



Institut
d'Economia
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CENTRE DE RECERCA EN
FEDERALISME FISCAL I
ECONOMIA REGIONAL

Document de treball 2003/4:

**FDI Determinant Factors:
The Case of Catalan Multinational Manufacturing Firms**

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FDI DETERMINANT FACTORS: THE CASE OF CATALAN MULTINATIONAL MANUFACTURING FIRMS^{a,b}

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ABSTRACT: In recent years, and for the first time in Spanish economic history, outward direct investment flows outweigh inward flows. Catalan manufacturing not only mirrors this pattern, but also represents a high proportion of all Spanish manufacturing outward direct investment. In this paper, we analyse the factors that determine outward direct investment by Catalan manufacturing firms. We apply Dunning's eclectic paradigm, which distinguishes between ownership, internalisation and location advantages. In applied studies, these advantages have usually been approximated by variables relating to the investing firm and variables about host countries. Our research endeavours to identify which of these variables determine the probability of a manufacturing Catalan firm to own production subsidiaries overseas.

Key words: foreign direct investment (FDI), multinational enterprises (MNEs), Catalonia, eclectic paradigm.

JEL Classification: F21, F23.

RESUMEN: Actualmente, y por vez primera en la historia de la economía española, los flujos de inversión directa hacia el exterior superan a los flujos procedentes del exterior. La manufactura catalana ha seguido esa pauta y además representa una elevada proporción de todos los flujos españoles de inversión directa manufacturera hacia el exterior. En este documento, se analiza los factores que determinan la inversión directa hacia el exterior de las empresas catalanas manufactureras. Se aplica el paradigma ecléctico de Dunning, el cual distingue entre ventajas de localización, internalización y localización. En los estudios aplicados, estas ventajas han sido normalmente aproximadas por variables relacionadas con la empresa que invierte y el país de destino. Esta investigación pretende identificar cuáles de esas variables determinan la probabilidad de que una empresa catalana manufacturera sea propietaria de filiales de producción en el exterior.

Palabras clave: inversión directa extranjera, empresas multinacionales, Cataluña, paradigma ecléctico.

Códigos JEL: F21, F23.

^a Comments are welcome. The opinions expressed in the papers do not necessarily reflect the IEB's opinions.

^b The author acknowledges the comments of an anonymous referee and the financial support of the *Grup Consolidat de Recerca de la Generalitat de Catalunya 2001SGR00030*. A first draft of this paper was presented at the applied economics national congress (*Encuentro de Economía Aplicada*) held in Granada, 2003.

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1. Introduction

In recent years there has been a significant growth in both foreign direct investment (FDI) flows and in the number of multinational enterprises (MNEs) in the world. Spain and Catalonia have mirrored this pattern and, in the last decade, have experienced a great increase not just in terms of investment flows in general, but particularly in terms of outward flows and specifically manufacturing flows. In the same way, the number of manufacturing firms investing abroad has grown intensively in recent years.

Nowadays, Catalan manufacturing outward direct investment has surpassed inward investment. Moreover, in the period 1993-2000, an average of 35% of Spanish manufacturing outward direct investment originated in Catalan manufacturing firms, indicating both the importance of manufacturing outward direct investment for Catalonia as well as the importance of manufacturing Catalan investment for Spain. It therefore seems appropriate to restrict our analysis to Catalan manufacturing outward investment flows and those Catalan firms originating them.

The aim of this paper is to identify those factors that influence the decision by Catalan manufacturing firms to establish foreign production affiliates. The next section (Section 2) briefly reviews, therefore, the existing theoretical and empirical literature on FDI determinants. Section 3 describes the data used in this empirical study, the methodology followed and the proposed econometric model. Section 4 outlines the hypotheses that test our econometric model and explains the results obtained. Finally, Section 5 discusses our conclusions and the limitations of the study.

2. Theoretical and empirical literature review: Dunning's eclectic paradigm

Dunning's eclectic paradigm is the most complete of the theories on FDI determinants and the most used in empirical studies. The paradigm states that a firm will invest more in a foreign country (or is more likely to invest in a foreign country) if three propositions in relation to ownership, location and internalisation advantages (known as the OLI factors) hold true (Dunning, 1979):

1. The firm possesses net ownership advantages vis-à-vis firms of other nationalities in serving particular markets. These ownership advantages largely take the form of the possession of intangible assets, which are, at least for a period of time, exclusive or specific to the firm possessing them.
2. Assuming Condition 1 is satisfied, it must be more beneficial to the firm possessing these advantages to use them itself rather than to sell or lease them to foreign firms, that is, the firm prefers to internalise its advantages through an extension of its own activities rather than externalise its advantages through licensing and similar contracts with independent firms.
3. Assuming Conditions 1 and 2 are satisfied, it must be profitable for the firm to utilise these advantages in conjunction with at least some factor inputs from outside its home country, otherwise foreign markets would be served entirely by exports.

