

WHICH FIRMS ARE INVOLVED IN FOREIGN VERTICAL INTEGRATION?*

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In line with the literature that considers that transaction costs, asset specificity and incomplete contracts play a key role in the “make or buy decision”, this paper seeks to identify the characteristics of offshoring firms that make them more or less likely to integrate their activities in a foreign country. Our results show that the real candidates for foreign vertical integration are those firms that have a large share of their inputs provided by headquarters. Firms engaged in foreign vertical integration are more capital and skill-intensive than those exclusively dedicated to foreign outsourcing. The degree of foreign vertical integration also matters since the most intensively integrated firms are also the most productive. We also demonstrate that international experience and product differentiation favor foreign vertical integration.

Key words: offshoring, vertical integration, firm heterogeneity.

JEL Classification: L23, F23, D21.

Globalization and easy access to information and communication technologies allow firms to organize their activity and choose their production strategies in a global framework [UNCTAD (2004)]. The goal of modern sourcing strategies is to obtain the optimum combination of inputs from a variety of opportunities available in the global market. Both the location factor and the choice between the internalization or externalization of the means of procurement will vary with circumstances and will change over time [Buckley and Ghauri (2004)].

The sourcing of intermediate goods and services provides firms with a decision making challenge [Grossman and Helpman (2002), Antràs and Helpman (2004), Helpman (2006)]. The firm has to consider two dimensions: the first is the way of sourcing –the producer must decide whether to undertake the activity in-house or purchase the input or service from outside, through the market (at arm’s length); the second is geography– that is, whether production can be performed domestically or in

(*) Previous versions of this paper were presented at the 8th Annual Meeting of the Asia Pacific Trade Seminar, Singapore Management University (July, 2012) and at the European Trade Study Group (ETSG), KU Leuven (September 2012). We want to thank the participants for helpful comments and suggestions. We thank the Generalitat of Catalonia (2014SGR420) for its support. We are very grateful for the suggestions and comments from two anonymous referees that were very useful for improving the paper.

a foreign country. The interaction of these two dimensions leads to four possibilities: insource at home, outsource at home (where both possibilities concern domestic activity), insource abroad or outsource abroad (where both possibilities concern offshoring activity).

This paper examines the characteristics of offshoring firms that make them more or less likely to integrate their activities in a foreign country (insource abroad), by exploiting a unique firm-level offshoring dataset. The data we employ are drawn from a longitudinal survey of Spanish manufacturing firms (Survey on Business Strategies, ESEE). The dataset comprises more than 8,000 observations, corresponding to an average of 2,015 firms per year during the period 2006 to 2009. This survey furnishes an extraordinary opportunity to test the predictions made in the literature regarding foreign vertical integration.

The contribution of this paper is to provide empirical evidence of the characteristics of offshoring firms that can influence the adoption of a foreign vertical integration strategy. Employing various strands of the literature, we investigate the role that intensity in headquarter services [Antràs and Helpman (2004)], international experience [Caves (2007)] and product differentiation [Grossman and Helpman (2002)] play in offshoring sourcing strategies. During recent decades Spain has been an important host country for affiliates of multinational companies [Pelegrín (2002), Pelegrín and Bolance (2008)]. Venables *et al.* (2000) show that from the late 1970s to the late 1990s Spain's share of all EU manufacturing stood at 6.5%. A large proportion of foreign firms that entered Spain in the 1980s are now offshoring [Myro and Fernandez-Otheo (2008)].

This paper makes the following contributions to the current empirical literature: first, factors that impact on a firm's offshoring foreign vertical integration, especially intensity in headquarter services, have received little attention to date in the empirical literature. Although a number of recent papers, including Corcos *et al.* (2012), Federico (2012) and Jabbour (2012) do address this issue, here we use a full set of variables that strengthen considerably the analysis that headquarter services play in foreign vertical integration. Second, although some evidence has been reported to illustrate the relationship between offshoring and international experience, most empirical studies have focused their attention on offshoring [Tomiura (2005), Görg, Hanley and Strobl, (2008) and Wagner (2010)], albeit not specifically on foreign vertical integration. The availability of empirical studies that analyze how international business experience impacts the probability of foreign vertical integration activities is still very limited. Third, the issue of differentiation has not been sufficiently analyzed elsewhere in the field. Here, however, the availability of information enables us to test whether differentiation is a determinant of foreign vertical integration strategy. Fourth, our dataset provides a unique opportunity to analyze the characteristics of firms involved in offshoring activities distinguishing those that engage in foreign outsourcing from those involved in foreign vertical integration. To date very few studies have enjoyed access to this degree of information disaggregation. A notable exception is Jabbour (2010) who considers the effect of offshoring on a firm's productivity and profitability using a survey that also permits the governance mode to be identified. Fifth, our results show that it is important to distinguish between the decision (extensive margin) and the intensity of foreign vertical integration (intensive margin).

In line with most recent empirical studies we conduct our analysis at the firm level. Antràs and Helpman (2004) assume that capital/labor intensity are determined by industry factors but, as Tomiura *et al.* (2011) show, substantial differences are to be found in capital intensity between firms within the same industry. Indeed, firm level analysis seems particularly appropriate for studying offshoring “make or buy decisions” given the degree of variation in a number of key firm characteristics, including capital intensity and skill intensity [Corcos *et al.* 2012)]. Greenaway and Kneller (2007) also conclude that the combination of sunk costs and the heterogeneity in the underlying characteristics of firms accounts for differences in their globalization strategies.

