711**	**94783**	**90307**	**77736**	**366537**
	Foreign	**4295**	**8002**	**13326**	**24289**	**49912**
	Total	**108006**	**102785**	**103633**	**102025**	**416449**
	Percentage of foreign ownership (%)	**3.98**	**7.79**	**12.86**	**23.81**	**11.99**
Control changes	**No. of Control Changes**	**739**	**1420**	**2519**	**4761**	**9439**
	Percentage of Plant/Year Control Changes (%)—*total*	**0.68**	**1.38**	**2.43**	**4.67**	**2.27**
	Percentage of Plant/Year Control Changes (%)—*Canadian-owned plants*	**0.47**	**0.99**	**1.87**	**3.87**	**1.67**
	Percentage of Plant/Year Control Changes (%)—*Foreign-owned plants*	**5.87**	**6.06**	**6.23**	**7.22**	**6.65**

Table 3: Differences between Foreign and Canadian Plants by Plant-Size Class (mean values)

Variable	Size Class	Canadian	Foreign	D=Foreign-Canadian	D is different from 0?
Relative Plant Size	The 1st Quartile	0.283	0.459	0.176	Yes
Relative Plant Size	The 2nd Quartile	0.863	1.0233	0.1603	Yes
Relative Plant Size	The 3rd Quartile	2.037	2.334	0.297	Yes
Relative Plant Size	The 4th Quartile	7.937	10.059	2.122	Yes
Relative Plant Size	total	2.488	5.694	3.206	Yes
Relative Human Capital	The 1st Quartile	0.252	0.809	0.557	Yes
Relative Human Capital	The 2nd Quartile	0.407	0.971	0.564	Yes
Relative Human Capital	The 3rd Quartile	0.667	1.053	0.386	Yes
Relative Human Capital	The 4th Quartile	1.01	1.179	0.169	Yes
Relative Human Capital	total	0.554	1.08	0.526	Yes
No of Products	The 1st Quartile	1.123	1.525	0.402	Yes
No of Products	The 2nd Quartile	1.278	1.76	0.482	Yes
No of Products	The 3rd Quartile	1.64	2.056	0.416	Yes
No of Products	The 4th Quartile	2.196	2.652	0.456	Yes
No of Products	total	1.518	2.252	0.734	Yes

Table 4: Mean Comparison between Plants with OC and Plants without

	Domestic-Owned Plants			Foreign-Owned Plants			
	(1): No OC	(2): with OC	Is (2) different from (1)?	(3): No OC	(4): With OC	Is (3) different from (4)?	Is (4) different from (2)?
# of Obs	**360,419**	**6118**		**46,591**	**3321**		
Rel_NL	**0.54714**	**1.01387**	**Yes**	**1.07592**	**1.14106**	**Yes**	**Yes**
Rel_L	**2.43223**	**5.80354**	**Yes**	**5.67927**	**5.91457**	**No**	**No**
Product	**1.50636**	**2.21462**	**Yes**	**2.24541**	**2.35824**	**Yes**	**Yes**
Age	**10.21261**	**13.11184**	**Yes**	**14.38715**	**15.12471**	**Yes**	**Yes**
Plant1961	**24.06918**	**25.22072**	**Yes**	**24.70538**	**24.84175**	**No**	**Yes**
Unrealted	**0.02808**	**.14090**	**Yes**	**0.20330**	**.25836**	**Yes**	**Yes**
ΔRel_NL	**-.05925**	**-.01363**	**Yes**	**-.022628**	**-.00797**	**Yes**	**No**
ΔRel_L	**.00009**	**.00011**	**No**	**.00010**	**-.00006**	**Yes**	**Yes**
ΔRel_WR	**.00813**	**.00271**	**Yes**	**.00424**	**.00009**	**No**	**No**
ΔRel_PR	**-.02571**	**-.00556**	**No**	**-.00095**	**-.17299**	**Yes**	**No**
Ind_Rel_NL	**.90593**	**1.03206**	**Yes**	**1.16683**	**1.17121**	**No**	**Yes**
Ind_Rel_L	**.89727**	**1.48489**	**Yes**	**1.77588**	**1.76953**	**No**	**Yes**
Ind_Rel_WR	**.89581**	**.95834**	**Yes**	**.99838**	**.98198**	**Yes**	**Yes**
Ind_Rel_PR	**.85142**	**.92590**	**Yes**	**1.00164**	**.99569**	**Yes**	**Yes**

