Foreign sourcing: vertical integration and firm heterogeneity

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Abstract

Based on the literature that considers that transaction costs, asset specificity and incomplete contracts play an important role in the "make or buy decision" this paper examines the characteristics of firms and the mode of organization-- foreign vertical integration and/or foreign outsourcing – in intermediate inputs. The dataset we employ is based on firm level data of Spanish manufacturing firms that comes from Survey on Business Strategies (ESEE) and provides information and allows us to identify whether imports are intra-firm (related party) or at arm’s-length (non-related party). We focus on trying to discriminate some firms’ characteristics that influence on the probability that a firm integrates its activities in a foreign country through the estimation of a probit model. The results show that headquarter intensity, notably skill intensity and capital intensity; product differentiation and international experience have a positive influence in determining foreign integration even after controlling by other firm’s characteristics.

JEI Classification: L23, F23, D21

Preliminary version
1. Introduction

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). Whether they are purchasing intermediate goods and services from foreign suppliers or locating parts of the production process in other countries through foreign direct investment (FDI), their objective is to maximize production value. The goal of modern sourcing strategy is to obtain the optimum combination of inputs from a variety of opportunities open in the global market, both the location factor (where the inputs are acquired) and the internalization and externalization choice of means of procurement will vary with circumstances and will change over time (Buckley & Ghauri, 2004).

The sourcing of intermediate goods and services provides business firms with a decision making challenge (Helpman, 2006; Grossman & Helpman, 2002; Antràs & Helpman, 2004). The firm has to consider two dimensions. The first is ownership: 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 a foreign country. The interaction of these two dimensions allows the firm to choose between four possibilities: insource at home, outsource at home, insource abroad or outsource abroad.

Following Olsen (2006), offshoring includes international outsourcing when the provider is external to the firm and international insourcing when the provider is an affiliated firm, with vertical foreign direct investment (FDI) and foreign outsourcing being the most frequently used offshoring governance modes.

This paper empirically examines firm characteristics and the mode of organization—foreign vertical integration and/or foreign outsourcing – in intermediate inputs by exploiting the unique firm-level offshoring data. The dataset we employ is a longitudinal survey of Spanish manufacturing firms that comes from Survey on Business Strategies (ESEE) and contains more than 8,000 observations that correspond to an average number of 2,015 firms per year during the period 2006 to 2009. From this data we find that 44% of firms source abroad (Offshoring), most part of them (96%) outsource their intermediate inputs (Foreign Outsourcing), while only the 23% import the intermediate inputs through intra-firm trade or foreign vertical
integration (Foreign Integration). This survey offers a very good possibility to test some predictions of the literature on foreign integration. We focus in trying to discriminate some firms’ characteristics that have influence in the probability that a firm integrates its activities in a foreign country (FI). We mainly consider that headquarter intensity, product differentiation and international experience have a positive influence in determining foreign integration even after controlling by other relevant firm’s characteristics.

Theory and empirical analyses show that firms involved in offshore activities exhibit a higher productivity than domestic firms (Antràs & Helpman, 2004; Tomiura, 2005 & 2007). Once assumed the existence of a self-selection of offshoring firms\(^1\), the contribution of this paper is to provide empirical evidence on the firms’ characteristics that influence the foreign integration strategy. Using different strands of literature, we investigate the role that headquarter services intensity (Antràs and Helpman, 2004), product differentiation (Grossman & Helpman, 2002), and multinational experience play in the offshoring sourcing strategies. This paper contributes to the current empirical literature in the following aspects: First, the issue of which factors have impact on firms’ offshoring foreign integration, especially headquarter services intensity, has received little attention in empirical literature and is still very scarce, even some firm level recent papers, as Corcos et al. (2009), Federico (2012) address this issue, we contribute with complementary aspects to their analysis. Second, the issue of differentiation seems to be not enough analysed by other studies in the field, the availability of the information related to differentiation has allowed testing the theoretical proposition of Grossman & Helpman (2002), in this paper we document the relevance of product differentiation in foreign integration. Third, our dataset provides the opportunity to carry out the analysis at the firm level, while most of the empirical research has been conducted at an aggregated level. Antràs & Helpman (2004) assume that capital/labour intensity is determined by industry factors but as Tomiura et al. (2011) show there exist big differences in capital intensity between firms in the same industry. Firm level analysis seems very appropriate to study offshoring make or buy decisions as the variance of some key firm variables, as capital intensity and skill intensity is very high (Corcos et al; 2009). Fourth, this paper also control for headquarter and subsidiary firms. Our firm level data provide information related to equity participation by other companies, enabling us to build a

\(^1\) A comprehensive survey of the literature and empirical evidence can be found in Görg, Greenaway & Kneller (2008)
restricted sample that we consider headquarter firms. This is an important improvement as most part of foreign sourcing studies do not take into account this important difference (good exceptions are Kohler & Smolka (2011) at the firm level and Nunn & Trefler (2011) at country and industry level).

The rest of the paper proceeds as follows. Section 2 reviews the main theoretical approaches and the empirical literature, Section 3 describes the database and outlines the econometric methodology and Section 4 reports the estimation results and discussion. The paper ends with a summary and conclusions.