In reviewing the extensive empirical literature on FDI determinants, we find that, generally speaking, authors have used variables related to investing firms to examine ownership and internalisation advantages¹, and variables related to host countries to examine location advantages. The variables that have produced the best explanatory results, listed in Table 1, are those used in our proposed econometric model.

¹ Internalisation advantages will be present where transactions in proprietary assets imply high transaction costs (i.e. costs related to information, negotiation, contract specification, or enforcing contract execution). High transaction costs usually occurs in an environment where agent behaviour is assumed to be opportunistic and where there exist asset-specificity and bounded rationality. In these cases, for instance, in transactions with technological assets, it is better for the firm to internalise its production. To an extent ownership and internalisation advantages tend to overlap, and empirical studies have often used the same firm-specific variables to assess both ownership and internalisation advantages.

Table 1. FDI determinant factors

Variables	Value	Authors
Firm size (assets, sales, employees)	Positive	Kim and Lyn (1987), Ratnayake (1993), Driffield and Munday (2000), Bassoamina (1999), Horst (1972), Wolf (1977), Juhl (1979), Sleuwagen (1985), Grubaugh (1987), Terpstra and Yu (1988), Yu (1990), Blomstrom and Lipsey (1991), Jeon (1992), Li and Guissing (1992), Breumenhjelm and Svensson (1996), Belderbos and Sleuwagen (1996), Louri et al (2000), García Blandón (1996), Arrainza and Lafuente (1984), López (1997), Gutiérrez and Heras (2000), Maté (1996b)
International experience	Positive	Ratnayake (1993), Terpstra and Yu (1988), Yu (1990), Breumenhjelm and Svensson (1996), Pfaffermayer (1996). Louri et al (2000), Bajo and López-Pueyo (1996), García Blandón (1996), Arrainza and Lafuente (1984), Maté (1996b)
Technological advantages (generally: R&D expenditure/sales)	Positive	Caves (1974), Kim and Lyn (1987), Kumar (1990), Ratnayake (1993), Driffield and Munday (2000), Kogut and Chang (1991), Yamawaki (1991), Pugel et al (1996), Anand and Kogut (1997), Kuemmerle (1999), Lall (1980), Sleuwagen (1985), Grubaugh (1987), Yu (1990), Blomstrom and Lipsey (1991), Breumenhjelm and Svensson (1996), Belderbos and Sleuwagen (1996), Pfaffermayer (1996), Bajo and López-Pueyo (1996), López (1997), Gutiérrez and Heras (2000), Maté (1996b), Rabanal (2001)
Marketing and product differentiation advantages (generally: advertising expenditure/sales)	Positive	Caves (1974), Kim and Lyn (1987), Kumar (1990), Ratnayake (1993), Driffield and Munday (2000), Pugel et al (1996), Anand and Kogut (1997), Lall (1980), Sleuwagen (1985), Yu (1990), Belderbos and Sleuwagen (1996), Bajo (1991), Campa and Guillén (1996), Rabanal (2001)
Host country size (GDP) Host country wealth (GDPpc) Host country dynamism (GDP growth rate)	Positive	Kravis and Lipsey (1982), Scarpelanda and Balough (1983), Root and Ahmed (1979), Schneider and Frey (1985), Coughlin et al (1991), Wheeler and Mody (1992), Koechlin (1992), Lee and Mansfield (1996), Pistoressi (2000), Cheng and Kwan (2000), Veugelers (1986), Culem (1988), Martín and Velázquez (1996), Grosse and Trevino (1996), Liu et al (1997), Kuemmerle (1999), Terpstra and Yu (1988), Yu (1990), Li and Guissing (1992), Breumenhjelm and Svensson (1996), Felipe and Fernández (1991), Bajo (1991), Bajo and Sosvilla (1992), García de la Cruz (1992), Muñoz (1999), Batalla and Costa (2001), Campa and Guillén (1996)
Labour costs	Negative	Kravis and Lipsey (1982), Schneider and Frey (1985), Coughlin et al (1991), Koechlin (1992), Yang et al (2000), Cheng and Kwan (2000), Culem (1988), Liu et al (1997), Donges (1976), Felipe and Fernández (1991), Bajo (1991), Bajo and Sosvilla (1992), Batalla and Costa (2001)
Geographical or cultural distance	Negative	Koechlin (1992), Veugelers (1986), Martín and Velázquez (1996), Grosse and Trevino (1996), Liu et al (1997), Bassoamina (1999), Yu (1990), Li and Guissing (1992), Breumenhjelm and Svensson (1996), García Blandón (1996)
Economic uncertainty (generally: inflation)	Negative	Schneider and Frey (1985), Pistoressi (2000), Yang et al (2000), Bajo (1991), Bajo and Sosvilla (1992), García de la Cruz (1992), Bajo and López-Pueyo (1996)
Country risk	Negative	Root and Ahmed (1979), Schneider and Frey (1985), Koechlin (1992), Pistoressi (2000), Yu (1990), Felipe and Fernández (1991), García de la Cruz (1992)
Infrastructure	Positive	Root and Ahmed (1979), Coughlin et al (1991), Wheeler and Mody (1992), Chang and Kwan (2000), Martín and Velázquez (1996)
Inward FDI or manufacturing weight in host country	Positive	Coughlin et al (1991), Scarpelanda and Balough (1983), Wheeler and Mody (1992), Lee and Mansfield (1996), Cheng and Kwan (2000), Terpstra and Yu (1988), Li and Guissing (1992), Campa and Guillén (1996)
Assets created (technological or human capital)	Positive	Dunning (1977), Kogut and Chang (1991), Yamawaki (1991), Martín and Velázquez (1996a), Anand and Kogut (1997), Kuemmerle (1999), Li and Guisinger (1992), Breumenhjelm and Svensson (1996)

