"Slicing the Value Chain" Internationally: Empirical Evidence on the Offshoring Strategy by French Firms*

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Abstract

This paper analyzes the offshoring strategy from an empirical view. It focuses on firm heterogeneity, asset specificity and search costs. On the basis of theoretical models, it extracts a set of testable hypotheses and creates a suitable set of variable to test their validity. This analysis is based on a data set from French manufacturing firms that provides detailed information on the offshoring strategy. The choice of offshoring modes is investigated through the estimation of a multinomial probit model and associated to a set of explanatory variables at the firm, industry and country levels. The results emphasize the role of firm heterogeneity, input specificity and of market thickness.

Keywords: Offshoring, Foreign Direct Investment, Outsourcing, Property Rights Theory, Transaction Costs.

JEL Classification: D23, F14, F23, L22

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1 Introduction

Globalization is changing the patterns of the international economy. Foreign direct investment (FDI) and international trade are growing faster than world GDP. The decline of trade barriers and of transportation costs is the most perceptible explanation of the growing internationalization of economies but it explains only a part of the growth of FDI and trade. Many observations, case studies (Feenstra, 1998; Hummels et al., 1998) and empirical analysis (Campa and Goldberg, 1997; Feenstra and Hanson, 1999; Hummels et al., 2001) indicate that the cause is the changing structure of the economic activity toward vertical specialization.

The question of vertical specialization has mainly been addressed theoretically. Grossman and Helpman (2003, 2004) Antras (2003), Antras and Helpman (2004) are examples of the theoretical literature trying to explain firm's offshoring strategy.[1] This literature puts forward the importance of firm heterogeneity and of sector characteristics (headquarter services, capital intensity) for the prevalence of one mode of vertical specialization over the others. Although these models have similar aspects they differ significantly in their conclusions, especially regarding the sorting pattern of heterogenous firms and offshoring choices. As stated by Antras and Helpman (2004): "*Empirical evidence is needed to discriminate between [them] the models*", which is the aim of this paper.

[1] I define offshoring as the delocalization of production to a different country. This delocalization can either take place within the firm boundaries, through vertical FDI, or at arm's length, through international outsourcing.

For the time being the empirical evidence on the determinants of the offshoring strategy is very scarce especially at the firm level. Antras (2003), Yeaple (2006) and Nunn and Trefler (2008) present evidence from the Unites States (U.S.) while Marin (2006) analyzes the case of Germany and Austria. In all these papers data is aggregated by industry and country.[2] The share of intra-firm imports is explained by industry and country characteristics. These papers put forward the significance of the intensity in research and development (R&D) and in capital as well as of the development levels of countries.

The aim of this paper is to present evidence on the determinants of the offshoring strategy. It focuses, mainly, on three aspects of offshoring that have received particular interest in the theoretical literature: firm heterogeneity, asset specificity and search costs. On the basis of the theoretical literature, the paper will draw a certain number of testable hypotheses related to these three aspects and test their validity. The empirical analysis is based on the "International intra-group exchanges" survey realized by the French ministry of economy for the year 1999. This survey provides very rich information on the structure of French trade and allows the analysis of the offshoring strategy by combining firm level, industry level and country level characteristics. This investigation corresponds to the estimation of a multinomial probit model at the transaction level.[3]

[2]The country refers to the country of origin of the imported inputs, where the offshoring is taking place.

[3]Each transaction has three dimensions, the offshoring firm, the imported input and the exporting country.

The paper shows that firm heterogeneity is a significant determinant of the choice of the mode of offshoring. Most efficient firms organize their offshoring transactions through partnerships while the least efficient firms vertically integrate. Firms with intermediate levels of efficiency outsource their inputs to independent suppliers. The paper also shows that intensity in headquarter services and input specificity favor vertical integration. At the country level, the results show that market thickness enhances arm's length transactions.

This paper's contribution to the literature is threefold. First, it offers empirical evidence based on disaggregated data on the offshoring activity and puts forward the significance of firm's and inputs characteristics, in comparison to the existing empirical evidence that focuses on industry and country level features. Second, it investigates the Grossman and Helpman (2003, 2005) predictions regarding the role of search costs and market thickness. To my knowledge, the impact of market thickness on offshoring strategies has not yet been explored. Third, it distinguishes between three forms of offshoring strategy, vertical FDI, arm's length outsourcing and partnerships.

2 Vertical FDI vs International Outsourcing: Asset Specificity, Search Costs and Firm Heterogeneity

This section presents the theoretical arguments related to the role of asset specificity, search costs and firm heterogeneity in determining the choice between vertical integration and outsourcing.

The transaction costs and property rights theories stipulate that real word contracts are incomplete. Parties engaged in a relationship need to renegotiate ex-post, after the production has took place and the production costs have been incurred, to set the price of the transaction and to bargain over the rents it generates. Ex-post renegotiation and bargaining are problematic when a transaction requires a relation specific investment (RSI) by one or the two parties.

The property rights theory of the firm, developed by Grossman and Hart (1986), Hart and Moore (1990) and Hart (1995), shows that the optimal allocation of ownership rights needs to depend on the parties specific investment.[4] Ownership rights increase ex-post bargaining power and reduce ex-ante under-investment. The allocation of ownership rights to the party realizing the most valuable specific investment will lead to the optimal outcome by reducing the severity of under-investment by this party.