Finally, this paper controls for headquarter firms. Our firm level data provide information related to equity participation by other companies, thereby enabling us to build a restricted sample of Spanish-owned firms. This is a notable step forward given that most studies of foreign sourcing fail to take this distinction into account, with the exception of the recent contributions of Kohler and Smolka (2011) and Nunn and Trefler (2012).

The rest of the paper proceeds as follows. Section 1 reviews the main theoretical approaches and the empirical literature, Section 2 describes the database and outlines the econometric methodology and Section 3 reports the estimation results and discussion. The paper ends with a summary and conclusions.

1. OFFSHORE SOURCING STRATEGIES

In the literature examining the determinants of multinational activity, Dunning’s eclectic paradigm suggests that an enterprise’s foreign direct investment (FDI) is determined by three types of potential advantage: ownership, location and internalization (otherwise referred to as the OLI-Framework) (Dunning, 1981). In other words, FDI is determined, first, by the extent to which an enterprise possesses net ownership advantages [Hymer (1960)]; second, by the perceived profitability of locating its production units either at home or abroad [Vernon (1966)]; and, third, by the degree to which it can either internalize these advantages or leave them for other enterprises to exploit [Buckley and Casson (1976)]. An alternative view points to a recent change in the motives underpinning FDI: namely, the growth in strategic asset-seeking. This strategy aims to protect or increase the investing firm’s ownership advantage rather than to exploit it as traditional FDI does [Dunning (1998)].

Offshoring would appear both to reaffirm and to challenge the OLI framework. In Doh’s (2005) opinion, location is prominent among the apparent motivations for offshoring, but the relevance of ownership and internalization is less evident – “By disintegrating production stages along the supply chain and transferring them to other locations, firms may create conditions for the erosion of ownership and internalization advantages” (p. 698).

Offshoring is not costless. Vertical fragmentation of production incurs substantial costs of coordination between the headquarters and its foreign affiliates, or independent suppliers. Drawing on Dunning’s eclectic paradigm, Kedia & Mukherjee (2009) provide a theoretical framework for a firm’s offshoring decisions. The authors suggest that firms go offshore when they perceive three types of related advantages: first, advantages derived from the disintegration of value chain activities,

since disintegration reduces the coordination costs associated with hierarchical governance, allows the firm to focus on its core activities and provides the firm with more flexibility; second, location-specific resourcing advantages, which are specific to a country and external to the firm, similar in this regard to the traditional country-level advantages identified by Dunning's eclectic paradigm, and human-capital-specific advantages; and, third, externalization-related advantages, involving externalization to independent foreign providers versus internalization via FDI.

Firms will tend to internalize whenever the costs of carrying out transactions (such as organization, management, and supply) are lower than the costs of subcontracting these transactions via the market. So, the decision of whether to internalize production or to subcontract externally (i.e., make or buy) depends on the costs and benefits associated with each alternative, where the factors influencing the decision are related to production and transaction costs – that is, the costs involved in identifying a suitable supplier, management costs, design costs and control of contracts (which tend to be imperfect), costs of coordinating the production process and the risk of transmitting strategic knowledge, which can generate opportunistic behaviour.

Grossman and Helpman (2002), Antràs (2003), Antràs and Helpman (2004) and Helpman (2006) consider transaction costs, asset specificity and incomplete contracts as playing an important role in the “make or buy decision”. Thus, explanations of qualitative and quantitative changes in foreign trade and in FDI focus their attention on the organizational strategies adopted by firms and attempt to determine what activities are carried out within firms (foreign subsidiaries) as opposed to through market transactions (international outsourcing) and the reasons underpinning their choices. The general principles of integration point to market failure, bargaining problems and dynamic aspects including entry deterrence [Casson (1986), Buckley (2011)].

As foreign vertically integrated firms can be seen simply as vertically integrated firms whose production units are located abroad, theoretical models of vertical integration should be equally applicable [Caves (2007)]. Coase's (1937) seminal work observed that as firms grow the cost of organizing additional transactions increases and so the loss in resources will be greater than the cost of completing the transaction through the market.

Taking Coase's main principles as his starting point, Williamson (1975, 1985) examines the nature and determinants of transaction costs. Transaction costs make any real contract inevitably incomplete and, as such, it must be renegotiated and ex post adaptation will be necessary. Such contractual limitations can lead to problems, such as delivery delays (holdups). As Kedia and Mukherjee (2009) emphasize, these costs can increase substantially when a firm is operating in a foreign country.

Based on Williamson's work, Grossman and Hart (1986) developed the property rights approach (or incomplete contracts approach), which is concerned with costly contracts. Their theory stresses that ownership provides the power to exercise control through all aspects of the asset not made explicit in the contract. Integration is optimal when production is intensive in the input that the firm owns and it is too difficult to specify all the particular characteristics that the asset possesses. In this case subcontracting in the market means giving the external supplier the power to threaten the firm by withholding its assets.

The study of the determinants of decisions that requires the fragmentation of production and the mode of governance has been a fruitful line of research. In Williamson (2005) asset specificity is relevant in determining the mode of governance. As the degree of asset specificity increases, bilateral dependency (between the contractor and supplier) also increases, which when combined with the uncertainty of incomplete contracts makes vertical integration more pervasive. Internalization occurs when the degree of asset specificity and uncertainty becomes so high that the parties need a high level of cooperation and adaptation.

Antràs (2003) and Antràs and Helpman's (2004) formal models provide hypotheses regarding the relationship between foreign sourcing and a firm's characteristics. Antràs (2003) interprets a multinational firm's inputs in terms of capital and develops a model in which foreign vertical integration of suppliers occurs mostly in capital-intensive industries. In Antràs and Helpman (2004), a multinational firm's input is referred to as headquarter services, and the hypothesis implies that FDI is most prevalent in industries in which headquarter services, such as R&D, are most intensive.