Note: Variables are defined in section 2. SD=significantly different

Table 4: Differences in Factors Leading to Ownership Changes across Plant-Size Classes

	First Q		Second Q		Third Q		Fourth Q		Total	
Foreign	**.00890****	(.00124)	**.01192****	(.00131)	**.01086****	(.00131)	**.01513****	(.00169)	**.01308****	(.00069)
Rel_L	**.00318****	(.00043)	**.00364****	(.00048)	**.00380****	(.00042)	**.00048****	(.00005)	**.00041****	(.00002)
Rel_NL	**.00220****	(.00019)	**.00407****	(.00033)	**.00734****	(.00053)	**.00717****	(.00100)	**.00841****	(.00024)
Product	**.00034****	(.00014)	**.00041***	(.00017)	**.00041&**	(.00022)	**.00044**	(.00029)	**.00077****	(.00009)
Age	**-.00005&**	(.00002)	**-.00013****	(.00004)	**-.00002**	(.00006)	**.00006**	(.00011)	**.00029****	(.00003)
Plant1961	**-.00001**	(.00002)	**.00003**	(.00003)	**-5.81e-6**	(.00005)	**.00022****	(.00008)	**.00030****	(.00002)
Unrelated	**.00912****	(.00162)	**.01145****	(.00176)	**.01995****	(.00215)	**.03157****	(.00249)	**.02000****	(.00105)
Δ*Rel_L*	**.15140**	(.09744)	**.26516&**	(.13741)	**.05001**	(.17164)	**.00832**	(.19361)	**.06181**	(.07113)
Δ*Rel_NL*	**.00100****	(.00026)	**.00207****	(.00051)	**.00452****	(.00083)	**.00758****	(.00146)	**.00470****	(.00039)
Δ*Rel_WR*	**-.00067**	(.00065)	**-.00268&**	(.00142)	**-.00200**	(.00241)	**-.00140**	(.00426)	**-.00190&**	(.00104)
Δ*Rel_PR*	**-.00001**	(.00002)	**-8.74e-7**	(.00006)	**.00006**	(.00011)	**-.00023&**	(.00014)	**-.00004**	(.00003)
Ind_Plants	**-1.77e-6****	(3.38e-7)	**-6.10e-6****	(6.23e-7)	**-.00001****	(8.98e-7)	**-9.67e-6****	(1.23e-6)	**-6.10e-6****	(3.76e-7)
Ind_L	**.00011****	(.00004)	**.00031****	(.00008)	**.00011**	(.00016)	**-.00007**	(.00037)	**.00027****	(.00007)
Ind_NL	**.00156****	(.00040)	**.00172***	(.00070)	**.00192&**	(.00116)	**.00747****	(.00208)	**.00244****	(.00056)
Ind_WR	**.00442****	(.00082)	**.00519****	(.00146)	**.01213****	(.00239)	**.00590**	(.00445)	**.00792****	(.00116)
Ind_PR	**.00220****	(.00088)	**.00706****	(.00154)	**.01560****	(.00254)	**.01661****	(.00465)	**.00895****	(.00123)
Obs	**108006**		**102785**		**104120**		**104194**		**416,449**	
Pseudo R^2	**.1808**		**.1316**		**.0944**		**.0363**		**.1009**	

Note: variables are defined as in section 2. Figures in parentheses are standard errors. Results on constant, industry and year dummies are not reported due to space limitations.