Note: The information in brackets in the first column refers to the typical measurement parameters.

Source: Author.

3. Data and methodology

In accordance with the theoretical and empirical review of the previous section, in order to investigate the investment behaviour of Catalan manufacturing firms with production affiliates abroad, data on both investing firms and host countries need to be assembled for our analysis of FDI determinants. To obtain data on firms it was decided to conduct a survey, and therefore, in the early part of 2002 a brief questionnaire was mailed out to Catalan manufacturing firms owning at least one overseas production subsidiary in 2001. The companies were selected from data provided by the Catalan Government (Fontrodona and Hernández, 2001). Host country data were obtained from secondary sources such as the World Bank, UNESCO, Hofstede (1980, 2001), and the investment magazine *Institutional Investor*.

Of the questionnaires mailed to 164 firms, 117 valid responses were received (representing a 71.34% response rate). These 117 firms own 268 overseas subsidiaries in 46 different countries. Data on firm size, distribution by industry and distribution by geographical area, respectively, are summarised in Tables 2, 3, and 4. Although our data is very similar to that of Fontrodona and Hernández (2001), our surveyed firms are generally larger, there are more chemical and fewer textile companies featured, and certain geographical areas have less (e.g. Africa) or more (e.g. Europe in general) weight in our sample.

Table 2. 117 Catalan manufacturing MNEs: Distribution by industry

Industry	Our study %	Reference base % (Fontrodona and Hernández, 2001)
Food and beverages	9.4	11.0
Wood and cork	4.3	--
Machinery	16.2	15.9
Transport	6.9	6.7
Electrical material	6.9	15.9*
Electronic material, precision instruments and office machinery	4.3	--
Minerals and non-ferrous metals	2.6	3.7
Printing	4.3	9.1**
Plastics and rubber	7.7	--
Paper articles	3.4	---
Metal products	5.6	--
Chemical products	18.8	16.5
Textile products, leather and footwear	9.4	14.6
Other manufacturing industries	---	6.7

Notes: *In the reference base, it is considered together electrical material, electronic material and metal products. **In the reference base, it is considered together printing and paper articles.

Source: Fontrodona and Hernández (2001) and author.

Table 3. 268 Catalan manufacturing MNE subsidiaries: Distribution by geographical area.

Geographical area	Our study %	Reference base % (Fontrodona and Hernández, 2001)
Africa	5.0	10.6
Latin America	24.5	25.1
Asia	12.9	12.0
NAFTA Area	16.2	16.1
European Union	33.2	25.9
Rest of Europe	8.3	10.4

Source: Fontrodona and Hernández (2001) and author.

Table 4. 117 Catalan manufacturing MNEs: Distribution by size (sales)

Size	Our study %	Reference base % (Fontrodona and Hernández, 2001)
€0-6 million	21.2	12.3
€6-30 million	27.5	39.9
€30-60 million	16.3	20.2
€60-300 million	23.8	19.6
>€300 million	11.2	8.0

Source: Fontrodona and Hernández (2001) and author.

From the survey we obtained firm-specific variables – see Table 5 - to be subsequently used as explanatory variables in our econometric model. Insufficient information was available from Catalan manufacturing multinational enterprises in relation to certain variables - such as research and development expenditure as a percentage of sales, or advertising expenditure in relation to sales - which are frequently used as proxy variables for a firm’s technological advantage and marketing/product differentiation advantages, respectively. Thus, following the empirical literature, we used the corresponding industrial sector data as proxies for these variables².

Table 5. Firm-specific variables used as explanatory variables in our econometric model

Variable (ACRONYM)	Description
Size (SIZE)	Number of employees
Experience (EXP)	Number of years in existence
Exports (EXPS)	Exports as a proportion of total sales
Subsidiaries (SUBS)	Number of sales/distribution subsidiaries
Number of zones (ZONES)	Number of geographical zones (EU, Latin America, Asia, NAFTA Africa, rest of Europe) where a firm has international experience (direct export or sales/distribution subsidiaries)
Presence in the area (PRES)	The value of 1 is given to a firm if it has a significant trade presence in the host country’s geographical region. (By ‘significant’ is meant that more than 20% of a firm’s exports go to this region and that it has sales/distribution subsidiaries there)
R+D (R+D)	Research and development expenditure as a proportion of total sales. (The figure used represents the Catalan industry sector in which the firm operates)
Advertising (ADV)	Advertising expenditure as a proportion of total sales. (The figure used represents the Catalan industry sector in which the firm operates)

Source: Author.