Antràs and Helpman (2004) assume a hierarchical order for the fixed costs associated with sourcing activities. Organizational forms are faced by two tensions: the first concerns location, where fixed costs are higher for foreign sourcing than for domestic sourcing; the second concerns the governance mode, where fixed costs are higher for insourcing than they are for outsourcing.

Antràs and Helpman's model predicts the different sourcing choices based on a firm's productivity. Thus, the most productive firms pursue foreign vertical integration while firms with high productivity engage in foreign outsourcing to an unrelated supplier. In their sector analysis, the prevalence of organizational forms depends on the industry characteristics and the degree of productivity dispersion across firms: in component intensive sectors (with very low intensity of headquarter services) no firms integrate. In headquarter intensive sectors all organizational forms are possible, but integration is more prevalent in sectors with higher firm productivity and in those with higher headquarter intensity. As a result, only the most productive firms capture the market share required to offset the high costs of vertical integration, but not all candidates for vertical integration will in fact integrate. The real candidates for vertical integration will be highly productive firms, with a large share of their inputs being provided by their headquarters.

Firms tend to externalize non-core activities to independent suppliers while retain control over the activities and processes that create the most value [Kedia and Mukherjee (2009), Liesch *et al.* (2012)]. Products which should not be outsourced include those where protection of intellectual property is decisive, those with high technology content and those related with corporate responsibility [Buckley (2011)]. Taking these studies as our starting point, we expect foreign vertical integration to be more pervasive the greater the multinational firm's input intensity is in headquarter services and the higher its productivity.

The few empirical studies that examine the determinants of foreign vertical integration at the firm level support the above hypothesis. Some of these papers center their attention on intensity in headquarter services and the choice of sourcing mode. Marin (2006) shows that intra-firm imports between German firms and their subsidiaries grow when the parent firm is more intensive in headquarter services

(R&D), while intra-firm imports between Austrian firms and their subsidiaries grow when the parent firm is more capital intensive and less R&D intensive. Corcos *et al.* (2012) find that highly productive, capital and skill-intensive firms favor intra-firm trade. Ito *et al.* (2011) examine the influence of knowledge capital on sourcing behavior. Their results show that R&D intensity and patenting contribute to offshore sourcing and increase the probability of engaging in foreign vertical integration as opposed to outsourcing. Federico (2012) shows that foreign vertical integration is positively related to a firm's capital intensity and Jabbour (2012) also reports evidence that the intensity of headquarter services can increase the probability of foreign vertical integration at the expense of foreign outsourcing.

Some studies focus primarily on productivity and choice of governance mode. Tomiura (2007) finds that firms integrating part of their activities abroad are more productive than foreign outsourcers and exporters, which in turn are more productive than domestic firms. Fariñas and Martín-Marcos (2010) conclude that high-productivity firms source intermediate inputs in international markets, whereas low-productivity firms acquire them at home. Arnold and Hussinger (2010) point out that German firms with subsidiaries abroad are generally more productive than either domestically focused or exporting firms. Federico (2010) and Kohler and Smolka (2011) provide empirical evidence for the sourcing strategies and heterogeneity of firms. Both papers find that productivity levels are generally higher (lower) for firms pursuing foreign vertical integration (domestic outsourcing). Kohler and Smolka (2014) find strong evidence that the more productive firms self-select into strategies of vertical foreign integration. Nevertheless, Jabbour (2012) finds that productivity is not significant when comparing firms involved in foreign integration with outsourcing firms.

International experience also influences the offshoring mode of the firms. As the cost of information increases, a firm becomes less willing to acquire it and, hence, the perceived risk of foreign vertical integration is greater while other options appear more attractive. The accumulation of foreign experience is costly and as such international experience represents a transaction cost advantage for multinational firms. Moreover, firms perform better when they are able to gather information via a learning process, which usually starts as an extension of domestic activities in similar, nearby host countries. Starting with exports, firms can obtain information on overseas suppliers via their dealings with foreign countries. This information minimizes the costs of inexperience when investing in a foreign country. The acquisition of successive incremental steps in experience has been demonstrated to be a more successful process than one in which a firm becomes directly involved in a foreign vertical integration project without previous experience [Caves (2007)].

In particular, multinational companies obtain advantages through both vertical and horizontal integration. They are able to segment their activities and to seek the optimal location for each activity [Buckley and Ghauri (2004), Buckley (2009)]. Foreign firms, which are assumed to be part of larger multinational companies, can be expected to use higher levels of technology, information and business experience than those employed by domestic firms because they have easier access to the parent firm's specific assets. Supply chain management has emerged as an important factor in the competitive success of multinational enterprises: a firm's relationships with the parent firm and other subsidiaries abroad facilitate the disintegration of production

structures [Girma and Görg (2004)]. Based on these studies, it is our assertion that firms with more international business experience can be expected to prefer foreign vertical integration as their governance mode.

Most empirical studies of international experience have focused their attention on offshoring, albeit not specifically on foreign vertical integration. Tomiura (2005), Görg, Hanley and Strobl (2008) and Wagner (2010) show that exports increase the probability of offshoring activities. Tomiura (2005) also reports empirical evidence for the offshoring activities of multinationals. His estimations show that firms with their own overseas affiliates are four times more likely than firms without experience in FDI to choose foreign offshoring. Empirical evidence of international experience specifically in sourcing through foreign vertical integration is low. To the best of our knowledge, only Ito *et al.* (2011) show a significant positive relationship between export activity and foreign vertical integration.