2. Offshore sourcing strategies

Nowadays theories focus on the different organizational strategies of firms and revolve around transaction costs, asset specificity and incomplete contracts. The theories that seek to explain the qualitative and quantitative changes in foreign trade and FDI focus on the different organizational strategies of firms and try to find out what activities are carried out within firms (foreign subsidiaries) rather than through market transactions (international outsourcing) and why. The seminal work by Coase (1937) observed that when firms grow, the cost of organizing additional transactions increases and, in the final event, the entrepreneur may not allocate production factors efficiently because he will find difficult to manage all the information to control his employees, so the loss in resources will be greater than the cost of the transaction through the market, and a firm “will tend to expand until the cost of organising an extra transaction within the firm become equal to the costs of carrying out the same transaction by means of an exchange on the open market” (p.395). Starting from Coase main principles, Williamson (1975, 1985) develops on the nature and determinants of transactions costs. Under market mechanism, there are ex ante costs of finding trading parties and negotiating incentives for quantities and specifications of the intermediate products. The search is expensive and often there are difficulties to demonstrate the attributes and the quality of the components. These costs make any real contract inevitably incomplete. If contracts are incomplete they must be renegotiated, ex post adaptation is necessary, if a party to the contract has incurred sunk costs in developing specific assets, the other party can opportunistically appropriate a part of the investment’s pay-off (“there are ex post quasi-rents, returns in excess of the alternative-use value of the assets) and hence the parties find it very difficult to change to another partner. These limitations in
contracts can lead to problems of delays in delivery (holdup), the supplier reduces the amount of product to avoid excessive risk and have greater bargaining power.

Williamson (2005) stresses two dimensions that are relevant for the governance mode, one is asset specificity and the other is the disturbances to which transactions are subject (and to which potential maladaptations accrue). Asset specificity (which can take the form of physical, human, site and brand name inter alia) is highly specific when it has value within the context of a particular transaction but has relatively little value outside the transaction. This opens the door to opportunism; in that case disputes in markets are treated in a legalistic way and rely on court under the contract law regime, whereas in internal disputes (between different departments or plants) the firm becomes its own court. As asset specificity degree increases bilateral dependency (between the contractor firm and the supplier firm) also increases, which combined with the uncertainty of incomplete contracts makes vertical integration more pervasive. Internalization appears when the degree of asset specificity and uncertainty is so high that the different parts need a high level of cooperation and adaptation. From Williamson’s work Grossman & Hart (1986) develop the property rights approach (or incomplete contracts approach), that focuses on the ex ante underinvestment problem. The theory defines ownership as the rights to control the uses of assets under contingencies that are not specified in the contract. Because of contractual incompleteness and asset specificity, each investing party cannot collect all the returns from investment, and hence the level of investment is short of efficiency, there is an ex ante holdup problem of underinvestment because agents will be less inclined to invest in specific assets if they do not own these and relevant complementary assets. Owning an asset is important if one undertakes a non-contractible investment which is specific to the asset. Integration and outsourcing are different in terms of asset ownership, all the assets are owned by multinational firm under integration, while under outsourcing they are separately owned by multinational firm and the supplier. According to this theory, the party making the most important (non-contractible) asset-specific investment should own the asset. In this sense integration is optimal when the production is intensive in the input that the firm owns, in this case subcontracting in the market means leaving to the external supplier the power to threaten the firm by quitting with his assets.²

² A review of these theories can be found in Itoh (2006)
Grossman & Helpman (2002), Antràs (2003), Antràs & Helpman (2004) and Helpman (2006) consider that transaction costs, asset specificity and incomplete contracts play an important role in the “make or buy decision”. Antràs (2003) interprets multinational firm’s input as capital. In his model vertical integration of suppliers occurs mostly in capital intensive industries and intra-firm trade flows mostly between capital-abundant countries. In Antràs and Helpman (2004), multinational firm’s input is called headquarter services, and the hypothesis implies that FDI is more prevalent in industries with headquarter services such as R&D being more important.

Antràs and Helpman (2004) combined firm heterogeneity (Antràs, 2003) and property rights theory (Grossman & Hart, 1986). Based on assumptions of incomplete contractibility and relationship-specific investment, their model considers two types of transactions: vertical integration and outsourcing where the outside option is different. If a firm chooses vertical integration, in the event that the hold-up problem cannot be resolved through bargaining its outside options increase by obtaining the residual rights of control. The final producer can appropriate higher incomes with vertical integration than with outsourcing because it has rights of control over inputs.