² The data used was taken from the *Encuesta sobre innovación tecnológica en las empresas* produced by the Spanish statistics office and *Estadística, producció i comptes de la indústria*, produced by the Catalan statistics office.

Finally, the variables considered for the 46 countries that host Catalan production subsidiaries are shown in Table 6. As mentioned above, the data was sourced from a range of secondary sources (mainly, the World Bank) and choice has been restricted by criteria of homogeneous availability.

Table 6. Country-specific variables used as explanatory variables in our econometric model

Variable (ACRONYM)	Description
Gross domestic product (GDP)	Host country GDP at constant prices (average for the last 7-10 years).
GDP per capita (GDPPc)	Host country per capita GDP at constant prices (average for the last 7-10 years).
GDP growth rate (GROWTH)	Host country annual GDP growth rate (average for the last 7-10 years).
Wages (WAGES)	Manufacturing wages per hour in host country (average for the last 7-10 years).
Socio-cultural distance (SCD)	Socio-cultural distance between Spain (Catalonia) and the host country, based on Hofstede's (1980, 2001) four cultural dimensions. Used was Kogut and Singh (1988) formula for obtaining a socio-cultural distance index: $CD_j = \sum_{i=1}^4 \left\{ \frac{(I_{ij} - I_{ih})^2}{V_i} \right\} / 4$, where I_{ij} is country j 's rating along cultural dimension i , I_{ih} is the rating for Spain (country of reference, h) and V_i is the variance for cultural dimension i
Inflation (INF)	Host country's annual rate of change in the consumer price index (average for the last 7-10 years).
Risk (RISK)	Host country's risk level (average for the last 7 years), obtained from the <i>Institutional Investor</i> index (based on a periodic survey mailed to more than 100 international banks). This index awards a higher value to less risky countries.
Manufacturing value-added (MVA)	Manufacturing value-added as a proportion of host country GDP (average for the last 7-10 years).
Foreign direct investment (FDI)	Inward FDI flows as a proportion of host country GDP (average for the last 7-10 years).
Infrastructure (INFRA)	Kilometres of road as a proportion of host country surface area (average for the last 7-10 years).
Students in third-level education (3L-ED)	Number of students in third-level education as a proportion of the host country population (average for the last 7-10 years).
Number of scientists and engineers (SCI-ENG)	Number of scientists and engineers per 1000 inhabitants (average for last 7-10 years).

Source: Author.

The variables listed in Tables 5 and 6 have been included in the proposed econometric model in order to describe the rationale behind decisions to establish production subsidiaries overseas by Catalan manufacturing firms. The ultimate aim is to test well-

established hypotheses in relation to FDI-determining factors formulated in the theoretical and empirical field. In this respect, the proposed econometric model follows the methodology applied in the international field by Tepstra and Yu (1988), Yu (1990), Li and Guissinguer (1992) and Braunerhjelm and Svensson (1996) but, to date, not used in Spanish or Catalan FDI studies. We propose a binomial logistic regression model that endeavours to identify the variables that affect the probability of any single Catalan firm in our sample possessing production affiliates in any country in our database. The endogenous (or dependent) variable takes one of two values, 0 or 1. Thus, 1 indicates that a firm has a production affiliate in a country; otherwise, a firm is rated with a 0. The independent variables explain, then, the probability that a Catalan MNE has a production affiliate overseas. The total number of observations in this case was 678³ and stepwise regression was used for the analysis⁴.

The model is formulated as follows:

$$Y^*_{ij} = \alpha + \beta X_{ij} + u_{ij} \quad \Leftrightarrow \quad \text{Prob}(Y_{ij}=1) = F(\alpha + \beta X_{ij}),$$

where F is the logistic distribution function, $Y_{ij}=1$ indicates that firm i has a subsidiary in country j , and Y^*_{ij} is a latent variable which is not observable - for instance, the calculated net benefits of setting up a subsidiary in a specific foreign country which, if positive, will lead a firm to proceed, and if negative, will mean that the investment does not occur. These net benefits depend on a set of explanatory variables in the vector X_{ij} , where $X_{ij} = (\text{SIZE}_i, \text{EXP}_i, \text{EXPS}_i, \text{SUBS}_i, \text{ZONES}_i, \text{PRES}_{ij}, \text{R+D}_i, \text{ADV}_i, \text{INF}_j, \text{FDI}_j, \text{MVA}_j, \text{INFRA}_j, \text{GDP}_j, \text{GDPpc}_j, \text{GROWTH}_j, \text{RISK}_j, \text{SCD}_j, \text{WAGES}_j, \text{3L-ED}_j, \text{SCI-ENG}_j)$, defined as in Tables 5 and 6 above.

