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ABSTRACT

Job Losses, Outsourcing and Relocation: Empirical Evidence Using Microdata^{*}

Using microdata, we analyse the determinants of firm relocation and outsourcing decisions and their effects on firms' employment decisions. The results for a sample of 32 countries show that both strategies have been more intense in the EU-15 countries than in the rest and that, in some cases, they have been complementary. Regarding the determinants, we have found that while some characteristics such as size, age, activity sector, main market or belonging to a group affect both decisions, other such as a higher innovation, demand sensitivity or productivity explain why some firms choose to subcontract instead of relocate.

JEL Classification: R30, M55, M51

Keywords: firm relocation, outsourcing, triprobit model

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JOB LOSSES, OUTSOURCING AND RELOCATION: EMPIRICAL EVIDENCE USING MICRODATA

1. Background and objectives

Due to the fast emergence of new competitors both in the industrial sector (China) and in the services sector (India), together with the recent enlargement of the European Union to the east, fears of job losses have increased among European citizens during the last few years. These fears are usually linked to the perception of a speeding-up of the globalisation process. As highlighted by the OECD (2007a), one of the reasons of this acceleration is that globalisation increasingly involves foreign direct investment and trade not only in goods but also in services. In fact, globalisation is related to the associated phenomenon of “globalisation of value chains” or, in other words, to outsourcing and partial relocation.

Outsourcing occurs when firms opt to “buy” rather than “make” things in-house. Outsourcing therefore involves greater specialisation as firms switch from sourcing goods and services internally to sourcing them from separately owned suppliers. When this party is located in another country the term offshore outsourcing makes more sense. Offshoring, in contrast, represents the transfer of an organizational function to another country, regardless of whether the work stays in the corporation or not. Partial relocation occurs when firms move productive activities to a different location. This new location can be placed in the same country or in a different one.

As highlighted by Olsen (2006), it is important to distinguish “offshoring” from “outsourcing” and “relocation” (see table 1). Whereas outsourcing refers to the relocation of jobs and processes to external providers regardless of the provider’s location, offshoring refers to the relocation of jobs and processes to any foreign country without distinguishing whether the provider is external or affiliated with the firm. Outsourcing and relocation may therefore include job relocations both within and between countries, whereas offshoring refers only to international relocations. The term

offshore outsourcing therefore only covers the relocation of jobs or processes to an external and internationally located provider.

TABLE 1

This paper focuses on the determinants of outsourcing and firm relocation and its impact on employment from a microeconomic perspective¹. The identification of the determinants of outsourcing and relocation decisions is clearly relevant from a policy perspective. If we can identify which firms are likely to externalise part of their production or even move to a different location, proper policy measures may be taken to provide support to the most affected sectors or territories.

The paper adds to a growing literature on theoretical and empirical analysis of the microeconomic determinants of relocation and outsourcing: Pennings and Sleuwaegen (2000), Van Dijk and Pellenbarg (2000), Kimura (2002), Brouwer et al. (2004), Girma and Görg (2004), Holl (2004), Mol, (2005), Tomiura (2005), Cusmano et al. (2006), Sleuwaegen and Pennings (2006), Holl (2007) and Diaz-Mora and Triguero (2007).

In particular, the objective of the paper is to test if there are different factors behind outsourcing and partial relocation decisions. While the main objective of both strategies will be related to minimize costs, there can be different reasons why firms prefer one alternative to the other. On the opposite, firms could also use both strategies in a complementary way. In particular, we will analyse the role of innovation and quality, but also the specific situation of labour intensive firms and multinationals. According to the previous literature, we will expect that highly specialised firms have a less propensity to outsource or relocate while labour intensive firms or firms belonging to multinational groups will have a higher propensity to reduce their activity levels.

A second aspect that will be tested is if the effect on firms' expectation of future employment of outsourcing and relocation is different. While both decisions have a direct negative effect on firms' employment, future developments are not clear. If the externalisation of part of its production enables a firm to relocate its relatively inefficient production processes to external providers with cheaper and perhaps more

efficient production capabilities, the firm can turn its focus to areas where it has a comparative advantage and expand output, or engage in new business activities that can have a positive effect on future employment.

Last, we will test if firms located in the European Union (EU-15) are experiencing the effects of globalisation with a higher intensity. Our database containing information for more than 30 countries will permit to test if there are different behaviours of firms located inside and outside the EU-15 during the analyzed period.

The paper contributes to the literature in several ways. Firstly, we make use of a dataset for the period 2003-2005, a period in which globalisation was growing and, at the European level, the introduction of the euro was completed and the single market took major steps forward. As a result, we expect firm relocation to be more relevant in this period than the period analyzed by previous authors. Secondly, we consider a wider sample of countries than in earlier studies, although focusing on the EU-15 countries. Lastly, following lines of research suggested by Brouwer et al. (2004), we consider the relative performance of firms within their own sectors, analysing various aspects (quality, productivity, profitability, time to market, and innovation) as potential determinants of relocation and outsourcing decisions. These aspects have not been in-depth analyzed by previous studies.

The rest of the paper is organised into three sections: firstly, in the second section, the existing literature is briefly summarised; then, in the third section, the dataset and the empirical evidence obtained are described; and lastly, the paper concludes with some final remarks.

2. Related literature

2.1. Theoretical framework

There are several studies analysing outsourcing and relocation determinants from a theoretical perspective. This section does not intend to summarise them all, but to

provide some theoretical insights on the reasons behind outsourcing and relocation decisions by firms.