Differentiation is also important in foreign “make or buy decisions”. Grossman and Helpman (2002) identify the industrial conditions that favor vertical integration or outsourcing as the equilibrium mode of organization, emphasizing technology, the distribution of bargaining power between intermediate and final goods producers, the size of the economy and the degree of substitutability between an industry’s consumer products.

Transaction-specific investments tend to be required when the production process involves non-standardized inputs as is the case of differentiated products [Levy (1985)]. If a firm develops such products, the risk of opportunism increases when it shares this knowledge with other host country firms, given that the acquisition of this knowledge might enable the latter to operate independently. This risk of opportunism is especially significant in the case of international transactions because legal and social systems may well differ [Agarwal and Ramaswami (1992)]. Therefore, when a firm is able to differentiate its products, greater control modes may be more efficient.

Product differentiation is also important when a firm has to choose its international distribution channel. Foreign vertical integration, as opposed to an independent distribution channel, is more profitable for the manufacturer when its final products are highly differentiated, as such products do not compete directly. Indeed, Coughlan (1985) and Anderson and Coughlan (1987) present evidence of the fact that highly differentiated products are more likely to be sold through integrated channels. Taking these findings into account, we would expect a positive relation between product differentiation and foreign vertical integration. Results for Spanish exporters [Rialp *et al.* (2002)] also show that firms with differentiated, high-priced products tend to establish independent distribution channels or commercial alliances while firms that export highly standardized, low priced goods tend to rely on independent distributors. However, Merino and Salas (2002) find that although asset specificity and product complexity are positively associated with having an export channel, the most robust explanatory variable for integrating the export distribution channel is the volume of exports.

2. DATA AND MODEL

2.1. Data

The dataset we use is the Survey on Business Strategies (*Encuesta Sobre Estrategias Empresariales*, henceforth ESEE) which has been conducted yearly since 1990 by the SEPI foundation on behalf of the Spanish Ministry of Industry. This survey gathers information from manufacturing firms operating in Spain employing more than nine workers. The annual survey comprises extensive information on around 2,000 companies (see <http://www.funep.es/esee/en/> for a more detailed description of the database). The sampling procedure ensures representativeness for each two-digit NACE manufacturing sector, following both exhaustive and random sampling criteria. In the initial year (1990) all firms employing more than 200 employees were required to participate and a sample of firms employing between 10 and 200 workers was selected using a stratified, proportional, restricted and systematic sampling method with a random start.

One of the main features of the ESEE is that it provides information based on longitudinal data, which involve the systematic tracking of changes in firm status. The survey generates an unbalanced panel and special attention has been paid to preserve the reliability and consistency of the longitudinal data so as to exploit the advantages that this type of data has for econometric analyses. Therefore, in order to guarantee a high level of representativeness and to preserve the inference properties, newly created companies have been incorporated in the survey every year according to the same sampling criteria. This database has been frequently used in empirical analyses [see, among others, Moreno and Rodríguez (2004) González *et al.* (2005), Lopez (2008) and Arqué-Castells (2013)] and also specifically for offshoring and outsourcing analyses [Fariñas and Marcos (2010), Kohler and Smolka (2011)].

The objective of this study is to provide empirical evidence about the features of offshoring firms that influence foreign vertical integration. Although the ESEE survey is particularly useful in this regard, it presents two main limitations: first, we are unable to study the location choice of the offshoring strategy as the survey provides no information about exporting countries; second, the survey has only provided information about offshoring governance modes since 2006. Therefore, for most firms included, we are unable to determine the year in which the decision was taken to integrate in a foreign country. So, while we can examine the relationships between a firm's characteristics and its offshoring strategy decision, they cannot necessarily be interpreted as being causal.

The estimations have been carried out with firm-level data from the ESEE database for the period 2006-2009. For this period the database contains 8,060 observations, including 7,252 observations for firms from the total current sample for all four years, together with the observations corresponding to new entries in each year and to a number of firms that were recovered from previous years (for further details, see the summary table of the sample evolution of the Survey on Business Strategies, available at <https://www.fundacionsepi.es/esee/en/evariables/indice.asp>).

2.2. Variables

2.2.1. Dependent variable

In 2006 the ESEE survey first began to incorporate information about the firms' organizational dimensions and their location. Here, we are particularly interested in details related to their offshoring activities. The questionnaire allows us to distinguish between foreign outsourcing and foreign vertical integration in the following questions:

“Indicate whether during the year (year) the company imported goods and services that are incorporated (transformed) in the production process and the percentage they represent of the total imports, according to type of supplier” (yes/no) (if yes, the percentage rate).

(1) From firms which belong to the same group and/or foreign firms participating in the capital of your company (yes/no) (if yes, the percentage rate)

(2) From other foreign firms (yes/no) (if yes, the percentage rate)

This information allows us to identify whether imports are intra-firm (related party) or at arm's-length (non-related party) and it enables us to examine the empirical implications of theoretical models of the “make or buy decision”. We construct the dependent variable Foreign vertical integration (FI), which is a binary variable indicating whether the company imported intermediate goods and services from other companies belonging to its group and/or from foreign companies participating in the capital of the company. In the database there are 3,570 observations for offshoring, of these 814 (22.8%) integrate their activities vertically in a foreign country (see Table 1 for a description of the variables and summary statistics).

