The Determinants of Changes in Outsourcing Practices: Evidence from Spanish Plant-Level Data*

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Abstract

In this paper we empirically explore the determinants of changes in outsourcing of services in manufacturing plants using detailed information on a data set from a new plant-level survey from 926 plants distributed in all manufacturing industries in Spain. In particular, and among many other things, survey respondents are asked how their practices of outsourcing of services to others had changed in the last three years. The answer to this question is informative of the changes in the importance of backward integration for each of the plants interviewed. Using other information provided in the survey, we relate the reported changes in outsourcing to changes in other relevant dimensions as possible determinants of the boundaries of the firm. Our findings show that increases in outsourcing of services are positively correlated with increases in the plant's market share and increases in product market competition. We also find that integrated plants and independent plants adjust their outsourcing practices differently to changes in their competitive environment. Our main result is more consistent with Adam Smith's claim that the extent of the market seems to be the only factor consistently limiting the degree of specialization, than it is with implications of other vertical integration theories.

Keywords: outsourcing, manufacturing plants, market share, competition,

JEL codes: L23, L22, L60

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1. Introduction

Simple observation and empirical evidence over the years have shown that firms and organizations display a wide variety of ways to organize their production. This fact remains a puzzle for economists since most theoretical approaches cannot explain different organizational forms taking place in the same industry (see Grossman and Helpman (2002) among others[1]). Therefore, understanding the organization of production within and across industries as well as within and across firms' boundaries is important for economics in general.

The study of the organization of production began with the seminal paper by Coase (1937). Coase's contribution remains being the first to post the question of why firms organize their production in the way they do. Not much later, Williamson (1975 and 1979), Klein, Crawford and Alchian (1978) and Grossman and Hart (1986) started the well-known vertical integration theories of Transaction Cost Economics (the former two) and Property Rights Theories (the latter). Despite these various theories, empirical evidence on vertical integration and outsourcing has come scarce. Even though early papers by Masten (1984) and Monteverde and Teece (1982) seem to support predictions of Transaction Cost Economics theories, these and other more recent papers say little about Property Rights Theories (see Whinston, 2003). In fact, in a recent survey paper of this empirical literature, Lafontaine and Slade (2008) emphasize the fact that more papers in this area are needed since economists do not fully understand yet how different theories and their different organizational trade-offs are relevant for making sense of outsourcing patterns that we observe in the real world.

Our paper here is an exercise that uncovers empirical correlations between changes in plants' levels of outsourcing of services and other changes in the plants' competitive environment. We hope that this resulting empirical evidence sheds light on possible determinants of outsourcing practices. Therefore our contribution is mainly on the

[1] Legros and Newman (2008) is an exception where, under certain circumstances, different organizational forms coincide in an industry.

empirical side and, if anything, we hope our results will foster further theoretical research that may provide sound explanations for the patterns in outsourcing that we find in our data set.

For this reason, we present a new data set on manufacturing plants[2] in Spain. This unique data set is comprised of direct information on several plants' practices for 926 industrial establishments in Spain. The data set has its origin on a survey conducted in 2006. All surveyed establishments are involved in production processes within the manufacturing sector. The questionnaire consists of 152 questions grouped in eight sections and some of these questions provide valuable information regarding backward integration and outsourcing practices of services. Overall, we obtain very homogeneous data for every surveyed plant. At the same time, the survey contains a wide scope of different establishments within the manufacturing sector.

Since the variables of interest in this data set, and relevant to our study, are informing us of changes occurred in outsourcing of services within a plant (as well as changes in other plant dimensions) in the last three years, we take these as proxy variables for the direction of change and the sign of the variable first differences. We then empirically examine how changes in outsourcing correlate with changes in the plants' competitive environment (our explanatory variables). We also create indicator variables for whether the plant experienced an increase in outsourcing of services as well as similar dummy variables for other changes at the plant level. We proceed to run linear probability OLS regressions as well as probit regressions. Finally, taking advantage of the ordered nature of the dependent variable we also run ordered logit and rank-ordered logit regressions.

Our main findings show that increases in market share and increases in product market competition are positively correlated with increases in outsourcing. We also find some evidence that increases in new technology adoption are associated with increases in outsourcing of services. These findings are robust to the inclusion of industry fixed effects as well as to using different specifications.

