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ABSTRACT: The paper analyses the drivers of international production relocation using a model built on intra-corporate factors. The results of an empirical research on an original and thorough data base for the Spanish automobile parts sector over the period 2001-2008 show the impact of corporate restructuring strategies on flexibility for transferring resources overseas. In particular, the larger the number of alternative plants in other countries, the greater the operational flexibility and, therefore, the more likely relocation will be. Second, lean supply requirements and technological complexity in the product or process at production plant level are both serious barriers to mobility. Finally, our results confirm that sunk costs are irrelevant in comparison with corporate factors.

JEL Codes: F2, F23, L2, L23

Keywords: International production relocation, corporate strategy, lean supply, technology.

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1. INTRODUCTION

De-regulation and the resulting liberalisation of markets, together with the revolution in ICTs and transport, have led to an outstanding process of international relocation of production with its consequent economic and social impact (Cavusgil et *al*., 2008). The extent of this phenomenon and, above all, its repercussions have been analysed from both the political and the academic standpoints (Sleuwaegen and Pennings, 2006; Kinkel, 2012).

In the academic area, studies on relocation are usually based on the neoclassical, behavioural and institutional arguments of location theory. These have given rise to various analytical models that include location, external and internal factors for explaining relocation (Lloyd and Dicken, 1992; Van Dijk and Pellenbarg, 2000; Brower et *al*, 2004; Holl, 2004; Knoben and Oerlemans, 2008). Although these contributions have allowed us to find out more about the motivations for, and facilitators of, international relocation of production, they suffer from two main shortcomings. First, the large number of explanatory variables usually included in the analyses makes it difficult to identify a single parsimonious model that can throw light on the key variables. Second, the operational flexibility of multinationals (MNEs) for transferring resources internationally (Kogut and Kulatilaka, 1994; Dasu and Li, 1997) makes it necessary to pay greater attention to internal strategies in relocation decisions rather than the institutional or macroeconomic factors associated with a given country or region. In fact, as we try to demonstrate, operational flexibility is the key factor to explain most of the processes of relocation of production at international scale. Besides, there are also other factors of an internal nature relating to technology (Pennings and Sleuwaegen, 2000; Danese and Vinelli, 2009) and supply chain (Bogataj et *al*., 2011) that have received little coverage in the literature but also relevant. Both these factors act as inhibitors of relocation processes and are associated with production plants.

This paper aims to provide a parsimonious empirical model based on three main hypothesis to predict international relocation of production on the basis only of intra-corporate factors within the company and the production plant. It places special emphasis on factors relating to the operational flexibility of companies and logistics and technological factors of production plants. Our model is then tested using a new and thorough data base expressly built for this research and focused on the automobile parts manufacturing sector. This sectorial choice is justified by the fact that it has a great impact worldwide in terms of production and employment, involves very heterogeneous products, processes and technologies, varying supply chain conditions, and includes many multinationals that are highly internationalised regarding both their consumer markets and their production plants.

In order to meet our aims, this paper is organized as follows. The next section reviews the existing literature and poses the hypotheses to be tested in the research. Section three describes the sample of production plants analysed and defines the variables. Section four analyses the data and discusses the results. Finally, section five concludes and suggests a number of relevant implications for both management and public policies design.

2. LITERATURE REVIEW

Most of literature relies upon location theory to determine the factors behind relocation. Studies based on this theory use an analytical model involving three types of factors: external factors related to the environment in each region or country, location factors relating to the physical place where the firm carries out its activity, and intra-corporate factors of each individual firm (Table 1).

