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Sourcing Patterns of Foreign-owned Multinational Subsidiaries in Europe

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ABSTRACT

This paper investigates the determinants of the international input sourcing propensities of foreign-owned multinational subsidiaries in four EU host countries. Major findings concern the impact of subsidiary roles and economic integration on international sourcing patterns. Regional and global integration are leading to a greater import-orientation among MNE subsidiaries, including Product Mandate firms which are assumed to be strongly embedded within host economies. The results cast serious doubts on the effectiveness of traditional criteria for investment attraction; and confirm that stimulating local sourcing is problematic. Specific policy implications are developed relating to the attraction of inward foreign direct investment and to corporate development policies.

Keywords: Multinational enterprises Subsidiaries Sourcing Europe

JEL Code: F23; F15

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INTRODUCTION

This paper undertakes a cross-country investigation of the sourcing patterns of the subsidiaries of foreign-owned multinational firms (MNEs) in the European Union (EU). It is based on a general framework of the factors influencing the choice between international and local sourcing¹ and investigates empirically the principal determinants of international input sourcing in MNE subsidiaries. The main contributions of this paper lie in an improved understanding of the influence of foreign-owned subsidiary strategies and economic integration in sourcing patterns, topics on which little research exists.² Important conclusions are drawn on the scope to increase local sourcing through policy intervention at national and regional level (CRONE, 2002).

The subject under analysis continues to attract considerable attention in national and regional economies. This is because of the importance of MNEs' local linkages in generating externalities and technology spillovers and in supporting the agglomeration of industries (RODRÍGUEZ-CLARE, 1996; MARKUSEN and VENABLES, 1999; BIRKINSHAW and HOOD, 2000). In addition there is a concern to reduce import levels since the globalization of MNEs' supply chains is creating major competitive pressures for local suppliers, as companies explore global- and single-sourcing options.

The paper involves an econometric analysis of the determinants of international sourcing patterns. Focusing on the import side of sourcing provides important and different perspectives for host country policy. It leads to greater consideration of the international competitiveness of the local supply base and emphasizes the importance of international benchmarking by domestic suppliers. It also focuses attention upon the location of decision-making, since decisions on international sourcing will be commonly made at parent MNE level, as part of global supply chain management strategies. These are designed to achieve global economies in large and complex purchasing decisions (LEVY, 1995; SWAMIDASS, 1993). By contrast the subsidiary management team is more likely to be an advocate of local sourcing, which is more in line with the interests of national and regional economies.

¹ The term 'international sourcing' is principally used in this paper, rather than alternatives such as 'foreign sourcing' or 'import sourcing'. It refers to all inputs and components bought outside the host country (including those bought in other EU countries).

² In respect of 'subsidiary roles', BIRKINSHAW (2001, p. 389) distinguishes between subsidiary roles and strategies. He suggests that the 'subsidiary role' is assigned to it by the parent company, whereas 'subsidiary strategy' suggests some level of self-determination. However, the terms are used interchangeably in the paper.

THEORY, LITERATURE AND CONCEPTUAL FRAMEWORK

Theory and literature.

The theoretical underpinnings for this paper derive from concepts relating to the MNE subsidiary from the perspectives of regional economic development and European integration.

Although theories pertaining to the MNE have traditionally focused upon the parent group, recent work has increasingly recognized the importance of the MNE subsidiary as the unit of analysis (BIRKINSHAW, 2001). This paper adopts the subsidiary perspective and draws on role typologies (summarized in PATERSON and BROCK, 2002) and on the factors influencing subsidiary evolution (BIRKINSHAW and HOOD, 1998; BIRKINSHAW, HOOD and JONSSON, 1998).

Much interest has centred on subsidiaries which possess specialized resources which are recognized by the MNE as a whole (BIRKINSHAW *et al*, 1998). Terms applied include the specialized contributor, strategic leader and active subsidiary types, as well as world product mandate (WPM) and centre of excellence designations. The WPM term has a long tradition, having been developed by Canadian researchers to refer to subsidiaries which have responsibility to develop, manufacture and market a product-line worldwide (CROOKELL, 1987). Such ‘high contributory role subsidiaries’ (BIRKINSHAW *et al*, 1998) are contrasted with the implementer and rationalized subsidiary types (commonly referred to as ‘branch plants’), which lack the authority or capability to generate independent competences.³

Relatively little theoretical or empirical consideration has been given to the relationship between MNE subsidiary roles and the sourcing decision *per se*. Nevertheless, there is an assumption that subsidiaries (particularly WPM and other high contributory role subsidiaries) which have greater capabilities for innovation and value creation are those which are strongly embedded in the local environment, through frequent interactions with local actors such as customers, suppliers, and competitors. This would imply stronger supply linkages and greater local sourcing as interactions with other parties and local competence increased. The relationship between sourcing and subsidiary roles is critical for this paper.

The literature in economic development and economic geography highlighting the positive impacts of input linkages on regional economies has a long history (HIRSCHMAN, 1958). Such work has been incorporated into the MNE literature through studies of inter-firm linkages between multinationals and

³ “Competence-based” theories/perspectives include the resource-based view (BARNEY, 1991), dynamic capabilities’ (TEECE *et al.*, 1997) and evolutionary theories (CANTWELL, 2001); and network perspectives (ANDERSSON, 1997; GUPTA and GOVINDARAJAN, 2000). These indicate how the subsidiary may acquire or develop distinctive competences or control critical resources, and hence contribute to an understanding of subsidiary evolution and development.

host country suppliers (GÖRG and RUANE, 2001; CRONE, 2002) and spillover effects (LALL, 1980; BLOMSTRÖM and KOKKO, 1998). A recent emphasis has been on the notions of the learning region and innovative milieu (e.g. COOKE and MORGAN, 1998), with ‘higher order’ regions being characterized by general technological excellence which may generate substantial spillovers for subsidiaries (e.g. CANTWELL and IAMMARINO, 2000). Host economy characteristics are thus significant in competence building within the multinational subsidiary, although the relationship with sourcing has not been investigated. Other literature has discussed how to ‘embed’ MNE subsidiaries in host regional economies in order to maximize long-term benefits (AMIN *et al* 1994; YOUNG *et al*, 1994).