As highlighted by Brouwer et al. (2004), relocation processes can be analysed in terms of neoclassical, behavioural and institutional theories. The neoclassical theory takes as a starting point the assumption that the location choice tries to maximise firm profits. From this perspective, determinants of firm relocation usually involve the characteristics of the host country relative to those of the home country. These characteristics can be related to market size, wage levels, worker education levels and so on. The behavioural location theory explores “internal” factors that are important in the decision-making process of a firm considering relocation. In particular, factors such as firm age and size are highlighted as relevant by this literature. Lastly, the institutional theory predicts that firm location is an outcome of a firm’s investment strategy and is, as a result, clearly influenced by external factors such as the growth in economic activity, the level of state intervention, or any involvement in a merger, takeover, or other similar situation.

Regarding outsourcing, Holl (2007) classifies the factors that influence the decision to subcontract into two groups: production cost factors and transaction cost factors. As highlighted by Abraham and Taylor (1996), subcontracting can imply production cost savings relative to in-house production in three ways; through labour cost savings, smoothing demand fluctuations and due to a specialised knowledge by the external provider. Transaction cost approaches argue that the choice between in-house production and subcontracting is also determined by the cost of setting up and maintaining a subcontracting relationship. Transaction costs arise from the need of asset specific investment and the specification, monitoring, and enforcement of contracts. Grossman and Helpman (2002) also emphasize that subcontracting will be more likely to be viable where firms find more potential subcontracting partners. When these costs savings exceed additional transaction and managerial from outsourcing, firms will opt for contracting out production.

Taking into account this summary, there seems to be a high degree of coincidence of potential determinants of outsourcing and relocation. First, a reduction in labour costs

seems to be an important determinant of both decisions. We will expect then that labour intensive firms will have a higher propensity to relocate part of its production or to subcontract to take advantage of lower wages in the new location or in the subcontracting firms.

Second, other common determinants of both decisions will be firm size, firm age, if the firm is part of a group and its main market. As suggested by Tomiura (2005), smaller firms could face higher search costs both to find contracting partners or new locations. A positive relationship between firm size and outsourcing and relocation would then be expected. Moreover, taking into account that outsourcing increases firm's capacity for adaptation and flexibility, it can be argued that large firms are more likely to carry out this process of vertically de-integration of production structures. Similar arguments can be used to consider the variable firm age as determinant of subcontracting and relocation. More mature firms could find suitable subcontractors or new locations easier due to a "learning effect" and due to higher incentives to focus on their core activities (Holl, 2004). Last, firms which are part of a network or competing in a global market have a higher potential to contract producers that are more efficient or to find locations that are more appropriate.

However, there are also specific factors of the decisions of outsourcing and relocation. For instance, according to the transaction costs theory, R&D intensive industries will tend to be vertically integrated because dedicated innovation will be particularly hard to achieve under outsourcing, as suppliers will tend to develop products that they can use for several customers (Mol, 2005). Following the cost saving theory, subcontracting allows firms responding to demand fluctuations. Firms may try smoothing their workload by subcontracting during peaks of demand. Therefore, we would expect that subcontracting decisions react to demand evolution, while relocation decisions will not be affected by the business cycle. An additional aspect to highlight is that once a business activity is outsourced, the technical expertise, infrastructure and knowledge to carry out that activity in house is eliminated or significantly reduced, and finally a firm has reduced options once having outsourced a business process. Retaining it in-house provides a degree of flexibility and protection in responding to future events (Cronin et al., 2002). Therefore, probably firms that are more profitable and productive firms

(which do not have an urgent pressure to cut costs) will be more reluctant to subcontract. It is worth mentioning that most studies have explored the impact of outsourcing on labour productivity (Olsen, 2006), while only very few studies have analysed the reverse direction of causality (Kimura, 2002; Tomiura, 2005; Cusmano et al, 2006).

Last, the advances in international economic integration after the World War II and its intensification during the nineties in some geographical areas such as the European Union have resulted in a gradual elimination of obstacles to trade and capital movements. For this reason, we could expect that outsourcing and relocation have been more intense in the EU countries than in other geographical areas.

Summarising, from the review on theoretical contributions, we formulate three hypotheses. First, as there are several common determinants of outsourcing and relocation decisions, firms with a certain combination of characteristics will probably not see outsourcing and relocation as alternative but complementary strategies. To our knowledge, this issue has not been explored in the literature. Second, there are, however, other determinants such as specialisation in innovation activities, demand sensitivity or profitability and productivity that can explain why some firms choose to subcontract instead of relocate. Third, it will also be interesting to test if relocating and outsourcing have been more intensely used in the European Union than in other geographical areas and if its determinants are different.

2.2. Empirical studies

This section focuses only on those previous studies considering outsourcing and relocation determinants from a microeconomic perspective.

From an empirical perspective, the first study to our knowledge that analyses relocation determinants at the firm level is Pennings and Sleuwaegen (2000). Using microdata on firms located in Belgium, they found that labour-intensive firms with a large workforce and links to a multinational group have higher probabilities of relocating. In a more recent study, Sleuwaegen and Pennings (2006) used a similar dataset for Belgium with

the aim of testing the following two hypotheses: first, if smaller firms relocate to a nearby location whereas larger firms move to a more remote location and, second, whether public aid distorts relocation decisions. They found that wages and market potential in a host region are important determinants for the location choice. Firm characteristics are also relevant as large firms have a higher propensity to relocate to remote countries, while public aid seems to affect only the decisions of firms moving to an adjacent region.

Using an approach similar to Pennings and Sleuwaegen (2000), Van Dijk and Pellenbarg et al. (2002) analysed the Dutch case and their main finding is that only factors internal to a firm and (surprisingly) external factors seem to have no effect on a firm's propensity to relocate.

Holl (2004) examined location determinants of domestic relocation in Portugal, comparing the situation in 1997 with the one observed in 1986. Relocation appears to be positively associated with domestic market accessibility, availability of producer services, and a large industrial base. Relocations are also more strongly attracted by the provision of inter-regional motorways.