Table 1: Relocation factors

Emphasis	***Factors***	***Authors***
External	▪ Labour costs	▪ Cordella and Grilo, 2001; Antras and Helpman, 2004
	▪ Size of potential market	▪ Holl 2004; Sleuwaegen and Pennings, 2006
	▪ Geographical location of market	▪ Brower et *al.*, 2004; Artís et *al.*, 2007; Knoben and Oerlemans, 2008
Location	▪ Local agglomeration factors	▪ Holl, 2004; Lee, 2006
	▪ Economic development	▪ Van Dijk and Pellenbarg, 2000
	▪ Infrastructure	▪ Holl, 2004
Internal	▪ Growth or expansion of the enterprise	▪ Chan et al., 1995; Hayter, 1997; Van Vilsteren and Wever, 1999; Brower et *al.*, 2004
	▪ Technology transfer	▪ Pennings and Sleuwaegen, 2000
	▪ Entry into new markets	▪ Belderbos and Sleuwaegen, 1996; Muchhielli and Saucier, 1997; Faust et *al.*, 2004
	▪ Efficiency and performance	▪ Lee, 2006; Artís et *al.*, 2007
	▪ Age of the enterprise	▪ Brower, 2000; Van Wissen, 2000
	▪ Intensity of inter-organisational relations	▪ Knoben and Oerlemans, 2008
	▪ Flexibility of production configuration	▪ Lee, 2006; Sleuwaegen and Pennings, 2006
	▪ Cost of relocation	▪ Rosenbaum and Lamort, 1992; Motta and Thisse, 1994; Clark and Wrigley, 1997
	▪ Capacity for financing relocation	▪ Caves, 1996; Pennings and Sleuwaegen, 2000

Table drawn up by the authors

While all factors can be relevant, studies linking relocation to environment factors are valid as long as they focus the problem on the comparative advantages of different regions or countries, mainly in terms of costs. However, we consider that such factors on their own do not help to explain the mechanisms that determine corporate relocation decisions. They are only relevant to the extent that they can be included in an equation aiming to explain intra-corporate strategies. For example, an external factor such as labour costs would only be a key factor in relocation if the enterprise adopts a labour-intensive strategy.

There are several reasons to focus attention on internal factors. First, production relocation can be explained as the result of a strategy to enter new markets (Belderbos and Sleuwaegen, 1996; Mucchielli and Saucier, 1997; Faust et *al*., 2004), to achieve internal growth (Chan et *al*., 1995; Hayter, 1997), to achieve external growth (Van Vilsteren and Wever, 1999; Brower et *al.*, 2004) or to transfer technology (Pennings and Sleuwaegen, 2000). Most studies stress inhibitors or facilitators of relocation such as the costs inherent in the relocation process (Rosenbaum and Lamort, 1992; Motta and Thisse, 1994; Clark and Wrigley, 1997), the economic-financial situation and resource availability (Caves, 1996), or the existence of alternative locations (Lee, 2006; Sleuwaegen and Pennings, 2006). These are largely associated with intra-corporate factors. Second, the literature generally discusses the link between international relocation processes and MNE strategies (Buckley and Mucchielli, 1997; Barba et *al.*, 2001; Belderbos and Zou, 2006; Konings and Murphy, 2006), placing understandable importance on the operational flexibility of such enterprises to coordinate and transfer resources internationally (Kogut and Kulatilaka, 1994; Huchzermeier and Cohen, 1996; Dasu and Li, 1997). Therefore, internal choices are more likely to explain the relocation of activities than factors relating to specific environmental or locational advantages. Third, the international dimension of relocation implies that the location factors of the physical place or the surrounding area become irrelevant. Economic development in the enterprise’s location (Van Dijk and Pellenbarg, 2000), nearby infrastructure (Holl, 2004) or local agglomeration economies (Lee, 2006) usually lead to nearby relocations of the activity (even within the home country), rather than international transfers.

In order to test the prevalence of intra-corporate factors in international relocation, we suggest three simple and testable hypotheses. The first is based on the idea that operational flexibility explains the production configuration of an MNE more efficiently than specific location advantages (Buckley and Casson, 1998; Fisch and Zschoche, 2012), because such flexibility allows the international transfer of resources and adaptation to changes in the environment, while maintaining an efficient production configuration (Kogut and Chang, 1996; Chung et *al*., 2010). Production restructuring strategies such as specialisation, concentration of production or rationalisation of production capacity allow MNEs to achieve operational flexibility and thus optimise their production configuration. Such strategies force enterprises to change their organisational and spatial structure, leading to total or partial relocation of some of their plants' production activity. Thus, the first hypothesis is:

H1: The probability that a production plant will be relocated is greater if it belongs to an enterprise that follows a corporate strategy of production restructuring (specialisation, concentration or rationalisation).

