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Size Matters:
Multi-plant operation and the separation of corporate headquarters

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Size Matters: Multi-plant operation and the separation of corporate headquarters

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Abstract

This paper addresses two questions: i) under what circumstances corporate headquarters are separated from production plants, and ii) what types of plants are operated by multi-plant firms. We examine these issues using plant-level manufacturing census data. This paper has two main findings. Firstly, when a plant is large, productive, or intensive in labor or material use, then the plant tends to be managed by a corporate headquarters that is geographically separated from the plant, and the plant is also more likely to be a part of multi-plant operation. Secondly, there is a substantially greater marginal effect from a change in plant size on the probability of multi-plant operation when plants have around two hundred workers than at the mean.

Keywords: corporate headquarters, multi-plant, and plant-level data.
JEL Classifications: L22; D23; R32

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1. Introduction

Plants vary widely in size and in many other dimensions. Corporate headquarters (HQ) of firms need to manage various production plants. According to our daily observations, as a firm expands, a single-plant firm whose HQ is collocated with the production plant is supposed to separate its HQ from production sites and also to split its production into multiple plants. This raises empirical questions. When do corporate headquarters become physically separated from production plants? Which types of plants are operated by multi-plant firms or single-plant firms? This paper empirically investigates these issues by using comprehensive plant-level data derived from Japan's *Census of Manufacturers*. Our plant-level empirical analyses of these decisions will reveal the important but unexplored roles of corporate headquarters and plant size in production activities.

As a theoretical framework, the simple theory of international fragmentation by Jones and Kierzkowski (2001) is useful to understand our viewpoint clearly. In their paper, they combine constant marginal costs of production with fixed costs for coordinating multiple production processes. These assumptions were motivated by the stylized fact that increasing returns tend to be stronger for service activities than production activities. If applied to our context, their model predicts that when a firm grows above the threshold size it chooses multi-plant operation or separated headquarters; this is due to fixed costs of linking multiple plants and of operating separated headquarters. In the terminology of Baldwin (2008), larger-sized firms are more likely to "unbundle" production processes and corporate functions.

Turning to economic geography literature, the standard models in New Economic Geography (NEG) mostly consider the location of single-plant firms. In the two-region setting, Ekholm and Forslid (2001) analyze firms producing in both regions ("horizontal multi-region firms") and firms producing in low-wage regions distanced from HQ ("vertical multi-region firms"). The former corresponds to the multi-plant operation decision and the latter to the HQ separation decision in our case. The NEG model by Fujita and Thisse (2006) examines the HQ separation decision, while Fujita and Gokan (2005) analyze it in the case of multi-plant firms. These models have focused on the same topic that ours have, however they have approached the topic from a different angle: the impacts of trade costs and communication costs on these decisions.[1]

As an empirical exploration into this issue, our plant-level estimation complements previous firm-level contributions. From U.S. micro data, Hortaçsu and Syverson (2009) find that transactions of goods between upstream and downstream plants within the firm boundary are extremely inactive, but that plant/firm size is the strongest determinant for the vertical ownership. They propose that the provision of corporate intangible inputs from HQ, rather than intra-firm trade in goods, determines which plants are owned by vertically linked firms. On the other hand, Aarland, Henderson and Ono (2007) investigate the HQ separation decision in U.S. firms and find that firms with separated HQ tend to be larger or diversified. Based on the same U.S. firm-level data, Henderson and Ono (2008) report that those firms whose HQ is separated tend to have their HQ located close to production plants. These results indicate that these decisions cannot be analyzed without plant characteristics.[2]

This paper investigates how plant characteristics are related with these decisions departing from previous literature which approached this issue from the firm or HQ side rather than plant side. Even if we expand our scope to traditional industrial organization literature, Scherer et al. (1975) is the only book, as far as the authors know, dedicated to the analysis of

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1 Our analysis also differs from recently developed theory of multinationals and offshoring (e.g. Antràs and Helpman, 2004) since they focus on the boundary of the firm under incomplete contract.

2 The location patterns of headquarters in the U.S. have been recently also analyzed at the firm level by Davis and Henderson (2008) and Strauss-Kahn and Vives (2009), however the relation with plant characteristics was not addressed.

multi-plant operation, however they depend on summary statistics from leading firms in each selected industry. The investigation of plant characteristics is important as plants vary considerably in size, productivity, and factor intensity even for plants owned within the same firm. Some plants, for example those with more workers, are supposed to be harder to manage with a separated HQ than plants with fewer workers. Among many plant-level factors, this paper pays special attentions to the plant size and tries to derive implications for economies of scale.

The rest of this paper is organized as follows. Section 2 describes our plant-level data. Section 3 explains the empirical specifications for our analyses and report estimation results. Section 4 concludes.

2. Description of plant-level data

This section describes the data used in our study. We derive plant-level data from Japan's *Census of Manufacturers*. Although the annual survey covers only plants above the given size threshold, during "census years" (year with 0, 3, 5, or 8 as its last digit) small-sized plants are also included. We concentrate on the census years to avoid truncations due to the sampling of plants. Our sample excludes plants with less than five employees, as original plant-level micro-data files of the central government are maintained only for those plants with no less than five employees (even for the most recent census),.

Basic plant characteristics, such as output (sales), employment (number of employees), expenditures on materials, are available for all plants in the census. The valuable information concerning whether or not each plant is a part of a multi-plant firm is directly captured by the census. There is no firm identifier available for linking plants under the same ownership, subsequently the aggregation of our plant-level data to the firm level is impossible.[3] The census also contains a question on the HQ separation. While the address of separated HQ is not identified, the census asks each plant whether or not its HQ is collocated with or physically separated from the plant.[4] This paper exploits this unusually rich plant-level data to explore relevant plant characteristics behind the decisions of HQ separation and of multi-plant operation.[5]

This paper investigates the plant-level data derived from the six consecutive waves of Japan's *Census of Manufacturers* (1978, 80, 83, 85, 88, and 1990) in a repeated cross-section format, as no plant identifier tracing plants over years is available in the census. Due to this data constraint, one cannot discuss entry/exit dynamics or causality direction. Our focus on early period until 1990 helps us avoid possible contaminations due to the large number of relocations across national borders after this period. Many Japanese multinationals actively relocated their production plants to neighboring low-wage Asian developing countries in the 1990s, accelerated by the appreciation of the yen. Manufacturing census data does not cover plants domiciled overseas, even if they are owned by Japanese firms. By concentrating on plants within Japan, we can assume away institutional or technological differences across plants. We will, however, later control for labor market variations across regions or industries to take account of labor immobility within the country.

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[3] As a result, we have no information how many plants each firm operates or which plants are operated by the same firm. Transactions between plants operated by the same firm are not distinguished either. This paper focuses on the relations with plant characteristics.

[4] Offices not involved in production are not captured by Manufacturing Census. Aarland et al. (2007) and Henderson and Ono (2008) use the U.S. data on "auxiliary establishments," which are non-production offices providing services to other plants/offices of the firm.

[5] In the original questionnaire of the census, each plant is asked to choose from the following three options: (1) single plant collocated with HQ, (2) single plant separated from HQ, and (3) one of the multiple plants. The economics guides us to investigate the HQ separation choice ((1) vs. (2)) and the multi- or single-plant choice ((1) combined with (2) vs. (3)), instead of a multinomial choice among these three options.

This sample period 1978-90 is also characterized by relatively high communication costs, since the widespread use of Internet and e-mail had not yet occurred. These new forms of communication drastically reduced intra-firm costs for information sharing and communications between distant locations, within and across borders, and thus assisted firms in "unbundling" production processes and corporate functions on the global scale, as described by Baldwin (2008). Consequently, during this earlier period, the physical separation of HQ and the physical split of production processes into multiple plants (probably located in different sites) should have been a critical corporate decision due to the high communication costs. In this sense, our choice of this sample period provides us with a good opportunity to investigate infrequent and critical organizational change of firms.

Before explaining our estimation framework, a brief report of summary statistics from the plant-level data in Table 1 is informative. Within our sample period, the composition of plants has slightly changed (declining share of single plants with collocated HQ), but the size of average plant in each category remains virtually unchanged; the plants operated as a part of multi-plant operation are on average larger than single plants with separated HQ, which are in turn larger than single plants with collocated HQ. This ordering appears consistent with our perception regarding the growth process of the firm.