Table 5: Plant Size, Nationality and Ownership Changes—(I) Pooled Sample

	Probit Coefficients		Marginal Effects	
Foreign	**2.02075****	(.07337)	**.38391****	(.02782)
Rel_L	**.01990****	(.00071)	**.00058****	(.00002)
Rel_NL	**.24526****	(.00731)	**.00716****	(.00021)
Age	**.00675****	(.00088)	**.00020****	(.00003)
Plant1961	**.00718****	(.00066)	**.00021****	(.00002)
Product	**.02004****	(.00303)	**.00058****	(.00009)
Unrelated	**.47903****	(.01919)	**.02576****	(.00154)
ΔRel_L	**6.56741****	(2.45221)	**.19165****	(.07157)
ΔRel_NL	**.13628****	(.01147)	**.00398****	(.00033)
ΔRel_WR	**-.01677**	(.03167)	**-.00049**	(.00092)
ΔRel_PR	**-.00005**	(.00108)	**-1.48e-6**	(.00003)
Ind_Plants	**-.00015****	(.00001)	**-4.36e-6****	(9.56e-08)
Ind_L	**.00936****	(.00252)	**.00027****	(.00007)
Ind_NL	**.05790****	(.01684)	**.00169****	(.00049)
Ind_WR	**.42036****	(.03721)	**.01227****	(.00109)
Ind_PR	**.44652****	(.03840)	**.01303****	(.00112)
Foreign x Rel_L	**-.01939****	(.00118)	**-.00052****	(.00011)
Foreign x Rel_NL	**-.17470****	(.01533)	**.00098**	(.00157)
Foreign x Age	**-.00313***	(.00159)	**.00022**	(.00016)
Foreign x Plant1961	**-.00236&**	(.00125)	**.00035****	(.00012)
Foreign x Product	**-.01390****	(.00532)	**.00012**	(.00051)
Foreign x Unrelated	**-.32590****	(.02809)	**-.00456**	(.00307)
Foreign x ΔRel_L	**-13.6936****	(3.76585)	**-1.01340****	(.33750)
Foreign x ΔRel_NL	**-.08320****	(.02557)	**.00214**	(.00266)
Foreign x ΔRel_WR	**-.13015&**	(.06790)	**-.01645***	(.00699)
Foreign x ΔRel_PR	**-.00258**	(.00195)	**-.00030**	(.00019)
Foreign x Ind_L	**-.00732&**	(.00388)	**-.00004**	(.00035)
Foreign x Ind_NL	**-.01002**	(.02932)	**.00383**	(.00296)
Foreign x Ind_WR	**-.69335****	(.05863)	**-.04375****	(.00564)
Foreign x Ind_PR	**-.60933****	(.06642)	**-.03180****	(.00651)
Net marginal effects on Foreign			**.04647**(.00114)**	
Obs		**416,449**		
R-squared		**0.1009**		

Note: variables are defined as in section 3. Figures in parentheses are standard errors. Results on constant, industry and year dummies are not reported due to space limitations.

Table 6: Plant Size, Nationality and Factors Leading to OC—(II)