2.2.2. Independent variables

Headquarter intensity: The proxies used to reflect headquarter intensity include R&D, skill intensity, capital intensity, design, marketing, quality control [see Antràs (2003), Antràs and Helpman (2004), Ito *et al.* (2011), Nunn and Trefler (2008 and 2011), Corcos *et al.* (2012) and Jabbour (2012)]. To capture headquarter intensity we construct the following measures instead of relying on just one: skill intensity; R&D intensity; capital intensity, patents and quality control. To measure skill intensity we use the percentage of engineers and graduates in relation to total employment while R&D intensity is calculated as internal R&D expenditure divided by sales. In line with Tomiura *et al.* (2011), capital intensity is defined by the value of tangible assets, excluding land and buildings, divided by the number of employees. Quality is measured with a dummy variable related to the firm's use of quality control procedures.

Productivity: We use labor productivity measured as the value added per worker. Labor productivity has the advantage of being relatively simple to construct and it is one of the most frequently used measures in offshoring studies [see Girma and Görg (2004), Tomiura (2007), Görg, Hanley and Strobl (2008), Görg, Greenaway and Kneller (2008), Federico (2010), Wagner (2010) and Kohler and Smolka (2011)].

International experience: To capture international experience we construct two measures: foreign capital participation (Foreign) and export intensity (Export). We expect foreign capital participation to increase the probability of foreign vertical integration. Export activity should help to explain the probability of foreign sourcing

since the level of internationalization and the experience in foreign markets should reduce transaction costs, thus favoring both foreign vertical integration and foreign outsourcing [Federico (2012)].

Product differentiation: This is a binary variable indicating the extent to which the products the company manufactures are differentiated. The variable indicates either high differentiation, when some specific investment is needed in order to attend to customer requirements, or low differentiation, when products are largely standard for all buyers as the producer has its own product range. Merino and Rodriguez (2007) and Díaz-Mora and Triguero-Cano (2012) also use this variable as a proxy of product differentiation. Although product differentiation might be introduced in other ways, such as by advertising, in line with Merino and Rodriguez (2007), we consider adaptation to customer requirements to be a major source of product differentiation.

Finally we include two control variables, *Age* and *Size*. The firm's age, defined as the number of years since the firm was established, is used to capture the effect of learning over time, a potential factor facilitating the firm's foreign operations. Size, measured as the total number of staff employed, also captures the firms' heterogeneity. As Tomiura (2007) claims large companies, with higher labor productivity, stronger headquarter functions, distribution networks, higher earnings and brand identification are more likely to offshore their activities.

Another desirable control variable would have been a proxy for the contracting environment in the exporting country, as differences across destinations can be critical in the make or buy choice. Tomiura *et al.* (2011) consider the choice of offshoring mode to a given region, and report some remarkable differences between China and ASEAN countries, on the one hand, and the United States and European countries, on the other. Corcos *et al.* (2012) find that intra-firm trade is more likely with countries that have good judicial institutions, especially in the case of highly productive, capital-, skill- and headquarter-intensive firms. Yet, for the Spanish case, this information is not available, although this absence of a variable for the contracting environment in the host country should not be a source of concern, given that Spain's main supplier of imports is the European Union (EU) and the top five countries, Germany, France, Italy, United Kingdom and the Netherlands, present similar institutional environments and legal systems [Kohler and Smolka (2011)]. Similarly, for the Italian case, Federico (2012) claims that the contracting environment in the host country is not a problem as Italy's foreign suppliers are mainly located in the EU.

2.3. Methodological issues

To carry out the empirical analysis, we use a binary dependent variable (foreign vertical integration) in a probit estimation.

$$\begin{aligned} \text{Prob}(\text{foreign vertical integration})_{it} = & \beta_0 + \beta_1(\text{headquarter intensity})_{it} + \\ & \beta_2(\text{productivity})_{it} + \beta_3(\text{international experience})_{it} + \\ & \beta_4(\text{differentiation})_{it} + \beta_5(Z)_{it} + \varepsilon_{it} \end{aligned} \quad [1]$$

The dependent variable is a dummy variable which equals one if the firm integrates its activities in a foreign country and zero otherwise, that is when a firm's offshoring activities only involve foreign outsourcing. The subscript *i* refers to the unit

Table 1: SUMMARY STATISTICS

Variable	Description of the variable	Obs.	Mean	Std. Dev.
FI	Foreign vertical integration. Dummy = 1 if the firm sources abroad through foreign vertical integration, 0 otherwise.	3570	0.228	0.420
Skill	Skill intensity. Percentage that engineers and graduates represent on the total personnel of the company.	3466	7.886	9.627
R&D	R&D effort (ratio of internal R&D expenditure to sales).	3557	0.012	0.0276
Patents	Number of patents filed abroad by the company during the year.	3570	0.697	8.709
Quality	Quality control. Dummy=1 if the company has carried out or contracted quality standardization and control works, 0 otherwise.	3540	0.501	0.500
Capital Intensity	Reported value on the balance sheet of tangible fixed assets (excluding land and buildings) per employee (in logarithms).	3567	11.209	1.060
Productivity	Value added per hour worked (in logarithms).	3534	3.332	0.677
Foreign	Percentage of direct or indirect foreign capital in the company.	3570	24.81	42.112
Export	Export intensity (ratio of exports to sales).	3566	0.280	0.288
Differentiation	Product differentiation. Dummy = 1 if most of the products manufactured by the company are highly differentiated, 0 otherwise.	3454	0.402	0.490
Size	Total number of employees.	3570	345.18	956.17
Age	Number of years that the firm has been operating.	3466	36.37	21.14

Note: Summary statistics are for the sample used in the empirical estimations that only includes offshoring firms.