Perhaps the most extensive study of this issue is the one by Brouwer et al. (2004). Using a multi-country dataset, they found a different result to Van Dijk and Pellenbarg (2000): the economic environment of firms does affect their mobility decisions. In particular, they found that change in a firm's demand is one of the key determinants of relocation.

Outsourcing has also been analysed from an empirical perspective by several studies. O'Farrell et al. (1993) analyse the demand by manufacturers in Scotland and South East England for key strategic business services. Their evidence suggests that variations in demand—and not restructuring strategies—are the primary cause of outsourcing. However, Doi (1999) obtained opposite results. In particular, he found that subcontracting relationships have an exit promoting effect on Japanese firms in the period 1981-1989. A possible explanation could be that exit costs are lower for firms with subcontractors than for firms with in-house production, since sunk costs are higher for plant closure than for rescinding subcontracting agreements. The Japanese case was

also analysed by Kimura (2002). In particular, he analysed subcontracting determinants of the Japanese machinery industry where this kind of arrangement is particularly relevant. He found that firm size does not seem to affect the use of subcontractors and that foreign-owned firms use subcontractors in a higher proportion. Tomiura (2005) uses a more detailed database and finds that more productive firms tend to be more active in outsourcing, and similarly that firms with more labour-intensive production tend to outsource more. Other factors positively related to outsourcing are the introduction of new technologies, skilled labour and higher R&D expenditures per employee.

Girma and Görg (2004) analysed the determinants of outsourcing in the chemical, engineering, and electronic manufacturing industries in the United Kingdom. Focusing on plant characteristics, they found that high wages were positively related to outsourcing. As they argue, this could suggest that cost-savings are important in the firm's decision to outsource. It could also indicate, however, a specialisation process by skill intensive plants in which they are outsourcing their relatively low-skill intensive processes.

Cusmano et al. (2006) analysed outsourcing and off-shoring using information from a sample of firms from Lombardy (Italy). Their results show that outsourcing is remarkably wide and interests all the industrial sectors to a similar extent. Firms with a higher specialization in R&D², with skilled labour, forming part of a group or more open to international trade have a higher probability to outsource. Moreover, they found that outsourcing has a clear regional dimension, concerning services at most, and taking the form of extended producer-driven chains, highly embedded in the regional system. This result was also found by Taymaz and Kiliçaslan (2005). These authors found that subcontracting can play an essential role in regional networking and development. However, they also highlighted that subcontracting relationships between large firms and small subcontractor firms do not necessarily have a developmental nature because large firms tend to transfer the burden of risks and costs onto their subcontractors (usually implying net job losses in the medium-to-long term).

More recently, Holl (2007) has explored the relationships between outsourcing and location. In particular, using data from a panel of Spanish manufacturing firms, she has found evidence that location matters. Firms in industry agglomerations are more likely to subcontract production activities. While in general, larger and older firms as well as high wage firms show a greater probability for production subcontracting, industry agglomeration particularly facilitates subcontracting for smaller and lower wage firms and it allows firms to respond to a greater degree to expansive demand conditions by taking advantage of subcontracting.

Last, using a dynamic panel data probit model for a wide sample of Spanish firms, Diaz-Mora and Triguero (2007) found that wages, product differentiation, industry-size, exporter status, market changes, R&D activities and product and process innovation affect positively the current subcontracting decision, but perhaps their most innovative result is that previous subcontracting decisions clearly affects current ones (inertia in subcontracting decisions).

Regarding employment effects, several studies have provided estimates of the potentially lost jobs due to offshoring but less attention has been paid to outsourcing in a more general sense. From a global point of view, outsourcing and partial relocation both create and destroy jobs, in the sense that someone is getting a job and someone is surrendering a job. However, certain regions, sectors and groups of workers may lose out in the process (OECD, 2007a and 2007b). For this reason, and due to data limitations, in this paper, we will only analyse if the effects of outsourcing and relocation on firms' employment dynamics are different.

3. Empirical evidence

The dataset used for the analysis is the 2005 Cranet Survey³. It is a representative survey of Human Resource Management policies and practices, based on standardised questionnaires and regularly carried out by several universities and business schools since 1990. It includes information about nearly 8,000 private and public firms located in 32 countries. The answers are related to the period 2003-2005.

An important difference related to the study by Brouwer et al. (2004), which uses a similar dataset, is that we do not limit our analysis to firms with more than 200 employees. However, we do not consider the answers of multi-plant firms which have not been disaggregated at the plant level. The reason for excluding these firms is that we would not be able to identify properly the firm characteristics that led to relocation or subcontracting. In particular, it would be impossible to distinguish the effect of size on relocation decisions from the influence of a higher number of plants. While large single-site firms are less willing to move, large multi-plant firms have a higher propensity to move because they have more plants that can be relocated (Pennings and Sleuwaegen, 2000). After excluding these observations, our initial effective sample includes the answers from 7,809 firms from more than 30 countries. Of these firms, 4,119 were located in the old member states of the European Union (EU-15) and the other 3,690 were located in non EU-15 countries (see table A.1 in the appendix for details).