We investigate further the robustness of these results and consider whether plants belonging to one-plant firms (independent plants) and plants belonging to multi-plant

[2] Here, we use the terms plant, establishment and manufacturing factory interchangeably.

firms (integrated plants) react differently to the changes in our explanatory variables. We find that these two types behave differently and therefore our main findings are the result of a composition effect. In particular, we find that changes in outsourcing in independent plants are more likely to be associated to increases in new technology adoption while changes in outsourcing in integrated plants are not. All plants are more likely to increase outsourcing when facing increases in market share and increases in competition. This difference in behavior also informs us that some plants are constrained in the way how they can reorganize their production and outsourcing practices. While independent plants are more likely to change their organization of production when facing changes in their competitive environment, integrated plants are more likely to "ignore" those changes in their competitive environment (new technological adoption).

Finally, we worry that despite the use of variables in differences in our analysis and the inclusion of industry and sector fixed effects there may still be problems of variable omission. For this purpose, we include other regressors that may be correlated with the error term in ways that our main specifications are not capturing. Our results are also robust to this final robustness checks.

The paper is organized as follows. After this introduction, we describe the data that we use for this study in section 2. Section 3 presents our methodology. Next, we show our results and the robustness checks that we undertake in section 4. In that section, we also offer a discussion of how our findings relate to previous results in the empirical make-or-buy literature. Section 5 concludes.

2. Data Description

In this section we describe the data source, how the data were collected and the variables that we use in our empirical exercise. We will start by describing the questionnaire from which we obtained the data set. Then we will proceed to describe the variables used in our analysis.

2.1 **The questionnaire**

Our analysis is based on data from a Spanish data set collected in 2006 as part of a survey on firms' employment and work practices in the Spanish manufacturing industry. Information was collected at the establishment level. Establishments are unique locations where economic activity takes place. In our case, and for the manufacturing industry, those locations are manufacturing factories. The data was gathered through personal interviews with managers in those manufacturing factories with fifty or more employees, and represents a unique source of information about diverse management practices in Spain. The project was intended to be a partial continuation of a previous study carried out in 1997.

The main reason to undertake the analysis at the establishment level, and not at the firm level, is that the establishment is the unit at which decisions about the implementation of the practices of interest are taken. Furthermore, we expected the knowledge of the issues and questions included in the questionnaire to be greater at plant level and, as a consequence, the information gathered to be more reliable. This idea was corroborated in the pre-test and confirmed, afterwards, during the development of the survey.

Once defined the objectives and scope of our study, and in order to properly design the questionnaire, we carried out a thorough examination of the literature related to the purpose of the project. With this information gathered, a first draft of the questionnaire was drawn up jointly by the members of the research group and the company in charge of the fieldwork. The questionnaire was pre-tested in nine plants. The pretest confirmed that the wording of the questions was precise and easy to understand by the respondents since no problems emerged during this part of the design process.

This final version of the questionnaire consists of 152 questions grouped in the following eight sections: General Characteristics of the Plant and the Firm, Human Resources, Payment Systems, Work Organization, Human Resource Outcomes, Human Resource Function, Other Groups of Workers and Characteristics of the Plant Manager.

The data was drawn from personal interviews with the general manager of the plant. The universe of potential respondents for the purposes of the project was constituted for all Spanish manufacturing establishments with fifty or more employees in 2005, which amounts to 6971 units. The aim was to obtain a sample of one thousand units, in order to get conclusions that could be extended to the entire Spanish manufacturing industry. After stratification by sector, size and location, a random selection of workplaces was obtained from the 2005 Spanish Central Directory of Firms (*Directorio Central de Empresas*, DIRCE) of the Spanish National Statistics Institute (*Instituto Nacional de Estadística*, INE). Finally, 1002 establishments were interviewed, what represents 14.38% of the total target population. The response rate was 25.44%.

The interviews with those managers that agreed to answer our questionnaire were performed by specially trained professionals using computer assisted telephone interviews (CATI). The establishments were first approached by a letter or an email indicating the goals of the survey and including a copy of the questionnaire.