[4]In the context of this theory, contract incompleteness and hold up problems are not specific to outsourcing. Transactions within integrated firms are also subject to incomplete contracts.

Antras and Helpman (2004) build on the property rights theory of the firm to model the offshoring decision as well as the choice of the mode of organization of the offshored production. Antras and Helpman (2004) consider a final good producer, located in the North, who faces four choices of production: vertical integration, outsourcing at home, vertical FDI and international outsourcing. The production of the final good requires two inputs, headquarter services and manufacturing components. At equilibrium, the difference in inputs' intensity tends to be a significant determinant of the offshoring strategy. Antras and Helpman (2004) show that a higher headquarter services intensity favors home sourcing over international one and favors the prevalence of integration over outsourcing. Antras and Helpman (2004) confirm the conclusions of the property rights theory; when the transaction is intensive in the services of the final good producer, vertical integration is the optimal mode of organization and when the transaction is intensive in the services provided by the supplier, outsourcing is preferred.
Another element that influences the choice between vertical integration and outsourcing is the degree of contract incompleteness. Grossman and Helpman (2003) and Antras and Helpman (2008) investigate the influence of contract incompleteness on the choice between international outsourcing and vertical FDI. Grossman and Helpman (2003) show that the relative prevalence of international outsourcing increases with the quality of the legal system in the host country. In the Antras and Helpman (2008) model, the final good producer and the supplier realize a continuum of relation specific activities to produce the intermediate inputs needed for the production of the final good. The de-

gree of contractual frictions differ from one activity to the other. Antras and Helpman (2008) show that an improvement in the quality of the legal system in the host country can raise either vertical FDI or international outsourcing. The relative prevalence of one mode of organization over the other depends on the extent to which the quality of the legal system is biased toward headquarter services or manufacturing components.

An important determinant of the firm's scope is the cost necessary to find a suitable partner. Grossman and Helpman (2002, 2003, 2005) consider the implications of search costs on the firm's offshoring strategy. These models consider two types of final good producers: integrated ones and specialized ones. The suppliers need to customize the input to the technological needs of the final good producers. The cost of customization depends on the technological distance between the supplier and the final good producer. Before establishing a transaction, specialized firms need to search and find a suitable partner. An important determinant of the ownership decision, at equilibrium, is the thickness of the market.[5] Grossman and Helpman (2003) show that, at equilibrium, the prevalence of international outsourcing over vertical FDI is enhanced by the size of the downstream industry. An increase in the size of the industry will increase the number of final good producers and thus the demand for suppliers services. Consequently, the entry by independent suppliers will increase and each final good producer

[5]McLaren (2000) considers the determinant effect of market thickness but the analytical mechanism that he develops is different from the one elaborated by the Grossman and Helpman (2002, 2003, 2005) models. In the Grossman and Helpman (2002, 2003, 2005) models market thickness acts on the vertical specialization choice through the search costs. In the McLaren (2000) model the market thickness influences the industry equilibrium through its impact on parties' outside option.

will find, more easily, a relatively close supplier.[6] Grossman and Helpman (2005) show that final good producers prefer to search for partners in a thicker market in order to increase the likelihood of finding a closer input supplier. Customizing technologies, represented by the use of computer-aided design for example, and search technologies, represented by the use of information and communication technologies (ICT), also facilitates the matching process. The technological catch-up, a larger use of computers and ICTs or a larger internet coverage ratio, in certain emerging and developing countries may explain the boost of production delocalization toward these countries.

Another significant element for the firm's choice between outsourcing and vertical integration on one hand, and between domestic and international outsourcing on the other hand is efficiency. Within an industry, firms are heterogeneous and present different levels of performance. Each form of vertical specialization requires a certain level of fixed organizational costs. These fixed costs are different from one strategy to the other. It is straightforward to assume that offshoring requires higher organizational costs than domestic sourcing because of the geographical distance between parties and the need to organize a transaction in two different environments.[7] However, the theory on offshoring does not present a definite assumption on the hierarchy of fixed costs between outsourcing and vertical integration. On one hand, vertical integration raises

[6]The distance between the final good producer and the supplier is in terms of technological compatibility. It corresponds to the distance between the supplier expertise and that of the final good producer and will affect the customizing cost.

[7]The parties engaged in offshoring transactions will need to adapt, among others, to the differences of language, of management culture and of legal systems.

governance inefficiencies but allows the firm to benefit from economies of scope in management. On the other hand, outsourcing raises search and transaction costs but reduces governance inefficiencies. Since offshoring necessitates higher costs than domestic sourcing, firms that engage in offshoring strategies will be more efficient than the ones that source at home. Among the firms that offshore the most efficient ones will outsource or integrate depending on the relative extent of fixed costs. Antras and Helpman (2004, 2008) assume that fixed costs of vertical integration are higher and show that the most productive firms engage in vertical FDI. Grossman et al. (2005) assume the opposite structure of fixed costs and find that most productive firms engage in international outsourcing.[8]

Providing empirical evidence for these theoretical predictions is not an easy or a simple task. The theoretical framework used in the different models consider: a firm producing a single product using one or two inputs; suppliers, integrated or independent, that produce a single product that is used as input by the downstream firm; and an organization choice that is one of two extremes, vertical integration or arm's length transactions. The reality of international vertical specialization is more complex. A large number of firms produce several products that differ in their production process and, especially, their factor intensity. The same is true for suppliers. The presence of multi-products firms complicates the evaluation of factor intensities, of the final goods