Table 2 shows some descriptive statistics of the relevance of outsourcing and partial relocation in our sample. The 13.2 % of firms in the EU-15 countries used outsourcing and 11.8% of firms underwent relocation. For non EU-15 firms, these values were 10.7% and 6.5%. While the use of outsourcing is more or less similar in the two geographical areas, relocation is clearly higher in the EU-15 sample. It is worth mentioning that, using data for the period 1995-1997, Brouwer et al. (2004) found that the percentage of firms involved in relocation decisions was 8.0% for a set of countries including EU and non-EU members. That percentage is lower than the one found here, although the two values are not strictly comparable, because Brouwer et al. (2004) analysed firms with more than 200 employees. It is also worth mentioning that a 1.92% of EU-15 firms and a 0.92% of non EU-15 firms have simultaneously taken decisions to outsource and relocate in the considered period. Although small, this percentage implies that in the EU-15 one out of five of the firms that have relocated part of its production during the considered period have also used outsourcing. The value of the Pearson's contingency coefficients for outsourcing and relocation decisions for firms in the two geographic areas considered are statistically different from zero at the usual significance levels, which permits to affirm that there is a relationship between both decisions.

TABLE 2

In order to identify the determinants of both decisions and the effects on expected employment developments, two triprobit models are specified and estimated for firms located inside and outside the EU-15. The reason to estimate an equation system instead of estimating each equation separately is that our preliminary analysis has shown a significant correlation between the different pairs of outcomes. Ignoring the correlation across outcomes estimating uniequational probit models could lead to bias. The trivariate probit model permits us to estimate three dichotomous dependent variables simultaneously and explicitly model the correlation in disturbance terms using the GHK algorithm⁴.

The trivariate probit model used to estimate the influence of firm characteristics on outsourcing, relocation and employment evolution is given by the following expression:

$$\begin{aligned}
 y_1 &= \beta_1 \cdot X_1 + \varepsilon_1 \\
 y_2 &= \beta_2 \cdot X_2 + \varepsilon_2 \\
 y_3 &= \beta_3 \cdot X_3 + \varepsilon_3
 \end{aligned} \tag{1}$$

where y_1 , y_2 and y_3 are three dichotomous variables taking value 1 if, respectively, the firm has adopted outsourcing or relocation during the considered period and if its employment has increased. The terms X_1 , X_2 and X_3 denote the firm characteristics that influence the considered decisions and ε_1 , ε_2 , and ε_3 are random error terms. We assume that the error terms are multivariate normal distributed with averages equal to zero and variances equal to one. We allow, however, for correlated disturbances:

$$\begin{aligned}
 \text{Cov}[\varepsilon_1, \varepsilon_2] &= \rho_1 \\
 \text{Cov}[\varepsilon_1, \varepsilon_3] &= \rho_2 \\
 \text{Cov}[\varepsilon_2, \varepsilon_3] &= \rho_3
 \end{aligned} \tag{2}$$

These three correlation coefficients (ρ_1 , ρ_2 , ρ_3) will be estimated and will represent the extent to which unobserved covariates jointly determine the outcomes of interest. It is worth mentioning that proceeding this way, the coefficient estimates from the trivariate

probit model will account for unobserved correlation among the outcomes and will be therefore less biased and more efficient than those produced by three independent models will.

The explanatory variables in the two first equations are identical. A first group of dummy variables is related to firm size measured by number of employees. A second group is related to firm age. Activity sector and the main market for products and services are also controlled. A dummy variable controls firms belonging to a group. The last group of variables is related to the relative performance of a firm with respect to several aspects that could affect outsourcing and relocation decisions. In particular, different dummy variables control if firm's quality, productivity, profitability, time to market and the rate of innovation are below the average of the sector. This last group of variables is not included in the employment increase model. In all models, two additional variables are also included: first, a dummy variable takes value 1 if labour costs account for more than a 75% of total operational costs; second, sectoral GDP growth over the period 2003-2005 at the country level is included to account for different business cycle phases⁵. Last, the institutional framework in which a firm operates is controlled for, using country fixed-effects. Table A.2 in the appendix provides summary statistics for the endogenous and the exogenous variables for both, firms located inside and outside the EU-15. Due to data limitations, we have not been able to control for other determinants suggested by previous literature such as past subcontracting decisions or the existence of regional networks of firms.

The results of the trivariate probit model for firms located in the EU-15 are presented in table 3 while table 4 shows the results for firms not located in the EU-15. In particular, the marginal effects (i.e., the percentage change in the probability of the associated outcome with a one-unit change in the covariate of interest) are shown in both tables.

TABLES 3 and 4

Regarding firm size, the results show that large and medium firms have a higher probability of outsourcing in order to externalise part of their production than small firms do in both groups of countries. This result is probably related to the fact that smaller firms

may encounter more difficulties adjusting their production processes quickly to higher capital-to-labour ratios. As regards relocation decisions, we do not find that firm size significantly affects such decisions in the EU countries, but larger firms in non-EU countries have a higher probability of relocation. Results regarding employment increase are also different between the two groups of countries: while there is no significant difference in EU countries, in non-EU countries firms with less than 100 workers have been particularly dynamic in terms of job creation.

Firm age affects outsourcing and relocation but with different signs. Middle-aged firms have a lower propensity to relocate than younger or older ones in the EU-15 sample. However, these two groups have a higher propensity to outsource. This result is consistent with institutional theories highlighting the fact that older firms usually take part in networks that are difficult to break and that younger firms are more willing to relocate. In the sample of non EU-15 countries, the same results are found but only for older firms. The effects on employment increase are similar in both samples of countries: older and middle-aged firms are less dynamic than younger ones.

From a sectoral perspective, there are significant differences in outsourcing and relocation decisions. Private services have been found to be more mobile than other sectors in both samples and with a higher intensity in the non EU-15 sample. Regarding outsourcing, private services are significantly different from manufacturing in the non EU-15 sample, while all sectors have a higher propensity to outsource than manufacturing.