Antràs and Helpman (2004) also assume the hierarchical order of fixed costs associated with sourcing activities. Organizational forms faces two tensions: one is related to location where fixed costs are higher in the case of foreign sourcing than in domestic sourcing; the other is related to government mode where fixed costs are higher for insourcing than for outsourcing, they reason that insourcing creates the need to control the production of intermediate inputs increasing managerial costs. In choosing between vertical integration and outsourcing the final-good producer trades off the benefits of ownership against the benefits of incentives for the independent supplier. The model predicts the different sourcing choices according to firm productivity; the most productive firms pursue foreign integration, firms with higher productivity engage in foreign outsourcing to an unrelated supplier, firms with lower productivity level choose domestic insourcing from a vertically integrated supplier, whereas the least productive firms choose domestic outsourcing. In their sectors analysis the prevalence of organizational forms depend on the industry characteristics and on the degree of productivity dispersion across firms: in component intensive sectors (with very low intensity of headquarter services) no firm integrates. In headquarter intensive sectors all organizational forms are possible but integration is more prevalent in sectors with more firm' productivity and in sectors with higher headquarter intensity. As a result only the most productive firms capture
the market share needed to offset the high costs of vertical integration, but not all firms candidates for vertical integration will in fact integrate. The real candidates for vertical integration will be very productive firms and with a large share of inputs provided by their headquarter. Taking these studies as our starting-point, we formulate the following hypothesis:

Hypothesis 1: Integration is more pervasive as the multinational firm's input intensity in headquarter services and the productivity are higher.

For the purposes of our analysis we just accept that firms involved in offshore activities show a higher productivity than domestic firms as theory predict (Antrás & Helpman, 2004; Helpman, 2006). Empirical analyses also support the theoretical prediction on sourcing modes by productivity (Görg & Hanley, 2005; Görg, Hanley & Strobl, 2008; Tomiura, 2005 & 2007, Ito et al. 2011). In Spain Fariñas & Martin-Marcos (2010) conclude that high-productivity firms source intermediate inputs in international markets, whereas low-productivity firms acquire these at home. The authors consider all sourcing firms, and do not distinguish between foreign outsourcing and foreign integration. Kholer & Smolka (2011) find that productivity levels are generally largest (lowest) for firms pursuing foreign integration (domestic outsourcing). The results of both empirical papers come from Survey on Business Strategies (ESEE), the same database that we are using in this research.

Empirical literature that investigates the offshoring choice distinguishing between foreign outsourcing and foreign integration at firm level is still very scarce. Marin (2006) conduct an empirical study related to the determinants of intra-firm imports for 2,200 FDI projects from 660 German and Austrian firms in Eastern Europe. Results show that intra-firm imports between German firms and their subsidiaries grow when the parent firm is more labour intensive, more intensive in headquarter services (R&D) and when the distance is lower, while intra-firm imports between Austrian firms and their subsidiaries grow when the parent firm is more capital intensive and less R&D intensive. These results suggest that German firms want to offshore to low wage countries when labour costs are important and transport costs are not, while Austrian firms, which are “human capital poor”, import the more from their Eastern European affiliates that are more R&D intensive. Tomiura (2007) studies the productivity variation with globalization modes (export, international outsourcing and/or FDI) and 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. Corcos et al. (2009) find that highly productive, capital, skill and
headquarter intensive firms favour intra-firm trade. Federico (2010) and Kholer &
Smolka (2011) provide empirical evidence on the sourcing strategies and
heterogeneity of firms, distinguishing between outsourcing and integration at home
and abroad. Both papers find that productivity levels are generally largest (lowest) for
firms pursuing foreign integration (domestic outsourcing). Ito et al. (2011) examines
the influence of knowledge capital on sourcing behaviour distinguishing between
foreign outsourcing, foreign integration and domestic sourcing. Their results show
that knowledge intensive firms, measured by R&D intensity and patent holder,
contribute to offshore sourcing and increase the probability to engage in vertical
integration rather than outsourcing. Tomiura et al. (2011) conduct a firm level
analysis comparing the capital intensity of offshore outsourcing firms and in-sourcing
firms distinguishing between regions in order to control by differences in contracting
environment. The authors find that foreign outsourcing firms tend to be more labour
intensive than foreign integration firms from the same region. Federico (2012) centres
the attention on headquarter intensity and the choice of different sourcing modes; his
results show that foreign integration is positively related to firm capital intensity and to
productivity.

Grossman & Helpman (2002), identify the industrial conditions that support vertical
integration or outsourcing as the equilibrium mode of organization, emphasizing the
technology, the distribution of bargaining power between intermediate and final good
producers, the size of the economy and the degree of sustituibility between industry’s
consumer products. When markets are highly competitive because products are
highly substitutable, the smaller is the number of firms that enter to produce
specialized components increasing the probability of matching, the probability to find
a partner. If specialised final producers would sell their output at a lower price than
would their vertically integrated counterparts, the potential operating profits of the
specialized firms would be relatively greater; the greater is the elasticity of the
demand for final goods, increasing the relative viability of outsourcing (p.104). The
prevalence of outsourcing requires enough cost advantage to compensate search
frictions and holdup problems.

Transaction-specific investments tend to be required when the production process
involves nonstandardized inputs as found in differentiated products (Levy, 1985).
Agarwal & Ramaswami (1992) point that a firm’s asset power is reflected by its size
and multinational experience, and skills by its ability to develop differentiated
products. If a firm develops differentiated products it may run the risk of opportunism if it shares this knowledge with other firms. Successful differentiation most often results from sunk investments in R&D (Coucke & Sleuwaegen, 2008) following a technological trajectory that opens up new possibilities for developing new products and new processes (Geroski, 1995). In this case higher modes of control may be more efficient. We formulate the following hypothesis:

Hypothesis 2: Integration is prevalent as the level of product differentiation is higher.