2.2 The variables

In what follows, we describe the variables used in our empirical analysis. We chose these variables mainly because of availability and prediction power according to well established theories of vertical integration (price, production cost, plant size, market share, etc). The sample means, standard deviations and definitions of these variables are presented in Table 1.[3]

[Table 1 here]

The questionnaire provides information on the factors that influence outsourcing practices of services, that is, backward vertical integration of services necessary for

[3] See that, even though 1002 plants were interviewed, only 926 of those responded to the question whether changes in outsourcing of services had occurred in the previous three years.

production. We obtain the information on those factors from the answers given in the questionnaire to a block question. In that question, the establishments are asked about the evolution of several aspects related to the plant in the three years previous to the survey. The seven aspects considered are the following (the name of the corresponding variable appears in parenthesis): the change in the outsourcing carried out by the plant (*change in service outsourcing*), the change in the number of employees at the plant (*change in # employees*), the change in the plant's production cost (*change in production cost*), the change in the plant's product quality (*change in product quality*), the change in the plant's product price (*change in product price*), the change in competition in the main sector where the plant develops its activity (*change in competition*) and the change in the market share of the plant (*change in market share*). For each one of these questions, the establishments were given five different options ranging from a large reduction (1) to a large increase (5) in the aspect being evaluated. We have recoded these answers assigning value 1 if there is an increase (values 5 and 4 in the original answer), value 0 if there is no change (value 3 in the original answer) and value -1 if there is a decrease (values 1 and 2 in the original answer). We used this criterion mainly because most observations in the original answer took values 2, 3 and 4 and therefore relying only on the extreme values 1 and 5 would have left us with almost no variation.

Along with these core variables, there are some others that we have used as controls in our empirical analysis. We can classify them in two groups depending on the type of question that was used to create the variable: questions that inquired a quantitative answer and questions that inquire a qualitative answer from the interviewee (again, the name of the corresponding variables appears in parenthesis). Among the first group we have the percentage represented by the labor costs in the total production cost of the establishment (*percentage labor cost*), the year in which the plant was built (*first year of plant*), the average number of employees that the plant had in the year 2005 (*average # employees 2005*) and a dummy variable that takes value zero if the plant is independent (it belongs to a single-plant firm) and value one if the plant is integrated (it belongs to a multi-plant firm). We only use this information to break our sample into plant types. In the second group we have only one variable (*change in technology*). In our survey, the establishments are asked about the technical change implemented by the plant in the three

years previous to the survey, if any. To answer that question, they were given five different options ranging from a total change to no change at all. From the answers gathered to that question we construct our variable in the following way: we assign value 1 if there has been substantial change in technology (values 5, 4 and 3 in the original answer), value 0 if there has been slight change or no change (values 1 and 2 in the original answer).

Let us now describe the summary statistics in Table 1. In this table, we provide summary statistics of the variables described above with values -1, 0 and +1, as well as indicator variables that are transformation of these and that take value 1 if there was an increase in the variable and 0 otherwise. See for example that, according to Table 1, 38% of the plants increased their outsourcing of services, 43% increased their number of employees, 63% increased the amount of technology, and 48% of the plants belong to multi-plant firms. Note that for some of the remaining variables used in our empirical analysis, we do not have information for the full sample. Of these other variables, we can see that 69% increased their production costs, 69% increased their product quality, 59% increased their product price, 63% saw their product market competition increase, and 48% increased their market share. On average, these plants had 190 employees, were built up in 1968 and their labor cost represent 31% of their total cost of production.

Table 2 breaks down in our sample the dependent variable "Change in Outsourcing?" by industry. This table shows the number of plants in each industry and the number of plants within each industry that decreased outsourcing of services, the number that did not experience any changes and the number of those that increased outsourcing of services. In total, 105 out of the 926 plants decreased outsourcing, 467 did not change and the remaining 354 increased outsourcing. Most industries follow the same pattern, except for "Mechanical Equipment," "Electrical Equipment" and "Transportation Equipment." These three differ from the others in that they have more plants increasing outsourcing than experiencing no change. All other industries are similar otherwise.