The main market of a firm clearly affects outsourcing and relocation decisions in both samples. In the EU-15 sample, firms serving local and regional markets have a lower probability of outsourcing than firms serving international markets, while in the non EU-15 sample only the same result is observed for firms serving national markets. Regarding relocation, EU-15 firms serving local markets and European ones have a lower probability than firms serving international markets do. In the non EU-15 sample, a similar result is observed for firms serving local and regional markets. Regarding employment increase, firms serving local and regional markets have experienced better results than the rest in the EU-15 sample. For the rest of countries, no significant differences are observed.

Firms that belong to a group do not have any significant different behaviour in the non EU-15 sample. However, in the EU-15 sample firms belonging to a group have a lower probability of outsourcing (although only significant at the 10% level) and a higher propensity to relocate.

The next set of dummy variables is related to the relative performance of a firm within its own sector with respect to several aspects: quality, productivity, profitability, time to market, and innovation. In the EU-15 sample, firms that are below their sector average in quality and innovation have a higher propensity to outsource, while the other factors do not have any significant effects. However, when looking at relocation decisions, profitability and time to market are the only relevant factors: low profitability firms and firms with slower than average time to market have a higher probability of relocating. In the non EU-15 sample of firms, profitability is the most relevant affecting both outsourcing and relocation decisions, while quality matters for relocation.

The next variable is related to labour intensive firms. These firms have a lower probability of outsourcing and a higher probability of relocation in the EU-15 sample, while in the non EU-15 significant differences are only observed for outsourcing decisions. In both samples, positive effects on employment increase are observed for these firms.

Demand fluctuations only affect firms located in the EU-15. In particular, GDP growth rates have a negative effect on outsourcing and a positive effect on relocation.

It is also important to point out that the estimated correlation coefficients, listed at the bottom of the two tables are statistically significant in all cases, suggesting that there are common unobservable factors that influence a firm decision to outsource, relocate and increase employment. The highest correlation is between outsourcing and employment increase; the correlation coefficient for these two outcomes is around -0.7 for both groups of countries. The correlation between relocation and employment increase is around -0.2 and between outsourcing and relocation is around 0.1.

Last, and in order to test if the role of the determinants of outsourcing and relocation together with firms' employment decisions are different in the firms located inside the

EU-15 that in the firms located outside the EU-15, we have carried out a LR test comparing the coefficients obtained for the full sample of firms with the ones obtained in the two separate sub samples. The obtained value of the test statistic is 225.92, which is clearly above the critical value of a chi-squared with 62 degrees of freedom, and so, we can affirm that there are significant differences between the different sets of marginal effects. However, it is important to remark that no significant differences are observed regarding the effects of outsourcing and relocation on firms' employment decisions.

4. Final remarks

Using microdata on firms for the period 2003-2005, we analyse the determinants of outsourcing and firm relocation and the effects on firm's job creation, putting special attention on EU-15 countries.

We have found evidence that there are some firm characteristics such as firms' size, age, the activity sector, the main market or belonging to a group, that have clear effects on both outsourcing and relocation decisions. In fact, there is also evidence that both strategies could be complementary for some firms due to additional unobservable characteristics. However, we have also found evidence that there are some factors such as a higher specialisation in innovation activities, demand sensitivity or profitability and productivity that can explain why some firms choose to subcontract instead of relocate. Last, descriptive statistics have shown that outsourcing and relocation have been more intense in the EU-15 countries than in the rest of analyzed countries during the considered period. Moreover, there are significant differences between the determinants of outsourcing and relocation decisions in the two geographical areas. However, there are no significant differences in the effects on firms' employment decisions. From our point of view, these results are particularly interesting from the perspective of policy makers, as they may facilitate the development of appropriate strategies to minimise the potential risks of job losses in a given area.

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6. Tables

Table 1. Location and sourcing decisions by firms

| | | Location | | |
|-----------------|--------------------------------|----------------------|---------------------------|--------------|
| | | National | International | |
| Sourcing | Between firms (outsourcing) | Domestic outsourcing | International outsourcing | } Offshoring |
| | Within firms (insourcing) | Domestic supply | International insourcing | |
| | | Within countries | Between countries | |

Source: Olsen (2006)

Table 2. Contingency tables of outsourcing and relocation of firms in EU-15 and non EU-15 countries.

EU-15 countries

| Outsourcing | Relocation | | Total |
|-------------|------------|-----|-------|
| | No | Yes | |
| No | 3170 | 405 | 3575 |
| Yes | 465 | 79 | 544 |
| Total | 3635 | 484 | 4119 |

| Outsourcing | Relocation | | Total |
|-------------|------------|--------|---------|
| | No | Yes | |
| No | 76.96% | 9.83% | 86.79% |
| Yes | 11.29% | 1.92% | 13.21% |
| Total | 88.25% | 11.75% | 100.00% |

Pearson chi2(1) 4.6432 P-value 0.031

NON EU-15 countries

| Outsourcing | Relocation | | Total |
|-------------|------------|-----|-------|
| | No | Yes | |
| No | 3091 | 205 | 3296 |
| Yes | 360 | 34 | 394 |
| Total | 3451 | 239 | 3690 |

| Outsourcing | Relocation | | Total |
|-------------|------------|-------|---------|
| | No | Yes | |
| No | 83.77% | 5.56% | 89.32% |
| Yes | 9.76% | 0.92% | 10.68% |
| Total | 93.52% | 6.48% | 100.00% |

Pearson chi2(1) 3.3738 P-value 0.066

Table 3. Results of the estimation of the triprobit model for firms located in EU-15 countries.