3. Estimation results

3.1. Empirical specifications

This section estimates whether or not plant-level characteristics are related with the HQ separation decision or with the multi-plant operation decision, and, if so, how they are related. We consider the following binary response model:

$$P(y_i = 1 | x_i) = P(y_i^* > 0 | x_i) = G(x_i \beta) \qquad (1)$$

where the plant is indexed by the suffix *i*. The model is in a repeated cross-section format as there is no record of plant identifier tracing plants over time in our data. The vector of plant characteristics is summarized by *x*, while β is the vector of parameters to be estimated. The binary variable *y* takes the value one (HQ located separated from the plant)[6] if the latent variable *y**, given below in (2), is positive.

$$y_i^* = x_i\beta + e_i \tag{2}$$

G in (1) is a cumulative distribution function of *e* in (2), where *e* is a continuously distributed variable independent of *x*. This paper reports the estimation results from logit and probit cases, given the functional form of *G*. We concentrate on single-plant firms, since the HQ separation decision of multi-plant firms is inevitably affected by other plants under the same ownership, which we cannot trace in our plant-level data.[7] By limiting our attention to single-plant firms, we can identify how the HQ decision is related with the characteristics of the plant. We will include multi-plant firms into our sample when we examine the multi-plant operation decision.

Included on the right-hand side of (2) within the vector of plant-level characteristics, *x*, are the following: (1) plant size *SIZE* (the number of workers),[8] (2) the labor intensity *LABOR* (total wage payment divided by the value of shipment), (3) the material use intensity *MAT* (expenditures on materials[9] divided by the value of shipment), and (4) the productivity *PROD* (per-worker value-added).[10] All these variables take logarithmic form. We cannot calculate the capital-labor ratio, as the data on capital (tangible fixed assets) is unavailable for a large number

6 Aarland et al. (2007) analyze the firm's decision of having independent central administrative offices and the decision of locating them in the same county as the firm's production plants, by estimating two probit models separately.

7 Aarland et al. (2007) exclude single-plant firms in their analysis of HQ collocation. Henderson and Ono (2008) concentrate on "the event where firms establish a single stand-alone HQ for the first time" (p.437) in their sample of multi-plant firms.

8 This paper counts the number of workers as being the number regular employees.

9 This includes expenditures on materials, fuels, and electricity.

10 The value-added is measured by the value of shipment minus expenditures on materials.

of smaller plants. Since our plant-level data is in a repeated cross-section format, it is practically impossible to estimate plant-level total factor productivity. We must also note that this reduced-form specification (2) does not imply the direction of causality.

Our focus on plant characteristics is motivated by the accumulated firm-level work on this topic. As a previous study complementary with ours, Henderson and Ono (2008) empirically examine the location of the HQ when the HQ is separated from production activities. They find that the “proximity to production plants is an overwhelmingly important attribute” (p.443).[11] As a related finding, Hortaçsu and Syverson (2009) conclude that vertically-linked plants are characterized not by ownership but by plant/firm size. As no firm identifier is available in our data set, we cannot link plants which are in the multiple-plant network operated by the same firm.

We next investigate how plant-level characteristics are related with the choice of multiple-plant operation by considering the following reduced-form:

$$z_i^* = \delta_0 + \delta_1 SIZE_i + \delta_2 LABOR_i + \delta_3 MAT_i + \delta_4 PROD_i + \varepsilon_i . \quad (3)$$

On the left-hand side of (3) is the latent variable z^* underlying the choice of multi-plant operation. The binary variable z takes the value one (the plant operated as a part of multiple-plant operation) if z^* is positive, and zero (operated as the single plant) otherwise. The variable ε is assumed to either have a standard logistic or normal distribution. The explanatory variables are the same as those in (2). The plant is again identified by the suffix i and the parameters to be estimated are expressed by δ. All plants (those operated by single-plant firms and multi-plant firms) are included in the estimation of (3).

As a noteworthy contribution, Scherer et al. (1975) is a rare book entirely focused on multi-plant operation. However, the main variable in their empirical study (which is framed by

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11 Aarland et al. (2007) also confirm that most firms locate their HQ near their production plants.

Structure-Conduct-Performance paradigm in traditional industrial organization) is not the decision of multi-plant operation *per-se*, but the number of plants or the average plant size operated only by leading firms, thus neglecting plants/firms without dominant market shares. In comparison, our plant-level data set covers all plants with five or more workers.

3.2. Estimation results

This section reports estimation results and discusses their implications. The logit/probit estimation results are shown in Tables 2 and 3. The decision of HQ separation (separated from versus collocated with the production plant) is examined in the upper panel, while the decision of multiple-plant (multi- versus single plant) is examined in the lower panel. Italic figures are z-values. The results are virtually unaltered between the logit and probit estimations. The notable findings from these tables are as follows.

Firstly, the plant size is strongly related with the HQ separation and the multi-plant operation decisions. Firms tend to split HQ from the production plant and to operate the plant as a part of multi-plant operation when the plant is large in size. This finding is congruent with the existence of certain forms of decreasing returns to scale in plant operation, for instance management overloads are supposed to rise with the number of workers. As discussed in the empirical analysis of HQ location by Strauss-Kahn and Vives (2009), HQ's are more likely to be separated from production plants to give more autonomy to managers of plants, especially plants employing larger numbers of workers. One might argue that each plant in multi-plant operation should be smaller than a single plant because the production is divided into multiple plants. However, our finding is plausible since single-plant firms are often smaller than multi-plant firms. This result is robust across all years in our sample, all prefectures, and most of the sectors. Our finding regarding the positive effect of plant size is in line with the previously established result from U.S. firms.[12]

Secondly, the productivity is also an important determinant of HQ location and multi-plant operation. The plants with higher productivity are significantly more likely to have their HQ separated from the production plants and to be operated by multi-plant firms. While we cannot control for possible differences in human skills across plants, this finding of higher productivity of multiple plants suggests that inputs from corporate headquarters (often invisible and intangible, such as brand name recognition or R&D) contribute to plant-level productivity as multi-plant firms tend to be large in size and to have large headquarters.[13] As a result related with corporate intangibles, Hortaçsu and Syverson (2009) argue that intangible inputs provided from HQ should be important based on their finding that the transactions of goods within vertically linked firms (in the U.S.) is extremely inactive. In other words, strong corporate headquarters are necessary for the effective management of production plants in geographically separated locations. We should not interpret the results of this estimation as any indication that the direction of causality runs from plant characteristics to headquarters locations. We also confirm that this relation is robust across all years, as well as across almost all the prefectures and sectors.

HQ services provided to separated plants have also been formalized theoretically (Ekholm and Forslid, 2001; Fujita and Gokan, 2005; Fujita and Thisse, 2006). While these models focus on the effect of communication costs, our finding of a significant relationship with the productivity suggests that productive firms are likely to be skillful in transforming information

12 Aarland et al. (2007) report that firms with separated HQ are substantially bigger than those without. Strauss-Kahn and Vives (2009) argue that "small headquarters may locate close to their plants" (p.178) in discussing their finding that larger headquarters are more likely to relocate. Hortaçsu and Syverson (2009) also find that firm size is strongly related with the firm's choice of owning vertically linked multiple plants.

13 High labor productivity could be due to high capital-labor ratio, but we find that these plants are labor-intensive. High labor productivity may also reflect rich human skills, but no employment data disaggregated by educational attainment or occupations/skills are available within our plant-level data and we have controlled for plant size, which tends to be correlated with human skills.

into codes suitable for distant communications and/or to effectively monitor efforts of plant managers from distance. Thus, our result is in line with their theoretical prediction if one interprets it as implying that plant-specific communication costs are relatively low in productive plants.

Finally, the labor intensity and the intensity of material use are also related with these decisions to have a separate HQ or multiple plants. The plants that are intensive in labor or material use tend to have their HQ separated from them and to be operated as a part of multi-plant operation. In line with the first finding reported above, this result is consistent with the view that management overloads are likely to increase with expenditures on labor or material inputs. As the values at stake become higher, corporate headquarters are required to become more independent or strong, allowing them to negotiate and conclude contracts more effectively or to improve the monitoring of performance or implementation. Although it is not as robust as the relation with plant size or with productivity, this relation with labor or material use intensity is observed across many years, prefectures, and sectors.

In sum, large-sized, productive plants intensive in labor and material use tend to have corporate headquarters separated from the production plant and to be a part of multi-plant operation. While we have established the sign of the effects of these plant characteristics, we will evaluate the magnitudes of these effects in the next section.

In addition to plant characteristics, this paper also includes industry- or region-level wage and employment to control for variations across labor markets. The estimation results in Table 4 show that a higher average wage or a limited number of workers in the region/industry is correlated with there being a separated HQ or a multi-plant operation. These observations are consistent with the interpretation that a HQ is separated from the production plant or the production is split into multiple plants in order to avoid higher wages or a scarce labor endowment. In the case where the firm has a multi-plant operation and a separated HQ, other plants or the separated corporate HQ are supposed to be located in other regions with lower wages or more abundant labor endowment.