The literature on economic integration (as represented here by host country membership of the EU and its Single Market programme) is also relevant. Although the impacts are uncertain, it has been suggested that MNEs may evolve from country-centred to regional (EU) strategies as economic integration proceeds (DUNNING and ROBSON, 1988). These will lead to changes in subsidiary roles; and in turn to changing trade patterns, and, in some cases at least, to higher levels of international sourcing. In fact it is not simply regional but also global integration which will influence sourcing patterns, through the globalization of corporate supply chains. There is little research on local sourcing in the economic integration literature.

There have been a range of empirical studies on the subject of MNEs and backward linkages, reviewed in the *World Investment Report 2001* (UNCTAD, 2001). The following variables were positively associated with local sourcing: domestic (as opposed to export-market) orientation; ventures formed through mergers and acquisitions [M&As]; smaller subsidiaries; and technologically mature and standardized operations.

The characteristics of national and regional economies, particularly the depth and sophistication of the local supply base, were also shown to impact positively on sourcing patterns. The results on age of subsidiary are not totally clearcut, but tend to show that longer established affiliates source more locally. As noted above, there has been little empirical research on the main themes of this paper which concern subsidiary strategies, economic integration and sourcing patterns from the perspective of host national and regional economies (but see YOUNG *et al*, 1988; BENITO *et al*, 2003).

Conceptual framework

Figure 1 provides an overview of the factors conditioning the choice between local and international sourcing. The figure draws upon the BIRKINSHAW and HOOD (1997) organizing framework for subsidiary evolution, which identifies three interacting drivers (parent MNE, subsidiary and host country/regional environment). The present framework expands the latter by including industry characteristics and other environmental features as further conditioning factors in the choice between local and international sourcing.

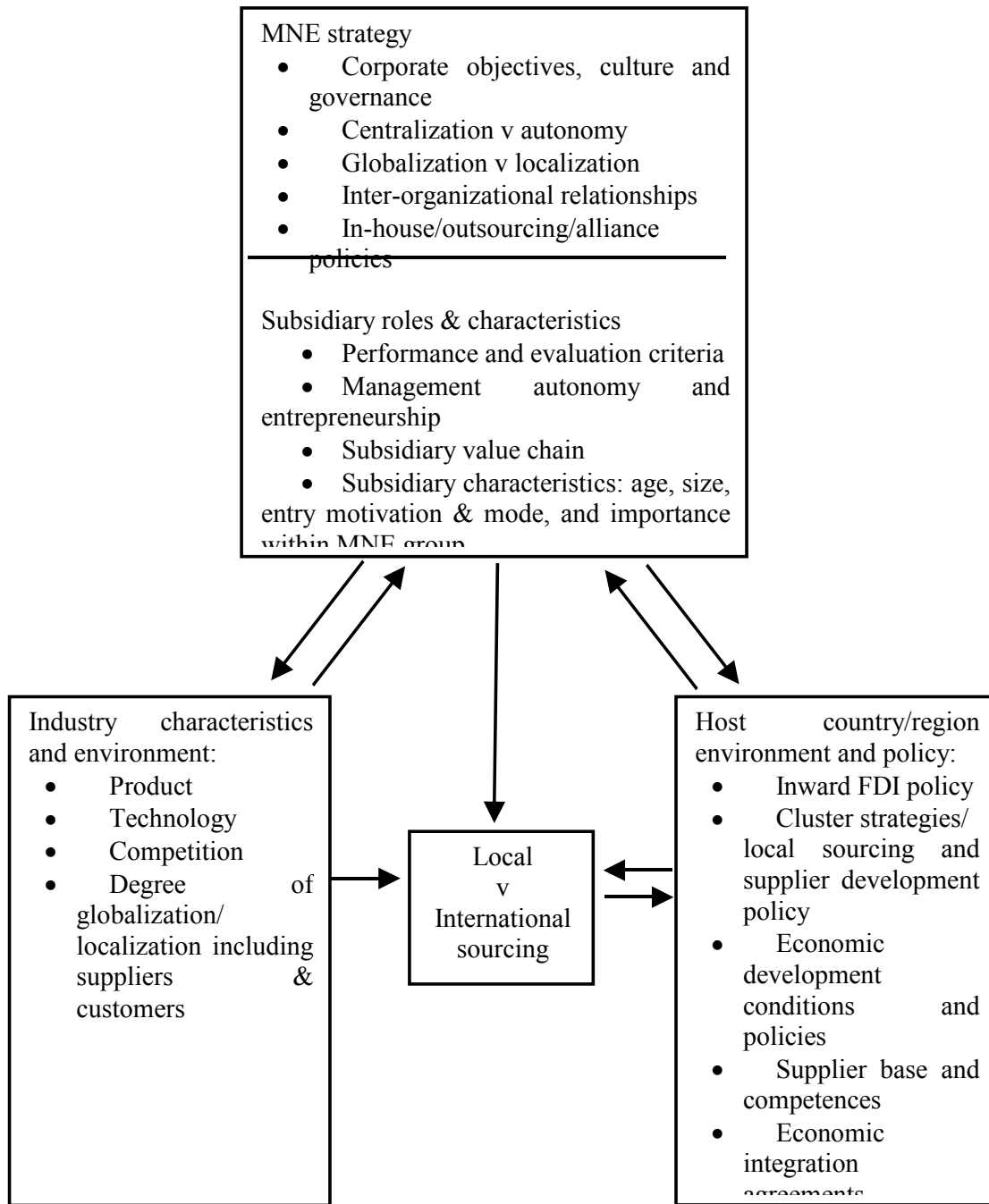


Fig. 1. Factors Conditioning the Choice between Local and International Sourcing

The following empirical study draws upon a range of variables highlighted in the framework, emphasizing those relating to subsidiary roles and economic integration which represent novel features of this research.