³ The 678 observations can be explained as follows: the total number of observations should be the result of multiplying the number of Catalan firms by the number of host countries, but this would have meant that over 95% of the observations would take a zero-value (indicating that a firm does not have a production subsidiary in a specific country). This fact would produce a poor goodness-of-fit, so, in accordance with the empirical literature, all observations with a one-value, but only 10% of those with a zero-value (chosen randomly) for the endogenous variable, were included, with both kinds of observations weighted differently.

⁴ We began with a model that included all the variables, but dropped the least significant variable after each step, thus terminating with a model in which all the variables were significant at 10%. Although this procedure could be affected by the problems associated with data mining, it has been widely used in the literature on FDI determinants. Other studies using this - or similar - procedure include, for instance, Gutiérrez and Heras (2000), Anderson and Coughlan (1987), Contractor (1990), Dunning (1977), Root and Ahmed (1979), Maté (1996b), Molero (1998), and Liu et al (1997).

4. Hypotheses and results

Using the database and methodology described in the previous section, and in accordance with the theoretical and empirical literature, the following hypotheses (H1-H11) will be tested:

H1: The bigger the firm, the more likely it is to have a production subsidiary in a foreign country. This is explained by the fact that larger firms (with more employees) have greater ownership advantages; for example, financing will be easier to obtain or raise, or they may benefit from economies of scale and scope or from obtaining easily information to set up affiliates in a foreign country.

H2: The more experienced the firm, the more likely it is to have a production subsidiary in a foreign country. This hypothesis takes account of experience in general (years in existence), international trade experience (exports as a proportion of sales; number of sales/distribution subsidiaries)⁵, and the extent of this international trade experience (number of different regions where the firm exports or has sales/distribution subsidiaries). The justification for this hypothesis is that the more experienced a firm is, the more ownership advantages it will have as a consequence of the greater knowledge accumulated. According to the Uppsala school, firms (and particularly smaller ones), for reasons of uncertainty and inexperience, first venture overseas via the direct exportation route, as it requires the least commitment in terms of resources. A firm with more experience and knowledge - and therefore, confidence - will, however, consider internationalisation in terms of a greater commitment, e.g., in the form of the establishment of sales/distribution subsidiaries, and eventually, production subsidiaries. By implication, having production subsidiaries requires sales/distribution subsidiaries, and therefore, a greater export/total sales ratio. As an additional reason, the difficulties implied in selling or buying knowledge acquired by experience - deriving from its intangibility and the potentially high associated transaction costs - would indicate that internalisation rather than leasing is a more suitable mean for the exploitation of this kind of advantage.

⁵ Following the Uppsala school (Johansson and Vahlne, 1977, 1990; Johansson and Wiedersheim-Paul, 1975), we consider sales subsidiaries to be the last step in a firm's trade internationalisation process, rather the first step in foreign direct investment. The main reason is that fewer resources are required for a sales subsidiary compared to a production subsidiary.

H3: A manufacturing firm is more likely to have a production subsidiary in a concrete country if this firm has important trade experience in the country's geographical region. If a firm has had substantial trade experience in a geographical area (measured here by PRES variable), it will have acquired knowledge of the countries of the region, and will therefore experience less uncertainty when it decides to set up a production affiliate in the region.

H4: The more technologically intensive its industrial sector, the more likely a firm is to have a production subsidiary in a foreign country. The explanation is that a firm operating in a technologically intensive industry (here measured by R+D expenditure as a percentage of sales) will possess ownership advantages that will make it easier and more profitable to enter a foreign market. Moreover, such a firm will also have a greater store of tangible and intangible assets as well as accumulated knowledge. Markets for this kind of technical know-how tend to have high transaction costs, and therefore, a firm in this situation will optimally exploit its advantage if production is internalised.

H5: The greater marketing/product differentiation advantage in a particular industry, the more likely a firm from that sector is to have a production subsidiary in a foreign country. If a firm operates in an industry with a high marketing/product differentiation advantage (here measured as advertising expenditure as a percentage of sales), then it will possess ownership advantages that will make it easier and more profitable to enter a foreign market. This advantage refers, typically, to superior quality products or well-established brands. Moreover, internalisation of this advantage will be entirely appropriate, since granting a franchise incurs the risk that the franchisee will act opportunistically, with possible negative consequences in terms of the prestige of the firm's brand.

H6: The greater the uncertainty and risk associated with a country, the less likely a firm is to locate a production subsidiary there. Macroeconomic uncertainty is assessed in terms of inflation and financial-political risk using the *Institutional Investor* ranking. Greater uncertainty means a riskier business environment, which in turn implies a reduced location advantage.