While the overall results discussed above reveal notable regularities, the disaggregated results are also informative. The estimation results for each prefecture are shown in Table 5, and those for each industry are presented in Table 6. The codes for prefecture and industry are listed in Appendix Tables A and B. First, the estimates differ across regions. The estimated coefficient on plant size in the multi-plant decision tends to be larger especially in core regions (Tokyo, Osaka, and their surrounding prefectures). Other variables are also generally significant in core regions. This contrast between core and periphery might be due to differences in production costs, though the superior overall fit is partly dictated by the law of large numbers. Higher wages and higher land prices in the core regions are supposed to induce larger firms to split their production across multiple plants, some of which are likely to be located in low-cost periphery. The geographic concentration of HQ in the core might also affect this result. The investigation of the HQ proximity and of inter-plant linkages is, however, beyond our scope of plant-level study and is left for future work.

Some of the cross-industry variations are also worth noting. For example, our model performs poorly in the furniture manufacturing and petroleum/coal products sectors. These “poor” results are to be expected since multi-plant operation is exceptional in the former and normal in the latter sector.

3.3. Evaluations of marginal effects

While the logit/probit estimates reported in the previous sub-section showed that the coefficient on plant size is significantly positive for both the multi-plant decision and the HQ separation decision, the mere report of coefficient estimates is insufficient for the evaluation of marginal effect in these non-linear models. From (1), the marginal effect of a variable in the vector *x*, say x_j, on the probability of multi-plant operation or of HQ separation depends on the level of *x* as follows:

$$\frac{\partial P}{\partial x_j} = g(x\beta)\beta_j \qquad where \quad g(u) \equiv dG(u)/du \quad . \qquad (4)$$

Thus, the same magnitude of plant size change should result in non-negligibly different responses depending on the initial plant sizes. Among the variables included in our regressions, the impact of plant size is particularly critical for evaluating the degree of decreasing returns to scale. For this purpose, we calculate the marginal effects of plant size on the headquarters decision or on the multi-plant decision at various plant sizes, keeping all other variables at the mean. The results based on the baseline specification for 1978 are shown in Figure 1. On the horizontal axis, we measure the plant size as the deviation from the mean. The marginal effect of plant size change, measured on the vertical axis, shows substantial variation over plant size; the same magnitude of plant size change results in four time larger marginal effect at the peak compared with that at the mean in the multi-plant decision case. Notable findings are as follows.

Firstly, the marginal effect of plant size change on the multi-plant decision monotonically increases up to the value of around three. As the logarithm plant size (the number of workers) is measured as the deviation from the mean, this threshold value corresponds to around two hundred workers.[14] Consequently, while larger plants are significantly more likely to be operated by multi-plant firms, whether or not a plant is operated as a part of multi-plant operation is especially sensitive to a marginal change in size when the plant employs at around two hundred workers.

In other words, for firms with less than two hundred workers, the impact of a given

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[14] The mean plant size is reported in Table 1 for different groups of plants.

change in its size on the multi-plant decision becomes monotonically stronger as the firm expands in size. On the other hands, the decision to fragment its production process into multiple plants may also be influenced by such other factors as product differentiations within a firm. As plant-level economies of scale are normally product-specific, a multi-variety firm may split its production into multiple plants by assigning each variety to each plant, while a single-variety firm with the same total production scale may keep its production at the single plant. As a result, some large firms, especially single-variety firms, employing more than two hundred workers may keep single-plant production. The extent of product differentiation, which is beyond our scope of this paper, is thus likely to affect the threshold plant size of the multi-plant operation. As a related finding, Aarland et al. (2007) report that the probability of multi-plant operation increases as the firm is industrially diversified.

Secondly, the marginal effect of a change in plant size on the decision of HQ separation gradually increases up to the value around five in logarithm deviation from the mean, which is approximate equal to one-thousand-three-hundred workers. As this peak value roughly corresponds to the plant size of upper ten percent of the sample, and as the curve shown in Figure 1 appears obviously less steep in the HQ separation than that in multi-plant operation,[15] we should interpret this result as suggesting that a given plant size increase tends to have a stronger impact on HQ separation as the plant becomes larger over a relevant range of plant sizes. In other words, as long as we exclude extremely large-sized single-plant firms, larger-sized plants are monotonically more likely to be operated by multi-plant firms.

We also note that HQ separation decision, compared with multi-plant operation decision, tends to be less sensitive to plant size changes. This finding of a weaker relation with plant size is in line with our report in previous tables (the size coefficient estimated to be smaller in HQ

[15] As we concentrate on single-plant firms in the analysis of HQ separation, these two peak values should not be directly compared.

separation than in multi-plant). Whilst we cannot pin down the exact cause within our plant-level data, our finding that HQ separation is less sensitive than multi-plant operations with respect to plant size could be explained by the HQ separation decision, compared with the multi-plant decision, strongly influenced by HQ-side factors omitted in our plant-level analysis, such as management overload or the capacity of managers in HQ.

4. Concluding remarks

This paper has empirically investigated how plant characteristics, especially plant size, are related with the HQ separation decision and with the multiple-plant operation decision. Our estimations have demonstrated that large-sized, productive plants which are intensive in labor or material use tend to be operated as a part of multi-plant operation with separated HQ, suggesting non-negligible decreasing returns to scale in plant operation. Our plant-level findings are also consistent and complementary with previous firm-level results. Our estimation of marginal effects of plant size changes suggests that a firm tends to split its production into multiple plants as the firm grows, particularly when it reaches the size of around two hundred workers. These findings, if combined with other evidence, will have important implications to various economic policies, such as policies for small- and medium-sized enterprises.

While we have detected previously unexplored relationships with plant characteristics, there remain several issues left for the future. For example, one fruitful research avenue will be found by linking similar plant-level or firm-level data with recent outsourcing literature and new economic geography models. Scherer et al. (1975) emphasized the roles of market size and transport costs within their traditional Structure-Conduct-Performance framework. Revisiting this issue with new approaches will be informative.

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Table 1: Basic Statistic

type 1 (Single plants collocated with HQ)

year		n	mean	sd	min	p10	median	p90	max
1978									
	Size	3E+05	2.177	0.785	1.386	1.386	1.946	3.258	8.186
	Labor	3E+05	0.325	1.708	0	0.1	0.29	0.583	1000
	Mat	3E+05	0.419	0.29	−0.02	0.093	0.418	0.731	100
	Prod	3E+05	5.467	0.807	0	4.564	5.509	6.367	10.25
	Town Wage	3E+05	5.018	0.265	1.504	4.677	5.034	5.329	5.686
	Sector Wage	3E+05	5.009	0.258	4.135	4.634	5.028	5.318	6.113
	Town Emp	3E+05	9.103	1.443	1.386	6.963	9.444	10.72	11.45
	Sector Emp	3E+05	10.63	1.186	4.06	9.182	10.78	12.18	12.9
1980									
	Size	3E+05	2.189	0.793	1.386	1.386	1.946	3.296	8.299
	Labor	3E+05	0.313	0.253	0	0.098	0.279	0.569	53.5
	Mat	3E+05	0.426	0.238	−0.98	0.1	0.426	0.737	20.86
	Prod	3E+05	5.618	0.832	0	4.702	5.665	6.531	10.06
	Town Wage	3E+05	5.16	0.261	2.416	4.827	5.166	5.468	5.827
	Sector Wage	3E+05	5.15	0.257	4.253	4.767	5.173	5.461	6.724
	Town Emp	3E+05	9.088	1.426	1.386	6.98	9.423	10.68	11.39
	Sector Emp	3E+05	10.65	1.195	1.609	9.165	10.71	12.14	12.99
1983									
	Size	4E+05	2.187	0.793	1.386	1.386	1.946	3.296	8.268
	Labor	4E+05	0.334	1.444	0	0.108	0.298	0.59	840
	Mat	4E+05	0.418	0.236	0	0.1	0.414	0.727	18.86
	Prod	4E+05	5.711	0.836	0	4.794	5.766	6.62	10.29
	Town Wage	4E+05	5.311	0.26	2.976	4.974	5.331	5.626	5.88
	Sector Wage	4E+05	5.299	0.265	4.347	4.922	5.327	5.632	6.616
	Town Emp	4E+05	9.103	1.406	1.386	7.044	9.434	10.63	11.37
	Sector Emp	4E+05	10.69	1.202	3.401	9.225	10.78	12.17	13.03
1985									
	Size	3E+05	2.197	0.8	1.386	1.386	1.946	3.296	8.011
	Labor	3E+05	0.332	0.382	0	0.112	0.3	0.585	141.2
	Mat	3E+05	0.413	0.295	0	0.1	0.405	0.717	100
	Prod	3E+05	5.792	0.852	0	4.865	5.792	6.71	12.15
	Town Wage	3E+05	5.403	0.26	2.205	5.073	5.433	5.699	6.212
	Sector Wage	3E+05	5.388	0.277	4.426	4.989	5.409	5.725	6.41
	Town Emp	3E+05	9.101	1.398	1.386	7.058	9.407	10.63	11.38
	Sector Emp	3E+05	10.64	1.247	3.664	9.062	10.68	12.21	13.14
1988									
	Size	3E+05	2.203	0.803	1.386	1.386	1.946	3.296	8.117
	Labor	3E+05	0.398	22.99	0	0.122	0.308	0.59	11924
	Mat	3E+05	0.397	0.233	0	0.1	0.389	0.699	27.81
	Prod	3E+05	5.902	0.833	0	4.977	5.959	6.809	12.06
	Town Wage	3E+05	5.504	0.25	2.177	5.18	5.519	5.805	6.224
	Sector Wage	3E+05	5.487	0.276	4.475	5.118	5.513	5.822	6.494
	Town Emp	3E+05	9.083	1.373	1.386	7.07	9.343	10.59	11.37
	Sector Emp	3E+05	10.68	1.261	3.85	9.114	10.68	12.3	13.12
1990									
	Size	3E+05	2.21	0.806	1.386	1.386	1.946	3.332	8.278
	Labor	3E+05	0.362	8.144	0	0.122	0.303	0.581	3928
	Mat	3E+05	0.392	0.25	0	0.1	0.381	0.696	41.67
	Prod	3E+05	6.026	0.877	0	5.081	6.09	6.968	10.39
	Town Wage	3E+05	5.619	0.254	2.015	5.292	5.632	5.921	6.313
	Sector Wage	3E+05	5.603	0.284	4.754	5.204	5.648	5.946	6.556
	Town Emp	3E+05	9.078	1.367	1.386	7.084	9.34	10.6	11.4
	Sector Emp	3E+05	10.71	1.268	2.639	9.138	10.7	12.3	13.21