Source: Own elaboration.

of analysis, firms, and t represents time. The independent variables are described in detail above and ε_i is an error term. As is well known, the estimation of a probit model is preferable to an OLS estimation when the dependent variable is binary.

A pooled probit estimation has been carried out (Table 2, model 1). Given the short period of time (four years) covered by the panel, and the fact that the relevant variation in the data is mostly cross-sectional, panel regression techniques are of limited use here. Therefore we implement a pooled data estimation over the sample period clustering the error terms at firm level to control for intra-firm serial correlation. The variables vary, albeit little, over the four-year time span, so that using a pooled model is preferable to conducting a cross-sectional analysis as it allows all the panel observations to be used. This option provides greater degrees of freedom and more variability and, hence, more efficient estimates. To control for any industry specific characteristics that may affect a firm's likelihood of integrating its activities abroad, a set of industry dummies (19 two-digit dummies) is included in both regressions. In addition, time dummies are included to control for cyclical effects.

3. RESULTS AND DISCUSSION

3.1. *Main results*

The main results from the estimation are shown in model 1 (Table 2). In this model we estimate the determinants that make offshoring firms more or less likely to integrate their activities in a foreign country. Among all the offshoring firms (that is, foreign vertically integrated firms and foreign outsourcing firms), we consider firms that import goods and services incorporated in the production process from foreign firms belonging to the same group and/or foreign firms participating in the capital of the company. Therefore our results refer solely to offshoring firms.

The empirical analysis confirms, first, that firms with the highest intensity in their headquarter services are more likely to be involved in activities of foreign vertical integration than in foreign outsourcing. Of the five variables used to control headquarter service intensity, the coefficients associated with the capital intensity and skill variable, which capture human capital, are positive and significant. By contrast, the variables that capture the research and development activities (R&D and patents) are not significant.

Our results regarding capital intensity are similar to those obtained in current empirical studies of the determinants of foreign vertical integration. Tomiura *et al.* (2011) and Corcos *et al.* (2012) report that capital intensive firms are more likely to engage in foreign vertical integration. Federico (2012), when using a set of variables to estimate the influence of headquarter intensity on the choice between integration or outsourcing, reports that the only variable to have a positive and significant influence on foreign vertical integration is the capital intensity of the firm.

The positive relationship between capital intensity and foreign vertical integration could also be linked to the kind of activities that have been moved abroad. With the current database it is very difficult to determine whether higher capital intensity is the result of a characteristic of firms that integrate, as self-selection theory predicts [Antràs and Helpman (2004)] and Kohler and Smolka (2014) find evidence for Spain, or whether it is the result of an ex post effect of moving the more labour-intensive activities abroad.

Table 2: PROBIT AND TOBIT ESTIMATIONS

	Probit	Probit	Probit	Tobit
	(1)	(2)	(3)	(4)
VARIABLES	FI	FI	FI	FI (intensity)
Skill	0.0193*** [0.00499]	0.0205*** [0.00692]	0.0210*** [0.00703]	0.736*** [0.226]
R&D	1.068 [1.668]	2.452 [1.846]	1.916 [1.981]	-26.83 [93.62]
Patents	0.000587 [0.00400]	-0.00232 [0.00429]	-0.00149 [0.00436]	0.0513 [0.139]
Quality	-0.0178 [0.0968]	0.111 [0.132]	0.118 [0.135]	-0.250 [4.322]
Capital intensity	0.0863* [0.0496]	0.131** [0.0590]	0.116** [0.0591]	1.028 [2.266]
Productivity	0.0763 [0.0646]	0.114 [0.0914]	0.0747 [0.0898]	7.706** [3.129]
Foreign	0.0183*** [0.00104]	0.00638 [0.00847]	0.165 [0.148]	0.809*** [0.0500]
Exports	0.472*** [0.159]	0.635*** [0.202]	0.630*** [0.208]	20.45*** [7.431]
Differentiation	0.226** [0.108]	0.0841 [0.153]	0.0953 [0.156]	7.199 [4.645]
Size	0.000184** [7.66e-05]	0.000394*** [0.000134]	0.000378*** [0.000136]	0.00455** [0.00192]
Age	0.00111 [0.00249]	0.00106 [0.00331]	0.00110 0.0210***	0.0208 [0.100]
Constant	-2.961*** [0.555]	-3.974*** [0.628]	-3.687*** [0.627]	-119.2*** [25.95]
Observations	3,214	2,314	2,252	3,343
Wald Chi-squared	497.1	115.1	112.9	
Pseudo R_squared	0.398	0.147	0.142	0.131

Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

All estimations include a complete set of industry (19) and year (3) dummies.

Note: In models 1 and 4 the sample comprises all the offshoring firms. In model 2 the sample is restricted to offshoring firms with less than 50 per cent foreign capital participation. In model 3 the sample is restricted to offshoring firms with less than 10 per cent foreign capital.

Source: Own elaboration.

Skill intensity has often been included in estimations of intra-firm characteristics, both at the industry and firm levels, but results have been inconclusive. Corcos *et al.* (2012) at the firm level and Bernard *et al.* (2010) and Nunn and Treffer (2011) at the industry level find that skilled labor increases the prevalence of intra-firm trade, while Antràs (2003), at the industry level, finds that human capital is not statistically significant. In this study our results support a positive relationship between human capital and foreign vertical integration at the firm level.