HYPOTHESES

Context

The overall objective is to provide explanations for the international sourcing propensities of MNE manufacturing subsidiaries, and to draw out scope to increase local sourcing through policy intervention at national and regional level. The analysis is based on the results of a survey of foreign subsidiaries operating in four EU economies (Ireland, Portugal, Spain and the UK).

The study uses imported inputs (rather than the conventional measure of locally-sourced inputs) as the dependent variable. Studies of local sourcing often focus upon sourcing from indigenous firms as opposed to MNE affiliates in the host country. This is because of the concern with embeddedness and the upgrading of the technological and other capabilities of domestically-owned enterprises (BLOMSTRÖM and KOKKO, 1998). However, the attraction of foreign direct investment (FDI) by multinational suppliers may represent a route for the economy into higher value-added and technology- and knowledge-intensive production inputs, which would otherwise be imported. Some foreign-owned suppliers commonly move abroad and co-locate together with their multinational customers. When local sourcing is taken to include both indigenous and foreign-owned suppliers, it is effectively the mirror image of international sourcing (although there are likely to be quality differences between local and foreign inputs [UNCTAD, 2001]). This empirical investigation used measures of international sourcing since information obtained on imported inputs may be more reliable than that on locally-sourced inputs. In addition, there can be difficulties in distinguishing between indigenous and foreign-owned suppliers; and some 'local' suppliers may simply be distributors of imported inputs.

The EU was chosen for the study since it represents the most developed economic integration experiment, hence allowing for corporate strategies to have developed as a reaction to key environmental changes which occurred in the last decades, such as the Single Market Programme (BÜRGENMEIER and MUCCHIELLI, 1991). The choice of these four countries reflects an interest in exploring cross-country comparisons and in understanding patterns in both large (Spain and UK) and small (Ireland and Portugal) EU economies, and countries which acceded to the EU at different times (Ireland and UK joined in 1973; Portugal and Spain joined in 1986).

Subsidiary Roles and Characteristics

Subsidiary roles. There is now considerable support for the notion of the MNE as a dispersed and differentiated network of subsidiaries with distinct strategic roles and scope. Relations within the MNE system are increasingly characterized by interdependence rather than by hierarchy (O'DONNELL, 2000). The issue of subsidiary roles has taken on increasing significance from a policy perspective, because of

the presumed economic benefits associated with subsidiaries with advanced contributory roles; but there is relatively little information on the independent effect on sourcing of subsidiary type *per se*.

In the present study a distinction was made among Miniature Replica, Rationalized Manufacturer and Product Mandate subsidiaries. The Miniature Replica is a subsidiary that produces and markets some of the parent's already existing product lines for the host country market; the Rationalized Manufacturer subsidiary produces a certain set of component parts or existing final products for a multi-country or global market; and the Product Mandate subsidiary has autonomy and creative resources to develop, produce and market a restricted product range for multi-country, regional or global markets.⁴ This represents a revised version of the categorization originally proposed in the pioneering work of WHITE and POYNTER (1984); similar three-way typologies have been applied in other empirical studies (YOUNG *et al.*, 1988; PEARCE and PAPANASTASSIOU, 1997; CRONE and ROPER, 2001).

The local market-oriented Miniature Replica should have a lower propensity to import, given its focus on the usually less demanding domestic market and perhaps for reasons of goodwill. This effect may be moderated by entry into the EU and the operation of the EU's Single Market which provides increased opportunities for sourcing internationally. It would be expected that the Rationalized Manufacturer would have a high import propensity, since its position within an integrated MNE group would suggest high levels of intra-firm trade (exports/imports). The Product Mandate subsidiary has autonomy and significant resources for development, production and marketing. Since the company has local R&D and understands the local market, this may encourage local sourcing (HOLM and PEDERSEN, 2000). However, the company's network relationships and its focus on competitive performance would suggest a significant import propensity, thereby leading to an uncertain international sourcing propensity overall. The expectations are thus that:

Hypothesis 1(a): Miniature Replica subsidiaries will have a low propensity to import inputs.

Hypothesis 1(b): Rationalized Manufacturers will have a high international sourcing propensity.

Hypothesis 1(c): The international sourcing propensity of Product Mandate subsidiaries is uncertain.

Age of subsidiary (and relationship to year of EU accession). There is evidence in the literature to indicate that older subsidiaries source more locally and hence import less (McALEESE and McDONALD, 1978; DRIFFIELD and MOHD NOOR, 1999). This reflects the evolution of the subsidiary itself and the accumulation of knowledge concerning supplier capabilities. Host government initiatives to develop the local supply base may be a further positive influence on local sourcing. However, recent work has

⁴ Respondents were given a description of these roles and asked whether the role was the subsidiary's: only/exclusive role; predominant/main role; secondary role; not part of its role.

questioned such a simple relationship between age and sourcing. GÖRG and RUANE (2001) found that the extent of linkages between MNEs and Irish indigenous firms was related in a non-linear fashion to the length of time the firm was located in Ireland, suggesting the existence of other influences. Given that no further evidence is known relating affiliate age and sourcing patterns for this cross-country sample, it is expected that:

Hypothesis 2(a): The age of the subsidiary is negatively associated with import propensity.