	First Q				Second Q			
	Probit coefficients		Marginal effects		Probit coefficients		Marginal effects	
Foreign	**2.15664****	(.22660)	**.24930****	(.07117)	**2.13080****	(.17586)	**.34138****	(.06401)
Rel_L	**.42058****	(.05518)	**.00310****	(.00043)	**.19033****	(.02714)	**.00314****	(.00046)
Rel_NL	**.25128****	(.02151)	**.00185****	(.00017)	**.21248****	(.01806)	**.00351****	(.00030)
Age	**-.01067****	(.00328)	**-.00008****	(.00002)	**-.00872****	(.00232)	**-.00014****	(.00004)
Plant1961	**-.00468**$^{\&}$	(.00254)	**-.00003**$^{\&}$	(.00002)	**-.00021**	(.00167)	**-.3.43e-6**	(.00003)
Product	**.07296****	(.01603)	**.00054****	(.00012)	**.02750****	(.01039)	**.00045****	(.00017)
Unrelated	**.67232****	(.06927)	**.01307****	(.00270)	**.49146****	(.0533)	**.01496****	(.00264)
ΔRel_L	**29.52898***	(12.42519)	**.21730***	(.09193)	**19.50006***	(7.97558)	**.32203***	(.13208)
ΔRel_NL	**.12713****	(.03074)	**.00094****	(.00023)	**.09642****	(.02766)	**.00159****	(.00046)
ΔRel_WR	**-.02430**	(.07865)	**-.00018**	(.00058)	**-.07213**	(.07909)	**-.00119**	(.00131)
ΔRel_PR	**-.00180**	(.00224)	**-.00001**	(.00002)	**-.00054**	(.00336)	**-.00001**	(.00006)
Ind_Plants	**-.00017****	(.00004)	**-1.122-6****	(3.01e-7)	**-.00027****	(.00003)	**-4.51e-6****	(2.88e-7)
Ind_L	**.01345****	(.00531)	**.00010***	(.00004)	**.01549****	(.005)	**.00026****	(.00008)
Ind_NL	**.13264****	(.04915)	**.00098****	(.00036)	**.03879**	(.03838)	**.00064**	(.00063)
Ind_WR	**.69450****	(.10435)	**.00511****	(.00080)	**.52491****	(.08547)	**.00867****	(.00143)
Ind_PR	**.32044****	(.10998)	**.00236****	(.00082)	**.58487****	(.08665)	**.00966****	(.00145)
Foreign x Rel_L	**-.31154****	(.09184)	**.00694**	(.00694)	**-.06516**	(.04639)	**.00840***	(.00366)
Foreign x Rel_NL	**-.16935****	(.04913)	**.00569**	(.00409)	**-.12868****	(.03725)	**.00422**	(.00302)
Foreign x Age	**.02003****	(.00566)	**.00094***	(.00043)	**.00621**	(.00413)	**-.00009**	(.00413)
Foreign x Plant1961	**.01032***	(.00491)	**.00055**	(.00039)	**.00473**	(.0032)	**.00042**$^{\&}$	(.00025)
Foreign x Product	**-.16395****	(.03670)	**-.00891****	(.00306)	**-.01989**	(.01723)	**.00025**	(.00128)
Foreign x Unrelated	**-.55650****	(.10325)	**-.00174**	(.00837)	**-.34199****	(.07691)	**-.00001**	(.00655)
Foreign x ΔRel_L	**-49.91368***	(22.71214)	**-2.09389**	(1.75694)	**-25.28223**$^{\&}$	(14.2496)	**-.85528**	(1.09880)
Foreign x ΔRel_NL	**-.13267**	(.08300)	**-.00145**	(.00711)	**.01411**	(.0632)	**.00860**$^{\&}$	(.00526)
Foreign x ΔRel_WR	**-.27808**	(.18714)	**-.02766**$^{\&}$	(.01565)	**-.23209**	(.16636)	**-.02687***	(.01356)
Foreign x ΔRel_PR	**-.00082**	(.00911)	**-.00023**	(.00081)	**.00490**	(.0132)	**.00041**	(.00118)
Foreign x Ind_L	**-.00751**	(.00827)	**.00045**	(.00060)	**-.00432**	(.00768)	**.00077**	(.00055)
Foreign x Ind_NL	**.09104**	(.09946)	**.01962***	(.00828)	**.08133**	(.07097)	**.01044**$^{\&}$	(.00586)
Foreign x Ind_WR	**-.81981****	(.17974)	**-.01665**	(.01397)	**-.79897****	(.14103)	**-.03394****	(.01091)
Foreign x Ind_PR	**-.38320**$^{\&}$	(.21742)	**-.00814**	(.01744)	**-.78449****	(.16317)	**-.02807***	(.01303)
Net M. E. for Foreign			**.04104****	**(.00352)**			**.03769****	(.00255)
Obs	**108006**				**102785**			
R2	**.1972**				**.1411**			

Note: same as those in Table 5.

Table 7: Plant Size, Nationality and Ownership Changes—(III)