Firm’s level on multinational experience also has influence in the offshoring mode (Agarwal & Ramaswami, 1992). Firms without foreign market experience are likely to have greater problems in managing foreign operations. Exporting firms may obtain more information on overseas and suppliers through dealings with foreign countries (Ito et al. 2011).

The 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. At the same time, multinational enterprises are also able to coordinate these activities by using a wide variety of mechanisms from wholly owned FDI, through joint ventures, licensing and subcontracting (Buckley & 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 than domestic firms because they have easier access to the parent firm’s specific assets (Tomiura, 2005). Supply chain management has emerged as an important factor in the competitive success of multinational enterprises, firms’ relationships with the parent firm and other subsidiaries abroad facilitate the disintegration of production structures (Girma & Görg, 2004). We formulate the following hypothesis:

Hypothesis 3: Firms with more multinational experience may be expected to prefer investment modes of entry.

3. Data and Model

3.1. 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 were selected using a stratified, proportional, restricted and systematic sampling method with a random start. 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 criteria. This database has been frequently used in industry empirical analysis (see, among others, González et al., 2005; Lopez, 2008) and also specifically for offshoring and outsourcing analysis (Fariñas and Marcos, 2010; Kohler and Smolka, 2011).

The structure of the data implies that the decision of offshoring is considered given. Our objective is to study the characteristics of the firm that make more likely the vertical integration strategy of offshoring. Given the scope of the ESEE survey it is not possible to study the location choice of the offshoring strategy; it is not possible to know the moment that the decision was taken so we cannot establish causal relationships between the firm characteristics and the offshoring strategy decision.

Dependent variable

From 2006 the ESEE survey incorporates information related to the organization dimension and to the location. Out of that we are especially interested in offshoring activities. The questionnaire allows us to distinguish between foreign outsourcing and foreign integration through the next questions:

“Indicate whether the company made during the year (year) imports of 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)
(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 is very appropriate for investigating the empirical implications of theoretical models on make or buy decision. We construct the following variables.

Offshoring (OFF) is a categorical variable indicating whether the company makes imports of intermediate goods and services (yes/no).

Foreign Outsourcing (FO) is a categorical variable indicating whether the company made imports of intermediate goods and services from foreign companies that do not belong to the same group or participate in the capital of the company (yes/no).

Foreign Integration (FI) is a categorical variable indicating whether the company made imports of intermediate goods and services from other companies belonging to its group and / or foreign companies participating in the capital of the company (yes/no).

The objective of this paper is to provide empirical evidence about the features that influence firms’ foreign vertical integration (FI). Table 1 shows the distribution of firms with respect to the inclusive sourcing modes for the period 2006-2009. On average the 44 percent of all firms engage in offshoring activities, out of that the 96 percent are involved in foreign outsourcing and 23 percent integrate. These percentages are similar to those of Kohler and Smolka (2011), and lower to those of Fariñas & Martin-Marcos (2010), where the participation rate in foreign sourcing for the period 1990-2002 is 50 percent of all firms, and notably higher than in Italy where Federico (2012) shows that only 298 firms (the 7.7% of the sample) purchased subcontracting inputs from abroad and in the 84 percent of firms all foreign inputs are foreign outsourcing inputs. In Japan Tomiura et al. (2011) also show that more firms are involved in foreign outsourcing that in foreign integration. The prevalence of outsourcing over integration is consistent with the evidence reported by these studies.

If we consider exclusive offshoring modes we find that, on average, merely 1.6 percent of total firms (or 3.6 of offshoring firms) integrate. As in Tomiura (2007) and

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3 This low percentage of offshoring firms could be explained because Federico only consider subcontracting of custom-made inputs while the rest consider imports of intermediate goods and services that are incorporated in the production process, which is a broader definition of sourcing.
in Kohler and Smolka (2011) these results confirm that firms active in one globalization mode are more likely to involve in other modes of offshoring, in Kohler and Smolka (2011) for example, the probability for a large firm following foreign integration increases from 27 percent to 36 percent if this firm is engaged in foreign outsourcing. On the contrary Tomiura et al. (2011) report that more than 80 percent of the Japanese firms choose foreign in-sourcing or outsourcing but not both.

(Table 1)

Figure 1 shows the heterogeneity of offshoring participation by industries. The industries with higher involvement in foreign outsourcing are computer, electronic and optical; chemicals and pharmaceuticals and motor vehicles, in these industries more than 60 percent of firms are involved in activities of foreign outsourcing. In foreign integration we also find motor vehicles which show the higher level of participation (34%), chemicals and pharmaceuticals (26%) and computer, electronic and optical (21%). These industries are able to segment their activities and to seek the optimal source for each activity. On the other extreme we find industries with none or very low propensity to integrate including beverages, food, meat, leather and foot wear, textiles and clothing, furniture and printing, all of them are industries characterized by a low intensity in technology and in capital related to labour.

