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Regional Mix and the Roles of Foreign Subsidiaries: A New Conceptualization and Empirical Evidence on the UK Case

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Abstract

This paper develops a new conceptualization of the relationship between regional determinants and roles of foreign subsidiaries and empirically investigates this relationship in the UK at a disaggregated regional level. It focuses particularly on a relatively under- investigated field, that of the linkage between choice of regional location -within a particular host country- and subsidiary roles. The key contribution steaming from this analysis is the development of the Asset Specificity Framework (ASF) combining regional characteristics with distinctive types of subsidiaries. This framework is further examined providing detailed support for our allegations. The external environment impacts differently on subsidiary types, with agglomeration features playing the most significant role. At the same time though, idiosyncratic Foreign Direct Investment (FDI) aspects do seem to exert the most important influence for these types of subsidiaries. Interesting policy implications may then be raised regarding the design of well-targeted FDI promoting policies, aiming at upgrading regional potential on one hand and pursue the attraction of specific sectors and companies on the other.

JEL Classification: F23, L20, R10

Keywords: UK Regions, subsidiaries' roles, regional mix, location choice, agglomeration.

1. Introduction

Foreign Direct Investment (FDI) and its agents, i.e. Multinational Corporations (MNCs), may contribute substantially to the economic development of nations via their impact on trade on one hand and their ability to generate jobs and produce new knowledge through technological and managerial advances on the other (UNCTAD, 2003). At the same time, the contemporary MNC is a continuously evolving institution which influences and simultaneously is influenced by its external environment. The issue then is to achieve the best fit between external environment, shaped primarily by policy actions, and the strategic orientation and goals of firms (Porter, 1990; Rugman and Verbeke, 2001). Subsidiaries are not allocated necessarily with *ad hoc* specific roles. They rather have a unique way of transforming and 'endogenising' country or regional specific advantages to firm specific advantages (Rugman and Verbeke, 2001).

This paper focuses on an under-investigated field, that of the linkages between choice of regional location -within a particular host country- and MNC subsidiary roles. We mainly build on the work of Taggard (1998) as regards strategic shifts of MNC subsidiaries, and the integration-responsiveness framework by Prahalad and Doz (1987), which extensively discusses how MNCs can achieve the right levels of global integration and local responsiveness in the various activities and functions (Bartlett and Goshal, 1989; Jarillo and Martinez, 1990). In this respect, we develop a conceptual framework, the Asset Specificity Framework (ASF), where we posit that distinctive types of foreign subsidiaries are attracted by a particular mix of regional characteristics.

The remainder of the paper is organized as follows: In section two we discuss the theoretical background and develop the ASF. Section three describes the dataset, analyses the econometric methodology and explains the empirical model formulation. Econometric results are discussed in section four and finally, section five concludes, offering possible policy implications.

2. Theoretical Background and Hypotheses

2.1 Environmental determinism and roles of subsidiaries

Currently, there has been a renewed interest in the spatial aspects of FDI and their immediate influence on the competitive advantage of firms. That interest induced scholars from economic geography, trade theory and international political economy to develop a new research agenda in an effort to formalize the relationship between MNC operations and the economic structure and dynamic evolution of countries and regions (Dunning, 2002).

In particular, "New Economic Geography" (NEG) posits a number of hypotheses on MNC location choice (Krugman, 1991; Krugman and Venables, 1995). Inspired by Marshall's seminal analysis (1890/1916) NEG theorists argue that specific industries are expected to become geographically concentrated and specific countries seem to be advantageous in attracting foreign activities within their grounds. According to Ottaviano (2003) the innovation of NEG lies in the fact that it explains the choice of location on microeconomic parameters and thus combines the existence of scale economies, strong market power, flexibility in the mobility of customers and suppliers

and the persistence of low trade costs. All these factors can explain agglomeration of firms in one location (Venables, 1996; Markusen and Venables, 1998; Fujita et al., 2001).

Whilst the essence of agglomeration is central to NEG theoretical models, there is scarce evidence in the empirical literature on the influence of NEG predictions. Most of the relevant empirical studies analyze the determinants of industrial activity, placing emphasis on firms' clustering at a national level (Wheeler and Mody, 1992; Devereux and Griffith, 1998). Nevertheless, there are a few exemptions that deal with thinner geographical analyses within countries (see Carlton, 1983; Friedman *et al.*, 1992). Guimaraes *et al*. (2000) present a spatial distribution of FDI start-ups in Portuguese concelhos. Crozet *et al*., (2002) map foreign investors' location choices within the French territory, and stress observed agglomeration effects and the impact of French and European regional policies. Boudier-Bensebaa (2005) examines the determinants of FDI at a regional level in Hungary and concludes that labor availability, demand conditions and agglomeration economies influence positively and significantly inward FDI in Hungarian counties. More recently, Ng and Tuan (2006) study the mainland investment decision at the provincial level of firms from Hong Kong and also find agglomeration effects to be significant. Pusterla and Resmini (2007) utilize firm-level data on foreign firm manufacturing plants in Bulgaria, Hungary, Poland and Romania to analyze the determinants of foreign firms' location choice and conclude in favour of agglomeration effects driven by multinational rather than indigenous firms.