Reflecting the work of GÖRG and RUANE (2001), during a subsidiary's lifetime some key events may plausibly affect its strategic behaviour. For this sample of EU-based subsidiaries, we hypothesize that accession of their host countries into the EU may have been a determinant of the selection of sourcing strategies. Indeed, radical environmental changes such as the formation of economic trading blocs are thought to impact significantly on various aspects of MNEs' strategies (DUNNING and ROBSON, 1988; CUERVO-CAZURRA, 1999). This effect is deemed more pronounced in small, peripheral economies such as Ireland and Portugal (BARRY and BRADLEY, 1997). Here it can be expected that economic integration will lead to considerable new investment, and to strategic changes in existing affiliates towards more interdependent and integrated roles.

Although the specific impact of economic integration upon foreign sourcing is not clear or well explored in existing research, there are pervasive factors encouraging stronger affiliate integration within the EU, meaning greater intra-plant trade and higher import propensities. It is thus expected that:

Hypothesis 2(b): Economic integration will lead to higher import sourcing propensities.

As will be shown, distinct specifications of the econometric model were employed to test Hypotheses 2(a) and 2(b).

Entry mode. As compared with greenfield ventures, lower import propensities are anticipated in subsidiaries established through M&As, at least in the early years of operation. The explanation lies in the local sourcing patterns established by the previous indigenous company owners (ANDERSSON *et al.*, 1996; BLOMSTRÖM *et al.*, 2000). A similar rationale applies to joint ventures. However, if existing linkages are inefficient, acquired firms or joint ventures may switch to foreign suppliers (UNCTAD, 2000). On balance it is expected that:

Hypothesis 3: Subsidiaries established as new greenfield ventures are likely to have higher foreign sourcing propensities than those established by takeover or joint venture.

Size of subsidiaries. Evidence on size of affiliate is contained in SCHACHMANN and FALLIS (1989) and BARKLEY and MCNAMARA (1994). Large subsidiaries have been found to procure a lower

proportion of inputs locally than smaller ones (although the absolute level of local sourcing may be much higher). One explanation is that local companies may lack the capacity to supply the large volume requirements of large MNEs (CRONE, 2002). It may, therefore, be expected that:

Hypothesis 4: Large MNE subsidiaries will import a higher proportion of inputs than small subsidiaries.

Country and Industry

While the main focus of this research concerns MNE subsidiaries and international sourcing, a number of other conditioning variables were included in the econometric model.

Host country characteristics have been shown to have significant influences on sourcing patterns. Positive features of importance in local sourcing include the size of the country and the availability of an established and diversified industrial fabric, which will influence the size and capabilities of the indigenous supplier base; as well as FDI policies in respect, for example, of incentives, and cluster and supplier development strategies. Conversely, barriers to local sourcing in some host countries (including developed nations), include the absence of indigenous supply capabilities, especially for meeting the new product / process development requirements of MNEs (UNCTAD, 2001). Further common criticisms include the inability of local suppliers to meet the quality / price / delivery specifications of MNEs; and the management and financial resource limitations of supplier enterprises, meaning an inability (or unwillingness) to invest in long-term partnerships with MNEs (CRONE, 2002). Ireland and Portugal are much smaller countries than Spain or the UK, and their industrial bases are perceived to be comparatively smaller and less diversified.⁵ Hence the expectation is that:

Hypothesis 5: Import sourcing propensities among multinational affiliates in Ireland and Portugal will be higher than in the UK and Spain.

Sector. Included in the sample are subsidiaries within sectors which are commonly viewed as ‘global industries’, namely, automobiles, chemicals, electronics, and pharmaceuticals [KOBRIIN, 1991; MORRISON and ROTH, 1992]). The expectation is for significant import propensities in these sectors, since the definition of global industries usually includes the extent of an industry’s international linkages

⁵ Basic statistics for 2001 for the sample countries are as follows:

	Population (000)	GDP per head (Purchasing power standard; EU 15 = 100)	Imports (% of GDP at market prices)
Ireland	3853	118.0	83.4
Portugal	10299	72.2	41.2
Spain	40266	82.8	31.6
UK	59942	100.2	29.5

Source: European Commission, 2002, Tables 1, 9 and 40.

(MAKHIJA *et al.*, 1997). By comparison the machinery and metal industries are low/intermediate technology with significant localization features relating to customer requirements and transport costs. The expectation is for lower import propensities. The textiles, clothing & footwear industry, also considered, is global in respect of its sales and supply chains, and evidence indicates relatively low local linkages (UNCTAD, 2001).⁶ The expectation is thus for a high foreign sourcing propensity. Overall, it is anticipated that:

Hypothesis 6: The more globalized the industry, the higher the international input sourcing propensity. This means higher foreign input sourcing propensities in autos, chemicals, electronics and pharmaceutical sectors than in the machinery and metals sectors. The international input sourcing propensity will also be high in the textiles, clothing & footwear industry.

Home country. Historically studies have indicated that Japanese-owned subsidiaries had a higher propensity to import (DUNNING, 1986; KOTABE and OMURA, 1989; MURRAY *et al.*, 1995); although UNCTAD (2001) reports evidence that Japanese affiliates increased their local procurement in all host countries during the 1990s. In the case of EU firms, there is some evidence from PEARCE and PAPANASTASSIOU (1997) of greater local sourcing propensities. By contrast, WILLIAMS' (1999) evidence suggests that North American and Asia-Pacific MNE subsidiaries in the UK were more likely to source locally than their EU counterparts. CRONE (2002) found that nationality of parent had no relationship with the extent of local input linkages in two UK regions. Because of the lack of strong evidence, the relationship between home country and foreign sourcing propensities is investigated as a research question.