(Figure 1)

Table 2 shows size matters in propensity to foreign integration. Almost the 69 percent of large firms are involved in offshoring activities while only the 36 percent of small companies participate in offshoring activities. As theory predicts size reflects the capability of firms to absorb the higher costs of foreign activities related to domestic costs. This is especially remarkable in case of fixed costs, where we have assumed that fixed costs of foreign integration are higher than in foreign outsourcing, as in Antràs and Helpman (2004), so the large firms show a much higher propensity to foreign integration (39%) than the small companies (11,8%). Related to intensity we observe that there are not so big differences between large and small firms but it favours small firms.

(Table 2)
Independent variables

**Headquarter intensity**: Antràs (2003) claims that capital investments can be provided by the headquarter; firms engaged in foreign outsourcing are more labour intensive than firms engaged in foreign integration. The proxies used to approach headquarter intensity include R&D, skill intensity, capital intensity, design, marketing, quality control (see Antràs, 2003; Antràs & Helpman, 2004; Nunn & Trefler, 2008 & 2011; Corcos et al; 2009; Ito et al. 2011). To capture headquarter intensity we construct the following measures instead of relying on a particular one: Skill intensity (Skill); R&D intensity (R&D); Capital intensity (K/L), Patents and Quality control (Quality). See Table 3 for the description of the variables and descriptive statistics.

**Product differentiation** (*differentiation*): Our data provide information to capture product differentiation. Is a Categorical variable indicating whether the products the company manufactures are mostly much differentiated. The states of the variable are two, high or low differentiation.

**Productivity**: This variable captures firm heterogeneity. The productivity of the company impact on the supply choice when fixed costs are different between foreign integration and foreign outsourcing (Antràs & Helpman, 2004).

**Multinational Experience**: To capture multinational experience we construct 2 measures: Export intensity (Export) and Foreign Ownership (Foreign). Empirical works such as Görg, Hanley & Strobl (2008), Wagner (2010) and Ito et al. (2011) introduce firms’ exports activity to propose that exports may have a positive effect on offshoring due to the international experience, as exporting firms are used to work in overseas markets and have an easier access to relevant information. Their findings show that exports increases the probability of offshoring activities. Whereas we expect that foreign ownership will increase the probability of foreign integration, we are not sure about exports effect on foreign integration versus outsourcing. Export activity can help to explain the probability of foreign sourcing but all the experience in foreign markets that the firm has accumulated and that helps to decrease transaction costs favours both foreign integration and foreign outsourcing (Federico, 2012).

We include two control variables, *Firm Age* and *Size*. The Firm Age, which is defined as the number of years since the firm was established is used to represent the effect
of learning over time, to control for the accumulated experience as it could be a helpful factor in the firm’s foreign operations. Size, measured as total staff employed, also captures firm heterogeneity. As Tomiura (2007) denotes high labour productivity, strong headquarter functions, distribution networks, higher earnings and brand identification facilitate to large companies offshoring activities.

Another desirable control variable would be a proxy for contracting environment in the exporting country, as differences across destinations can be critical in the make or buy choice. To overcome this problem Tomiura et al. (2011) consider the choice of offshoring mode to a given region, the authors report some remarkable differences between China and ASEAN countries in one side and United States and European countries (North) on the other side, for example for any relevant capital intensity more firms choose to integrate in China than in the North, so the average capital/labour ratio of foreign integration firms in China will be lower than that in the North. In the authors opinion this is in line with the transaction cost literature as China is supposed to have a poorly developed contracting environment. On the contrary, following Antràs & Helpman (2008), Nunn & Trefler (2008) find that an improvement in contractibility has two effects, the standard effect, in this case the most productive domestic firms switch to foreign outsourcing; and the surprise effect, in this case most productive firms internalize previously outsourced inputs, encouraging vertical integration, as with better contracting environment the party that requires relatively more incentives in now the headquarter firm. Corcos et al. (2009) also find that intra-firm trade is more likely with countries having good judicial institutions, especially for highly productive, capital, skill and headquarter intensive firms. Overall, a better contracting environment in the exporting country favours offshoring but does not clearly favour one sourcing mode. For the Spanish case we do not consider a potential source of concern the differences in contracting environment in the host country as our first supplier of imports is the European Union with difference (90 percent of importing firms, 75 percent of total imports, came from European Union countries in 2006), and the top five countries are Germany, France, Italy, United Kingdom and the Netherlands where institutional environment and legal systems are fairly alike (Kholer & Smolka, 2011). Something similar happens in Italy where its foreign suppliers are mainly located in European Union also (Federico, 2012).

(Table 3)

3.2. Methodological issues
Given that the main objective of this paper is to link the probability of foreign integration mode with firm characteristics, we use a binary dependent variable (foreign integration) in a probit estimation.