Part of the empirical literature reports a positive and significant relationship between research and development activities and foreign vertical integration. For example, Antràs (2003) and Nunn and Treffer (2011) find that, at the industry level, R&D expenditure increases U.S. intra-firm imports. Ito *et al.* (2011) report that a firm's R&D intensity and patenting are positive and significant increasing the probability of engaging in foreign vertical integration in order to protect their own technology. Jabbour (2012) finds that marketing services and industry R&D intensity (two variables used to proxy headquarter service intensity) appear positive and significant. However, Federico (2012) does not obtain significant values for R&D activity at either the firm or the industry levels. Our results suggest that human capital has a stronger influence than R&D activities.

We find that firms involved in foreign vertical integration are no more productive than the rest of the offshoring firms. Although some theoretical and empirical studies conclude that firms involved in foreign integration are more productive than firms involved in foreign outsourcing [Tomiura (2007), Kohler and Smolka (2011), Corcos *et al.* (2012) and Federico, (2012)], our results show that the productivity variable is not significant. Likewise, Jabbour (2012) finds that productivity is not significant when comparing firms involved in foreign integration with outsourcing firms. The author justifies her findings by suggesting that contractual agreements are associated with higher fixed costs of organization than those associated with foreign vertical integration, confirming the predictions of Grossman *et al.* (2005).

Second, international experience is also seen to matter more for foreign vertical integration than for foreign outsourcing, as the coefficients associated with both variables (foreign and exports) are positive and significant. The variable that captures the presence of foreign capital in the company is highly significant demonstrating the prominence of foreign capital participation among those that engage in foreign vertical integration. The estimations also show a positive association between export intensity and foreign vertical integration. In the estimations we use contemporaneous values of these variables. As pointed out above, the survey only provides information about foreign integration since 2006 and so for most firms it is not possible to know the year in which this decision was taken. However, an alternative specification could involve using a lag for export intensity so as to control for previous experience in international activities. In the results obtained with this specification, the parameter for the lag of export intensity is positive and significant and the rest of the results hold, with the same variables as those in the main estimation (Table 2) being significant.

Third, the coefficient of the differentiation variable has a positive sign and is significant. Thus, foreign vertical integration is more likely than foreign outsourcing when a firm develops differentiated products that require a superior relationship between parent and subsidiary and specific assets (for example, marketing, brand, technology, quality, etc.) that are better protected against imitation within the firm's boundaries.

Of the control variables, firm size is relevant in foreign vertical integration although the calculation of the marginal effects suggests that the magnitude of the effect of size is small. Tomiura (2007) points out that larger firms have a greater capacity to cope with the higher costs of foreign vertical integration. Firms need asset power to engage in international expansion, which is costly and size reflects the capability of a firm to absorb these costs. Tomiura *et al.* (2011) note that large firms may prefer integrated sourcing based on their rich internal resources within multinationals, and they report that exclusively insourcing firms are significantly larger than exclusively outsourcing firms.

3.2. Robustness checks

To verify the robustness of our results we carried out three complementary estimations. In the first two, we estimate foreign vertical integration using a restricted sample of Spanish-owned firms (Table 2 models 2 and 3), in the last estimation we consider intensity (or intensive margin) instead of participation (or extensive margin) as the dependent variable (Table 2 model 4).

In the theoretical models the strategic decision as to whether to make or buy is taken by the parent company, which imports the intermediate inputs produced in the country of one of its foreign subsidiaries (that is, companies whose capital is more than 50 per cent controlled by a foreign company, the parent company). As Nunn and Trefler (2011) point out, it could be the case that these imports were shipped from a foreign parent to a subsidiary. Empirical studies usually lack such information, which is critical if firm level variables are related to intensity in headquarter services. Jabbour (2012) considers this to be especially important in the case of firms affiliated to a group, as it is difficult to know if the decision maker is the parent firm or the firm conducting the trade transaction.

Our data, in line with Kohler and Smolka (2011), provide information related to equity participation by other companies, enabling us to build a restricted sample of Spanish-owned firms. Note, we assume the decision maker to be the headquarter or parent firm; we do not take into account foreign subsidiaries located in Spain, although some groups provide autonomy to the affiliates located in Spain it is difficult to discriminate between subsidiaries, so we do not consider them to be decision makers. This is a marked improvement, as most foreign sourcing studies do not take this difference into account.

To control for headquarter firms, we assume that firms with more than 50 per cent of national capital are the ones that take the sourcing decisions, and we run two Probit estimations (Table 2 models 2 and 3): the first considering firms with less than 50 per cent of foreign capital participation, and the second reducing this threshold control value to less than 10 per cent of foreign capital participation. As Table 2 shows the number of observations falls from 2,314 in model 2 when considering firms with less than 50 per cent of foreign capital participation to 2,252 in model 3 when considering firms with less than 10 per cent of foreign capital participation. The difference is very small (the reduction being just 62 observations), which suggests that once a firm is controlled by domestic capital the rate of control becomes very high.

Our results for this restricted sample (Table 2 models 2 and 3), show some differences from those for the general model 1. First, we confirm that firms more in-

tensive in headquarter services are also more likely to engage in foreign vertical integration activities than are foreign outsourcing firms, with skill and capital intensity showing positive and significant coefficients. Second, the coefficient associated with the differentiation variable is no longer significant. In this sense, it should be noted that our variable, which proxies differentiation, only captures product adaptability to the client and not differentiation understood in a much broader sense. Highly detailed information would be needed to explain these differences in the main estimation and in that for just domestic headquarter firms.

Third, the results for Spanish-owned firms also show that international experience, measured by export intensity, is positive and significant. However, the intensity of foreign participation is no longer significant. Hence, when the domestic capital is dominant then the intensity of foreign capital participation is not a particularly notable characteristic of firms involved in foreign vertical integration activities. These results suggest that minority foreign capital is not relevant as a supplier of international experience, since it is the domestic headquarter which provides the international business experience.