type 2 (Single plants with separated HQ)

year		n	mean	sd	min	p10	median	p90	max
1978									
	Size	34376	2.707	0.979	1.386	1.609	2.565	4.043	9.002
	Labor	34376	0.292	0.36	0	0.083	0.238	0.561	31.76
	Mat	34376	0.477	0.275	0	0.125	0.491	0.778	22.21
	Prod	34376	5.812	0.963	0	4.866	5.877	6.788	10.14
	Town Wage	34178	5.067	0.246	2.735	4.729	5.099	5.34	6.108
	Sector Wage	34376	5.092	0.246	4.135	4.737	5.117	5.393	6.033
	Town Emp	34178	8.951	1.48	1.792	6.807	9.272	10.59	11.45
	Sector Emp	34376	10.51	1.215	4.06	8.88	10.56	12.1	12.9
1980									
	Size	34444	2.724	0.984	1.386	1.609	2.565	4.078	8.408
	Labor	34443	0.28	0.452	0	0.078	0.224	0.542	65.22
	Mat	34443	0.487	0.25	0	0.131	0.5	0.794	7.333
	Prod	34444	5.96	1.003	0	4.989	6.033	6.96	10.26
	Town Wage	34444	5.207	0.248	3.148	4.868	5.237	5.513	6.132
	Sector Wage	34444	5.23	0.249	4.253	4.878	5.256	5.517	6.385
	Town Emp	34444	8.935	1.466	1.386	6.836	9.264	10.59	11.39
	Sector Emp	34444	10.52	1.225	3.989	8.85	10.67	12.14	12.99
1983									
	Size	37841	2.665	0.959	1.386	1.609	2.485	3.989	7.982
	Labor	37841	0.299	0.439	0	0.085	0.244	0.568	58.18
	Mat	37841	0.473	0.249	0	0.125	0.486	0.778	7.527
	Prod	37841	6.049	0.992	0	5.089	6.12	7.044	10.84
	Town Wage	37565	5.356	0.247	3.02	5.019	5.389	5.63	6.555
	Sector Wage	37840	5.378	0.256	4.347	5.012	5.397	5.684	6.241
	Town Emp	37565	8.971	1.452	2.565	6.894	9.318	10.63	11.37
	Sector Emp	37840	10.57	1.235	1.609	8.885	10.65	11.9	13.03
1985									
	Size	40762	2.646	0.954	1.386	1.609	2.485	3.951	7.877
	Labor	40762	0.574	38.61	0	0.091	0.251	0.565	7445
	Mat	40762	0.469	0.247	0	0.125	0.478	0.77	12
	Prod	40762	6.116	1.005	0	5.175	6.194	7.088	10.85
	Town Wage	40470	5.449	0.246	3.126	5.118	5.478	5.719	6.379
	Sector Wage	40762	5.465	0.269	4.448	5.067	5.493	5.793	6.41
	Town Emp	40470	9.013	1.426	2.398	6.959	9.335	10.62	11.38
	Sector Emp	40762	10.52	1.273	3.664	8.759	10.55	11.87	13.14
1988									
	Size	42866	2.639	0.946	1.386	1.609	2.485	3.932	8.174
	Labor	42866	0.384	12.16	0	0.096	0.255	0.565	2314
	Mat	42866	0.449	0.237	0	0.117	0.454	0.745	7.031
	Prod	42866	6.222	0.973	0	5.271	6.299	7.174	13.64
	Town Wage	42400	5.544	0.237	3.583	5.225	5.57	5.811	6.43
	Sector Wage	42866	5.561	0.267	4.563	5.164	5.6	5.896	6.407
	Town Emp	42400	9.005	1.408	2.079	6.961	9.296	10.59	11.37
	Sector Emp	42866	10.57	1.273	4.564	8.875	10.61	11.95	13.12
1990									
	Size	45217	2.634	0.948	1.386	1.609	2.485	3.932	8.221
	Labor	45217	0.321	2.377	0	0.096	0.254	0.569	500
	Mat	45217	0.442	0.276	0	0.101	0.443	0.745	17.92
	Prod	45217	6.323	1.023	0	5.331	6.42	7.315	13.88
	Town Wage	44486	5.656	0.244	3.97	5.326	5.679	5.928	6.56
	Sector Wage	45217	5.672	0.272	4.754	5.272	5.726	5.983	6.55
	Town Emp	44486	8.998	1.402	1.609	6.984	9.268	10.57	11.4
	Sector Emp	45217	10.63	1.284	3.714	8.907	10.64	12.02	13.21

type 3 (multi-plant)

year		n	mean	sd	min	p10	median	p90	max
1978		3							
	Size	48040	3.316	1.28	1.386	1.792	3.135	5.043	9.781
	Labor	48040	0.284	0.355	0	0.073	0.218	0.578	43.42
	Mat	48040	0.498	1.185	0	0.126	0.514	0.795	254.4
	Prod	48040	5.845	1.06	0	4.781	5.917	6.944	10.59
	Town Wage	47683	5.037	0.259	3.209	4.686	5.058	5.353	5.62
	Sector Wage	48035	5.086	0.268	4.135	4.718	5.115	5.411	6.058
	Town Emp	47683	8.947	1.526	1.386	6.688	9.282	10.71	11.45
	Sector Emp	48035	10.56	1.206	4.635	8.955	10.64	12.1	12.9
1980									
	Size	48559	3.31	1.273	1.386	1.792	3.135	5.037	9.796
	Labor	48559	0.271	0.279	0	0.066	0.205	0.565	17.91
	Mat	48559	0.506	0.27	0	0.133	0.527	0.813	19.62
	Prod	48559	5.98	1.116	0	4.887	6.063	7.133	10.82
	Town Wage	48559	5.177	0.258	3.159	4.832	5.198	5.481	5.827
	Sector Wage	48559	5.221	0.269	4.253	4.841	5.241	5.532	6.724
	Town Emp	48559	8.924	1.506	1.386	6.704	9.255	10.68	11.39
	Sector Emp	48559	10.59	1.225	4.127	8.997	10.69	12.2	12.99
1983									
	Size	53655	3.276	1.265	1.386	1.792	3.091	4.984	10.05
	Labor	53655	0.291	0.382	0	0.072	0.22	0.594	44.31
	Mat	53655	0.491	0.271	0	0.123	0.51	0.798	17.52
	Prod	53655	6.052	1.13	0	4.952	6.14	7.221	11.67
	Town Wage	53417	5.321	0.258	3.312	4.969	5.34	5.63	5.88
	Sector Wage	53648	5.36	0.277	4.347	4.971	5.379	5.69	6.243
	Town Emp	53417	8.96	1.488	1.609	6.792	9.299	10.64	11.37
	Sector Emp	53648	10.66	1.234	3.401	8.989	10.76	12.33	13.03
1985									
	Size	57942	3.314	1.245	1.386	1.792	3.135	4.99	10.11
	Labor	57942	0.292	0.482	0	0.077	0.223	0.582	63.56
	Mat	57942	0.49	0.689	0	0.125	0.503	0.793	143.5
	Prod	57942	6.138	1.121	0	5.058	6.225	7.28	11.59
	Town Wage	57674	5.416	0.256	3.098	5.07	5.441	5.718	6.212
	Sector Wage	57942	5.448	0.289	4.448	5.043	5.484	5.803	6.41
	Town Emp	57674	8.976	1.466	1.946	6.821	9.297	10.63	11.38
	Sector Emp	57942	10.65	1.291	4.913	8.947	10.68	12.26	13.14
1988									
	Size	61726	3.303	1.231	1.386	1.792	3.135	4.963	9.923
	Labor	61726	0.466	23.33	0	0.079	0.227	0.588	4439
	Mat	61726	1.859	344.6	0	0.117	0.484	0.776	85623
	Prod	61726	6.237	1.125	0	5.137	6.325	7.396	11.8
	Town Wage	61234	5.511	0.249	2.485	5.168	5.535	5.805	6.224
	Sector Wage	61726	5.538	0.292	4.563	5.118	5.579	5.896	6.494
	Town Emp	61234	8.962	1.444	1.386	6.862	9.237	10.61	11.37
	Sector Emp	61726	10.68	1.3	4.564	8.944	10.7	12.3	13.12
1990									
	Size	66093	3.3	1.22	1.386	1.792	3.135	4.942	9.943
	Labor	66093	0.373	13	0	0.078	0.221	0.571	2751
	Mat	66093	0.467	0.349	0	0.108	0.478	0.773	45.19
	Prod	66093	6.347	1.155	0	5.251	6.448	7.507	12.44
	Town Wage	65187	5.626	0.252	3.97	5.278	5.645	5.924	6.313
	Sector Wage	66093	5.647	0.293	4.754	5.21	5.698	6	6.79
	Town Emp	65187	8.961	1.433	1.609	6.866	9.208	10.61	11.4
	Sector Emp	66093	10.73	1.304	4.369	8.963	10.72	12.3	13.21