H7: The more agglomeration economies in a country, the more likely a firm is to have a production subsidiary there. The degree of agglomeration is measured here in terms of the relative importance of manufacturing value-added, the presence of inward FDI and infrastructures (Wheeler and Mody, 1992). More agglomeration economies mean that investing firms can draw on a pool of skilled labour and specialised suppliers -accustomed to work in manufacturing and with foreign employers- and avail of logistical and operational facilities.

H8: The more attractive a market, the more likely a firm will possess a production subsidiary in this country. Market attractiveness is assessed in terms of GDP (market size), GDP growth rate (market dynamism) and GDP per capita (a measure of a country's wealth). The more attractive the market, the more likely a firm is to increase its profits through increased sales. This kind of location advantage is particularly important for firms whose motivation for investing abroad is to locate new markets for their products/services.

H9: The lower the cost of labour in a country, the more likely a firm is to own a production subsidiary there. This hypothesis is evaluated in terms of manufacturing wages per hour⁶. Lower local labour costs mean lower overall production costs and greater profits. This kind of location advantage is particularly important for firms interested in availing of natural production factors when considering overseas investment.

H10: The more socio-culturally distant a country is, the less likely a firm is to locate a production subsidiary in that country. Greater socio-cultural distance implies greater uncertainty and risk for the investing firm, so socio-culturally different countries will be less attractive as potential locations. According to the Uppsala School, moreover, firms tend to invest initially in socio-culturally similar countries, and then, after obtaining experience and confidence there, the firm will risk investing in non-similar countries. In this respect, production internationalisation for Catalan

⁶ Although ideally unit labour cost (which takes into consideration labour costs other than wages - such as taxes - and productivity) should have been used, our sources did not provide this kind of information for all the countries considered.

manufacturing firms is a relatively recent phenomenon, and therefore, investment is more likely to occur in socio-culturally similar countries.

H11: The more assets created (that is, human capital -third level students per inhabitant- and technological capital -scientists and engineers per 1000 inhabitants) in a country, the more likely a firm is to possess a production subsidiary in that country. If a firm is interested in improving its knowledge base or learning new operating methods, then it will be interested in investing in a country with substantial quantities of these strategic assets.

Four variations of the same model were created. Model 1 and 3 do not consider, in the first step of the stepwise regression, the variable about firms's substantial presence in the host country's geographical region (the only explanatory variable in our study that is qualitative), whereas Model 2 and 4 do consider this variable. At the same time, Model 1 and 2 do not include GDP per capita, in the first step of the stepwise regression, and Model 3 and 4 do include GDP per capita but not wages. The reason is that we found the correlation between these two variables -that is, wages and GDP per capita- (see Appendix) to be very high (0.95), and therefore, susceptible to causing multicollinearity.

In terms of results (Table 7), goodness-of-fit statistics are satisfactory. As χ^2 shows, all the variables are globally significant at $p\text{-value} < 0.01$, and R^2 statistics are comparable to those obtained in similar studies. The percentage of correct predictions was high⁷.

In relation to the stated hypotheses, the results obtained show that firm size is positively associated with the probability of investing abroad (H1). Likewise, exports and subsidiaries are positively and significantly associated with the endogenous variable. Therefore, we obtain support for the hypothesised importance of a firm's previous international trade experience in setting up production affiliates abroad (H2). Moreover, this result confirms the Uppsala observation in relation to the different steps involved in the internationalisation process (see Hypothesis 2). As far as presence in the area is

⁷ The percentage of correct predictions was greater than 55%, which would be the percentage obtained by chance (Hennart, 1991) through the formula $(a^2 + (1-a)^2)$, where a is the number of zero-value observations.

concerned (H3), results (for the models that included this variable) show that this is highly significant and, moreover, positively associated with the probability of investing in a foreign country within a particular region. Finally, we find that the R+D variable is positively significant in models 1 and 3 at a 10% significance level. This result corroborate Hypothesis 4.

Variables such as experience, number of zones or advertising are shown to be non-significant. The non-significance of advertising may be due to the fact that brand advantages are not sufficiently important to Catalan firms. Lopez (1997) found that this variable was relatively unimportant in Spain as a whole, and Durán (2001) observed that advertising expenditure by foreign multinationals operating in Spain was much higher than that recorded for Spanish multinationals. Likewise, another possible explanation is that, for Catalan manufacturers, advertising expenditure is not a suitable proxy for marketing and product differentiation advantages.

However, in our case, host country variables are undoubtedly the most relevant; in other words, a Catalan manufacturing firm is more likely to invest in a country for location rather than firm-specific reasons. We find that for all proposed model specifications, the variables about risk manufacturing value-added, gross domestic product, GDP growth rate, socio-cultural distance and wages (in the model in which it was included) are significant and with the value (either positive or negative) stated in the corresponding hypotheses. Thus, significant support is obtained for Hypotheses 6, 7, 8, 9 and 10, all referring to countries. Contrary to Hypothesis 8, however, we obtain (where taken into account) a negative association between the endogenous variable and per capita GDP; in other words, Catalan firms are more likely to invest in less developed countries. This may be explained by the fact that the countries in question enable Catalan firms to exploit their own specific internal advantages (Campa and Guillén, 1996). In fact, five of the six most important host countries for Catalan FDI are countries at a less advanced stage of development than Spain (namely, Mexico, Argentina, Brazil, Portugal and China).