DATA AND METHODOLOGY

Data

A postal questionnaire was deemed the most appropriate data collection method given the intention of gathering information on a large number of subsidiaries across four countries in order to enable rigorous quantitative analysis and to allow results to be generalized (TAGGART, 1999). The survey instrument was pre-tested by interviews with subsidiaries' top managers. Several academics were also consulted, which led to some changes to the wording of the questionnaire. The pre-tested and amended version was then mailed to the managing director of each selected subsidiary. The questionnaire was administered in

⁶ Textiles, clothing and footwear were not included in the studies referred to in this section, although MORRISON and ROTH (1992) defined textile machinery as a global industry.

the language of the host country, and was translated from the original English version and then backtranslated.

A total of 1092 questionnaires were sent.⁷ The selection of the subsidiaries was based on the most credible publications listing the largest MNEs in each country (e.g. DUN and BRADSTREET, WHO'S WHO, JORDAN and KOMPASS), and on directories provided by Chambers of Commerce and Industry, Embassies and various Ministries and Government agencies. Distinct sources were compared to increase reliability. Only majority-owned manufacturing subsidiaries were chosen.

The survey was administered in 1999, and for each country the survey was sent twice, the second time four weeks after the first. 265 replies were received (a response rate of 24.3 per cent, which compares favourably with that obtained in similar studies [HARZING, 1997]), and a total of 233 valid replies were considered (as 32 replies were deemed incomplete or incorrectly classified).⁸

Method

Given the continuous nature of the dependent variable (explained below), the hypotheses were tested using the method of ordinary least squares (OLS). The number of observations permitted robust estimations using the linear regression model. Another alternative would be to divide the sample into a number of finite categories and use (still under the distributional assumption of normality) a qualitative response, or discrete choice model (McFADDEN, 1984; AMEMIYA, 1985). This alternative was also estimated (through ordered probit models with distinct thresholds). The results were similar but the use of the continuous variable option is preferable since it does not reduce arbitrarily the variability of the dependent variable and it reflects exactly the question asked of the firms in the survey.⁹

Measures

The *dependent variable* is the percentage of inputs/components that are imported by each subsidiary surveyed. These include raw materials, component parts and other physical intermediates obtained from

⁷ Brief description of sample

	No. firms surveyed	Replies	Valid replies	Response rate
Portugal	419	118	95	28.2%
Spain	145	37	34	25.5%
Ireland	200	49	46	24.5%
UK	328	61	58	18.6%
Total	1092	265	233	24.3%

⁸ They were incorrectly classified in the lists used (e.g., some firms classified as foreign were in fact domestic, and others listed as manufacturing subsidiaries were only commercial subsidiaries).

⁹ The respective question included in the survey was: "What is the percentage of inputs and components imported by your subsidiary?"

another country (whether a country inside or outside the EU); and the import source may be internal or external to the MNE group. This variable is continuous and assumes values between 0 and 100 per cent.

The *independent variables* are identified in Table 1 below. These variables permit the testing of the posited relationships and hypotheses on the determinants of subsidiaries' sourcing behaviour. Table 1 also indicates the expected signs associated with each explanatory factor, derived from the hypotheses mentioned above.

As can be seen in Table 1, the variable groupings include explanatory variables of distinct nature, mainly binary and categorical or based on a Likert scale (reflecting the purposefully-collected data in the survey). In respect of *Host country*, because all variables are dichotomous (or 'dummy'), one had to be excluded from the estimations. Even if there is no *a priori* rule to select which variable to exclude, and therefore any choice is acceptable, it was decided to exclude the *UK* dummy. The logic here is that the UK is perceived as having a more sophisticated industrial base than the other three peripheral EU economies (both due to having stronger domestic firms and foreign subsidiaries with higher levels of value-added scope). Similarly in respect of *Sector*, all variables are dichotomous and one had to be excluded. The most defensible decision was to omit the residual category *Other manufacturing (OTHMFG)* in the estimations.

Table 1. Variable description

VARIABLE	TYPE ^a	OPERATIONAL DEFINITION	EXPECTED SIGN
CONSTANT		Constant	
SUBSIDIARY ROLES			
MR	L/D	Miniature replica subsidiary (4=only role; 3=main role; 2=secondary role; 1=not part of role)	-
RAT	L/D	Rationalized subsidiary (4=only role; 3=main role; 2=secondary role; 1=not part of role)	+
PM	L/D	Product mandate subsidiary (4=only role; 3=main role; 2=secondary role; 1=not part of role)	?
AGE	C	Age (Number of years subsidiary has been established in host country)	-
DATEST	B/D	Date of establishment (1=subsidiary set up before its host country's integration in the EU; 0=if subsidiary was set up after EU integration or in year of accession)	-
AGESQ	C	Age squared (number of years subsidiary has been in the host country squared)	-
AGEDAT	C	Interaction term (number of years if subsidiary has been set up before its host country's accession; 0 if subsidiary has been established after EU integration)	-
MODE	B/D	Mode of entry (Greenfield=0; Non-greenfield (takeover and JV)=1)	-
SIZE	L/D	Employment (Logarithm of number of employees in subsidiary)	+
HOST COUNTRY^b			
IRL	B/D	1= Subsidiary is located in Ireland/0=otherwise	+
PORT	B/D	1= Subsidiary is located in Portugal/0=otherwise	+
SPAIN	B/D	1= Subsidiary is located in Spain/0=otherwise	-
UK	B/D	1= Subsidiary is located in the UK/0=otherwise	-
HOME COUNTRY			
EU	B/D	1=Parent from the EU; 0=otherwise	?
US	B/D	1=Parent from the US; 0=otherwise	?
OTHER	B/D	1=Parent from other home countries; 0=otherwise	?
SECTOR^c			
AUTO	B/D	1=Subsidiary belongs to sector 'Automobiles & auto components'/0=otherwise	+
CHEM	B/D	1=Subsidiary belongs to sector 'Chemicals & plastics'/0=otherwise	+
ELECTR	B/D	1=Subsidiary belongs to sector 'Electrical & electronics'/0=otherwise	+
PHARM	B/D	1=Subsidiary belongs to sector 'Pharmaceuticals & healthcare'/0=otherwise	+
TEXT	B/D	1=Subsidiary belongs to sector 'Textiles, clothing & footwear'/0=otherwise	?
MACHIN	B/D	1=Subsidiary belongs to sector 'Machinery, engineering & instruments'/0=otherwise	-
METAL	B/D	1=Subsidiary belongs to sector 'Metal products'/0=otherwise	-
OTHMFG	B/D	1=Subsidiary belongs to sector 'Other manufacturing'/0=otherwise	?