| EU15 countries | | Outsourcing | | Relocation | | Employment increase | |
|------------------|----------------------------|-----------------|---------|-----------------|---------|--------------------------|---------|
| | | Marginal effect | P-value | Marginal effect | P-value | Marginal effect | P-value |
| Size | Less than 100 | | | | | | |
| | 101-500 | 0.05 | 0.60 | 0.07 | 0.32 | -0.04 | 0.59 |
| | 501-1000 | 0.01 | 0.91 | -0.01 | 0.92 | 0.06 | 0.49 |
| | 1001-1500 | 0.30 | 0.00 | 0.10 | 0.31 | 0.01 | 0.92 |
| | 1501-5000 | 0.26 | 0.01 | 0.10 | 0.27 | 0.12 | 0.16 |
| Age | Less than 30 years old | | | | | | |
| | 30-80 years old | 0.08 | 0.14 | -0.13 | 0.01 | -0.13 | 0.01 |
| | >80 years old | 0.23 | 0.00 | -0.09 | 0.12 | -0.21 | 0.00 |
| Sector | Agriculture | 0.53 | 0.00 | 0.08 | 0.45 | -0.06 | 0.74 |
| | Manufacturing and building | | | | | | |
| | Private services | 0.14 | 0.02 | 0.15 | 0.00 | -0.26 | 0.00 |
| | Public services | 0.13 | 0.03 | 0.03 | 0.57 | -0.13 | 0.03 |
| Main market | Local | -0.35 | 0.00 | -0.45 | 0.00 | 0.29 | 0.00 |
| | Regional | -0.25 | 0.00 | -0.02 | 0.68 | 0.12 | 0.09 |
| | National | -0.06 | 0.32 | 0.08 | 0.14 | -0.02 | 0.72 |
| | European | 0.08 | 0.29 | -0.13 | 0.03 | 0.02 | 0.80 |
| | International | | | | | | |
| Group | | -0.09 | 0.10 | 0.11 | 0.05 | 0.07 | 0.17 |
| Quality | | 0.32 | 0.00 | 0.13 | 0.27 | | |
| Productivity | | 0.03 | 0.64 | -0.05 | 0.48 | | |
| Profitability | | 0.07 | 0.22 | 0.14 | 0.02 | | |
| Time to market | | -0.03 | 0.57 | 0.11 | 0.07 | | |
| Innovation | | 0.23 | 0.00 | 0.06 | 0.41 | | |
| Labour intensive | | -0.09 | 0.04 | 0.09 | 0.03 | 0.14 | 0.00 |
| GDP | | -0.04 | 0.03 | 0.04 | 0.02 | 0.08 | 0.00 |
| Intercept | | -1.19 | 0.00 | -1.18 | 0.00 | 0.21 | 0.05 |
| | | Value | P-value | | | | |
| | rho12 | 0.12 | 0.00 | | | Observations | 4119 |
| | rho13 | -0.68 | 0.00 | | | | |
| | rho23 | -0.22 | 0.00 | | | Country dummies included | |
| | LR test | 617.87 | 0.00 | | | | |

Table 4. Results of the estimation of the triprobit model for firms located in non EU-15 countries.

| Non EU15 countries | | Outsourcing | | Relocation | | Employment increase | |
|--------------------|----------------------------|-----------------|---------|-----------------|---------|--------------------------|---------|
| | | Marginal effect | P-value | Marginal effect | P-value | Marginal effect | P-value |
| Size | Less than 100 | | | | | | |
| | 101-500 | 0.13 | 0.08 | 0.05 | 0.56 | -0.06 | 0.37 |
| | 501-1000 | 0.34 | 0.00 | 0.04 | 0.72 | -0.17 | 0.07 |
| | 1001-1500 | 0.42 | 0.00 | 0.04 | 0.81 | -0.20 | 0.07 |
| | 1501-5000 | 0.48 | 0.00 | 0.37 | 0.00 | -0.11 | 0.22 |
| Age | Less than 30 years old | | | | | | |
| | 30-80 years old | 0.08 | 0.14 | 0.02 | 0.72 | -0.16 | 0.01 |
| | >80 years old | 0.13 | 0.09 | -0.18 | 0.06 | -0.20 | 0.01 |
| Sector | Agriculture | 0.12 | 0.23 | -0.18 | 0.14 | 0.24 | 0.01 |
| | Manufacturing and building | | | | | | |
| | Private services | 0.21 | 0.00 | 0.23 | 0.00 | -0.28 | 0.00 |
| | Public services | 0.10 | 0.21 | 0.11 | 0.18 | -0.05 | 0.51 |
| Main market | Local | -0.05 | 0.50 | -0.24 | 0.03 | 0.12 | 0.19 |
| | Regional | -0.10 | 0.17 | -0.26 | 0.00 | 0.05 | 0.52 |
| | National | -0.19 | 0.00 | -0.01 | 0.89 | 0.08 | 0.19 |
| | European | 0.05 | 0.56 | -0.08 | 0.51 | 0.01 | 0.87 |
| | International | | | | | | |
| Group | | 0.05 | 0.53 | 0.09 | 0.27 | -0.01 | 0.93 |
| Quality | | -0.16 | 0.17 | 0.83 | 0.00 | | |
| Productivity | | -0.10 | 0.26 | -0.14 | 0.17 | | |
| Profitability | | 0.19 | 0.00 | 0.39 | 0.00 | | |
| Time to market | | -0.03 | 0.67 | 0.02 | 0.80 | | |
| Innovation | | 0.08 | 0.37 | 0.11 | 0.26 | | |
| Labour intensive | | -0.11 | 0.04 | -0.02 | 0.71 | 0.17 | 0.00 |
| GDP | | -0.01 | 0.52 | 0.01 | 0.58 | 0.00 | 0.85 |
| Intercept | | -1.16 | 0.00 | -1.97 | 0.00 | 0.34 | 0.01 |
| | | Value | P-value | | | | |
| | rho12 | 0.08 | 0.04 | | | Observations | 3428 |
| | rho13 | -0.71 | 0.00 | | | | |
| | rho23 | -0.24 | 0.00 | | | Country dummies included | |
| | LR test | 371.03 | 0.00 | | | | |