When considering operational flexibility, special attention should be paid to two matters. First, certain characteristics of the international network of an MNE, such as its size or presence in a large number of countries, increase its capacity for transferring activities internationally (Allen and Pantzalis, 1996; Tong and Reuer, 2007); the more alternative plants it has in other countries, the easier it will be for it to transfer activities and the more likely it will be that production will be relocated amongst its own plants. Second, when a plant belongs to an international production network, its activity may be transferred without requiring sunk costs, described by Motta and Thisse (1994) as the main barrier to international relocation due to their large proportion over relocation costs. These sunk costs, as well as production assets, workers' contracts and especially costs relating to the skills developed and routines adopted by workers and territorialised in the plant are irrelevant in MNEs because they mostly remain in the enterprise even if the plant is fully relocated. Therefore, in our proposal, sunk costs do not amount to a significant barrier for transferring activity in a MNE. Setting aside the operational flexibility of MNEs, their multiple locations make it necessary to analyse aspects that inhibit or facilitate relocation processes at production plant level, in order to explain why some plants are relocated and others are not. So far, studies on relocation have not covered the production plant level and only use enterprise-level data in their analyses. This shortcoming can be partially corrected by the arguments given in the literature on selective plant closures in multi-plant enterprises (Kirkham and Watts, 1998; Tomaney et *al*., 1998; Kirkham et *al*., 1999; Watts and Kirham, 1999; Richbell and Watts, 2000; Watts, 2003). Such selective closures are considered to be most frequent in the industrial sector (Fothergill and Guy, 1990) and are often linked to production restructuring processes. While this literature suggests a large number of explanatory factors, size and aspects relating to production technologies play an important role. In addition to these, in our research we include factors relating to supply logistics which, to date, have been omitted from the literature on relocation.

The new economic geography maintains the validity of the neoclassical approach which considers that transport costs are one of the main determinants of location (Fujita et *al.*, 1999), and that a rise or drop in such costs may be decisive effect in changing the location of economic activities (Puga, 2002). More specifically in the case of relocation, there is evidence that relates market proximity location – linked to transport costs – and mobility of the activity (Holl, 2004; Brower et *al.*, 2004; Knoben and Oerlemans, 2008). However, in many sectors today lean supply or JIT purchasing have become standards for the way in which the supply chain is organised (Lamming, 1996; Cox, 2001; Bruce et *al*., 2004; Alonso et. *al*, 2006), that is, short lead times, pull ordering, minimal inventories and small, frequent deliveries (De Toni and Nassimbeni, 2000; González-Benito and Spring, 2000), making the link between production and location especially relevant. Under such supply systems, geographical distance between customer and supplier leads to a marked increase in transport costs (Vonderembse et *al*., 1995). However, enterprises do not always consider this distance to be a barrier for adopting this type of supply system (Wafa et *al*., 1996; Das and Handfield, 1997). Consolidation of loads and the use of buffer warehouses have been the most widely-used solutions for overcoming the drawbacks of lack of proximity (Handfield, 1993; Miemczyk and Holweg, 2004). Lean supply involves a change in transport costs and has internal strategic implications that affect the relocation of production activities (Puga, 2002). First, when a multinational chooses to adopt lean supply, proximity between supplier and customer is a requirement for certain products so plants that are close to the customer are not likely to be relocated. Second, there are certain restrictions on location for products under lean supply and these can only be avoided by increasing logistics costs, which often amounts to a limitation on relocation. Third, more demanding lean supply requirements amount to a greater restriction on relocation. The second hypothesis for the model is then:

H2: The probability of relocation decreases in production plants that supply under lean requirements.

One of the main results of globalisation has been the international breaking up of production processes and of enterprise functions (Jones and Kierzkowski, 1990; Mouhoud, 2006). This phenomenon of vertical disintegration of the value chain carried out by enterprises has aimed to standardise many products and processes in which technological requirements are not especially demanding. This standardisation, together with a low level of technological complexity, makes it easy to replicate and transfer production processes (Dicken, 2003; Camuffo et *al*. 2006, Nassimbeni and Sartor, 2006). Undoubtedly, the lower costs of training on the one hand and of industrialisation and quality assurance on the other are behind the explanation for this facility in transferring such processes. Conversely, greater technological complexity in processes leads to a greater need for skills, capabilities and knowledge (Guilhon, 1992) and, therefore, to higher costs and requirements for industrialisation and quality assurance in the case of transfer. So, the third hypothesis is as follows:

H3: The probability of relocation decreases in plants with a technologically complex process.