[Table 2 here]

The last table in this section is Table 3. This table reports Spearman rank correlations between the variable "Change in Outsourcing" and each one of the other variables in Table 1 named "Change in Y" (where Y stands for Production Cost, Quality, etc). Spearman rank correlation is a better statistic in this case because it provides a correlation between variable pairs without assuming linearity of the variables. The results in Table 4 show that there is a positive (and statistically significant) correlation between "Change in Outsourcing?" and all the other variables. Some of these are stronger than others. For example, the strongest correlations are for "Change in # Employees?" (0.11) and "Change in Market Share?" (0.24), while the weakest correlations are for "Change in Product Quality?" (0.057) and "Change in Technology?" (0.067).

[Table 3 here]

3. Empirical Methodology

The traditional empirical approach in the literature of the determinants of organizational form runs a simple OLS regression using cross-sectional data[4] such that,

$$Y^*_{it} = \alpha + \beta X^*_{it} + u_{it} \qquad (1)$$

where Y^*_{it} is an indicator variable for the extent to which a firm i uses a determinate organizational form, X^*_{it} is a control variable that includes various determinants of organizational form (according to the theory or theories that are being tested) and u_{it} is just some random noise where each observation is assumed to be an identically and independently random draw from a normal distribution. Our data does not allow us to perform this type of analysis because we do not observe the amount of outsourcing in

[4] See Monteverde and Teece (1982) or Masten (1984).

each plant. Instead, we only observe whether the amount of outsourcing increased, decreased or stayed the same.

For this reason, we transition from equation (1) to our final empirical regression by taking first differences from equation (1) and obtaining:

$$\Delta Y^*_{it} = \beta \Delta X^*_{it} + \Delta u_{it}. \qquad (2)$$

where ΔY^*_{it} and ΔX^*_{it} are first differences of variables Y^*_{it} and X^*_{it}, and $\Delta u_{it} = u_{it} - u_{it-1}$.

We still cannot observe this directly. In our study, ΔY^*_{it} and ΔX^*_{it} are latent variables since we can only observe whether $\Delta Y^*_{it} > 0$, $\Delta Y^*_{it} = 0$, or $\Delta Y^*_{it} < 0$ (the same goes for ΔX^*_{it}). For this reason, we create variables ΔY_{it} and ΔX_{it} such that $\Delta Y_{it} = +1$ if $\Delta Y^*_{it} > 0$, $\Delta Y_{it} = 0$ if $\Delta Y^*_{it} = 0$, and $\Delta Y_{it} = -1$ if $\Delta Y^*_{it} < 0$ (same rule would apply to ΔX_{it} and ΔX^*_{it}). Once this is established, we transform our variables into dummy variables $D[\Delta Y_{it}=+1]$ (and $D[\Delta X_{it}=+1]$) that take value 1 if $\Delta Y^*_{it} > 0$ (or $\Delta X^*_{it} > 0$) and 0 otherwise.

In our empirical analysis, we run three types of regressions. The first one is a simple OLS regression analysis taking the following regression equation as basis,

$$D[\Delta Y_{it} = +1] = \alpha + \beta D[\Delta X_{it} = +1] + \Delta u_{it}. \qquad (3)$$

This first specification is just uncovering raw correlations between our indicator variables. In the second type of analysis, we run a probit regression such that,

$$\text{Prob}\,[\Delta Y^*_{it} > 0] = \text{Prob}\,[\alpha + \beta D[\Delta X_{it} = +1] + \Delta u_{it} > 0] \qquad (4)$$

Finally, we take full advantage of the ranking-type form of our data and realize that if $\Delta Y_{it} > \Delta Y_{jt}$, it must also be true that $\Delta Y^*_{it} > \Delta Y^*_{jt}$ and therefore that $\beta D[\Delta X_{it} = +1] +$

$\Delta u_{it} > \beta D[\Delta X_{jt} = +1] + \Delta u_{jt}$. For this purpose, we run ordered logit and rank-ordered logit regressions such that,

$$\text{Prob}\,[\Delta Y_{it} > \Delta Y_{jt}] = \text{Prob}\,[\beta(D[\Delta X_{it} = +1] - D[\Delta X_{jt} = +1]) > \Delta u_{jt} - \Delta u_{it}] \qquad (5)$$

Along all specifications, we also introduce fixed effects at the industry level such that the determinants of changes in outsourcing practices are identified from variation within an industry and not out of industry-specific shocks common to all plants in a particular industry. Nevertheless, we anticipate that different plants within an industry may face different shocks or may react differently to these same shocks. In order to control for this underlying heterogeneity, we introduce all variables available to us in our data set that vary at the plant level and may be correlated with plant-level shocks that drive outsourcing decisions. We show our results in the next section keeping in mind that, eventually, we are posting an empirical question and therefore we are aiming to unravel which factors are correlated with observed changes in outsourcing practices in our sample.