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Prob(\text{foreign integration})_t = \beta_0 + \beta_1(\text{headquarter intensity})_t + \beta_2(\text{productivity})_t + \beta_3(\text{differentiation})_t + \beta_4(\text{multinational experience})_t + \beta_5(Z)_t + \epsilon_t \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. The subscript \(i\) refers to the unit of analysis, firms, and \(t\) to time. The independent variables are described in detail above and \(\epsilon_t\) 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 estimations have been carried out. The first one for all firms and the second one only for the firms that imports of intermediate goods and services (offshoring). These two estimations allow examining in more detail the characteristics of the firms that make foreign integration. Given the short period of time of the panel, only four years, and that the relevant variation in the data is mostly cross-sectional, panel regression techniques are of limited use. Therefore we implement pooled data estimation over the sample period clustering the error terms at firm level to control for intra-firm serial correlation. To control for any industry specific characteristics that may affect a firm’s likelihood to make foreign integration a set of industry dummies (19 two-digit dummies) was included in both regressions. In addition, time dummies have been included to control for cyclical effects.

Finally, we are aware that the independent variables are to some extend correlated with each other, although this implies a risk of collinearity, not to use all these variables would generate a possible problem of an omitted variable bias.

4. Results and discussion

4.1. Main results

The main results from the estimation are displayed in Table 4 model 1. First, empirical analysis confirms that firms involved in foreign integration activities are more productive and more intensive in headquarter services, from the five variables
used to control the headquarter service intensity, the coefficient associated to the variable skill, that captures human capital, and to the variable capital intensity are positive and significant. Corcos et al. (2009) obtain similar results for the same variables and Tomiura et al. (2011) show that capital intensity is positive and significant for insourcing firms. Federico (2012) also uses one set of variables to estimate the influence of headquarter intensity in the choice between integration versus outsourcing. The set of indicators (capital intensity, skill intensity, R&D intensity, scale and wages) is used in the different estimations a two levels, one is at firm level and the other at industry level, but in their results, including different robustness checks, only firm capital intensity and industry scale have a positive and significant influence in foreign integration.

(Table 4)

Unlike our results Antrás (2003) found that, at industry level, R&D expenditures increased intra-firm imports while human capital was positive but not statistically significant. Nunn & Trefler (2011), at industry level also, find that R&D intensity and skilled labour increase U.S. intra-firm imports. In Ito et al. (2011) results, firm R&D intensity and patent holder are positive and significant increasing the probability to engage in foreign integration. Skill intensity has been often included in estimations of intra-firm characteristics, at industry and at the firm level, but in few cases was found statistically significant; in this paper we confirm the positive and highly significant relationship between skill and foreign integration. The empirical literature related to productivity and foreign integration is not so scarce, Tomiura (2007) and Ito et al. (2011) for Japan, Corcos et al. (2009) for France, Federico (2010 & 2012) for Italy and Kholer & Smolka (2011) for Spain find that productivity and foreign integration are positively and significantly related.

Second, the coefficient associated to the variable that captures differentiation has a positive sign and is significant. As the theory predicts (Grossman & Helpman, 2002) foreign integration is more likely when firm develops differentiated products that need a superior relationship between parent and subsidiary, and specific assets that embody costly R&D efforts (for example marketing, brand, technology, quality), which are better protected against imitation within the firm boundaries. Foreign integration allows the firm to protect itself from the risk of opportunism (Agarwal & Ramaswami, 1992). The issue of differentiation seems to be not enough analysed by other studies
in the field; the availability of the information related to differentiation has allowed testing the theoretical proposition.

Our results confirm the third hypothesis. Multinational experience also matters in foreign integration and the coefficients associated to both variables (exports and foreign) are positive and significant. In particular the variable that captures the presence of foreign capital in the company is highly significant; as foreign capital participation increases, the probability of foreign integration increases too, proving the special prominence of foreign firms among those that engage in foreign integration. Tomiura (2005) obtained empirical evidence on the offshoring activities of multinationals. His estimations show that firms with their own affiliates overseas are four times more likely to choose foreign offshoring than firms without experience in FDI. At the same time exports are also highly significant, confirming that international experience in all of its different aspects is a main characteristic of foreign vertical integration.

From among the control variables firm size is relevant in foreign integration. As Tomiura (2007) points out, larger firms, through their superior distribution networks, higher earnings and brand identification own a greater capacity to cope with the higher costs of foreign integration. Firms need asset power to engage in international expansion, which is costly and size reflects the capability of firm to absorb all these costs (Agarwal & Ramaswami,1992). Tomiura et al. (2011) denotes that large size firms may prefer integrated sourcing based on their rich internal resources within multinationals, when the authors compare outsourcing firms versus insourcing firms among the firms offshoring to the same destination, they find that exclusively insourcing firms are significantly larger than exclusively outsourcing firms.

4.2. Robustness checks

To analyse if the results obtained in the estimation of foreign integration characteristics in front of all firms, hold also in front of firms involved in offshoring activities, we have carried out a complementary estimation only for the firms that make imports of intermediate goods and services (Table 4 model 2). The results are similar to the previous estimation (Table 4 model 1) proving that the foreign integration characteristics hold in front of all offshoring firms. However our results do not support that productivity is higher in firms involved in foreign integration in front of all offshoring firms. Even the most part of theoretical and empirical literature hold that
productivity in foreign integration is higher than in foreign outsourcing firms, Jabbour (2012) finds that productivity reduce the probability of vertical integration relative to outsourcing, confirming the predictions of Grossman et al. (2005).