Table 2 summarises the proposed model, which emphasises intra-corporate factors for explaining relocation and includes plant-level analysis. According to this model, the corporate restructuring strategies of the parent company would be the main motivation for international relocation of production. This process would be facilitated by the existence of alternative plants and the consequent operational flexibility to be gained from them. The specific logistics and technological determinants of each production plant complete the model, acting as the main inhibitors of international relocation. Finally, the model does not consider sunk costs to be a barrier to a change in location because of the operational flexibility of MNEs for internationally transferring resources.

Table 2: Model for international relocation

	Internal factors in the parent company	***Internal factors in the production plant***
Motivators	▪ Corporate restructuring strategies	
Facilitators / Inhibitors	▪ Alternative plants	▪ Lean supply requirements ▪ Technological complexity

3. METHODOLOGY

3.1. Active plants and relocated plants

The data base used for testing the model is focused on the automobile sector. More specifically, the automobile parts or auxiliary sector in Spain. The automobile sector in Spain, comprising both vehicle and parts manufacturers, represents 6.1% of Spanish GDP and 17.6% of the total value of exports. The parts sector is an essential element, especially in terms of employment. Of every 100 workers associated with this sector, 78 are employed by components manufacturers (170,000 in 2009). The value of production amounted to 23 billion euros that same year, placing Spain in third position in Europe for parts production. Taking into account the subject of the research, its specificities and the levels of analysis, we chose to use two samples of production plants belonging to two study universes: one sample of plants which, during the period 2001-2008, had relocated all or part of their production (relocated plants), and another comprising plants that during that same period had not undergone this process (active plants).

a) Plants relocated during the period 2001-2008

The process of obtaining the sample of relocated plants started out with a laborious analysis of several sources of information (scientific literature, sector reports and studies, public and private surveys on relocation and data bases on European restructurings). Subsequently, the cases were verified through direct contact established with managers in the companies involved. All cases in which such comparison was not possible were dropped. The final number of plants relocated during this period for which information was available for the analysis was 33. These amounted to 11.5% of total plants in the sector, and represented an annual relocation rate of 1.44%, similar to the rate obtained in other studies on relocation (Brower et *al.*, 2004; Sleuwaegen and Pennings, 2006, Artís et *al.*, 2007). These relocations led to the loss of 9,300 jobs in Spain in the plants of multinational groups, most of them foreign-owned. Of these 33 cases, in 28 the whole of the production was relocated and the plant was closed down, and in 5, relocation was partial, affecting just one of the products or a part of the production process, and the remaining activity continued as before.

Regarding the relocated products and activities, wire harnesses amounted to more than 35% of the cases, followed by textile products (fabrics, seat covers and airbags) at 18%, rubber and plastics (pipes, tyres and external design features) at 12% and electric motor assembly at 9%. The remainder were safety elements, steering columns, door locks, valves and other metal elements. The geographical destination of relocated production mainly followed the criterion of proximity. The main destinations were Europe (Portugal, Czech Republic, Slovakia, Romania, France and others) which received 63% of the relocated jobs and North Africa (Tunisia and Morocco) which received 28%. Asia (China and India) and Latin America (Mexico) received 6% and 3% respectively.

b) *Plants that remained in their location (active plants) between 2001 and 2008*

The AMADEUS data base was used to determine the universe of active plants, selecting from it firms classified as Motor Vehicle Parts and Accessories (SIC 3714), with over 99 employees and non-consolidated accounts (in order to guarantee that the firm is a single production centre): 254 plants met these criteria. Finally, in order to simplify data collection and processing, a sample of 153 plants was selected at random[2].

3.2. Data and variables

Empirical studies on relocation have generally resorted to management opinion surveys to evaluate objectivisable facts and in many of them the reasons for relocation are often ordered by the percentage of responses in a questionnaire. Such opinions are often biased by many cognitive factors (Sudman et *al*., 1996; Tanur, 1992) so they generate measurement errors that affect both the validity and reliability of the models (Bertrand and Mullainathan, 2001). This research therefore performed its analysis on the basis of objective markers in order to answer the research question with quality and objectivity. Table 3 shows the variables used, distinguishing between those relating to the production plant and those relating to the parent company, and indicating data sources.