Nevertheless, an important aspect of analysis, that of the "nature of relationship between the subsidiary and its host country environment" remains unexplored (Birkinshaw, 1998, p. 269). In this context pioneering is the paper of Young, Hood and Peters (1994) where they synthesize different strands of literature and present conclusions on potential effects of different subsidiary roles in regional economic development. In a similar manner, Malmberg et al. (1996, p, 86) bring together "theory from economic geography and international business and strategy to address the phenomena of spatial clustering, accumulation of knowledge in local milieu and firm competitiveness".

From the viewpoint of strategic management and international management in particular, a number of authors have classified subsidiaries according to their development and roles assigning different typologies to each group (see Rugman and Bennett, 1982; Poynter and Rugman, 1982; White and Poynter, 1984; Bartlett and Ghoshal, 1986; Birkinshaw and Hood, 2000; Taggart, 1997; Birkinshaw and Morrison, 1996; Pearce, 1995; Crookell and Morrison 1990; Papanastassiou and Pearce, 1999 Holm and Pedersen, 2000). The evolution of the literature on the roles of subsidiaries has extended our understanding on the importance of two basic components that shape these roles, i.e. factors related to the external environment of the subsidiary and factors related to the internal environment of the MNC network (Birkinshaw et al., 1998; Birkinshaw et al., 2002)[1]. Regarding the external environment, Porter's contribution is seminal through his acknowledgement of the fact that innovative activities will tend to cluster in certain geographical areas (Porter 1990; Håkanson and Nobel, 2001). The strategic importance of market conditions for attracting, sustaining and affecting a firm's performance and development has by now been well established (Bartlett and Ghoshal, 1989; Young et al., 1994; Malmberg et al., 1996). Later work on

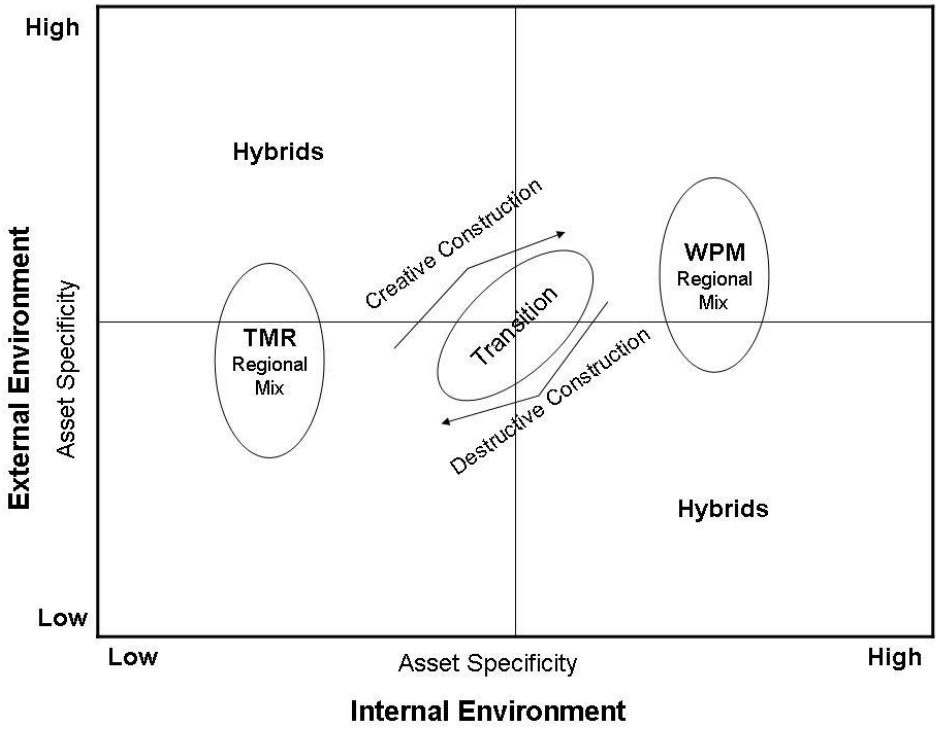
[1] However, we should not ignore and forget pioneering work by Hymer (1976), Vernon (1966), Buckley and Casson (1976), Dunning (1993), Hedlund (1986) in the analysis of FDI.