^a Binary (B); /Likert (L); /Continuous (C); /Discrete (D).

^b The host country variable UK has been excluded.

^c Other manufacturing, a residual category, has been also excluded.

RESULTS

Preliminary Considerations

In total, four models were estimated (Table 2). All four models have similar combinations of variables, differing only in the proxy used for the variable representing age of subsidiary. In the first model, this proxy is simply the age of the subsidiary measured in terms of the number of years since the establishment of the subsidiary (AGE). The second model uses age squared (AGESQ), with the objective of testing a possible nonlinear (quadratic) relationship between age of subsidiary and its respective sourcing patterns (following GÖRG and RUANE, 2001). The third specification uses the variable date of establishment (DATEST) that distinguishes subsidiaries established before and after EU integration, thereby including an ‘integration’ effect, and also an underlying ‘vintage’ effect. The last model uses an interaction term between age of subsidiary and date of establishment (coded AGEDAT), aiming to capture the two effects. This variable assumes the value of AGE (as defined above) in case this establishment occurred before the host country’s EU accession, and 0 if the subsidiary was set up after EU integration.

The comparison of the results of these four models is interesting since it permits testing the significance of subsidiary age and EU integration *per se*, and of their combined effect. It also may allow inferences on the linearity or non-linearity of the potential impact of age on subsidiaries’ sourcing patterns.

Tests

All variants of the models estimated passed the usual tests performed to ensure their validity. The models’ overall goodness of fit was confirmed by the F-test. The values for this test reported in Table 2 indicate that the overall model is significant at the 0.00001 per cent level. All models were corrected for heteroscedasticity using White’s correction (WHITE, 1980). This procedure ensures the consistency of the estimates. Regarding multicollinearity, and as there are no formal tests for such problem, the common rules of thumb were used in order to detect whether it was a feature of the sample. Partial correlations were examined. The classic symptom of high R^2 with few significant t-ratios does not apply to the estimations as well, as many variables proved statistically significant. The Durbin-Watson statistics reported in Table 2 indicate that these models do not suffer from autocorrelation.

Table 2. Model estimates

DESCRIPTION	MODEL I	MODEL II	MODEL III	MODEL IV
CONSTANT	29.21 (17.48)*	29.49 (17.12)*	27.29 (16.87)	26.43 (17.06)
SUBS ROLES AND CHARACTERISTICS				
SUBS ROLES				
MR	-0.91 (3.30)	-0.88 (3.03)	-1.00 (2.97)	-1.14 (3.00)
RS	7.53 (2.72)***	7.54 (2.88)***	7.58 (2.83)***	7.47 (2.85)***
PM	8.20 (2.80)***	8.12 (3.01)***	8.49 (2.97)***	8.36 (2.99)***
AGE	-0.11 (0.11)			
AGESQ		-0.57 (0.001)		
DATEST			-10.64 (4.60)**	
AGEDAT				-0.16 (0.09)***
MODE	0.83 (4.32)	0.33 (4.45)	1.08 (4.33)	1.39 (4.41)
SIZE	-0.94 (2.03)	-1.29 (1.96)	-0.59 (1.93)	-0.57 (1.98)
COUNTRY AND INDUSTRY				
HOST COUNTRY				
IRL	19.47 (7.23)***	20.17 (7.55)***	18.41 (7.35)***	18.15 (7.50)**
PORT	2.31 (6.43)	2.96 (6.16)	4.26 (6.01)	2.51 (6.06)
SPAIN	-22.97 (6.89)***	-22.53 (8.24)***	-19.56 (8.15)***	-22.48 (8.13)***
HOME COUNTRY				
EU	1.29 (6.12)	0.67 (5.97)	1.64 (5.84)	1.92 (5.93)
US	-0.03 (6.30)	-0.477 (6.38)	0.46 (6.29)	-0.57 (6.35)
SECTOR				
AUTO	17.87 (6.92)**	18.36 (7.70)**	16.53 (7.62)**	17.13 (7.66)**
CHEM	12.32 (7.36)*	11.82 (7.32)*	12.63 (7.15)*	12.99 (7.24)*
ELECTR	23.44 (6.73)***	23.50 (7.32)***	22.42 (7.22)***	23.38 (7.25)***
PHARM	20.46 (7.42)***	20.17 (8.01)***	19.52 (7.94)***	21.22 (7.97)***
TEXT	12.35 (12.11)	12.71 (9.91)	11.56 (9.78)	11.97 (9.83)
MACHIN	-19.78 (7.62)***	-19.26 (9.34)**	-19.94 (9.18)**	-20.32 (9.26)**
METAL	-0.58 (16.11)	-0.84 (14.48)	-0.32 (14.27)	0.11 (14.36)
Overall goodness of fit (F test)	6.00 (0.00000)	5.93 (0.00000)	6.25 (0.00000)	6.18 (0.00000)
<i>Autocorrelation: Durbin-Watson Statistic</i>	1.93151	1.93893	1.89558	1.91804
N	175	175	174	175

Results correspond to coefficients and standard errors (the latter in brackets).