The main research technique used for obtaining these variables was surveys. For the active plants, a sequential methodology based on three methods (post, telephone and face-to-face interviews) using TNS-Demoscopy for the field work, during the months of March and October in 2009. In addition to the survey, the variables and quality information on relocation for the relocated plants comes from in-depth interviews during the period 2006-2009 with the plant managers. In addition to the variables obtained from the survey, AMADEUS provided the number of employees. The Corporate restructuring strategy variable was calculated using information gathered from the *European Restructuring Monitor (ERM)*[3].

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[2] Sample error ±5.01%, for a confidence level of 95% considering the equal population proportions of the characteristics being studied

[3] This covers cases of production restructuring that involve an increase or loss of at least 100 jobs, or affect at least 10% of the workers in plants having more than 250 employees.

Table 3: Independent variables, definition and data sources

Variable	*Definition*	*Source*
Parent company variables		
Corporate restructuring strategies	[Number of plants closed by processes of production restructuring in the last 3 years in Europe] / [Total number of plants in Europe]	European Restructuring Monitor
Alternative plants	Number of plants located in other countries that produce the same product	Survey
Production plant variables		
Sunk costs	Size of the plant by number of employees	AMADEUS Data base
Lean supply requirements	Dummy: takes 1 if the plant operates under lean supply (pull supply system and multiple deliveries per day); 0 otherwise	Survey
Technological complexity	[Number of process technologies] x [Number of employees with higher-level qualifications / Total number of employees] x [Factor in terms of the number of references involved in the product] x [Number of employees in quality jobs / Total number of employees]	Survey

4. ANALYSIS AND DISCUSSION OF RESULTS

4.1. Econometric analysis

The following two nested econometric specifications are estimated:

$$\begin{aligned} Relocation_i = \; & b_0 + b_1 \times Corporate\ restructuring\ strategies_i + \\ & + b_2 \times Alternative\ plants_i + b_3 \times Sunk\ costs_i + e_i \end{aligned} \qquad [1]$$

$$\begin{aligned} Relocation_i = \; & b_0 + b_1 \times Corporate\ restructuring\ strategies_i + b_2 \times Alternative\ plants_i + \\ & + b_3 \times Sunk\ costs_i + b_4 \times Lean\ supply\ requirements_i + b_5 \times Technology\ complexity_i + e_i \end{aligned} \qquad [2]$$

Specification [1] includes variables for the parent company and *Sunk costs*, which are identified as the critical factor in the relocation decision. Specification [2] also includes the effect of logistics and technological requirements. Basic statistics descriptive of all variables are reported in Table 4. Table 5 shows linear correlations between variables. Multicollinearity between regressors is not a serious concern.

The endogenous variable shows a binary response (0/1; active plant / relocated plant). Hence we fit a logit model using a maximum-likelihood estimator. Iterative computations are made using the software STATA 12. Results are reported in Table 6. Column 3 reflects the corresponding elasticities for coefficients in column 2 in order to make easier the analysis of the relative relevance of the several variables. Elasticities are computed at means of the independent variables.

In column 1 of Table 6, the *Corporate restructuring strategies* and the *Alternative plants* variables are significant ($p<0.01$), while the *Sunk costs* variable is not.. The more alternative plants a multinational has and the more restructuring processes it has gone through over the last three years, the more likely it is that the plant will be relocated. As expected, results for those variables are the same in column 2. But the two new variables – *Lean supply requirements* and *Technological complexity* – are also highly significant. Therefore model [2] performs better than [1] in terms of goodness of fit (Pseudo-R^2) and predictive capacity. ROC curves plotted in figures 1 and 2 confirms that model [2] ranks significantly better than model [1] in terms of diagnosis accuracy[4]. The corresponding AUC increases from 0.79 to 0.87.

Finally, elasticity is over 1 in absolute value only in the case of *Technology Complexity* (-1.43). It remains below unity for *Alternative plants* (0.84), and *Lean supply requirements* (0.77), and it is significantly lower for *Corporate restructuring strategies* (0.22).