One difficulty of the dependent variable is that in the theoretical models the strategic decision between make or buy is taken by the parent company, who imports the intermediate input produced in a foreign subsidiary’s country but as Nunn & Trefler (2011) point these imports could be imports shipped from a foreign parent to a subsidiary, empirical studies usually lack of this information, which is critical if firm level variables are related to headquarter services intensity.

As in Kohler and Smolka (2009), our data provide information related to equity participation by other companies, enabling us to build a restricted sample that we consider headquarter firms. This is an important improvement as most part of foreign sourcing studies do not take into account this difference.

To control for this parent firms we assume that firms with more than 50 percent of national capital are the ones who make the organizational decisions, and we run two Probit estimations (Table 4 models 3 and 4), the first one considering firms with less than 50 percent of foreign capital participation, and the second one reducing the threshold control value to less than 10 percent of foreign capital participation only. As Table 4 shows the number of observations is reduced from 7,197 in model 1 considering all firms, to 5,848 in model 3 considering firms with less than 50% of foreign capital participation, but the difference between firms with less than 50% and firms with less than 10% of foreign capital participation (Table 4 model 4) is very small as the reduction is only 92 observations.

As the results in the restricted headquarter sample show (Table 4 models 3 and 4), we find some differences from the general model 1. First, we confirm that foreign integration firms are more productive and more headquarter services intensive, with skill and capital intensity showing positive and significant coefficients, but now the coefficient associated to the variable R&D appears positive and significant, especially for firms with less than 50% of foreign capital participation. Second, the coefficient associated to the differentiation variable is now not significant, neither in less than 50% nor in less than 10% foreign participation model, we have to conclude that there exist some features in Spanish majority ownership firms that while being more R&D intensive, they do not differentiate products more intensively than the rest of the
firms, we believe that more research is needed in this aspect. Multinational experience is also another characteristic, as the coefficient associated to the variable exports is highly positive and significant, as in model 1.

Finally, in the last estimation (Table 4 model 5) we use the intensity of foreign integration measured as the percentage of total imports that represent imports of intermediate goods and services from foreign companies belonging to its 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%. The results confirm those obtained for the main estimation except the coefficient associated to the variable capital intensity that now appears as no significant. This result suggests that capital intensity matters particularly for the integration decision but not for the integration intensity.

5. Concluding remarks

This study analyzes firm characteristics that influence the foreign integration strategy, the issue of which factors have impact on firms’ offshoring foreign integration has received little attention in empirical literature and is still very scarce. We investigate the role that headquarter services intensity, productivity levels, product differentiation and multinational experience play in the offshoring sourcing strategies. The dataset we employ is a longitudinal survey of Spanish manufacturing firms that comes from Survey on Business Strategies (ESEE) covering the period 2006 to 2009. The analysis is conducted at the firm level and in the econometric estimation we control for industry specific characteristics.

The results of our paper provide immediate answers for a number of the questions raised at the beginning. First, we show that on average the 44 percent of all firms engage in offshoring activities, most part (96%) are involved in foreign outsourcing, besides the 23 percent integrate, while only 1.6 percent of firms use integration as the unique mode of foreign offshoring. As in Tomiura (2007) and in Kohler and Smolka (2011) these results confirm that firms active in one globalization mode are more likely to involve in other modes of offshoring.

Second, industries show a high level of heterogeneity in offshoring activities. The industries that exhibit a higher propensity to offshore activities are able to segment
their activities and to seek the optimal source for each activity. On the other extreme we find industries with none or very low propensity to integrate, all of them are industries characterized by a low intensity in technology and in capital related to labour, named traditional industries.

Third, our estimations confirm that the real candidates for vertical integration are the most productive firms and with a large share of inputs provided by their headquarter, as Antràs & Helpman (2004) predicts. Capital intensive and skill intensive firms are likely to foreign integration. In this paper we confirm the positive and highly significant relationship between skill and foreign integration.

Fourth, although theoretical contribution (Grossman & Helpman, 2002) support that foreign integration firms also exhibit a higher level of product differentiation, empirical evidence is very scarce. Our results show the company's ability to develop differentiated products, which also reveals a superior knowledge and skills, and the need to protect them through higher modes of control as vertical integration.

Fifth, firms with multinational experience, as foreign firms, domestic firms with foreign capital participation and export firms are more likely to foreign integration. In the case of parent companies because they posses ownership advantages that make foreign integration more preferably than foreign outsourcing. In the case of subsidiaries because they have easier access to the parent firm’s specific assets and in the case of exporting firms because their foreign market experience facilitates obtaining overseas information.

Sixth, big companies are more likely to foreign integration. The capability of firms to absorb the higher costs of foreign integration is especially remarkable and the large firms show a much higher propensity to foreign integration than the small companies.

Our results suggest that only firms with very specific characteristics are capable to engage in vertical integration and these results hold when we compare not only in front of all firms but also in front of offshoring firms. However our results do not support that productivity is higher in firms involved in foreign integration in front of all offshoring firms.