4. Results

In this section we show the results of applying the methodology previously described. We divide the results presented here in two main bulks of evidence. The first part directly addresses the question of what are the determinants of the changes in outsourcing practices. The second part will try to explore alternative explanations and robustness checks for our initial results.

4.1 Initial Set of Results

We develop our first set of results in Tables 4 and part of Table 5. We start by showing results from Table 4 by running the regression specified in equation (3) in the methodology section. Table 4 shows correlation coefficients between a dummy variable that takes value 1 if a plant has increased outsourcing practices in the last three years and 0 otherwise and similarly defined variables describing changes in the competitive environment such as plant size, price, competition and market share, among others.

We start in column (1) of Table 4 with our simplest specification. This shows that increases in outsourcing of services are positively correlated with increases in product price, increases in competition, increases in market share and substantial increases in new technology adoption. In column (2) we repeat the analysis performed in the first column introducing industry dummies, with no apparent changes in the results. The second part of Table 4 (columns (3) and (4)) reports marginal effect probabilities of running probit regressions for the same set of data and specifications as in the first two columns. Not surprisingly, the marginal effects reflect the same set of results as described in the first two columns of this Table 4. Essentially, the most robust result across all specifications is that plants that increased their market share also increase their outsourcing of services. But also increases in outsourcing are positively correlated with increases in price, competition and adoption of new technologies.

[Table 4 here]

Finally in the first three columns of Table 5 we take advantage of the ordered-ranking form of the data and run ordered logit and rank-ordered logit specifications. The first two columns show results of running an ordered logit with and without industry fixed effects. The results change much from those in Table 4 since we now find that the only robust result here is that increases in market share are associated with increases in outsourcing of services. In column (3) we run rank-ordered logit regressions and find yet very similar

results. If anything, in this specification increases in competition and increases in new technology adoption also seem to be positively associated with increases in outsourcing of services.

[Table 5 here]

Before proceeding with various robustness checks below, let us summarize our findings so far. Our most robust result shows that increases in market share alone are correlated with increases in outsourcing. Finally, we have also find quite robust evidence that increases in product price, increases in competition, and increases in technology adoption seem to be positively correlated with increases in services outsourcing practices.

4.2 Alternative Explanations

Our first robustness check has to do with the unit of observation in our data set, the manufacturing plant. Our sample is composed by two types of plants: those that belong to multi-plant firms (integrated plants) and those that are firms by themselves (independent plants). The changes in outsourcing practices that take place in either of these types of organizational units may be very different even when the answer to whether outsourcing has increased is the same. Plants belonging to multi-plant firms may be experiencing a reorganization of services and tasks across plants within the firm, whereas we are certain that plants that are firms themselves (one-plant firms) are reorganizing activities across their boundaries when claiming a change in outsourcing practices.

For this purpose, we examine separately the behavior of plants belonging to one-plant firms and multi-plant firms in columns (4) to (9) in Table 5 using the same specifications as in the first three columns of this same Table. Columns (4) to (6) provide evidence for 385 integrated plants. One can see very clearly that increases in outsourcing practices that occurs in these plants is only associated with increases in market shares. Every other variable in the specification seems to have no explanatory role in this part of the sample,

except maybe for increases in competition in column (6). On the other hand, columns (7) to (9) run the same exact specifications for the remaining 432 independent plants and find basically the same results, these are that outsourcing practices in independent plants are positively associated to increases in market share as well, but also increases in competition and increases in new technology adoption.