[4] ROC analysis quantifies the accuracy of diagnostic tests used to discriminate between two states or conditions, normal and abnormal. The discriminatory accuracy of a diagnostic test is measured by its ability to correctly classify known normal and abnormal subjects. The analysis uses the ROC curve, a graph of the sensitivity versus 1-specificity of the diagnostic test. The sensitivity is the fraction of positive cases that are correctly classified by the diagnostic test, whereas the specificity is the fraction of negative cases that are correctly classified. Thus the sensitivity is the true-positive rate, and the specificity is the true-negative rate. The area under the ROC curve (AUC) serves as a summary measure of diagnostic accuracy. It can take values from 0.0 to 1.0. An AUC of 0.50 means that the diagnostic accuracy in question is equivalent to that which would be obtained by flipping a coin. See Pepe et *al*. (2009)

Table 4: Descriptive statistics of both endogenous and exogenous variables

Variable	***Observations***	***Mean***	***Std. Dev.***	***Min***	***Max***
Relocation	186	0.177	0.383	0	1
Corporate restructuring strategies	186	0.030	0.066	0	0.5
Alternative plants	186	13.89	14.77	0	80
Sunk costs	186	280.6	273.04	25	1600
Lean supply requirements	186	0.349	0.478	0	1
Technology complexity	186	0.171	0.043	0.0001	0.415

Table 5: Correlations between independent variables

	(1)	(2)	(3)	(4)	(5)
(1) *Corporate restructuring strategies*	1				
(2) *Alternative plants*	0.123	1			
(3) *Sunk costs*	0.076	0.346**	1		
(4) *Lean supply requirements*	-0.161*	0.086	-0.009	1	
(5) *Technological complexity*	-0.027	-0.068	-0.130	0.099	1

Note: Pearson correlation coefficient between pairs of quantitative variables and Spearman correlation coefficient between pairs of variables in which one of them is qualitative.

Table 6: Summary of the results of the logistic regression models

Variables	***Model 1***	***Model 2***	***Model 2 Elasticities***
Corporate restructuring strategies	8.861** (3.038)	7.641** (3.225)	0.22
Alternative plants	0.050** (0.014)	0.064** (0.016)	0.84
Sunk costs	-0.0001 (0.001)	-0.0001 (0.001)	-0.04
Lean supply requirements		-2.332** (0.746)	-0.77
Technological complexity		-88.165* (40.673)	-1.43
Constant	-2.869** (0.396)	-1.692** (0.475)	
Number of observations	186	186	
Pseudo-R^2	0.175	0.301	
Predictive capacity (%)	84.9	88.7	