7. Appendix

Table A.1. Description of the information available by country

| Country | Observations | Frequency (%) | Country | Observations | Frequency (%) |
|-----------------|--------------|---------------|---------------------------|--------------|---------------|
| Austria | 270 | 6.55% | Australia | 259 | 7.02% |
| Belgium | 230 | 5.58% | Bulgaria | 157 | 4.25% |
| Denmark | 516 | 12.53% | Canada | 364 | 9.86% |
| Finland | 293 | 7.11% | Cyprus | 85 | 2.30% |
| France | 140 | 3.40% | Czech Republic | 72 | 1.95% |
| Germany | 320 | 7.77% | Estonia | 118 | 3.20% |
| Greece | 180 | 4.37% | Hungary | 59 | 1.60% |
| Italy | 117 | 2.84% | Iceland | 114 | 3.09% |
| Spain | 158 | 3.84% | Israel | 175 | 4.74% |
| Sweden | 383 | 9.30% | Nepal | 204 | 5.53% |
| The Netherlands | 397 | 9.64% | New Zealand | 286 | 7.75% |
| United Kingdom | 1115 | 27.07% | Norway | 303 | 8.21% |
| | | | Philippines | 56 | 1.52% |
| | | | Slovakia | 259 | 7.02% |
| | | | Slovenia | 161 | 4.36% |
| | | | Switzerland | 311 | 8.43% |
| | | | Tunisia | 189 | 5.12% |
| | | | Turkey | 171 | 4.63% |
| | | | Turkish Cypriot Community | 87 | 2.36% |
| | | | USA | 260 | 7.05% |
| EU15 | 4119 | 100.00% | Non EU15 | 3690 | 100.00% |

Table A.2. Summary statistics of the CRANET sample of firms (1/3)

| | | EU15 | | | NON-EU15 | | | | |
|-----------------|----------------|----------------|----------------|-------------|------------|-------------|-------------|------|------|
| | | Relocation | Outsourcing | Empl. Incr. | Relocation | Outsourcing | Empl. Incr. | | |
| All firms | Proportion | 0.12 | 0.13 | 0.35 | 0.06 | 0.11 | 0.36 | | |
| | Std. Deviation | 0.32 | 0.34 | 0.48 | 0.25 | 0.31 | 0.48 | | |
| | Observations | | 4119 | | | 3690 | | | |
| Firm size | less than 100 | Proportion | 0.38 | 0.17 | 0.50 | 0.19 | 0.14 | 0.69 | |
| | | Std. Deviation | 0.35 | 0.32 | 0.44 | 0.28 | 0.24 | 0.49 | |
| | | Observations | | 122 | | | 503 | | |
| | 101-500 | Proportion | 0.12 | 0.13 | 0.34 | 0.06 | 0.09 | 0.40 | |
| | | Std. Deviation | 0.32 | 0.33 | 0.48 | 0.24 | 0.28 | 0.49 | |
| | | Observations | | 1930 | | | 1624 | | |
| | 501-1000 | Proportion | 0.10 | 0.12 | 0.40 | 0.05 | 0.13 | 0.38 | |
| | | Std. Deviation | 0.31 | 0.33 | 0.49 | 0.23 | 0.34 | 0.49 | |
| | | Observations | | 742 | | | 494 | | |
| | 1001-1500 | Proportion | 0.13 | 0.15 | 0.34 | 0.08 | 0.15 | 0.35 | |
| | | Std. Deviation | 0.33 | 0.35 | 0.48 | 0.27 | 0.36 | 0.48 | |
| | | Observations | | 319 | | | 222 | | |
| | 1501-5000 | Proportion | 0.13 | 0.16 | 0.37 | 0.08 | 0.18 | 0.32 | |
| | | Std. Deviation | 0.34 | 0.36 | 0.48 | 0.27 | 0.38 | 0.47 | |
| | | Observations | | 747 | | | 518 | | |
| | Firm age | <30 years old | Proportion | 0.15 | 0.12 | 0.41 | 0.07 | 0.08 | 0.43 |
| | | | Std. Deviation | 0.35 | 0.32 | 0.49 | 0.26 | 0.28 | 0.49 |
| | | | Observations | | 1093 | | | 1360 | |
| 30-80 years old | | Proportion | 0.09 | 0.13 | 0.36 | 0.07 | 0.11 | 0.35 | |
| | | Std. Deviation | 0.29 | 0.34 | 0.48 | 0.26 | 0.31 | 0.48 | |
| | | Observations | | 1156 | | | 1040 | | |
| >80 years old | | Proportion | 0.12 | 0.19 | 0.31 | 0.06 | 0.16 | 0.36 | |
| | | Std. Deviation | 0.32 | 0.39 | 0.46 | 0.24 | 0.36 | 0.48 | |
| | | Observations | | 885 | | | 456 | | |