"embeddedness" also places emphasis on the characteristics of the external environment hosting the subsidiary (Håkanson and Nobel, 2001) whilst Frost (2001) and Cantwell and Piscitello (2005) relate the innovation ability of a subsidiary and thus its role, to its "membership" in the local knowledge community and therefore the regions' ability to create and diffuse innovation[2]. Thus, there are many cases of subsidiaries that perform specific value-added activities, which are fundamentally "embedded" in their respective host-countries' production systems (evidence is provided by: Kuemmerle, 1999; Dunning, 1996; Cantwell, 1995; Jarillo and Martinez, 1990). In the last decade, Benito et al. (2003) clearly state that subsidiaries' competences are determined to a great extent by the quality of location characteristics. We also quote Birkinshaw et al. (1998) who assert that "While there is no shortage of typologies suggesting that subsidiaries vary in their contributory role,…, there is no definitive evidence for the sources of such variation." (p. 222).

2.2 The Asset Specificity Framework (ASF) - Regional Mix

Building on the above theoretical conceptualization, i.e. on the roles of subsidiaries and environmental determinism, we result in an asset-specificity framework which is depicted in figure 1.

Figure 1
The Asset Specificity Framework



[2] Also, Brand et al. (2000) and Andersson and Forsgren (2000), though from a different perspective, underline the importance -for the development of the local subsidiary as well as of the MNC group - of the realization of linkages with local business environment.

On the vertical axis we measure the degree of asset specificity of the local external environment. The local environment is endowed with certain characteristics that are either inherited to the locality, such as natural resources, or shaped, such as various aspects of infrastructure. In our case these aspects of created infrastructure are measured on a range from low or general, to high or specific. Mariotti and Piscitello, (2001), refer to this kind of infrastructure as the *generalized capabilities* of an area. Examples of the former could include physical infrastructure, like road and rail network [see Coughlin et al. (1991) on the impact of general infrastructure variables in attracting FDI]. These generalized capabilities show a relatively low degree of specificity. On the other hand, capabilities of a high specific nature can be captured by specialized technological inputs such as the existence of universities or overseas R&D laboratories. These factors contribute to the agglomeration economies and thus to the generation of particular to the locality attributes which are unique in nature and consequently are very difficult to imitate. In this context, Storper (1995) argues that the existence of intangible assets contribute critically to the competitiveness of a region. Cantwell and Iammarino (2000) demonstrate the agglomeration of MNCs' R&D in the South East of the UK whilst Basile (2004) confirms the importance of research centers as well as sophisticated business services as factors attracting FDI in regions of Italy [see also de Propis et al., (2005) for a very thorough analysis on the impact of Local Industrial Systems, as a modern expression of the *Marshallian economies*, on FDI at a county level in Italy].

At the same time on the horizontal axis we measure the degree of asset specificity of the internal to the MNC environment as this is reflected through the roles of subsidiaries. We hereby adopt a typology emerging from White and Poynter (1984) and we distinguish between two major subsidiary roles:

One the one hand we have Truncated Miniature Replicas (TMRs), which tend to produce well-established final products already existing in the MNC group value chain. The literature has also identified "implementers" or "branch factories" as those subsidiaries with relatively low competences whose main task is to implement the group's existing and already shaped strategy (Bartlett and Ghoshal, 1986; Ghoshal and Nohria, 1993; Young et al. 1994; Taggart and Hood, 1999).

On the other hand, World Product Mandates (WPMs) are assigned with the introduction of innovative products and thus they are the ones in charge of expanding the product line of the MNC group. WPMs are found on the top of "competence ladder" and correspond to "strategic leaders" (Bartlett and Ghoshal, 1986;) "centers of excellence" (Andersson and Forsgren, 2000); "global innovators" (Gupta and Govindarajan, 1991)[3]. Expanding the above typology, we hereby identify a third type of subsidiary that is attributed a more specialized, narrow product mandate, related to horizontal integration (Papanastassiou and Pearce, 1999; Venables, 1999), thus we introduce this role as the Specialized Miniature Replica (SMR), though in broad terms it falls within the TMR category.

Hence, on the left hand side of the quadrant we will place TMRs and in the far right WPMs. In the case of TMRs, the standardized nature of their production mandates is reflected whilst in the case of WPMs their position mirrors their innovativeness and creativity.

[3] See also Rugman and Verbeke, (2001) for a thorough discussion on the internal patterns of competence creation in MNC groups.