[8]The assumption by Grossman et al. (2005) is more appropriate when "the economies of scope in management exceed the managerial overload integration.

and of the inputs. Multi-products suppliers do not cause a serious problem because the data set I use identifies the imported import at a disaggregated level. To deal with the presence of multi-products downstream firms, I have estimated the multinomial probit model on a set of single product firms and have found similar results to the ones obtained from the entire sample of firms.[9] Regarding the organization choice, a multitude of governance structures exists; integration, joint venture, partial ownership agreements, complex contracts, market transactions, etc, where integration and spot market transactions represent two opposite extremes. In this study I consider three forms of offshoring; vertical FDI, outsourcing and partnerships. The first two forms correspond to the theoretical mode of organization considered in the literature while the partnerships represent an intermediate form of organization.

Another conceptual difficulty relates to the identity of the principal or the firm making the organization decisions. In the theoretical model the principal is well identified as the final good producer (or the manager of the downstream firm whose objective is to maximize the profit of the firm). This is certainly the case for single firms.[10] In the case of firms affiliated to a group, it is difficult to determine with certainty if the principal is the parent firm or the firm importing the input. The identity of the principal matters for the measurement of firm's level variables like productivity, scale, headquarter services and capital intensity. I chose to measure firm's level variables using information

[9]The results based on the sample of single product firms are not reported in the paper but are available upon request.

[10]By single firms I mean independent and non affiliated firms. Evidently, if these firms decide to invest abroad they will become multinational parent firms.

at the level of the affiliates. The main reason is the unavailability of information at the level of the parent firms. Moreover, many parent firms are registered in the financial or service sectors which characteristics do not reflect the activity and the heterogeneity of the firms offshoring their production. The degree of asset specificity and the degree of input intensity relate to the production of the final good. Even if the decision is not made at the level of the importing firm, the parent firm needs to take into account the factor intensity of the good produced by the offshoring firm, the degree of asset specificity related to the production process and the ability of the offshoring firm to deal with suppliers located abroad.

3 Data Description

This empirical analysis is based on a data set extracted from the "International intra-group exchanges" ("Enquête sur les Échanges Intra-Groupe") survey realized by the French ministry of economy in 1999. One of the main objectives of the survey is to analyze the strategy of French firms, and especially French groups, toward globalization and how this strategy is affecting the organization of their international trade transactions. This investigation resulted in a unique data set of 4305 individual firms located in France and controlled by 2023 international and industrial groups. It covers, on average, 55% of the French imports and 61% of the French exports.

Each firm has to provide, for each of its international trade transactions, the value of the

transaction, the classification of the imported product (following the 4 digits HS classification) as well as the country of origin. Each transaction has three dimensions, the trading firm, the traded product and the trading country. There are several transactions (or observations) per firm each one corresponding to the combination of a traded product and a trading country. On average, each firm has reported 320 international trade transactions. For each of these transactions, a firm has reported the organization mode; the share of the value of the transaction that is traded with an affiliated firm, the share traded with partners and the share traded with third parties or independent suppliers. The survey considers as partnership: technological alliances, licensing agreements, franchises and subcontracting agreements. This detailed presentation of the international trade activity gives the possibility to identify three modes of organization: vertical integration (associated with intra-group trade), partnerships (associated to trade with partners) and arm's length transactions (associated to trade with independent suppliers). More than half of the transactions are entirely realized with independent suppliers, almost 30% are entirely realized within the group and only 4% of the transactions are partially or entirely realized with partners. This paper focuses on firms in manufacturing sectors. The data set is limited to manufacturing affiliates, from which I exclude natural resources sectors,[11] and to import transactions. The final number of firms is 2790. The offshoring structure shows that French firms import their inputs mostly from

[11] Antras (2003) considers that the patterns of ownership in natural resources sectors may be determined by factors such as national sovereignty.

developed countries.[12] and that the dominant mode of organization is outsourcing regardless of the location.

Figure 2 illustrates the offshoring intensity, measured as the share of the value of imported inputs in total output, by industry. Figure 3 represents the average share of intra-firm trade, or vertical FDI, in offshoring transactions for each industry. Both figures show a heterogenous structure of the offshoring activity across industries. While some industries; like the food industry, other transport equipment or the wearing apparel and the textile industries rely significantly on offshored inputs, others, like the printing and publishing industry, present a relatively low intensity of offshoring activity. The organization of the offshoring activity also differs across industries. The share of vertical FDI is relatively large in industries such as the electric components, the electric products and the mechanical products while it is relatively low in the food or the wearing apparel industries.

The "International intra-group exchanges" survey focuses on the determinants, motivations and evolution of intra-group trade. It shows that the control of the production process plays an important role in the decision to trade within the group. For 63% of the firms, the control of the quality of the production is a motivation to supply within the group. The control of the marketing strategies and of the after-sale services is a valid argument in favor of intra-group trade for almost 54% of the firms. Another important

[12]The distinction between countries follows the World Bank definition of developed and developing countries.

matter for firms seems to be the cost of organization; 66% of them prefer intra-group trade in order to reduce organizational costs and 60% of the firms choose internalization in order to be supplied with more stability and at lower costs. This is a significant indication on the structure of fixed organization costs, it tends to confirm the assumption by the Grossman et al. (2005) model.