Finally, in the last estimation (Table 2 model 4) we use the intensity of foreign vertical integration measured as the percentage of total imports represented by imports of intermediate goods and services from foreign companies belonging to the firm's group and/or foreign companies participating in the capital of the company. The estimation has been carried out using a Tobit model because the dependent variable ranges between 0 and 100 per cent. The results largely confirm those obtained for the main estimation (Table 2 model 1), with the exception of the coefficients associated with the productivity variable, which is now significant, and the capital intensity variable, which is no longer significant. These results suggest that the most intensive foreign vertically integrated firms are also the most productive of the offshoring firms and that capital intensity matters particularly for the integration decision, but not as far as the intensity of integration is concerned. The positive relationship between productivity and foreign vertical integration could also be linked to the kind of activities that have been moved abroad, as it is very difficult to determine whether higher productivity comes from the characteristics of firms that integrate [Antràs and Helpman (2004)] or whether it is the result of an ex post effect of moving the more labour-intensive activities abroad, as some empirical papers prove [Feenstra and Hanson (2001), Görg *et al.* (2008), Wagner (2010), Fariñas and Martín-Marcos (2010)].

4. CONCLUDING REMARKS

This paper has undertaken an analysis of the characteristics of offshoring firms that make them more or less likely to integrate their activities in a foreign country. We examine the role that intensity in headquarter services, productivity levels, multinational experience and product differentiation play in vertical integration sourcing mode. The dataset we employ comprises a longitudinal survey of Spanish manufacturing firms drawn from the Survey on Business Strategies (ESEE) for the period 2006 to 2009. The analysis is conducted at the firm level.

The main conclusions from the empirical analysis are as follows. First, our estimations confirm that the real candidates for foreign vertical integration are those firms that have a large share of their inputs provided by headquarters. Firms engaged

in foreign vertical integration are more capital and skill-intensive than those exclusively dedicated to foreign outsourcing. Our results support a positive and highly significant relationship between skill levels and foreign vertical integration. These results also hold for Spanish-owned firms, whose capital and skill have a strong influence on their foreign vertical integration strategy. Moreover, capital intensity favors the establishment of a related-company, but it has no impact on the intensity of foreign vertical integration once the latter has been established.

The results related to productivity suggest that firms involved in foreign vertical integration are no more productive than outsourcing firms but that intensity matters, as the most intensive foreign vertically integrated firms are also the most productive.

Second, firms with international experience, including firms with foreign capital participation and export firms, are more likely to engage in foreign vertical integration – in the case of subsidiaries, because they enjoy easier access to the international experience of the foreign parent; and, in the case of exporting firms, because their foreign market experience facilitates access to overseas information. The acquisition of international business experience is a costly learning process, making the course of international expansion highly path dependent [Caves (2007)]. Firms without any foreign market experience are likely to face greater problems when attempting to manage their foreign operations, thereby reducing the likelihood of their engaging in foreign vertical integration activities. Our results for Spanish headquarter show that the intensity of foreign participation is not significant. This result suggests that international business experience is an intangible asset related to ownership.

Third, our results regarding the role of differentiated products are inconclusive. In the general estimation (Table 2 model 1) differentiation appears to be a relevant characteristic of firms engaging in foreign vertical integration. This suggests that the risk of opportunism in international transactions is high for these firms [Agarwal and Ramaswami (1992)]. However, this is not the case for firms operating as Spanish headquarter, where the variable capturing differentiation is not significant.

Our results suggest that only firms with very specific characteristics are able to take advantage of foreign vertical integration. These firms tend to be intensive in their headquarter services and they strive to retain control over their ownership specific advantages. At the same time they are companies with sufficient international experience to be able to reduce their transaction costs. Without these conditions, the chances of success of a foreign vertical integration strategy are low and other sourcing options are better, or more efficient.

In this paper we have focused our attention on the characteristics of the firms that are most prevalent in the foreign vertical integration governance mode. However, a number of interesting points remain to be addressed in future studies. First, a better understanding is needed of the characteristics of the exporting country and the attributes of the imported inputs that determine the foreign sourcing strategy in the light of existing literature on incomplete contracts. Second, the contracting environment in the exporting country and the associated governance mode is an additional aspect to investigate, as empirical evidence to date is limited and largely inconclusive. A third aspect of interest concerns the determinants of foreign vertical integration at firm level and its ex-post effects. To further our understanding here would require a larger database so that we might establish the point in time when the firm establishes a foreign subsidiary.



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Fecha de recepción del original: marzo, 2014

Versión final: marzo, 2015

RESUMEN

De acuerdo con la literatura que considera que los costes de transacción, la especificidad de los activos y los contratos incompletos juegan un papel clave en las decisiones sobre “producir o contratar”, este trabajo examina que características de las empresas que realizan actividades de *offshoring* inciden en la propensión a integrar sus actividades en el exterior. Los resultados muestran que las empresas candidatas a integrar verticalmente sus operaciones en el exterior mantienen un elevado porcentaje de inputs intermedios suministrados por su empresa matriz. Las empresas intensivas en capital físico y humano son más propensas a la integración vertical que al *outsourcing*. En referencia a la productividad el grado de integración es relevante, ya que las compañías más integradas verticalmente son también las más productivas. Los resultados también muestran que la experiencia internacional y la diferenciación de producto favorecen la integración vertical en el exterior.

Palabras clave: offshoring, integración vertical.

Clasificación JEL: L23, F23, D21.