	Third Q				Fourth Q			
	Probit coefficients		Marginal effects		Probit coefficients		Marginal effects	
Foreign	1.88795**	(.1479)	.35454**	(.05491)	1.75392**	(.11700)	.43822**	(.04609)
Rel_L	.11680**	(.01187)	.00391**	(.00040)	.01098**	(.00086)	.00083**	(.00007)
Rel_NL	.18973**	(.01532)	.00635**	(.00051)	.09120**	(.01369)	.00690**	(.00103)
Age	-.00312$^{\&}$	(.00177)	-.00010$^{\&}$	(.00006)	.00005	(.00147)	4.12e-6	(.00011)
Plant1961	-.00230$^{\&}$	(.00133)	-.00008$^{\&}$	(.00004)	.00200$^{\&}$	(.00110)	.00015$^{\&}$	(.00008)
Product	.00858	(.00633)	.00029	(.00021)	.00063	(.00404)	.00005	(.00031)
Unrelated	.44924**	(.03811)	.02411**	(.00301)	.35340**	(.02638)	.03519**	(.00331)
ΔRel_L	11.88453*	(5.20487)	.39773*	(.17425)	1.88584	(2.8827)	.14274	(.21819)
ΔRel_NL	.12298**	(.02312)	.00412**	(.00077)	.09645**	(.01909)	.00730**	(.00144)
ΔRel_WR	-.01220	(.06792)	-.00041	(.00227)	.00050	(.05700)	.00004	(.00431)
ΔRel_PR	.00256	(.00335)	.00009	(.00011)	-.00136	(.00315)	-.00010	(.00024)
Ind_Plants	-.00024**	(.00002)	-.00001**	(8.13e-7)	-.00010**	(.00001)	-.00001**	(1.87e-7)
Ind_L	.00671	(.00509)	.00022	(.00017)	.00163	(.00572)	.00012	(.00043)
Ind_NL	.05759$^{\&}$	(.03231)	.00193$^{\&}$	(.00108)	.08824**	(.02812)	.00668**	(.00212)
Ind_WR	.53815**	(.0718)	.01801**	(.00240)	.29519**	(.06154)	.02234**	(.00465)
Ind_PR	.58620**	(.07314)	.01962**	(.00244)	.46904**	(.06494)	.03550**	(.00488)
Foreign x Rel_L	-.09532**	(.02068)	-.00179	(.00180)	-.01216**	(.00144)	-.00098**	(.00016)
Foreign x Rel_NL	-.07907**	(.03102)	-.00458$^{\&}$	(.00270)	-.06089*	(.02434)	-.00299	(.00279)
Foreign x Age	.00704*	(.00316)	.00049$^{\&}$	(.00027)	-.00108	(.00247)	-.00014	(.00029)
Foreign x Plant1961	.00678**	(.00256)	.00052*	(.00022)	-.00104	(.00190)	-.00003	(.00022)
Foreign x Product	.00336	(.01161)	.00089	(.00099)	.00570	(.00678)	.00077	(.00077)
Foreign x Unrelated	-.28919**	(.05604)	-.00697	(.00562)	-.19942**	(.03862)	-.01401**	(.00529)
Foreign x ΔRel_L	-31.31593**	(8.77957)	-2.31645**	(.72033)	-5.48055	(4.39047)	-.60635	(.47979)
Foreign x ΔRel_NL	-.06084	(.04847)	-.00202	(.00428)	-.07392$^{\&}$	(.03925)	-.00440	(.00465)
Foreign x ΔRel_WR	-.13929	(.13858)	-.01455	(.01214)	-.04564	(.10653)	-.00586	(.01239)
Foreign x ΔRel_PR	-.00315	(.00679)	-.00014	(.00059)	-.00160	(.00362)	-.00029	(.00033)
Foreign x Ind_L	-.01074	(.0081)	-.00062	(.00065)	-.00644	(.00838)	-.00074	(.00091)
Foreign x Ind_NL	-.08490	(.05695)	-.00462	(.00498)	-.03874	(.04516)	-.00030	(.00516)
Foreign x Ind_WR	-.72268**	(.1146)	-.03623**	(.00951)	-.67484**	(.09175)	-.07131**	(.01032)
Foreign x Ind_PR	-.59483**	(.12903)	-.02047$^{\&}$	(.01098)	-.71520**	(.10201)	-.06725**	(.01146)
Net M. E. for Foreign			.03435**	(.00201)			.03231**	(.00187)
Obs	103633				102025			
R2	.0973				.0442			

Note: same as those in Table 5.

Table 8: The Difference between Foreign-and Domestic-owned Plants Control Changes (%):by Plant Size-class

		The 1st Quartile	The 2nd Quartile	The 3rd Quartile	The 4th Quartile	Total
I	**Incidence difference (from Table 2)**	**5.4**	**5.1**	**4.4**	**3.4**	**5.0**
II	**Foreign Effect (Table 4)**	**0.6**	**1.1**	**1.4**	**1.5**	**1.3**
III	**Net Foreign Effect (Tables 5-7)**	**4.1**	**3.8**	**3.4**	**3.2**	**4.7**
IV	**(I) – (III)**	**1.3**	**1.3**	**1.0**	**0.2**	**0.3**