The data set has been completed with information on the productive activity of firms. This information is extracted from the firm annual survey "Enquête Annuelle d'Entreprise (EAE)" realized by the French ministry of industry. The "EAE" survey provides data on the activity of firms such as output, sales, value-added, number of employees, stock of capital, investment and use of intermediates. This data allows the estimation of total factor productivity (TFP), the construction of several control variables and the identification of the sector of main activity. Moreover, I have constructed several variables at the industry and country levels using the OECD statistical sources, the World Bank "World Development Indicators" database, the World Bank "Trade, Production and Protection" database and the CEPII "Trade and Production" database.

4 Methodology and Variables

This paper focuses on the offshoring strategy, it does not analyze domestic sourcing nor the choice between domestic and international sourcing. Three modes of offshoring are

considered: FDI, partnerships and outsourcing. I assume that a transaction is realized under FDI if 50% or more of its value is imported from affiliated firms. Similarly, I assume that a transaction is organized by a partnership (outsourcing) if 50% or more of its value is imported from a partner (third party). As a robustness check I also present results where the cut-off defining the nature of a transaction is 100%.

I have analyzed the choice of offshoring strategies by estimating a multinomial probit model. Each firm faces three different choices to organize its international trade transactions. A multinomial probit model allows the simultaneous estimation of these three choices. The choice of each mode of offshoring is associated to a set of variables reflecting firm heterogeneity, asset specificity and search costs.[13]

Firm Level Variables: At the firm level, I control for several aspects of firm heterogeneity and activity. As measures of heterogeneity, I use the firm's total factor productivity ("TFP"), estimated using the semi-parametric methodology proposed by Olley and Pakes (1996)[14], and "Scale", measured by the number of employees. I expect the pattern of firm heterogeneity to follow the structure of organizational costs. Larger firms have the possibility to spread the fixed costs of organization on a larger scale and thus maintain a competitive average cost of production. I assume that the productivity may be affected by the offshoring strategy, for this reason I use a two years lag of "TFP" as

[13]Details of the variables definition and construction are presented in table 3.

[14]I have estimated TFP industry by industry using the entire "EAE" data set. The purpose of the O&P methodology is to overcome the selection and simultaneity problems faced by the econometrician when estimating productivity.

explanatory variable.

I include a measure of "Marketing Services", represented by the share of marketing expenses in the total output of the firm. Marketing services are an indicator of the value attributed, by the firm, to her image or the image of her brand. It can also be used as a proxy for headquarter services or for the tasks provided by the final good producer within the vertical chain of production. In both cases, I expect this variable to increase the probability of vertical FDI. The image of a firm or her brand is a specific asset. Firms that have significant concerns about the quality of their brands would prefer to maintain the production process within their boundaries in order to exercise a high level of quality control.[15] I also include a measure of the "Capital Intensity" of the firm's production represented by the ratio of fixed assets over total employment. This variable is also a proxy for services provided by the final good producer. Finally, I add a measure of the firm's use of "Communication Technologies". It is represented by the amount of expenses on information technology services per employee. This variable may represent the search technologies available to the firm, and the easiness through witch the firm can find and establish contacts with foreign suppliers.

Industry level variables: I create two variables at the industry level; the first controls for the intensity in headquarter services and the second represents the size of the downstream industry. The first variable "Headquarter Services" is measured as the ratio of

[15] As mentioned earlier, quality control is a significant motivation for intra-firm trade in the case of 63% of the firms in the survey.

R&D expenditures to total production at the two digit industry level. [16] Information on the R&D expenditures and production at the industry level are extracted from the OECD's STAN Structural Analysis database. Following the predictions of the transaction costs and property rights theories, this variable is expected to favor vertical FDI. The second variable "Industry Size" represents the relative significance of the firm's industry. According to Grossman and Helpman (2002, 2003) the size of the firm's industry may have two opposite effects on the organization choice. On one hand, a larger downstream industry increases the demand for suppliers's services, induces the entry by specialized suppliers and creates a thicker upstream market. On the other hand, a larger downstream industry means a larger number of final good producers searching for suitable suppliers which makes it harder and more costly for each one of them. The measure of the industry size is constructed using the World Bank "Trade, Production and Protection" data set. It corresponds to the share of the the industry output in the total manufacturing output worldwide.

Product level variables: "Asset Specificity" at the product level is measured as R&D intensity (ratio of R&D expenditures to total production) at the imported product level.[17] Input specificity represents the RSI required for the production of the input and indicates the extent of transaction costs related to the transaction. A higher input specificity

[16] In the case of these variables the sectoral classification is related to the main activity of the importing firms. I have also measured R&D intensity as the ratio of R&D expenditures to value added but the results are very similar across these two measures.

[17] In the case of this variable the sectoral classification is related to the imported input's industrial classification. The "Asset Specificity" variable is measured at the 2 digits product classification, information at a more disaggregated level being not available.

increases transaction costs as well as the severity of hold-up problems. The input specificity variable is expected to increase the prevalence of vertical FDI.