*** p<0.01; * p<0.05; standard deviation between brackets.*

Figure 1: ROC curve for Model 1

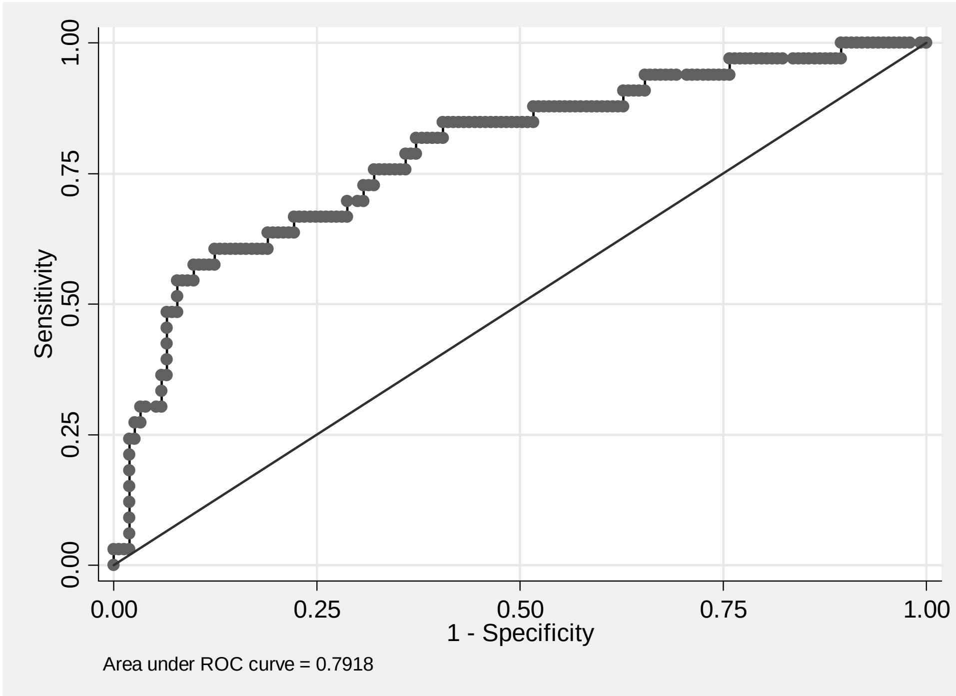
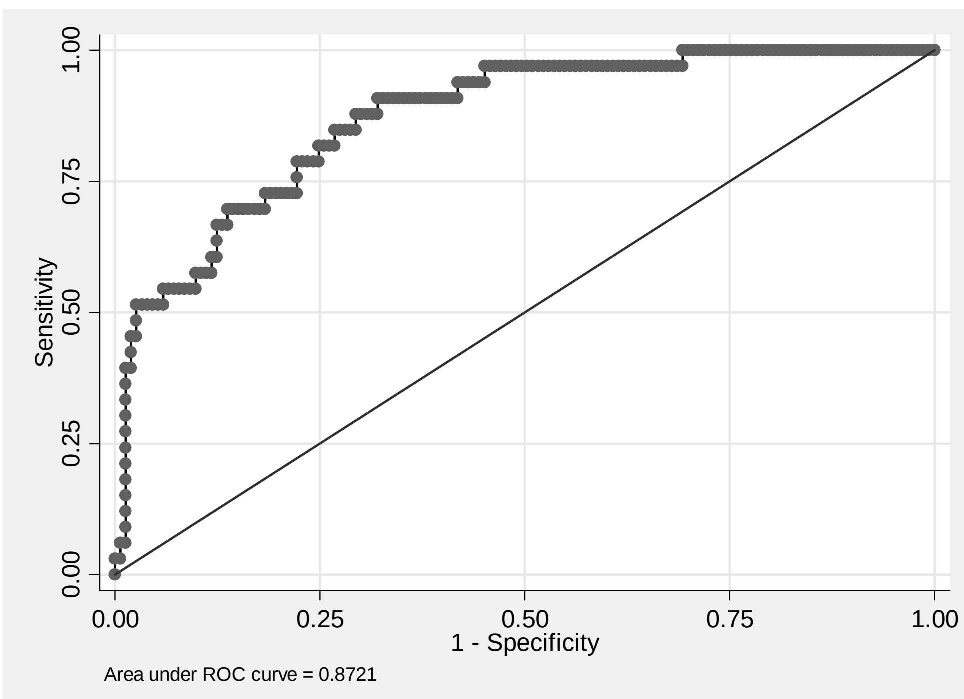


Figure 2: ROC curve for model 2



4.2. Discussion

Based on the criterion of searching for a parsimonious model, our interpretation of results is that overseas production relocation can be predicted from intra-corporate factors associated with the production plant and the parent company. The relocation of production plants is more likely for production activities that are not complex, that operate under logistics conditions that are not demanding, and that belong to companies with many international locations and marked policies for production restructuring. More in-depth consideration of the results points to the motivations behind relocation and the factors that facilitate or hinder this process. The main motivations are specialisation strategies, production concentration and rationalisation of the multinational's capabilities. The other factors act as facilitators or inhibitors of the relocation process.

Results for Model [1] show the relevance of MNEs in relocation processes. First, they indicate how aspects of internal decision-making in such companies, especially corporate restructuring strategies, can determine the international relocation of their production plants. The organisational and spatial changes involved in such corporate processes of specialisation, production concentration and capacity rationalisation help explain the relocation of many of the plants that belong to such companies, especially those that the management did not choose for concentrating or specialising production, thus confirming hypothesis H1. And second, the significance of the *Alternative plants* variable suggests that a larger-sized network of alternative plants located in other countries favours relocation of the activity. This result confirms that greater size of the production configuration increases the degree of flexibility for coordinating and transferring resources internationally.