In the case of host country-specific determinants, inflation is not significant. This variable may, however, be implicitly taken into account in the *Institutional Investor*

index⁸. The importance of FDI to the host country is not a significant variable, either, nor the variable related to infrastructure. The latter result may be explained by the fact that kilometres of road is a crude measure that fails to take into consideration road quality or alternative transport and communications infrastructures. Unfortunately, problems of homogenous data availability prevented us from constructing more suitable variables in this case. Finally, Hypothesis 10 was not supported, since Catalan firms are not interested in investing heavily in foreign countries at an advanced stage of development in order to update their own advantages⁹.

In comparing our results with other similar studies at the international level, we too find country-specific variables to be more important overall than firm-specific variables. Market size is significant in Li and Guissinguer (1992), Braumenhjelm and Svensson (1996), Tepstra and Yu (1988) and Yu (1990); socio-cultural distance in Li and Guissinguer (1992) and Braumenhjelm and Svensson (1996); country risk in Yu (1990), and agglomeration economies in Li and Guissinguer (1992) and Tepstra and Yu (1988). All the same, certain firm-specific variables used in this study with positive results have also been found to be significant in similar international studies (firm size: Li and Guissinguer, 1992, Braumenhjelm and Svensson, 1996, Tepstra and Yu, 1988, Yu, 1990; international experience: Braumenhjelm and Svensson, 1996, Tepstra and Yu, 1988, Yu, 1990; technological intensity: Braumenhjelm and Svensson, 1996, Yu, 1990).

5. Conclusions

In general, we can conclude that Catalan manufacturing multinational enterprises are more likely to invest in a foreign country if they are large, possess international trade experience, and operate in technologically intensive industries. They are also more likely to invest in a foreign country if it has a large market, is perceived to be relatively

⁸ The attitude of the host government to FDI, on the other hand, could be also another variable implicitly taken into account in the *Institutional Investor* index.

⁹ It is appropriate at this point to mention that we performed two further models and calculated two other econometric equations. One where the number of foreign affiliates for each firm in our database is explained by firm-specific variables and the other where the number of Catalan subsidiaries in each country is explained by host country variables. The number of observations in the first case was 228 firms and in the second 46 countries, and the equations were estimated using a Poisson model. The results obtained in these partial models were in line with those described here.

risk-free and is socio-culturally similar, can offer lower labour costs, and is located in a geographical region where substantial trade experience has been acquired. Moreover, less developed countries are also attractive as they permit ownership advantages to be exploited.

It is appropriate at this stage to point out some of the limitations of this study. For instance, the choice of explanatory variables might be considered arbitrary, in the sense that there are many other possible OLI variables. This criticism, however, applies to all empirical studies based on Dunning's eclectic paradigm, which could be considered less a theory than a taxonomy of possible variables to be included in empirical analyses. In other words, the absence of structural models in this theoretical field is one of the main reasons for this arbitrariness. Nevertheless, in our study we included variables 1) for which it was possible to obtain homogeneous data for our firm and country database, 2) that were extensively used in empirical studies of FDI, and 3) that permits well-established theoretical hypotheses in relation to FDI determinant factors to be tested¹⁰.

Given the difficulty of obtaining individual data for Spanish and Catalan multinational enterprises, we were obliged to carry out our own survey, which in itself has the drawback that our conclusions are not entirely comparable to similar studies, and cannot be considered representative of the whole population.

Another limitation is the fact that internalisation advantages consist of many theoretical notions (such as information and contract negotiation costs) difficult to measure- except in terms of firm-specific advantages (such as technology ownership), as high transaction costs are implicit in the purchase or sale of such intangible assets¹¹.

Finally, in interpreting our results it should be borne in mind, firstly, that only those Catalan firms with foreign production affiliates are included in our study. Therefore, our

¹⁰ Dunning's eclectic paradigm referred to ownership or location advantages vis-à-vis other firms or countries. For our research, we have assumed that the inclusion of data on other firms and countries would make no difference, since the home country was always the same, and given that it is very difficult to assess ownership advantages for firms in other countries. Culem (1988) found that absolute or relative location advantages made no difference to results.

¹¹ Brouthers (2002) endeavoured to measure transaction costs using manager perceptions, but this approach is complex given the difficulties involved in asking managers about perceived transaction costs in each country invested in by their firm.

sample suffers from a selection bias, in that it excludes firms that have never invested abroad via production subsidiaries, and in respect of which we are unable to make comparisons. And, secondly, another problem is the definition of the endogenous variable. We have considered if a firm in our sample has production affiliates abroad or not, but we could not consider investment's volume, which it would be a more suitable variable. Nevertheless, these two problems mentioned were caused by the limitations of our initial database and could not be avoided.