Another potential problem that our analysis in Table 5 may have is that of omission bias. If this was a problem, even after including industry fixed effects, the difference in error terms may actually be correlated with our explanatory variables. This could potentially bias our results to the point of flipping signs of coefficients from negative to positive or vice versa or even making some variables statistically insignificant even though they have explanatory value for changes in outsourcing practices.

To address this issue, we basically use all relevant variables that are available in our data set and that describe dimensions of the plants that a priori may be correlated with differences in levels of outsourcing adopted by the firms. Therefore in the last three columns of Table 5 we introduce variables such as the percentage of labor costs for the plant, the average number of employees during 2005 and the year in which the plant started working as a proxy for the age of the plant. We introduce all these variables to attenuate the omission variable bias. The results from columns (10) to (12) show that the inclusion of these variables has no impact on the results obtained in previous tables. As a matter of fact, none of these three extra control variables appear to be statistically significant. Moreover, it is still true that increases in competition and market share alone are positively associated with increases in outsourcing of services at the plant level. Finally, there is some limited evidence that increases in new technology adoption are positively correlated with increases in outsourcing practices.

4.3 Discussion of Results

Some of the empirical findings portrayed here are consistent with a few results of different theories of vertical integration and outsourcing. As a starter, the finding that plants rely on outsourcing of services more when they obtain a larger market share is

consistent with Adam Smith's claim that the degree of specialization (more specialization means more outsourcing) is limited by the extent of the market. Our findings show that as firms can exploit economies of scale, the gains of specialization and outsourcing grow as well.

Even though a bit far-fetched from the usual scenario portrayed by Transaction Cost Economics theories, our result that increases in competition are correlated with increases in outsourcing is also consistent with predictions from this literature in that when a firm faces more competition the degree of vertical integration (outsourcing) decreases (increases). This is so because with increases in competition the value of relationship-specific investment (and the value of quasi-rents) decreases. Therefore the need to vertically integrate to prevent hold-up diminishes.

On this same result, recent theoretical papers associated with Property Rights Theories that highlight the role of competition in make-or-buy decisions have also argued that there is a positive relationship between competition and outsourcing (see De Bettignies, 2007). However, others such as Grossman and Helpman (2002) have shown that this relation could go either way. Therefore, this becomes an empirical question for which we provide partial evidence that, if anything, competition and outsourcing are positively correlated within our sample of Spanish manufacturing plants.

We have also examined the role of technology adoption in outsourcing decisions and, contrary to Acemoglu et al (2006), we find evidence that increases in technology adoption are positively correlated with outsourcing of services. We are aware that ours is a sample of manufacturing firms and that the outsourcing takes place in services and not manufacturing related activities (as in Acemoglu et al (2006)), but within the limitations of our data we find no support for their claims.

On the other hand, our results are also partially contradicting evidence of findings in Hortaçsu and Syverson (2008). First, contrary to them, we find that increases in market share or plant size (as they define plant size) are positively related to outsourcing. This is not much of a problem because we are examining outsourcing of services and they examine outsourcing of material inputs. Second, contrary to them, we find that independent plants (one-plant firms) and integrated plants (belonging to multi-plant

firms) show the same patterns in changes of outsourcing and adjust their make-or-buy decisions in similar ways to different changes in their market environment.

5. Conclusions

In this paper we have explored how plants within the Spanish manufacturing industry have changed their service outsourcing practices due to changes in their competitive environment. This empirical exercise sheds light at the make-or-buy decisions in a comprehensive manner since plants in our sample are spread across 12 manufacturing industries and therefore the analysis here departs from the industry-specific studies that have been flooding the empirical literature in vertical integration and outsourcing.

Our findings show that increases in the levels of outsourcing of services at the plant level are positively associated with increases in market share, market competition and new technology adoption in our sample of 926 manufacturing Spanish plants. Some of these results are consistent with both Transaction Cost Economics theories and Property Rights Theories predictions in patterns of vertical integration and outsourcing, but others are not. Eventually the simple explanation provided by Adam Smith in that the degree of specialization is limited by the extent of the market seems to be the most reconciling explanation for all the patterns that we observe in our paper.