***p<0.01; ** p<0.05; * p<0.10

Findings

The models' results confirm some usually held expectations but also highlight some innovative and less commonly explored aspects. The most relevant contribution is to have shown empirically that subsidiary strategies and economic integration are influential determinants of sourcing patterns in EU host economies.

Subsidiary roles and characteristics:

Subsidiary roles. Both Rationalized Manufacturer and Product Mandate subsidiaries are strongly associated with high import propensities; the results for Miniature Replicas were not significant.

Hypothesis 1(b), concerning the high international sourcing propensity of Rationalized Manufacturers, is clearly supported, confirming this group as the most internationally integrated (and possibly ‘footloose’) subsidiary type.

However, the fact that Product Mandates are so clearly prone to import a considerable part of their inputs contrasts with expectations, and represents a crucial finding [Hypothesis 1(c)]. Their assumed interaction with the local industrial fabric and research base was expected to result in higher local sourcing levels. The integration of Product Mandates within global MNE networks was clearly stronger than their possible local roots. Moreover, the fact that they may draw more heavily on local attributes does not imply that they source inputs locally. Their principal focus may be local intangible, knowledge-based factors, with sourcing of physical inputs/components undertaken abroad in the interests of competitiveness.

The hypothesized tendency for Miniature Replicas to display lower import propensities did not hold. Hypothesis 1(a) is then rejected. This subsidiary type is domestic market-oriented in terms of sales, but trade liberalization, economic integration and the globalization of supply chains have clearly become major influences on input sourcing patterns.

Overall, these findings highlight the strong interdependence and international flexibility characterizing contemporary MNEs. These forces are strengthening international as opposed to local sourcing patterns.

Age. No clearcut relationship was found between subsidiary age and import propensity. Hypothesis 2(a) is rejected, a result which contrasts with previous empirical evidence (MCALEESE and MCDONALD, 1978; DRIFFIELD and MOHD NOOR, 1999). Furthermore, given the non-significance of AGESQ in Model II, there was no support for a quadratic relationship between both variables (GÖRG and RUANE, 2001).

The estimations (Model III) support the significance of the date of establishment variable, meaning that subsidiaries established before their host country’s EU accession tend to import less; conversely, subsidiaries set up post-accession, typically more integrated with their MNE groups, source more abroad. Hypothesis 2(b), which predicted that economic integration will lead to higher import sourcing propensities, is therefore supported. Subsidiaries established before EU accession were mainly supplying their local markets. Trade barriers on foreign inputs and less liberal FDI laws (commonly associated with local content requirements [BELDERBOS, CAPANNELLI and FUKAO, 2000]) also meant that subsidiaries had to purchase a significant share of their inputs in the host country. With economic integration and the concomitant disappearance of trade barriers on both manufactured products and inputs/components, most MNE subsidiaries saw their role changed towards more integrated strategies with their corporate groups. However, for subsidiaries established after integration, the emphasis on

international networks was greater from the outset, leading to a stronger international *vis-à-vis* local sourcing effect.

This result may be capturing a ‘vintage’ effect as well as an ‘integration’ effect. In these circumstances, there was a case to introduce an interaction term Age/Datest, which proved significant (Model IV), hence confirming that economic integration mattered.

Entry mode. The hypothesized relationship between greenfield subsidiaries and higher import propensities is not supported. Thus, Hypothesis 3 is rejected.

Subsidiary size. The size variable was non-significant, hence rejecting Hypothesis 4 that large subsidiaries will be more import-oriented than their smaller counterparts.

Country and industry

Host country. The results highlight the strongly significant import propensities of Irish subsidiaries and, conversely, the greater propensity of their Spanish counterparts to buy locally. However, the result for Portugal was not significant, even though the respective coefficient is positive. It can thus be concluded that Hypothesis 5 receives partial support.

Sector. The results strongly support Hypothesis 6 concerning high import sourcing propensities in global industries (especially electrical & electronics and pharmaceuticals). Subsidiaries in the machinery, engineering & instruments are significantly associated with a low propensity to import inputs/components (as suggested in Hypothesis 7). However, the results do not support expectations in the textiles, clothing & footwear industry (which turned out to be a non-significant variable).

Home country. In respect of MNEs’ home country, EU, US and Other nationality ownership was tested as a research question given previous conflicting evidence. No significant home country effect was found, supporting the recent results of CRONE (2002) for two UK regions.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

There are powerful arguments for trying to enhance local linkages; and a significant albeit incomplete body of evidence is now available on the topic of international (versus local) sourcing by multinational plants, an issue of major policy significance in national and regional economies.

The role / strategy of MNE subsidiaries has been assumed to influence economic impact in host economies, with especial emphasis being placed on the positive contributions of subsidiaries with high contributory roles, termed Product Mandates in the present research. These subsidiaries possess distinctive competences, and have been viewed as producing significant static and dynamic economic benefits in a

range of areas including backward linkages and spillovers. However, our results show a highly significant positive relationship between Product Mandates and *imported* inputs/components, throwing considerable doubts on the positive impact of mandate subsidiaries. Our evidence also reveals a strong positive association between the Rationalized Subsidiaries (classic branch plants) and foreign sourcing propensities as anticipated. No association was found in the case of Miniature Replicas.

A related important finding of this study concerned the significance of economic integration (along with age) in inducing changes in sourcing patterns. Evidence indicates that radical environmental transformations, such as those created by entry into the EU, may have a substantial impact on sourcing patterns (as part of wider strategic change within MNEs located within the EU). European economic integration is thus being matched by MNE corporate integration (DUNNING and ROBSON, 1988). The impact of this, as this research shows, is a greater trade (import)-orientation among MNE subsidiaries.