All

year		n	mean	sd	min	p10	median	p90	max
1978									
	Size	4E+05	2.346	0.946	1.386	1.386	2.079	3.638	9.781
	Labor	4E+05	0.318	1.544	0	0.095	0.278	0.582	1000
	Mat	4E+05	0.433	0.481	−0.02	0.098	0.434	0.744	254.4
	Prod	4E+05	5.536	0.864	0	4.601	5.577	6.483	10.59
	Town Wage	4E+05	5.024	0.263	1.504	4.681	5.043	5.331	6.108
	Sector Wage	4E+05	5.024	0.26	4.135	4.682	5.03	5.351	6.113
	Town Emp	4E+05	9.073	1.457	1.386	6.919	9.415	10.72	11.45
	Sector Emp	4E+05	10.62	1.192	4.06	9.104	10.77	12.18	12.9
1980									
	Size	4E+05	2.359	0.951	1.386	1.386	2.079	3.638	9.796
	Labor	4E+05	0.305	0.278	0	0.09	0.267	0.567	65.22
	Mat	4E+05	0.44	0.244	−0.98	0.104	0.443	0.752	20.86
	Prod	4E+05	5.686	0.894	0	4.732	5.733	6.649	10.82
	Town Wage	4E+05	5.165	0.26	2.416	4.831	5.176	5.477	6.132
	Sector Wage	4E+05	5.164	0.26	4.253	4.772	5.197	5.487	6.724
	Town Emp	4E+05	9.057	1.44	1.386	6.933	9.393	10.68	11.39
	Sector Emp	4E+05	10.63	1.201	1.609	9.118	10.7	12.14	12.99
1983									
	Size	4E+05	2.358	0.95	1.386	1.386	2.079	3.638	10.05
	Labor	4E+05	0.326	1.301	0	0.1	0.285	0.589	840
	Mat	4E+05	0.432	0.243	0	0.103	0.431	0.743	18.86
	Prod	4E+05	5.781	0.901	0	4.824	5.834	6.74	11.67
	Town Wage	4E+05	5.316	0.259	2.976	4.979	5.335	5.626	6.555
	Sector Wage	4E+05	5.313	0.267	4.347	4.93	5.345	5.659	6.616
	Town Emp	4E+05	9.075	1.421	1.386	6.999	9.404	10.63	11.37
	Sector Emp	4E+05	10.67	1.209	1.609	9.121	10.77	12.17	13.03
1985									
	Size	4E+05	2.386	0.966	1.386	1.386	2.079	3.714	10.11
	Labor	4E+05	0.349	11.78	0	0.102	0.286	0.583	7445
	Mat	4E+05	0.428	0.37	0	0.102	0.424	0.735	143.5
	Prod	4E+05	5.868	0.915	0	4.906	5.928	6.833	12.15
	Town Wage	4E+05	5.409	0.259	2.205	5.076	5.436	5.7	6.379
	Sector Wage	4E+05	5.403	0.279	4.426	5.002	5.436	5.754	6.41
	Town Emp	4E+05	9.076	1.41	1.386	7.017	9.385	10.63	11.38
	Sector Emp	4E+05	10.63	1.256	3.664	9.024	10.64	12.21	13.14
1988									
	Size	4E+05	2.401	0.97	1.386	1.386	2.079	3.738	9.923
	Labor	4E+05	0.406	22.22	0	0.11	0.293	0.587	11924
	Mat	4E+05	0.608	129.4	0	0.1	0.406	0.716	85623
	Prod	4E+05	5.981	0.905	0	5.017	6.04	6.937	13.64
	Town Wage	4E+05	5.509	0.249	2.177	5.181	5.524	5.805	6.43
	Sector Wage	4E+05	5.501	0.279	4.475	5.118	5.53	5.85	6.494
	Town Emp	4E+05	9.058	1.388	1.386	7.029	9.326	10.59	11.37
	Sector Emp	4E+05	10.67	1.268	3.85	9.037	10.65	12.3	13.12
1990									
	Size	4E+05	2.419	0.978	1.386	1.386	2.197	3.761	9.943
	Labor	4E+05	0.36	8.694	0	0.109	0.288	0.579	3928
	Mat	4E+05	0.408	0.271	0	0.1	0.4	0.715	45.19
	Prod	4E+05	6.105	0.95	0	5.122	6.172	7.095	13.88
	Town Wage	4E+05	5.624	0.253	2.015	5.295	5.637	5.924	6.56
	Sector Wage	4E+05	5.617	0.285	4.754	5.204	5.649	5.965	6.79
	Town Emp	4E+05	9.052	1.382	1.386	7.022	9.319	10.6	11.4
	Sector Emp	4E+05	10.7	1.275	2.639	9.106	10.7	12.3	13.21

Table 2: Basic Results (Logit)

Regression 1: HQ separation

year / Variables	1978		1980		1983		1985		1988		1990	
Size	0.497		0.483		0.445		0.421		0.413		0.414	
	77.053	***	***74.382***	***	***71.273***	***	***71.043***	***	***71.071***	***	***72.986***	***
Labor	−0.071		0.487		0.006		0.337		0		0.001	
	−21.833	***	***13.959***	***	***2.372***	**	***12.367***	***	***1.153***		***1.095***	
Mat	0.755		0.995		0.775		0.936		0.786		0.731	
	28.655	***	***31.005***	***	***29.689***	***	***33.661***	***	***32.331***	***	***30.805***	***
Prod	0.39		0.439		0.403		0.441		0.416		0.351	
	45.809	***	***44.793***	***	***49.96***	***	***53.013***	***	***56.228***	***	***50.605***	***
N	383061		380774		393287		380576		375848		369904	
Loglikelihood	−1.00E+05		−1.10E+05		−1.10E+05		−1.20E+05		−1.20E+05		−1.30E+05	

Regression 2: Multi-plant decision

year / Variables	1978		1980		1983		1985		1988		1990	
Size	0.86		0.846		0.838		0.899		0.888		0.889	
	163.288	***	***160.104***	***	***166.005***	***	***186.799***	***	***188.36***	***	***191.909***	***
Labor	0.501		0.299		0.006		0		0		0.001	
	16.642	***	***10.182***	***	***2.142***	**	***−0.517***		***0.433***		***2.192***	**
Mat	0.794		0.678		0.514		0.354		0.437		0.426	
	27.838	***	***24.231***	***	***22.669***	***	***16.851***	***	***20.922***	***	***20.877***	***
Prod	0.315		0.25		0.212		0.186		0.182		0.16	
	38.542	***	***32.269***	***	***33.685***	***	***32.257***	***	***32.451***	***	***30.44***	***
N	431099		429333		446942		438518		437574		435997	
Log Likelihood	−1.20E+05		−1.30E+05		−1.40E+05		−1.40E+05		−1.50E+05		−1.60E+05	

bold italic figures are z-values

*** statistically significant at 1 %, ** statistically significant at 5% and * statistically significant at 10%.

Prefecture dummies and 2-digit sector dummies are omitted.