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Table 1. Summary Statistics

Variable	Obs	Mean	Std. Dev.
Changes in Outsourcing?	926	0.268899	0.651024
Increase in Outsourcing?	926	0.38	0.49
Change in # Employees?	926	0.157667	0.828532
Increase in # Employees?	926	0.43	0.50
Change in Production Costs?	903	0.545958	0.729367
Increase in Production Costs?	903	0.69	0.46
Change in Product Quality?	920	0.681522	0.491147
Increase in Product Quality?	920	0.69	0.46
Change in Product Price?	904	0.471239	0.694267
Increase in Product Price?	904	0.59	0.49
Change in Competition?	910	0.596703	0.546003
Increase in Competition?	910	0.63	0.48
Change in Market Share?	843	0.37841	0.668503
Increase in Market Share?	843	0.48	0.50
Average # employees 2005	924	191.45	483.42
First year of plant	906	1968.84	29.22
Multi-Plant Firm?	926	0.48	0.50
Percentage Labor Cost	709	31.45	17.10
Change in Technology?	926	0.63	0.48

This table provides summary statistics of all variables used in our empirical section.

Table 2. Changes in Outsourcing of Services by Industry

	Decrease	No Change	Increase	Total
Food, Beverage and Tobacco	7	78	47	132
Textile	7	38	14	59
Wood and Cork	5	16	10	31
Paper and Graphical Arts	9	33	24	66
Chemical Industry	5	39	30	74
Plastics	17	30	18	65
Mineral Products no Metals	7	57	39	103
Metalic Products	18	72	56	146
Mechanical Equipment	6	32	33	71
Electrical Equipment	12	22	34	68
Transportation Equipment	4	25	28	57
Other Manufacturing Industries	8	25	21	54
Total	105	467	354	926

This Table decomposes the dependent variable in this study "How has outsourcing changed in the last 3 years in your plant?" by industry and for all the 926 for which this information is available. Similarly, this table also provides information regarding the number of plants available per industry in our sample.

Table 3. Spearman Rank Correlation Between the Change in Outsourcing and Other Changes

"Dep Var": Change in Outsourcing?	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Change in # Employees?	0.1096 (0.0008)***						
Change in Production Cost?		0.0899 (0.0069)***					
Change in Product Quality?			0.0577 (0.0805)*				
Change in Product Price?				0.0973 (0.0034)***			
Change in Competition?					0.0704 (0.0337)**		
Change in Market Share?						0.2412 (0.0001)***	
Change in Technology?							0.0678 (0.0391)**
Observations	926	903	920	904	910	843	926

P-Values in parentheses.* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4. Linear Probability & Probit Regressions of "Increase in Outsourcing"

Dep Var: Increase in Outsourcing?				
	OLS Regressions		**Marginal Prob.**	
	(1)	**(2)**	**(3)**	**(4)**
Increase in # Employees?	0.0167	0.0171	0.0168	0.0172
	(0.0369)	(0.0370)	(0.0380)	(0.0385)
Increase in Production Cost?	0.0391	0.0441	0.0409	0.0469
	(0.0363)	(0.0361)	(0.0379)	(0.0381)
Increase in Product Quality?	-0.0003	-0.0053	0.0002	-0.0052
	(0.0364)	(0.0366)	(0.0387)	(0.0392)
Increase in Product Price?	0.0620	0.0606	0.0673	0.0670
	(0.0335)*	(0.0339)*	(0.0348)*	(0.0353)*
Increase in Competition?	0.0637	0.0719	0.0665	0.0745
	(0.0338)*	(0.0344)**	(0.0351)*	(0.0357)**
Increase in Market Share?	0.1916	0.1893	0.1938	0.1939
	(0.0361)***	(0.0363)***	(0.0362)***	(0.0367)***
Change in Technology?	0.0596	0.0585	0.0641	0.0635
	(0.0343)*	(0.0341)*	(0.0355)*	(0.0357)*
Constant	0.1295	0.1268		
	(0.0443)***	(0.0449)***		
Fixed Effects	No	Industry	No	Industry
Observations	817	817	817	817
R-squared	0.06	0.08		

Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5. Ordered Logit (OL) and Rank-Ordered Logit (ROL) Regressions on "Change in Outsourcing?" Original Variable