Country level variables: At the country level, I control for the quality of the legal system in the exporting country by adding a "Rule of Law" variable that corresponds to the "Rule of Law" variable from the Kaufmann et al. (2003) governance database for the year 1999. A better legal system reduces the costs associated contract enforcement, reduces risks related to the hold-up problem and is expected to favor partnerships and outsourcing.

To investigate the significance of search costs I create a series of variables representing the size of the market as well as the state of search technologies. The "Market Thickness" variable is specific to every country-product pair. It is measured as the ratio of the exports of a certain product by a certain country over the total exports of this product. This variable represents the thickness of the market in each country for each product. If a country is responsible for a significant share of the total exports of a certain product, it will be relatively easy for a foreign firm to find a domestic supplier ready to produce and export the product. The "Market Thickness" variable is based on the World Bank "Trade, Production and Protection" database. Figure 1 gives a first insight of the relationship between the offshoring strategy and the market thickness. This figure plots the average share of intra-firm trade for each country-product pair against the variable "Market Thickness". Figure 1 illustrates a negative relationship between intra-firm

tarde and market thickness. As the share of a country in the total exports of a product increases, the share if intra-firm imports of this product from this country decreases.

The variable "Internet Diffusion" represents the state of search technologies in the exporting country. It is measured as the number of internet users per 1000 people. A good level of search technologies reduces search costs and facilitates the communication between foreign partners. This variable is extracted from the World Bank "World Development Indicators" database. Finally I have included two control variables at the level of the exporting country: the "Distance" from France and the relative wage in the exporting country. The variable "Wage Ratio" corresponds to the wage ratio of the average wage in the exporting country to the average wage in the French region where the offshoring firm is localized. Summary statistics of the firm level, industry level, product level and country level variables are presented in table 1.[18]

5 The Results

Results of the multinomial probit estimation are presented in table 2. The first (third) column compares FDI to outsourcing and the second (fourth) column compares partnership to outsourcing. In the first two columns the threshold defining the mode of organization is 50% of the value of the transaction. In the last two columns the thresh-

[18] All the monetary variables are expressed in constant 2000 US$.

old is 100%. In all regressions standard errors are clustered at the firm-country level.[19] The multinomial probit estimation shows that variables representing firm heterogeneity enhance the prevalence of contractual agreements especially partnerships. Productivity as well as scale reduce the probability of vertical integration relatively to outsourcing and partnerships, moreover they enhance the probability of establishing partnerships in comparison to outsourcing. While the TFP variable has no significant effect on the choice between partnerships and outsourcing, the scale variable favor the relative prevalence of partnerships over outsourcing. To summarize, more productive firms and larger ones offshore their production through partnerships, firms with intermediate levels of productivity and scale establish arm's length transaction with independent suppliers and relatively small and low productive firms offshore through vertical integration. The pattern of firm heterogeneity suggests that contractual agreements are associated with higher fixed costs of organization in comparison to vertical integration. This results confirms the assumption by Grossman et al. (2005) and is also in line with the firms' perception and evaluation of fixed costs. As mentioned earlier, a larger share of the firms covered by the survey specified that they turn to vertical integration in order to reduce organizational costs. Partnerships requires higher fixed costs than outsourcing probably because they are associated with complex contracts and a costly search process.

[19] All the results are robust to the estimation of a multinomial logit model. The multinomial probit model is preferred because it does not rely on the independence of irrelevant alternatives assumption.

The second point I consider is related to asset specificity. The transaction costs theory predicts that, when input specificity is significant, transaction costs related to outsourcing are high and vertical integration is more efficient to organize production. The property rights theory puts forward that when the transaction is intensive in the final good producer's specific investment, vertical integration is optimal. The results confirm both these assumptions. The intensity in "Headquarter Services" raises the relative probability of FDI in comparison to outsourcing as well as partnerships as expected by the Antras and Helpman (2004) model. Moreover, the "Asset Specificity" variable, that reflects the degree of asset specificity of the imported products, also favors FDI relatively to outsourcing and partnerships. The measures of asset specificity and intensity in headquarter services do not have a significant impact on the choice between outsourcing and partnerships. In the case of both outsourcing and partnerships, final good producers are subject to opportunistic behavior and hold-up problems. Variables reflecting headquarter services at the firm level are "Marketing Services" and "Capital Intensity". The "Marketing Services" variable seems to favor mostly the establishment of partnerships while the "Capital Intensity" variable is only significant for the choice between outsourcing and partnerships. "Marketing Services" have a positive and significant effect on the relative probability of partnerships in comparison to outsourcing as well as FDI. This result means that "Marketing Services" reflects an intermediate level of asset specificity pushing firms to establish intermediate forms of organization (partnerships) that present an intermediate level of contract incompleteness and allow coop-

eration and quality control between the partners.

Regarding the impact of the quality of the legal system the theory does not present conclusive predictions. The results show that this variable has no robust significant effect on the organizational choice. The "Rule of Law" variable is only significant, at the 10% level, for the choice between FDI and outsourcing in the third column. It increases the prevalence of vertical FDI while having no significant effect on the choice between outsourcing and partnerships.