Table 3: Basic Results (Probit)

Regression 1: HQ separation

year Variables	1978	1980	1983	1985	1988	1990
Size	0.28	0.275	0.254	0.251	0.24	0.243
	_80.274_ ***	**_79.26_** ***	**_75.001_** ***	**_78.221_** ***	**_74.989_** ***	**_77.431_** ***
Labor	−0.035	0.133	0.004	0.039	0	0
	_−20.757_ ***	**_12.871_** ***	**_3.038_** ***	**_7.205_** ***	**_1.135_**	**_0.822_**
Mat	0.379	0.437	0.39	0.334	0.405	0.346
	_29.158_ ***	**_32.639_** ****	**_30.652_** ***	**_44.095_** ***	**_34.513_** ***	**_34.156_** ***
Prod	0.18	0.188	0.185	0.187	0.197	0.166
	_45.082_ ***	**_45.559_** ***	**_49.116_** ***	**_52.471_** ***	**_55.693_** ***	**_50.087_** ***
N	383061	380774	393287	380576	375848	369904
Loglikelihood	−1.00E+05	−1.10E+05	−1.10E+05	−1.20E+05	−1.20E+05	−1.30E+05

Regression 2: Multi-plant decision

year Variables	1978	1980	1983	1985	1988	1990
Size	0.487	0.477	0.472	0.513	0.508	0.513
	_172.022_ ***	**_167.675_** ***	**_171.971_** ***	**_198.636_** ***	**_196.983_** ***	**_203.048_** ***
Labor	−0.023	0.077	0.004	0	0	0.001
	_−14.291_ ***	**_9.329_** ***	**_2.692_** ***	**_−0.524_**	**_0.631_**	**_2.725_** ***
Mat	0.257	0.294	0.262	0.134	0.226	0.187
	_22.153_ ***	**_24.033_** ***	**_22.712_** ***	**_18.423_** ***	**_21.397_** ***	**_20.704_** ***
Prod	0.124	0.115	0.108	0.097	0.097	0.085
	_36.251_ ***	**_33.458_** ***	**_34.519_** ***	**_33.314_** ***	**_33.834_** ***	**_31.397_** ***
N	431099	429333	446942	438518	437574	435997
Log Likelihood	−1.20E+05	−1.30E+05	−1.40E+05	−1.40E+05	−1.50E+05	−1.60E+05

bold italic figures are z-values
*** statistically significant at 1 %, ** statistically significant at 5% and * statistically significant at 10%.
Prefecture dummies and 2-digit sector dummies are omitted.

Table 4: Additional Results

Regression 1: HQ separation

	year	1978	1980	1983	1985	1988	1990
Variables	method	Logit	Logit	Logit	Logit	Logit	Logit
Size		0.481	0.471	0.435	0.42	0.413	0.415
		73.816 ***	*72.07* ***	*69.001* ***	*70.141* ***	*70.367* ***	*72.237* ***
Labor		−0.071	0.401	0.006	0.232	0	0
		−21.736 ***	*11.178* ***	*2.353* **	*9.034* ***	*0.889*	*0.713*
Mat		0.743	0.934	0.749	0.87	0.761	0.697
		28.053 ***	*28.759* ***	*28.459* ***	*31.555* ***	*31.029* ***	*29.157* ***
Prod		0.352	0.389	0.361	0.358	0.34	0.281
		40.446 ***	*38.604* ***	*43.591* ***	*41.17* ***	*43.465* ***	*38.284* ***
Town Wage		1.443	1.496	1.34	1.142	1.07	1.107
		31.361 ***	*31.972* ***	*30.206* ***	*27.948* ***	*25.838* ***	*27.056* ***
Sector Wage		0.636	0.634	0.662	0.437	0.442	0.417
		16.57 ***	*16.333* ***	*17.825* ***	*19.347* ***	*19.897* ***	*19.439* ***
Town Employment		−0.247	−0.249	−0.236	−0.207	−0.187	−0.186
		−43.576 ***	*−43.811* ***	*−42.426* ***	*−38.545* ***	*−35.433* ***	*−35.79* ***
Sector Employment		−0.044	−0.042	−0.036	−0.079	−0.073	−0.06
		−7.681 ***	*−7.439* ***	*−6.616* ***	*−17.695* ***	*−16.819* ***	*−14.109* ***
N		380757	380774	392055	379226	373545	364978
Loglikelihood		−1.00E+05	−1.00E+05	−1.10E+05	−1.20E+05	−1.20E+05	−1.30E+05

Regression 2: Multi-plant decision

	year	1978	1980	1983	1985	1988	1990
Variables	method	Logit	Logit	Logit	Logit	Logit	Logit
Size		0.86	0.838	0.831	0.899	0.889	0.888
		162.325 ***	*157.916* ***	*163.94* ***	*185.812* ***	*187.47* ***	*190.154* ***
Labor		−0.048	0.28	0.006	0	0	0.001
		−15.827 ***	*9.47* ***	*2.202* **	*−0.563*	*0.365*	*2.171* **
Mat		0.521	0.66	0.512	0.346	0.43	0.424
		22.391 ***	*23.438* ***	*22.445* ***	*16.365* ***	*20.439* ***	*20.57* ***
Prod		0.241	0.24	0.211	0.18	0.177	0.163
		33.88 ***	*30.176* ***	*32.587* ***	*29.515* ***	*29.575* ***	*28.726* ***
Town Wage		0.412	0.453	0.192	0.256	0.276	0.3
		10.4 ***	*11.314* ***	*5.031* ***	*7.306* ***	*7.67* ***	*8.481* ***
Sector Wage		0.405	0.389	0.286	0.12	0.058	0.006
		12.217 ***	*11.61* ***	*8.956* ***	*6.1* ***	*2.992* ***	*0.345*
Town Employment		−0.135	−0.14	−0.109	−0.114	−0.102	−0.098
		−26.246 ***	*−27.468* ***	*−21.794* ***	*−23.769* ***	*−21.77* ***	*−21.276* ***
Sector Employment		−0.007	−0.004	0.003	−0.022	−0.022	−0.014
		−1.38	*−0.78*	*0.701*	*−5.561* ***	*−5.635* ***	*−3.814* ***
N		428433	429333	445465	436900	434779	430165
Log Likelihood		−1.20E+05	−1.30E+05	−1.40E+05	−1.40E+05	−1.50E+05	−1.50E+05

Italic figures are z-values.
*** statistically significant at 1 %, ** statistically significant at 5% and * statistically significant at 10%.

Table 5: Prefecture Results (logit regression in 1980)

Regression 1: HQ separation

Prefecture code

Variables	1	2	3	4	5	6	7	8	9	10	11	12
Size	0.383	0.409	0.557	0.456	0.478	0.555	0.549	0.624	0.655	0.48	0.524	0.63
	8.96 ***	4.519 ***	7.984 ***	7.621 ***	5.685 ***	8.235 ***	10.527 ***	14.695 ***	14.755 ***	10.973 ***	22.065 ***	16.943 ***
Labor	0.352	0.397	−0.521	0.502	−0.047	1.361	1.347	1.27	0.3	0.88	1.159	1.152
	1.734 *	1.294	−0.897	1.163	−0.08	3.237 ***	3.898 ***	4.406 ***	2.027 **	3.434 ***	7.133 ***	3.708 ***
Mat	1.237	1.301	−0.109	0.73	−0.093	0.601	1.45	1.522	1.04	0.855	1.756	1.824
	6.197 ***	3.246 ***	−0.259	2.173 **	−0.188	1.88 *	5.019 ***	6.843 ***	5.317 ***	3.96 ***	13.423 ***	8.101 ***
Prod	0.406	0.209	0.237	0.304	0.151	0.464	0.635	0.693	0.245	0.672	0.844	0.659
	7.921 ***	2.371 **	2.271 **	3.349 ***	1.126	3.913 ***	6.54 ***	9.638 ***	4.258 ***	9.507 ***	20.605 ***	10.907 ***
N	9145	2192	2644	4102	2741	4043	5958	7341	7228	8532	18343	7753
Loglikelihood	−2737	−556.3	−885.8	−1239	−681.1	−956.3	−1556	−2487	−2157	−2431	−7632	−3036