Dep Var: Change in Outsourcing?												
Type of Regression:	**OL**	**OL**	**ROL**	**OL**	**OL**	**ROL**	**OL**	**OL**	**ROL**	**OL**	**OL**	**ROL**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
Increase in # Employees?	0.0520	0.0296	0.0544	-0.1851	-0.2149	-0.2053	0.2573	0.2594	0.2943	0.0010	-0.0051	0.1219
	(0.1557)	(0.1557)	(0.1424)	(0.2155)	(0.2230)	(0.1724)	(0.2250)	(0.2243)	(0.1751)*	(0.1776)	(0.1776)	(0.1620)
Increase in Production Cost?	0.2190	0.2385	0.0749	0.3517	0.4387	0.2134	0.1077	0.1087	-0.0504	0.2236	0.2140	-0.0330
	(0.1553)	(0.1559)	(0.0742)	(0.2241)	(0.2273)*	(0.1292)*	(0.2208)	(0.2282)	(0.0815)	(0.1777)	(0.1787)	(0.0784)
Increase in Product Quality?	-0.0115	-0.0150	-0.0140	-0.1121	-0.1096	-0.0653	0.0708	0.0487	-0.0118	-0.0163	-0.0085	-0.1123
	(0.1547)	(0.1558)	(0.0566)	(0.2299)	(0.2421)	(0.1229)	(0.2136)	(0.2201)	(0.0892)	(0.1787)	(0.1803)	(0.0876)
Increase in Product Price?	0.2570	0.2213	0.1457	0.4112	0.3357	0.1370	0.1263	0.0863	0.1310	0.2927	0.2578	0.1444
	(0.1422)*	(0.1468)	(0.0940)	(0.2127)*	(0.2213)	(0.1046)	(0.1959)	(0.2049)	(0.1550)	(0.1616)*	(0.1666)	(0.1186)
Increase in Competition?	0.1660	0.1959	0.3199	0.0941	0.0900	0.2983	0.2504	0.2945	0.3326	0.2693	0.2917	0.3819
	(0.1387)	(0.1439)	(0.1369)**	(0.2035)	(0.2140)	(0.1703)*	(0.1890)	(0.1985)	(0.1728)*	(0.1579)*	(0.1651)*	(0.1579)**
Increase in Market Share?	0.8668	0.8639	0.3878	1.1332	1.2592	0.5843	0.6140	0.5623	0.1606	0.9462	0.9452	0.4134
	(0.1529)***	(0.1538)***	(0.0826)***	(0.2260)***	(0.2334)***	(0.1679)***	(0.2125)***	(0.2142)***	(0.0868)*	(0.1727)***	(0.1746)***	(0.1058)***
Change in Technology?	0.1285	0.1122	0.2508	0.1794	0.1711	0.2400	0.0460	0.0721	0.2424	0.0168	-0.0064	0.1822
	(0.1432)	(0.1444)	(0.1418)*	(0.2167)	(0.2192)	(0.2087)	(0.1947)	(0.1960)	(0.1434)*	(0.1624)	(0.1641)	(0.1419)
Percentage Labor Cost										-0.0017	-0.0019	0.0016
										(0.0041)	(0.0042)	(0.0018)
Average # employees 2005										0.0001	0.0001	0.0001
										(0.0001)	(0.0001)	(0.0001)
First year of plant										0.0007	0.0010	-0.0002
										(0.0024)	(0.0025)	(0.0017)
Sample	Full	Full	Full	Integ. Plants	Integ. Plants	Integ. Plants	Indep. Plants	Indep. Plants	Indep. Plants	Full	Full	Full
Fixed Effects	No	Industry	Industry	No	Industry	Industry	No	Industry	Industry	No	Industry	Industry
Observations	817	817	817	385	385	385	432	432	432	644	644	644

Note: This table provides evidence on two types of regressions: Ordered Logit (OL) and Rank-Ordered Logit (ROL). I specify on top of each column what type of regression each specification belongs to. Columns (1) to (3) show results from using the whole sample. Columns (4) to (6) show results from the subsample of Integrated Plants. Columns (7) to (9) show results from the subsample of independent plants. Columns (10) to (12) show results from full sample adding three level variables, Percentage Labor Cost, Average Number Employees in 2005 and First Year of Plant.
Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.