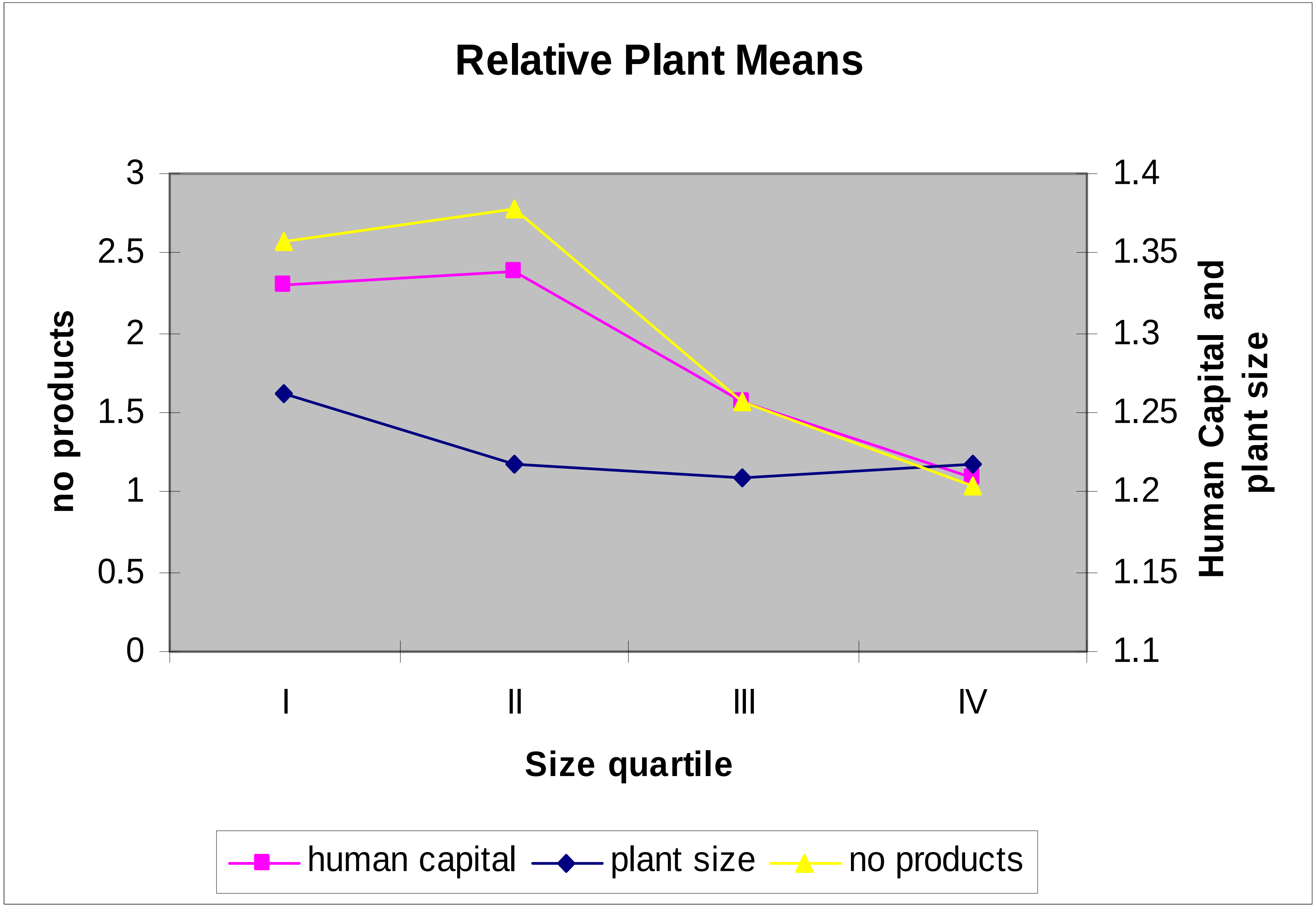
Relative Plant Means
3
2.5
2
1.5
1
0.5
0
no products
1.4
1.35
1.3
1.25
1.2
1.15
1.1
Human Capital and plant size
I
II
III
IV
Size quartile
human capital
plant size
no products

Figure 1