Aside from European integration, it seems likely that global integration may also be impacting upon sourcing patterns. In this research, high import propensities were evident in global industries; and integrated production strategies (evidenced in Rationalized Subsidiaries) may be implemented at global and not simply European levels. There is some evidence from other research (FIRN CRICHTON ROBERTS *et al*, 2000) of a trend towards greater global sourcing for customized products and services, with global sourcing being followed by single sourcing from one key supplier. By comparison, it is commodity goods and services (bulky, low-value, off-the-shelf items) which will be sourced locally.

This research thus confirms the significant body of evidence that multinationals have seldom developed extensive input linkages with their host economy. It develops previous research by highlighting the importance of regional and global integration in limiting the potential for local sourcing; and in challenging previous notions that particular MNE subsidiary roles are more likely to generate strong local sourcing linkages.

Policy implications.

The importance of the international / local sourcing decision from an economic development perspective is reflected in the interest shown by policy makers in national and regional economies around the world. A wide range of policy initiatives have been launched to stimulate local sourcing and promote the local supply base, including information and matchmaking; technology upgrading of local firms; human resource development programmes with local suppliers and other forms of training support; financial assistance; and cluster-oriented programmes ([UNCTAD, 2001]; see CRONE and ROPER, 2001 for details of the policy models operated in the UK regions and in Ireland). In a thorough review of policy, CRONE (2002) concluded that the scope for policy intervention was quite limited in general because of

the sourcing strategies of MNEs and problems in the local supply base (availability, capacity and competitiveness). It was also proposed that measures to tackle supplier capacity and competitiveness had greater potential than 'brokering' services.

The results from this research on four EU countries both confirm and extend the conclusions of CRONE (2002) on the UK regions. A critically important conclusion concerns the requirement for policy measures to enhance the general capabilities of the local industrial fabric in national and regional economies and thereby strengthen its supplier base. However, European and global integration trends begin to ask questions about the appropriate spatial area on which to base, for example, cluster development strategies; and whether a small host country or administrative region provides the necessary scale to benefit from local sourcing initiatives.

Aside from the recommended emphasis on investment in the industrial infrastructure, the specific policy implications of the present research may be divided into two groups, the first, relating to the attraction of inward foreign direct investment (FDI); and, the second, to corporate development policies (commonly referred to as 'after-care' [YOUNG and HOOD, 1994]).

There are a series of implications of the present work for the promotional activities of investment attraction agencies. First, promotional targeting is commonly sectoral in nature. However the greatest opportunities generally exist in high growth, technology-intensive sectors which are global, and here import propensities are likely to be high. Second, targeting tends to be focused more directly on the export potential of the subsidiary, rather than its sourcing patterns. The present research questions targeting strategies which solely emphasize export potential, and suggests that net export contribution (exports minus imports) is a more appropriate measure. Third, parent MNE nationality does not appear to affect the propensity to source locally. Hence country targeting is not useful if the objective is that of local sourcing. Finally, it cannot be assumed that subsidiaries will gradually reduce foreign sourcing as they become longer established; while policies favouring the attraction of very large subsidiaries cannot be advocated if the priority is local embeddedness.

UNCTAD (2001) suggest a different approach which is to directly target foreign investors with linkage potential, as part of a general inward foreign direct investment targeting strategy; the challenge here is to identify such investors.

Although this next proposal does not meet the objective of improving the indigenous supplier base, the fact that there may be no appropriate or capable local suppliers does suggest that greater efforts might be made to attract inward investments from the MNE's global supplier base. Certainly this is a policy pursued by some countries / agencies.

The targeting of the MNE's global supplier base is particularly appropriate in situations where regionally and globally integrated (and centralized) strategies are being pursued; and Rationalized Subsidiaries with low levels of competence and autonomy exist at host country level. Policy initiatives to stimulate higher local sourcing are most difficult among such subsidiaries, since parent MNEs may be scanning globally for competitive suppliers. Bringing local suppliers to the level where they are even considered as potential supply sources is a major challenge. Failure to achieve this, of course, weakens the embeddedness of the subsidiary and makes it vulnerable to divestment pressures.

Turning to the second area of policy, namely, that concerning corporate development policies, it is clear that there are no quick fixes. Moreover, the focus upon subsidiary roles does emphasize the diversity of multinational plants, and, therefore, the requirement for a company-specific approach rather than simply generic local linkage policies. The high import propensities of Product Mandate subsidiaries are clearly a cause for concern among policy makers. Conventional wisdom is that these are exactly the firms that should be encouraged and nurtured for their contribution to dynamic comparative advantage. Results here suggest that these subsidiaries' search for global competitiveness (involving *inter alia* international sourcing) may now override any affinities to local suppliers. Alternatively globalization may be leading to greater central control over decision-making in specific critical areas such as international procurement, thereby reducing the authority of these quasi-autonomous subsidiaries. It is still the case that these companies should be the focus of policy support, given both their competences and their autonomy.

Possible initiatives may include support for company-led supplier development programmes; providing assistance to suppliers to access purchasing decision-makers in multinational subsidiaries; direct support for suppliers with genuine development potential; and assistance to suppliers with outward internationalization. The latter is very important: locking-in local suppliers to subsidiary plants may make the suppliers very vulnerable if rationalization occurs across the MNE. The subsidiary may be able to help relationship building and subsequently export sourcing links with other group subsidiaries internationally. Success is not guaranteed with any of these initiatives; and they require entrepreneurial and capable suppliers, and a long-term commitment by all parties.

The present research strengthens the preliminary conclusion of previous authors that the potential for local linkages is now significantly reduced as compared with the past. And yet the recent literature on multinationals lays great stress on the opportunities and potential for innovation and entrepreneurship in foreign subsidiaries (BIRKINSHAW and HOOD, 2001). This paradox is undoubtedly worthy of further investigation, given the policy importance of international versus local sourcing for national and regional host economies.

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