Another significant element of the organizational choice of offshored production is the market thickness in the exporting country. The thickness of the market will determine the search effort required by each final good producer to find a suitable partner. When the search costs are very high, vertical integration is optimal. The results confirm this assumption. The "Market Thickness" variable, specific to every pair of country-product, reduces significantly the relative probability of FDI and in one specification favors outsourcing relatively to partnerships. The size of the downstream industry, represented by the "Industry Size" variable, favors long term relationships, vertical integration and partnerships, relatively to outsourcing. It also enhances the probability of partnerships in comparison to FDI. This result may be explained by the double effect of the size of the downstream industry on search costs. A large number of final good producers increases the entry by specialized suppliers as well as the competition for their services. Each final good producer, in a large industry, prefers to establish a long term

relationship to avoid recurrent high search costs, and the entry by specialized suppliers enhances the attractiveness of partnerships compared to vertical integration.

Variables representing The quality of the search technologies do not have the expected effect on the offshoring modes. The "Internet Diffusion" variable increases the probability of FDI relatively to that of outsourcing.[20] The "Communication Technologies" variable increases the prevalence of partnerships. This latter result suggests that this mode of offshoring gives place to an exchange of information and technology as well as monitoring and control that require the use of communication technologies. Relationships between parent companies and their affiliates also give place to flows of information and technology, however these flows are easier to channel between integrated firms. Arm's length relationships with independent suppliers do not seem to engage the firms in information and technology transfer.

6 Conclusion

This paper presents an empirical analysis of the offshoring strategy by French manufacturing firms. Offshoring can take place within the boundaries of the firm, through FDI, or at arm's length, with independent suppliers. Offshoring can also be organized through certain "Hybrid" forms of organization such as the establishment of long term partnerships. This paper focuses on three aspects of the offshoring activity: firm hetero-

[20] I have used other variables representing the quality of communication technologies in the exporting country and they had no significant effect.

geneity, asset specificity and search costs. On the basis of theoretical models analyzing these aspects, it defines a certain number of testable assumptions and empirically investigates their validity.

The paper studies the offshoring strategy by applying a multinomial probit model. The results confirm the significance of firm heterogeneity as a determinant of firm's offshoring choices as expressed by the models of Antras and Helpman (2004, 2008) and Grossman et al. (2005). The pattern of firm heterogeneity, represented by the productivity and scale, validates the assumption by Grossman et al. (2005) that organizational costs are higher in the case of outsourcing in comparison to vertical integration.

The results validate the conclusions of the transaction costs and property rights theories regarding asset specificity. In the presence of relation specific investment and because of contract incompleteness, contractual agreements (outsourcing and partnerships) raise transaction costs and vertical integration is preferred. The paper also shows that market thickness is a significant determinant of the mode of offshoring. As expected by Grossman and Helpman (2003, 2005), market thickness enhances outsourcing in comparison to vertical FDI.

Given the scarcity of the empirical evidence on internationalization and vertical specialization, this paper offers a significant contribution to the growing literature on this subject. The empirical analysis is based on a large set of firms and allows the clear definition of organizational modes and to control for determining elements at the firm,

industry and country levels. The main contribution is to present empirical answers to the assumptions presented by the theoretical literature. This paper focuses on theoretical models based on transaction costs and the property rights theories of the firm, yet the literature on internationalization includes also theoretical contributions based on alternative theories like the theory of managerial incentives and that of formal and real authority. A natural extension of this work will be to present empirical investigation of these alternative theories and to confront their validity in the explanation of the internationalization strategy.

Table 1: Summary Statistics

Firm Level				Industry Level (2 digits)			
Variable	Nb Observation	Mean	St Deviation	Variable	Nb Observation	Mean	St Deviation
Productivity	2375	4.16	0.9	Headquarter Services	13	0.1	0.11
Scale	2375	516	1270	Industry size	13	0.07	0.04
Marketing Services	2375	0.025	0.06				
Capital Intensity	2375	538888.4	1157249				
Communication Technologies	2375	2304	8313				
Product Level (4 digits)				**Country Level**			
Variable	Nb Observation	Mean	St Deviation	Variable	Nb Observation	Mean	St Deviation
Asset specificity	1028	0.051	0.072	Market thickness	11262	0.038	0.039
				Internet users	136	69.7	110
				Distance	136	3556.1	2456.4
				Rule of Law	136	0.17	1.04
				Wage ratio	2827	1.15	1.17

Table 2: The Choice of Offshoring Strategies: A Multinomial Probit Estimation

Base Group:	Outsourcing		Outsourcing	
	(FDI)	(Partnership)	(FDI)	(Partnership)
TFP	–0.059**	0.017	–0.085***	0.074
	(0.026)	(0.061)	(0.029)	(0.064)
Scale	–0.084***	0.236***	–0.1***	0.239***
	(0.02)	(0.072)	(0.022)	(0.085)
Marketing Services	0.055***	0.137***	0.038**	0.094***
	(0.015)	(0.024)	(0.017)	(0.026)
Capital Intensity	0.007	-0.066**	0.021	-0.062*
	(0.02)	(0.03)	(0.022)	(0.025)
Communication	0.013***	0.057***	0.012***	0.046***
Technologies	(0.004)	(0.013)	(0.004)	(0.014)
Headquarter Services	0.113***	–0.05	0.112***	0.039
	(0.018)	(0.044)	(0.02)	(0.034)
Asset Specificity	0.084***	–0.002	0.082***	–0.042*
	(0.013)	(0.026)	(0.014)	(0.023)
Market Thickness	–0.135***	–0.078*	–0.118***	–0.081
	(0.02)	(0.045)	(0.022)	(0.052)
Industry Size	0.16***	0.305***	0.062	0.21***
	(0.036)	(0.06)	(0.04)	(0.065)
Internet Coverage	0.103***	–0.122	0.088**	–0.206**
	(0.034)	(0.08)	(0.04)	(0.8)
Rule of Law	0.54***	0.144	0.602***	0.165
	(0.154)	(0.36)	(0.171)	(0.33)
Distance	0.092***	0.209***	0.121***	0.156***
	(0.028)	(0.057)	(0.031)	(0.052)
Wage Ratio	–0.118***	0.073	–0.12***	0.176***
	(0.018)	(0.052)	(0.02)	(0.053)
No. of obs	63720	63720	55998	55998
Log Pseudolikelihood	–39438.657	–39438.657	–31235.394	–31235.394
Wald Chi2	500.24	500.24	407.48	407.48
Prob> Chi2	0.000	0.000	0.000	0.000