Table A.2. Summary statistics of the CRANET sample of firms (2/3)

| Activity sector | | | EU15 | | | NON-EU15 | | |
|-----------------|------------------|----------------|------------|-------------|-------------|------------|-------------|-------------|
| | | | Relocation | Outsourcing | Empl. Incr. | Relocation | Outsourcing | Empl. Incr. |
| Activity sector | Agriculture | Proportion | 0.16 | 0.16 | 0.28 | 0.05 | 0.17 | 0.30 |
| | | Std. Deviation | 0.37 | 0.37 | 0.45 | 0.22 | 0.38 | 0.46 |
| | | Observations | | 178 | | | 240 | |
| | Industry | Proportion | 0.11 | 0.17 | 0.29 | 0.07 | 0.12 | 0.38 |
| | | Std. Deviation | 0.31 | 0.38 | 0.46 | 0.26 | 0.32 | 0.49 |
| | | Observations | | 1426 | | | 1088 | |
| | Private services | Proportion | 0.14 | 0.13 | 0.38 | 0.08 | 0.12 | 0.38 |
| | | Std. Deviation | 0.35 | 0.34 | 0.49 | 0.27 | 0.32 | 0.49 |
| | | Observations | | 908 | | | 588 | |
| | Public services | Proportion | 0.11 | 0.09 | 0.41 | 0.05 | 0.08 | 0.39 |
| | | Std. Deviation | 0.31 | 0.29 | 0.49 | 0.21 | 0.26 | 0.49 |
| | | Observations | | 1494 | | | 1096 | |
| Main market | Local | Proportion | 0.08 | 0.07 | 0.40 | 0.05 | 0.08 | 0.37 |
| | | Std. Deviation | 0.27 | 0.25 | 0.49 | 0.21 | 0.27 | 0.48 |
| | | Observations | | 561 | | | 432 | |
| | Regional | Proportion | 0.10 | 0.10 | 0.43 | 0.06 | 0.07 | 0.39 |
| | | Std. Deviation | 0.30 | 0.30 | 0.50 | 0.23 | 0.26 | 0.49 |
| | | Observations | | 545 | | | 517 | |
| | National | Proportion | 0.15 | 0.14 | 0.37 | 0.08 | 0.09 | 0.39 |
| | | Std. Deviation | 0.36 | 0.34 | 0.48 | 0.28 | 0.29 | 0.49 |
| | | Observations | | 1004 | | | 1028 | |
| | European | Proportion | 0.10 | 0.18 | 0.31 | 0.07 | 0.16 | 0.37 |
| | | Std. Deviation | 0.30 | 0.39 | 0.46 | 0.26 | 0.37 | 0.48 |
| | | Observations | | 483 | | | 335 | |
| International | Proportion | 0.13 | 0.16 | 0.31 | 0.08 | 0.14 | 0.36 | |
| | Std. Deviation | 0.34 | 0.37 | 0.46 | 0.27 | 0.35 | 0.48 | |
| | Observations | | 1327 | | | 888 | | |
| Group | Proportion | 0.15 | 0.12 | 0.38 | 0.08 | 0.13 | 0.36 | |
| | Std. Deviation | 0.36 | 0.32 | 0.49 | 0.28 | 0.34 | 0.48 | |
| | Observations | | 801 | | | 495 | | |

Table A.3. Summary statistics of the CRANET sample of firms (3/3)

| | | EU15 | | | NON-EU15 | | |
|---------------------------------|----------------|------------|-------------|-------------|------------|-------------|-------------|
| | | Relocation | Outsourcing | Empl. Incr. | Relocation | Outsourcing | Empl. Incr. |
| Quality below the average | Proportion | 0.16 | 0.23 | 0.37 | 0.05 | 0.13 | 0.24 |
| | Std. Deviation | 0.37 | 0.42 | 0.48 | 0.22 | 0.34 | 0.43 |
| | Observations | | 172 | | | 122 | |
| Productivity below the average | Proportion | 0.12 | 0.20 | 0.29 | 0.07 | 0.17 | 0.23 |
| | Std. Deviation | 0.32 | 0.40 | 0.45 | 0.26 | 0.37 | 0.42 |
| | Observations | | 435 | | | 284 | |
| Profitability below the average | Proportion | 0.15 | 0.22 | 0.22 | 0.07 | 0.09 | 0.26 |
| | Std. Deviation | 0.36 | 0.41 | 0.42 | 0.26 | 0.29 | 0.44 |
| | Observations | | 686 | | | 549 | |
| Longer time to market | Proportion | 0.12 | 0.17 | 0.28 | 0.08 | 0.14 | 0.32 |
| | Std. Deviation | 0.32 | 0.37 | 0.45 | 0.26 | 0.35 | 0.47 |
| | Observations | | 669 | | | 542 | |
| Innovation below the average | Proportion | 0.15 | 0.27 | 0.25 | 0.08 | 0.20 | 0.23 |
| | Std. Deviation | 0.36 | 0.45 | 0.43 | 0.28 | 0.40 | 0.42 |
| | Observations | | 270 | | | 205 | |
| Labour intensive firms | Proportion | 0.13 | 0.12 | 0.35 | 0.06 | 0.09 | 0.34 |
| | Std. Deviation | 0.34 | 0.32 | 0.48 | 0.23 | 0.28 | 0.48 |
| | Observations | | 2448 | | | 2018 | |
| GDP growth | Average | | 1.94 | | | 3.39 | |
| | Std. Deviation | | 1.39 | | | 2.62 | |

8. Footnotes

¹ For a macroeconomic perspective on this issue, see Amiti and Wei (2005) and Boulhol and Fontagné (2006). The first study analyses the services sector while the second focuses on manufacturing. It is also worth reading the OECD reports on global value chains (OECD, 2007a) and on offshoring and employment (OECD, 2007b).

² Moll (2005) also analysed the effects of R&D on outsourcing in a sample of manufacturing firms in the Netherlands. He found that although being R&D intensive was traditionally seen as an impediment to outsourcing, the situation has evolved during the nineties of the last century. In particular, he found that firms in R&D intensive industries had increasingly started to rely on partnership relations with outside suppliers.

³ For more details, see <http://www.cranet.org>.

⁴ STATA's TRIPROBIT module by Terracol (2002) has been used. Alternatively, we have also used the STATA's MVPROBIT module by Cappellari and Jenkins (2003) to estimate the system. The conclusions, which are available from the authors' on request, were identical to the ones presented here.

⁵ GDP data have been obtained from the World Development Indicators (World Bank).