Variables	13	14	15	16	17	18	19	20	21	22	23	24
Size	0.367	0.3	0.497	0.238	0.565	0.561	0.689	0.539	0.564	0.555	0.394	0.592
	16.72 ***	11.352 ***	10.194 ***	3.407 ***	8.998 ***	8.256 ***	9.143 ***	12.814 ***	13.106 ***	16.355 ***	16.699 ***	10.306 ***
Labor	0.145	0.431	0.826	1.987	1.634	1.7	1.233	0.419	0.496	0.274	0.909	0.599
	3.229 ***	2.525 **	3.164 ***	4.167 ***	4.942 ***	3.818 ***	2.426 **	2.117 **	3.021 ***	2.159 **	6.222 ***	1.573
Mat	1.202	1.351	0.735	2.734	1.157	1.211	1.489	0.42	0.477	0.697	1.409	0.423
	12.944 ***	9.347 ***	3.048 ***	7.041 ***	4.038 ***	3.345 ***	3.637 ***	1.96 *	3.078 ***	4.46 ***	12.11 ***	1.603
Prod	0.396	0.41	0.222	0.673	0.677	0.381	0.484	0.338	0.696	0.284	0.627	0.35
	12.904 ***	9.622 ***	2.86 ***	5.526 ***	7.043 ***	3.445 ***	4.093 ***	5.072 ***	10.93 ***	6.078 ***	16.53 ***	4.324 ***
N	47599	13571	9634	4065	6720	4631	3250	8964	11915	16290	30819	6285
Loglikelihood	−11796	−5581	−1931	−933.5	−1383	−1034	−805.4	−2229	−2493	−3810	−8385	−1468

Variables	25	26	27	28	29	30	31	32	33	34	35	36
Size	0.556	0.432	0.262	0.454	0.791	0.753	0.289	0.346	0.487	0.461	0.542	0.747
	9.425 ***	10.301 ***	11.387 ***	13.897 ***	9.574 ***	8.245 ***	2.82 ***	3.487 ***	9.508 ***	10.044 ***	7.064 ***	8.85 ***
Labor	0.651	0.32	0.643	0.462	0.731	0.583	−0.072	1.754	1.018	0.513	−1.342	−0.417
	2.992 ***	2.394 **	6.421 ***	3.272 ***	2.403 **	2.369 **	−0.092	3.518 ***	3.145 ***	1.478	−2.038 **	−0.662
Mat	0.977	0.842	1.499	0.848	0.985	0.31	0.746	2.248	0.652	0.787	−0.095	0.456
	3.762 ***	4.846 ***	14.779 ***	5.843 ***	2.703 ***	0.815	1.213	4.177 ***	2.504 **	3.015 ***	−0.187	0.932
Prod	0.589	0.363	0.552	0.325	0.565	0.364	0.202	0.707	0.409	0.205	0.027	0.144
	7.276 ***	7.094 ***	16.993 ***	7.531 ***	5.254 ***	3.242 ***	1.311	4.125 ***	5.204 ***	3.032 ***	0.237	1.262
N	3752	9909	39944	16278	3993	3815	1526	2012	6017	7796	2907	2643
Loglikelihood	−1232	−2847	−10031	−4260	−739	−673.1	−430.8	−490.5	−1712	−2080	−672.8	−643

Variables	37	38	39	40	41	42	43	44	45	46	47
Size	0.559	0.718	0.544	0.506	0.474	0.335	0.424	0.677	0.324	0.626	0.436
	8.032 ***	10.2 ***	5.008 ***	11.228 ***	5.029 ***	3.813 ***	5.928 ***	7.189 ***	3.679 ***	9.05 ***	3.479 ***
Wage	0.032	0.383	0.482	1.058	−0.28	−0.465	0.427	−1.015	1.152	0.444	0.174
	0.385	1.085	0.984	4.865 ***	−1.631	−0.586	1.015	−1.388	1.858 *	2.439 **	0.358
Mat	0.294	−0.103	0.313	0.789	0.892	1.116	1.191	0.213	0.802	1.099	1.435
	0.959	−0.288	0.715	3.366 ***	2.22 **	2.073 **	3.08 ***	0.413	1.607	3.924 ***	2.26 **
Prod	0.301	0.207	0.013	0.565	0.585	0.75	0.436	0.062	0.504	0.307	0.068
	3.333 ***	2.144 **	0.135	7.387 ***	3.933 ***	5.075 ***	4.022 ***	0.52	3.556 ***	4.368 ***	0.557
N	3846	4431	1851	8771	1868	2626	3281	2386	2107	3275	1110
Loglikelihood	−939.6	−942.6	−505.1	−2150	−433.9	−597	−897.1	−526.2	−571	−1010	−269.2

Italic figures are z-values

*** statistically significant at 1 %, ** statistically significant at 5% and * statistically significant at 10%.

Sectoral dummies are omitted

Regression 2: Multi-plant decision

Prefecture c	1	2	3	4	5	6	7	8	9	10	11	12
Size	0.774	0.705	0.745	0.819	0.643	0.647	0.635	0.815	0.811	0.914	0.854	0.802
	23.624 ***	10.573 ***	12.95 ***	16.503 ***	10.643 ***	13.118 ***	16.422 ***	22.683 ***	20.629 ***	24.038 ***	34.654 ***	24.14 ***
Wage	−0.394	−0.038	0.585	0.277	0.296	1.241	1.267	0.745	0.437	0.152	0.405	0.801
	−1.46 *	−0.086	1.965 **	0.768	0.74	3.791 ***	4.598 ***	2.678 ***	2.92 ***	0.535	1.861 *	2.473 **
Mat	1.29	0.812	0.459	0.803	0.602	0.436	0.616	1.205	0.922	0.532	1.31	1.338
	6.84 ***	2.349 **	1.561	2.76 ***	1.696 *	1.766 *	2.77 ***	5.679 ***	4.896 ***	2.427 **	7.831 ***	5.803 ***
Prod	0.337	0.297	0.232	0.286	0.122	0.479	0.559	0.332	0.395	0.108	0.481	0.377
	8.241 ***	3.889 ***	2.918 ***	3.834 ***	1.34	5.199 ***	7.671 ***	5.921 ***	6.858 ***	1.966 **	10.112 ***	7.042 ***
N	10751	2652	3178	4750	3202	4641	7047	8609	8148	9542	20476	9020
Log Likelihood	−3734	−878.1	−1188	−1492	−1130	−1526	−2508	−2879	−2266	−2675	−5448	−2938

Variables	13	14	15	16	17	18	19	20	21	22	23	24
Size	0.9	0.832	0.674	0.95	0.884	0.826	0.854	0.774	0.921	0.881	0.844	1.009
	54.388 ***	36.002 ***	19.685 ***	15.792 ***	16.186 ***	14.322 ***	13.622 ***	22.739 ***	25.535 ***	33.34 ***	44.385 ***	23.099 ***
Wage	0.223	0.29	0.842	1.601	1.695	0.442	−0.177	0.615	0.416	−0.08	0.577	1.327
	3.141 ***	2.271 **	3.549 ***	3.899 ***	5.448 ***	0.935	−0.384	3.405 ***	2.828 ***	−0.41	4.52 ***	4.187 ***
Mat	0.861	1.07	1.026	0.818	1.54	1.133	−0.037	0.772	0.101	0.581	1.088	0.827
	10.115 ***	7.987 ***	5.223 ***	2.391 **	5.613 ***	3.308 ***	−0.106	4.271 ***	0.721	3.765 ***	10.196 ***	3.32 ***
Prod	0.251	0.251	0.395	0.358	0.477	0.241	0.101	0.271	0.329	0.127	0.317	0.28
	9.767 ***	7.302 ***	6.552 ***	3.216 ***	5.473 ***	2.542 **	1.144	4.941 ***	5.81 ***	3.364 ***	10.5 ***	4.321 ***
N	53184	16058	10803	4451	7168	5009	3629	10036	12879	18189	34336	7107
Loglikelihood	−15260	−5540	−3120	−1037	−1429	−1135	−1001	−2850	−2814	−4925	−9281	−2003