All independent variable are in natural logarithm. ***, ** and * represent respectively statistical significance at the 1%, 5% and 10% levels. In the first two columns the threshold defining a mode of organization is 50% of the value of the transaction. In the last two columns the threshold is 100%.

Figure 1: Vertical FDI and Market Thickness

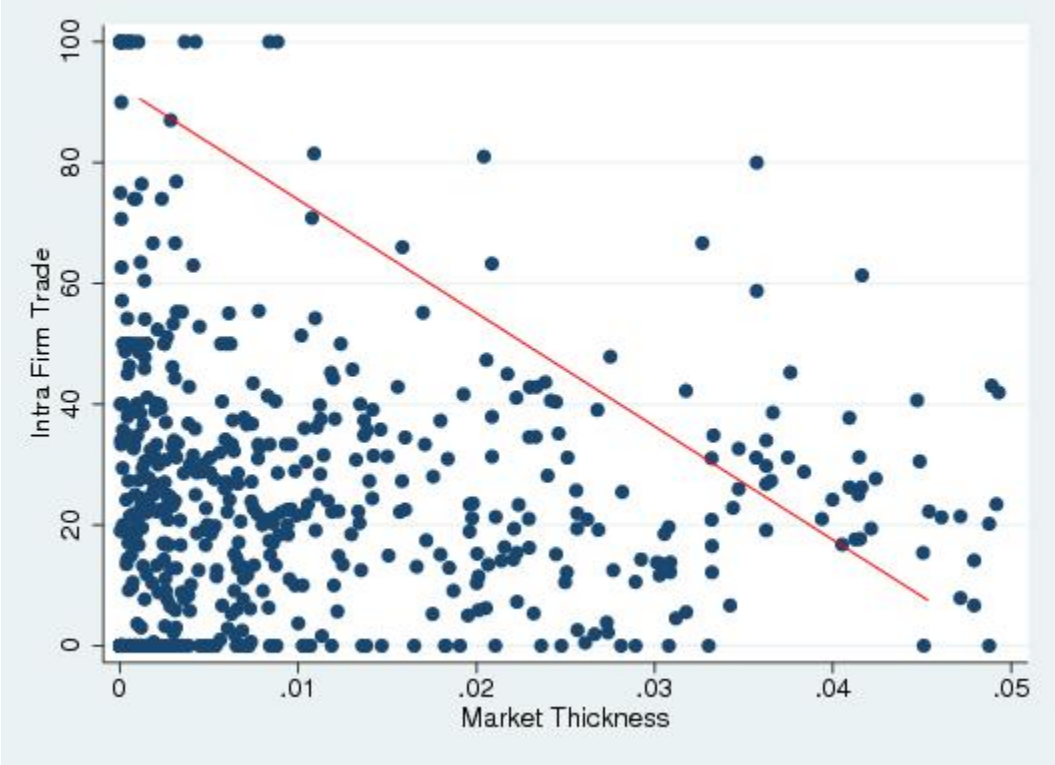


Table 3: Variables Definition

Variable	Description	Source
TFP	Total factor productivity estimated with the Olley and Pakes (1996) methodology separately for each sector using the entire "EAE" data set.	The firm annual survey ("EAE")
Scale	Number of employees.	"EAE"
Marketing Services	The ratio of marketing expenditures over total output.	"EAE"
Capital Intensity	The ratio of capital (fixed assets) stock to total employment.	"EAE"
Communication Technology	Expenses on information technologies services per employee.	"EAE"
Headquarter Intensity	The ratio of R&D expenditures to total production at the two digits industry (firm's main activity) level.	OECD STAN Structural Analysis database
Industry Size	The share of the exporting country in the total exports of the industry	World Bank TPP database
Asset Specificity	The ratio of R&D expenditures to total production at the two digits industry (input's classification) level.	OECD STAN Structural Analysis database
Market Thickness	The share of the exporting country in the total exports of a certain product	World Bank TPP database
Internet Diffusion	The number of internet users per 1000 people in the exporting country.	World Bank WDI database
Rule of Law	The quality of the legal system in the exporting country.	Kaufmann et al. (2003)
Wage Ratio	The ratio of the wage level in the exporting country to the wage level of the region where the firm is located	Rama and Artecona (2002) and the French National Statistics Institute.
Distance	The distance between the exporting country and the offshoring firm. The firm annual survey provides, for each firm, the location at the regional level. The distance variable is measured as the great circle distance between the main city of the exporting country and the main city of the firm's region. The countries' geographical coordinates are from the CEPII's "Trade and Production" database and those of the French regions are from Crozet et al. (2004). New York, Toronto and Frankfurt are the main cities for the U.S., Canada and Germany.	The CEPII "Trade and Production" database, "EAE" and Crozet et al. (2004)