Table 7. Firm-specific and host contry-specific determinants related to outward FDI in production by Catalan manufacturing MNEs¹²

	Model 1	Model 2	Model 3	Model 4
SIZE (hundreds of employees)	--	0.00730* (2.28)	--	0.0750* (2.33)
EXPS	0.0140** (3.50)	0.0147** (3.76)	0.0139** (3.50)	0.0146** (3.74)
SUBS	0.060** (2.80)	--	0.059** (2.77)	--
R+D	0.0460+ (1.88)	--	0.0464+ (1.89)	--
MVA	0.0530** (2.70)	0.0542** (2.68)	0.067** (3.56)	0.067** (3.52)
GDP (\$bn)	0.210** (3.10)	0.260** (3.75)	0.230** (3.33)	0.286** (4.02)
GDPpc (\$000)	--	--	-0.053** (-2.75)	-0.063** (-3.09)
GROWTH	0.160** (4.14)	0.152** (3.79)	0.153** (3.78)	0.139** (3.37)
RISK	0.0289** (3.70)	0.0255** (3.20)	0.0325** (3.41)	0.0309** (3.19)
SCD	-0.730** (-5.40)	-0.691** (-5.16)	-0.804** (-6.10)	-0.769** (-5.85)
WAGES	-0.110** (-3.13)	-0.124** (-3.30)	--	--
PRES	--	1.046** (4.46)	--	1.064** (4.52)
Goodness of fit	R2 Nagelkerke: 0.235 R2McFadden: 0.145 χ^2 : 126.53** % correct predictions: 0: 84.9 1: 43.4 Total: 70.5	R2 Nagelkerke: 0.240 R2McFadden: 0.163 χ^2 : 142.67** % correct predictions: 0: 85.1 1: 49.4 Total: 72.7	R2 Nagelkerke: 0.231 R2McFadden: 0.142 χ^2 : 124.16** % correct predictions: 0: 85.3 1: 42.9 Total: 70.6	R2 Nagelkerke: 0.240 R2McFadden: 0.161 χ^2 : 141.31** % correct predictions: 0: 83.5 1: 49.3 Total: 71.7
Observations	678	678	678	678

Notes: (i) z-statistics in brackets (ii) *Significant at the 5% level. **Significant at the 1% level. +Significant at the 10% level.

¹² Significant explanatory variables up to $p < 0.10$ are provided. All the models include a constant term. Model run under Limdep and SPSS.

Appendix: Correlation matrix

	EXP	SIZE	EXPS	SUBS	ZONES	R+D	ADV	PRES	INF	FDI	MVA	INFRA	GROWTH	GDP	GDPpc	RISK	3L-ED	WAGES	SCD	SCI-ENG
EXP	1,000																			
SIZE	,187	1,000																		
EXPS	-,056	,119	1,000																	
SUBS	,166	,458	,291	1,000																
ZONES	,262	,063	,313	,259	1,000															
R+D	,141	,013	,179	,144	,536	1,000														
ADV	,144	,045	,146	,070	,244	,133	1,000													
PRES	,213	,048	,007	,165	,082	,036	,229	1,000												
INF	-,065	,016	,018	,009	,033	-,071	-,031	-,005	1,000											
FDI	-,010	-,022	,090	,012	,036	,001	-,028	,023	-,164	1,000										
MVA	-,040	,063	,024	,048	-,014	-,083	-,035	-,023	,418	,092	1,000									
INFRA	-,028	-,038	,088	,054	-,037	,090	-,046	-,058	-,235	,409	,155	1,000								
GROWTH	-,002	-,033	-,016	-,018	-,018	,062	,017	,023	-,563	,395	-,290	,080	1,000							
GDP	-,011	-,001	-,009	,063	-,022	,026	-,004	,001	-,114	-,189	,011	,230	,008	1,000						
GDPpc	,020	-,035	,012	,005	-,081	,198	-,027	-,066	-,309	-,048	-,023	,621	-,003	,516	1,000					
RISK	,018	-,034	,031	,004	-,043	,208	-,035	-,044	-,445	,089	,034	,622	,198	,504	,776	1,000				
3L-ED	,042	-,009	,014	-,011	-,015	,118	-,005	,024	-,119	-,132	-,044	,121	-,154	,454	,590	,573	1,000			
WAGES	,006	-,047	-,011	-,009	-,065	,190	-,012	-,066	-,349	-,114	-,111	,493	,051	,459	,944	,738	,638	1,000		
SCD	-,012	-,003	-,016	,030	-,025	,026	-,018	-,037	-,314	,451	,107	,442	,307	,226	,268	,306	,117	,286	1,000	
SCI-ENG	-,001	,010	-,003	,039	-,032	,040	-,024	-,019	,062	-,122	,302	,434	-,433	,583	,701	,579	,639	,643	,199	1,000

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