Variables	25	26	27	28	29	30	31	32	33	34	35	36
Size	0.91	0.573	0.866	0.933	0.901	1.07	0.558	0.479	0.722	0.817	0.766	0.731
	19.413 ***	19.122 ***	47.818 ***	36.263 ***	13.671 ***	14.512 ***	7.086 ***	6.886 ***	18.665 ***	24.347 ***	14.423 ***	10.893 ***
Wage	0.422	0.595	0.038	0.247	0.137	0.232	0.894	1.032	0.397	0.776	0.894	0.238
	2.028 **	5.372 ***	1.049	2.711 ***	0.385	0.717	1.958 *	2.603 ***	1.727 *	3.365 ***	2.663 ***	0.673
Mat	0.664	0.474	0.911	0.638	0.578	−0.306	1.039	1.17	0.409	0.55	1.478	0.312
	2.888 ***	3.623 ***	10.546 ***	5.433 ***	1.777 *	−0.931	2.376 **	3.055 ***	2.038 **	2.926 ***	4.468 ***	0.884
Prod	0.326	0.207	0.307	0.184	0.186	0.061	0.032	0.53	0.115	0.102	0.312	0.003
	5.244 ***	5.595 ***	12.561 ***	5.894 ***	2.245 **	0.751	0.307	4.347 ***	2.249 **	2.232 **	4.053 ***	0.045
N	4485	11640	43945	18460	4318	4073	1791	2437	7056	9127	3615	2991
Loglikelihood	−1591	−4565	−11156	−5402	−966.4	−879.7	−613.2	−843.4	−2509	−3188	−1128	−890.4

Variables	37	38	39	40	41	42	43	44	45	46	47
Size	0.859	0.868	0.595	0.826	0.902	0.73	0.774	0.849	0.583	0.9	0.697
	15.14 ***	14.821 ***	6.894 ***	23.565 ***	12.355 ***	9.512 ***	12.565 ***	11.531 ***	7.471 ***	16.292 ***	5.203 ***
Wage	0.031	0.641	0.639	0.885	−0.372	1.999	0.838	−0.714	0.479	−0.075	1.314
	0.536	2.756 ***	1.469	3.943 ***	−2.771 ***	2.602 ***	2.774 ***	−1.182	0.802	−0.319	2.427 **
Mat	−0.002	−0.369	0.629	1.298	1.071	1.923	1.084	0.193	1.096	0.952	2.427
	−0.007	−1.282	1.635	6.44 ***	3.377 ***	3.54 ***	3.341 ***	0.452	2.318 **	3.864 ***	3.652 ***
Prod	0.251	0.182	0.363	0.687	0.325	1.286	0.485	0.168	0.257	0.161	0.649
	3.514 ***	2.239 **	3.29 ***	11.078 ***	3.386 ***	8.229 ***	4.975 ***	1.636	2.148 **	2.859 ***	3.495 ***
N	4285	4862	2108	9921	2227	2993	3688	2703	2211	3819	1194
Loglikelihood	−1171	−1168	−664.1	−2736	−646.5	−594.4	−1001	−726.7	−619.5	−1283	−246.4

Italic figures are z-values.
*** statistically significant at 1 %, ** statistically significant at 5% and * statistically significant at 10%.
Sectoral dummies are omitted

Table 6: Sectoral Results (Logit regression in 1980)

Regression 1: HQ separation

Variables	Sector Code	1	2	3	4	5	6	7	8	9	10
Size		0.509	0.68	0.633	0.621	0.604	0.577	0.495	0.252	0.229	−0.011
		22.892 ***	*16.98* ***	*24.613* ***	*22.595* ***	*18.011* ***	*16.501* ***	*11.231* ***	*7.826* ***	*6.179* ***	*−0.1*
Labor		0.439	0.239	0.803	0.139	0.249	0.965	0.831	0.727	−1.938	0.389
		3.723 ***	*1.348*	*6.649* ***	*1.94* *	*2.309* **	*5.705* ***	*3.316* ***	*4.093* ***	*−4.481* ***	*0.436*
Mat		1.2	1.349	0.918	0.315	0.65	0.837	1.319	1.241	−0.041	3.08 ***
		10.057 ***	*6.955* ***	*7.662* ***	*2.834* ***	*5.164* ***	*4.625* ***	*6.295* ***	*7.284* ***	*−0.169*	*4.399*
Prod		0.371	0.525	0.35	0.309	0.205	0.455	0.566	0.561	0.287	0.191
		12.846 ***	*10.142* ***	*9.393* ***	*8.291* ***	*6.216* ***	*7.967* ***	*8.926* ***	*9.701* ***	*4.716* ***	*1.57*
N		31449	16421	36062	24655	25257	17829	10272	24841	3499	395
Log likelihood		−8182	−3117	−6685	−6310	−6445	−4794	−2871	−5295	−1929	−234.4

Variables	Sector Code	11	12	13	14	15	16	17	18	19	20
Size		0.432	0.837	0.469	0.298	0.419	0.453	0.296	0.388	0.414	0.388
		6.963 ***	*11.484* ***	*16.843* ***	*7.347* ***	*8.208* ***	*21.658* ***	*14.187* ***	*18.557* ***	*12.387* ***	*9.993* ***
Labor		0.651	1.158	0.404	0.299	0.551	0.692	0.668	−0.13	1.111	0.059
		3.242 ***	*3.171* ***	*4.085* ***	*0.767*	*2.501* **	*5.369* ***	*3.893* ***	*−2.955* ***	*5.078* ***	*0.588*
Mat		1.755	1.396	1.181	0.859	1.556	1.438	1.86	0.585	0.902	1.409
		6.039 ***	*4.369* ***	*9.623* ***	*3.497* ***	*6.191* ***	*14.376* ***	*14.87* ***	*7.53* ***	*4.907* ***	*7.057* ***
Prod		0.637	0.494	0.492	0.251	0.386	0.598	0.671	0.397	0.576	0.45
		6.916 ***	*4.928* ***	*14.079* ***	*3.65* ***	*5.193* ***	*17.738* ***	*15.323* ***	*12.557* ***	*8.593* ***	*6.715* ***
N		4503	5350	18522	5921	3509	45088	34382	21922	12521	6859
Log likelihood		−1165	−1081	−6297	−2185	−1342	−13173	−10117	−7373	−3353	−2112

Regression 2: Multi-plant decision

Variables	Sector Code	1	2	3	4	5	6	7	8	9	10
Size		0.976	0.981	0.822	0.797	0.94	1.065	0.809	0.732	0.681	0.007
		51.172 ***	*28.844* ***	*43.492* ***	*35.877* ***	*30.897* ***	*28.888* ***	*25.086* ***	*28.95* ***	*23.316* ***	*0.096*
Labor		0.376	0.238	0.8	0.512	−0.242	−0.188	0.073	0.676	0.643	−5.235
		3.148 ***	*1.731* *	*8.056* ***	*4.49* ***	*−1.154*	*−0.641*	*0.961*	*4.133* ***	*3.047* ***	*−3.967* ***
Mat		1.572	0.369	0.54	0.034	0.74	0.186	1.322	0.579	1.724	0.291
		13.985 ***	*2.11* **	*5.722* ***	*0.319*	*4.755* ***	*0.791*	*9.102* ***	*3.684* ***	*8.992* ***	*0.476*
Prod		0.403	0.227	0.157	0.097	0.167	0.114	0.358	0.396	0.277	0.183
		16.238 ***	*5.372* ***	*5.834* ***	*2.996* ***	*4.909* ***	*1.89* *	*9.073* ***	*7.45* ***	*6.755* ***	*1.863* *
N		34909	17546	39703	28289	27294	18699	12065	27276	5044	871
Log likelihood		−8717	−3545	−10295	−9274	−6324	−3358	−4128	−6282	−2504	−530.5

Variables	Sector Code	11	12	13	14	15	16	17	18	19	20
Size		0.926	0.996	0.764	0.654	0.782	0.901	0.811	0.716	0.797	0.741
		18.636 ***	*15.29* ***	*35.485* ***	*20.97*	*18.688* ***	*48.618* ***	*46.25* ***	*46.379* ***	*33.493* ***	*22.918* ***
Labor		−0.003	1.311	0.427	0.404	0.28	0.331	0.401	−0.039	0.189	−0.026
		−0.052	*4.345* ***	*4.938* ***	*1.59* ***	*1.663* *	*3.112* ***	*3.155* ***	*−0.956*	*1.001*	*−0.176*
Mat		0.326	0.243	1.723	1.588	0.943	0.9	1.071	0.32	1.036	0.4
		1.42	*0.833*	*16.508* ***	*8.579* ***	*4.112* ***	*9.535* ***	*9.648* ***	*5.274* ***	*6.982* ***	*2.181* **
Prod		0.004	0.342	0.609	0.376	0.103	0.43	0.228	0.101	0.289	0.028
		0.075	*3.744* ***	*21.408* ***	*7.141*	*1.965* **	*14.173* ***	*6.957* ***	*4.808* ***	*6.836* ***	*0.546*
N		5068	5806	22494	7158	4201	49641	38499	27249	14925	7929
Log likelihood		−1426	−1243	−8526	−2773	−1543	−13071	−10967	−11634	−5107	−2640

*** statistically significant at 1 %, ** statistically significant at 5% and * statistically significant at 10%.
Prefecture dummies are omitted

Figure 1: Marginal Effect in Plant Size