The data enables us to build a restricted sample that we consider headquarter firms. In the restricted headquarter sample we confirm that foreign integration firms are
more productive, more headquarter services intensive, and with higher multinational experience. However there exist some features in Spanish majority ownership firms that while being more R&D intensive, they do not differentiate products more intensively than the rest of the firms, we believe that more research is needed in this aspect. Finally our findings show that capital intensity matters particularly for the integration decision but not for the integration intensity.
Acknowledgements
We want to thank the participants at the European Trade Study Group, Copenhagen (2011), for helpful comments and suggestions.

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References

Corcos, G., Irac, D; Mion, G; Verdier, T; (2009). The determinants of intra-firm trade. CEPR Discussion Papers No. 7530.


Table 1- Inclusive offshoring modes
(percentage of participation)

<table>
<thead>
<tr>
<th>Year</th>
<th>OFF/total firms</th>
<th>FO/total firms</th>
<th>FI/total firms</th>
<th>FO/OFF</th>
<th>FI/OFF</th>
<th>DO</th>
<th>Total firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>41</td>
<td>39</td>
<td>9</td>
<td>95</td>
<td>21</td>
<td>59</td>
<td>2023</td>
</tr>
<tr>
<td>2007</td>
<td>45</td>
<td>43</td>
<td>10</td>
<td>96</td>
<td>23</td>
<td>55</td>
<td>2013</td>
</tr>
<tr>
<td>2008</td>
<td>46</td>
<td>44</td>
<td>11</td>
<td>97</td>
<td>23</td>
<td>54</td>
<td>2009</td>
</tr>
<tr>
<td>2009</td>
<td>45</td>
<td>44</td>
<td>11</td>
<td>97</td>
<td>24</td>
<td>55</td>
<td>2015</td>
</tr>
<tr>
<td>2006-2009</td>
<td>44</td>
<td>43</td>
<td>10</td>
<td>96</td>
<td>23</td>
<td>56</td>
<td>2015</td>
</tr>
</tbody>
</table>

OFF: Offshoring firms, FO: Foreign outsourcing firms, FI: Foreign integration firms, DO: Domestic firms

Table 2
Firms’ Heterogeneity: Size matters

<table>
<thead>
<tr>
<th>2006-2009</th>
<th>Small firms*</th>
<th>Large firms**</th>
</tr>
</thead>
<tbody>
<tr>
<td>%OFF/Total firms</td>
<td>35,9</td>
<td>68,7</td>
</tr>
<tr>
<td>%FO/OFF</td>
<td>97,4</td>
<td>93,8</td>
</tr>
<tr>
<td>%FI/OFF</td>
<td>11,8</td>
<td>39,4</td>
</tr>
<tr>
<td>FO intensity</td>
<td>73,3</td>
<td>64,7</td>
</tr>
<tr>
<td>FI intensity</td>
<td>41,4</td>
<td>37,5</td>
</tr>
</tbody>
</table>

* If the firm has less than 200 workers
** If the firm has less than more than 200 workers

FO and FI intensities are measured respectively as the percentage of total imports that represent imports of intermediate goods and services from foreign companies that do not belong to the same group or participate in the capital of the company and the percentage from other companies belonging to its group and / or foreign companies participating in the capital of the company.
Table 3: Summary statistics

<table>
<thead>
<tr>
<th>Variable</th>
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<tbody>
<tr>
<td>Description of the variable</td>
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<tr>
<td>FI</td>
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<tr>
<td>Skill</td>
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<tr>
<td>R&amp;D</td>
</tr>
<tr>
<td>Patents</td>
</tr>
<tr>
<td>Quality</td>
</tr>
<tr>
<td>Capital Intensity</td>
</tr>
<tr>
<td>Productivity</td>
</tr>
<tr>
<td>Differentiation</td>
</tr>
<tr>
<td>Productivity</td>
</tr>
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<td>Export</td>
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<td>Foreign</td>
</tr>
<tr>
<td>Size</td>
</tr>
<tr>
<td>Age</td>
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<td>VARIABLES</td>
</tr>
<tr>
<td>-----------</td>
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<td></td>
</tr>
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</table>

VARIABLES (intensity)

<table>
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<tr>
<th></th>
<th>All firms</th>
<th>All firms</th>
<th>All firms</th>
<th>All firms</th>
<th>All firms</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Offshoring</td>
<td>Foreign&lt;50%</td>
<td>Foreign&lt;10%</td>
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<table>
<thead>
<tr>
<th>Differentiation</th>
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<tbody>
<tr>
<td></td>
<td>[0.0950]</td>
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<tr>
<td>R&amp;D</td>
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<td>[1.554]</td>
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<td>Skill</td>
<td>0.0183***</td>
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<td>Quality</td>
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<tr>
<td>Capital intensity</td>
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<tr>
<td>Productivity</td>
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<tr>
<td></td>
<td>[0.0603]</td>
</tr>
<tr>
<td>Size</td>
<td>0.000105**</td>
</tr>
<tr>
<td></td>
<td>[4.73e-05]</td>
</tr>
<tr>
<td>Foreign</td>
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</tr>
<tr>
<td></td>
<td>[0.000947]</td>
</tr>
<tr>
<td>Exports</td>
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<td>Age</td>
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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.
Figure 1: Percentages of participation by industries