Figure 2: The Offshoring Intensity by Industry

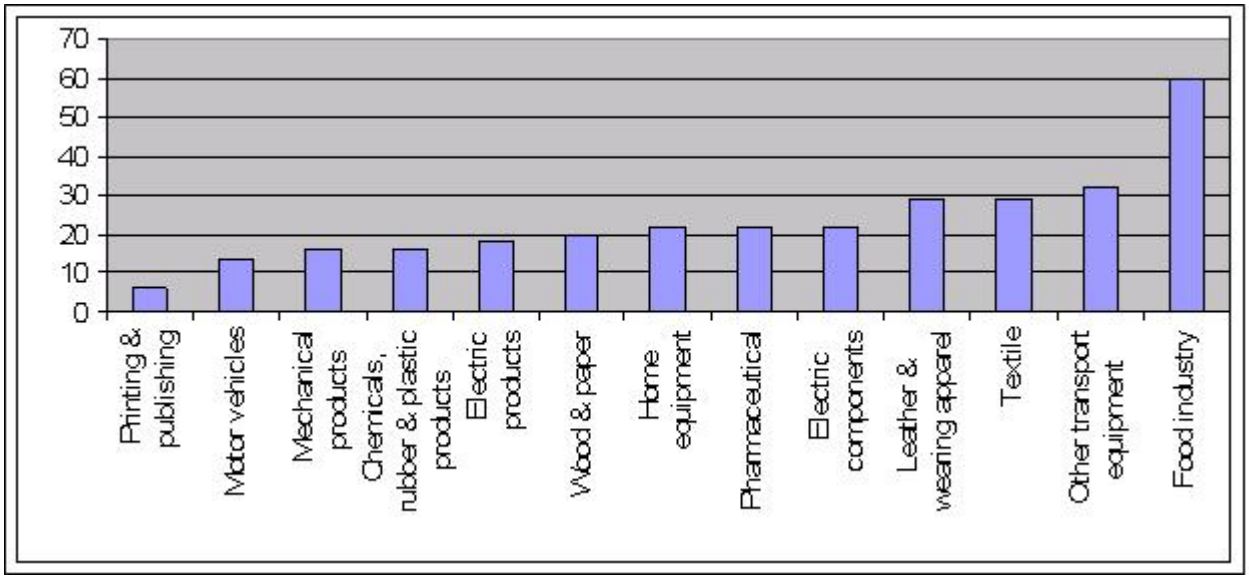
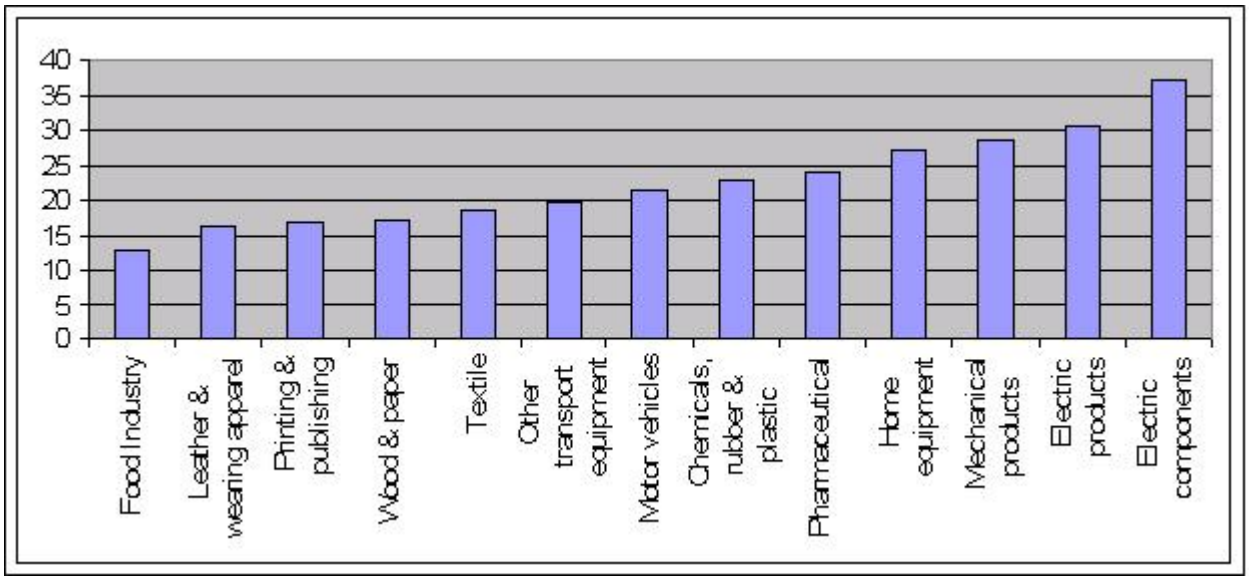


Figure 3: Intra Firm Trade by Industry



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