Of note is the non-significance of sunk costs in relocation in a context of MNEs with operational flexibility. When a production plant forms part of an international network of production locations, the sunk costs – especially those linked to routines and skills developed by the employees and territorialised in the plant – are irrelevant in MNEs because they remain in the company even if the plant is relocated.

Results for model [2] demonstrate that when factors belonging to the production plant are included, the model gives a better explanation of relocation. It explains why within a single company some plants are relocated while others are not. This result has an important implication for future research on international production relocation, because it emphasises the relevance of the production plant as the unit of analysis. Only by analysing factors at production plant level can we find out which mechanisms explain the relocation of plants at an intra-corporate level. Operating under logistics conditions that are less demanding regarding both the system and delivery frequency facilitates plant mobility. Conversely, requirements for a nearby location and the logistics costs linked to demanding delivery conditions amount to one of the main restrictions on mobility. Lean supply systems and multi-day delivery frequency anchor the plant to its current location. The results therefore verify hypothesis H2 and confirm the effect of complex logistics conditions in terms of production location and the place where the product is consumed.

Regarding technological factors, our results show that the greater skills, knowledge or capabilities needed for complex products or processes in comparison with less complex ones pose a restriction to their being transferred. This therefore confirms hypothesis H3. The need to guarantee efficiency and quality of production in these complex processes requires investing in human capital and in technology, which is often not feasible in terms of cost. In fact, the products that were relocated in the plants analysed in this research did not involve a complex production process. In some cases, they were standard processes at a low position in the value chain (small metal components, textile products or plastic items) and, in others, the processes were technologically not difficult, mostly assembly activities (wiring or the assembly of electric motors).

5. CONCLUSIONS

While traditional models on relocation include firms' internal factors as well as factors relating to the environment and the location, this paper presents a model that aims to explain international production relocation as a consequence of a small number of internal (intra-corporate) factors associated with the production plant and its parent company. The combination of these factors has a high predictive capacity for relocation, so this amounts to a renovation of the classic models. The research stresses how internal decision-making in MNEs and, in particular, corporate strategies for production restructuring – concentration, specialisation and rationalisation – plus their operational flexibility for transferring resources internationally, help explain international relocation. However, to focus the analysis on internal factors does not mean that the environment has no influence – macroeconomic, social and institutional variables – but that these are relevant to the extent that they can be internalised in an equation to explain business strategies.

In addition, the lean supply requirements at production plants amount to one of the main obstacles for relocation. When delivery conditions are demanding, there are greater links between production and consumption – small, frequent batches, orders based on real consumption rather than predictions, short response times – so logistics costs become especially important in location decisions. The inclusion of logistics requirements represents progress because it has held little weight in the literature on relocation. In addition, the results indicate that greater technological complexity is directly related to a lower probability of relocation. Greater requirements for knowledge and skills, and greater costs for industrialisation and quality assurance in complex processes amount to a restriction on mobility. Finally, in this context of MNEs, sunk costs linked to the production plant do not have consequences in the relocation model. This result conflicts with previous contributions that identify such costs as the main barrier to international relocation.

Our results have also implications for both business management and public policies. The former include the competition that exists among the plants belonging to an MNE. This should lead plant managers, in spite of their limited decision-making power in such companies, to update facilities and processes from a technological point of view in order to minimise the risk of relocation in corporate restructuring processes. Secondly, along the same lines, public policies should aim not so much to reduce operating costs (tax rebates or subsidies for employment) as to generate human capital and organisational capabilities in order to stimulate technological improvements. Regional or national governments have a decreasing influence on the relocation decisions adopted by MNEs. Such enterprises are motivated by essentially corporate criteria, which are favoured by globalisation and by their flexibility for transferring resources internationally.

Finally, this paper has a number of limitations that could be considered in future research. Although the sector has suitable characteristics for generalising the results, it would be advisable to validate the model for other sectors, even in a multi-sector analysis. Secondly, even though the purpose of the research was to find a parsimonious model and even if this model has a very good predictive capacity and diagnosis accuracy, other internal variables could be included to improve both aspects.

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