These two elements result in a different *regional mix* for each one of the two different types of subsidiaries. As one can see in figure 1, the two types of subsidiaries base their operations on both general and specific local assets. Nevertheless, the different nature of their mandates requires a different mix of local variables with TMRs relying more on general assets and WPMs on specific assets. Although they do not discriminate between different subsidiary roles, Coughlin and Segev (2000) show how the variety of local factors ranging from favorable taxation to sophistication of education of inhabitants of a region influence the decision of foreign investors in their choice of establishment in a region.

Acknowledging the fact that there is insufficient empirical evidence on the effect of "environmental determinism", in particular, on the observed variation of roles of subsidiaries (Ottaviano, 2003; Neary, 2001; Birkinshaw and Hood, 2000) the value added of this study is the empirical documentation of location factors, at a narrow regional level that are tentatively of great importance for MNCs' strategic location decisions at a first step, and the discrimination of these regional characteristics' significance for alternative subsidiary roles or the evolution of subsidiaries' mandates (Birkinshaw, 1996; Cantwell and Mudambi, 2006). In this respect, and building on *Porter's diamond* (1990) (though not exhausting it) we account for two significant measures that have emerged as partially driving competitiveness at regional level: on one hand, 'Educational and Vocational Attainment' as well as 'Research & Development Density and Employee Jobs in High Technology' are clearly recognized by Timothy Edmonds (2000) as attributes that enhance competitiveness, thus, create the appropriate environment for innovative activities. Beyond that, other factors that have been proven of special importance consist of infrastructure availability, both basic and technological, human resources such as managerial skills, labor force characteristics and the wider production conditions, including entrepreneurial culture, capital availability as well as the nature of competition (Department of Industry and Trade, 2002).

In conformity with the above, we hereafter investigate the role of *regional market size* as the most pervading depiction of market-seeking behavior strongly supported in previous studies at a national level (Braunerhjelm and Svenson, 1996; Wheeler and Mody, 1992; Veugelers, 1991). In order to capture *sophistication of local demand* in terms of purchasing power, we apply regional income per capita. Per capita income indicates potentially sophisticated consumer preferences and, thus, an advanced level of development and is a well-established determinant in the relevant literature (Holm et al., 2003). Labour availability and thus *compensation of employees' considerations* is of primary concern to investors in their choice of locating operations with wage variations resulting in different sets of industries (Bernard et al., 2003). We also take into consideration the existence of a minimum level of *regional physical infrastructure* as a necessary condition that facilitates production, transportation and distribution of both final goods and imports. On the other hand, the above-mentioned authors tell apart the knowledge infrastructure as representing *technological sophisticated competencies* particularly attractive to knowledge-seeking investors (also Håkanson and Nobel, 2001; Cantwell and Iammarino, 2000; Guerrero and Sero, 1997). Though the availability of advanced resources is a prerequisite for these types of activities, conventional wisdom points to the success of technological capabilities by innovations developed locally, hence *regional innovativeness* may stand for a knowledge generation index locally (Bottazzi and Peri, 2003). Finally, *agglomeration*

of firms belonging to the same sector has by now been well-documented evidence in related bibliography (Porter, 1990), making the region especially suited to meet the specific location requirements of firms (Maskell and Malmberg, 1999; Benito et al., 2003). Hence, the optimal location would usually be a region with long track record of servicing firms in the specific sector. Agglomeration in terms of the presence of same nationality firms traditionally represents is also taken into consideration, since investors tend to 'believe' in their country-mates decisions (Crozet et al., 2004).

3. Sample Description and Econometric Specification

3.1 Data Collection and Descriptive Statistics

For our purposes, we investigate regional location choices of foreign affiliates within the UK territory. The analysis is based on the results of a survey of foreign subsidiaries operating in the UK. The most appropriate data collection was through a postal questionnaire, given the scope of the study to gather information on a large number of subsidiaries that would allow rigorous quantitative analysis. Experienced academics were consulted with regards to particular phrasing and sequence of questions asked. The final version of the questionnaire was posted to 812 subsidiaries extracted from the International Directory of Corporate Affiliations (1992). The sampling process aimed at subsidiaries with parent - companies enlisted in Fortune 500.

The survey was conducted in 1994-1995 and the questionnaire was sent twice within a month's time. We collected 190 replies, which represent 23.3% of total number of questionnaires sent out. The response rate compares favourably with the ones obtained in similar surveys (Harzing, 1997). We excluded one reply though due to inadequate information, thus we finally had 189 valid responses. Our sample is an accurate representative of UK FDI sectoral distribution as it is compatible with aggregate inward FDI data[4].

Using managers' responses we were able to assign each affiliate a specific role and classify them in the respective two categories, i.e. WPMs or TMRs. In regards to location of their activities, information was obtained from the International Directory of Corporate Affiliations (1992), from where firms were originally extracted.

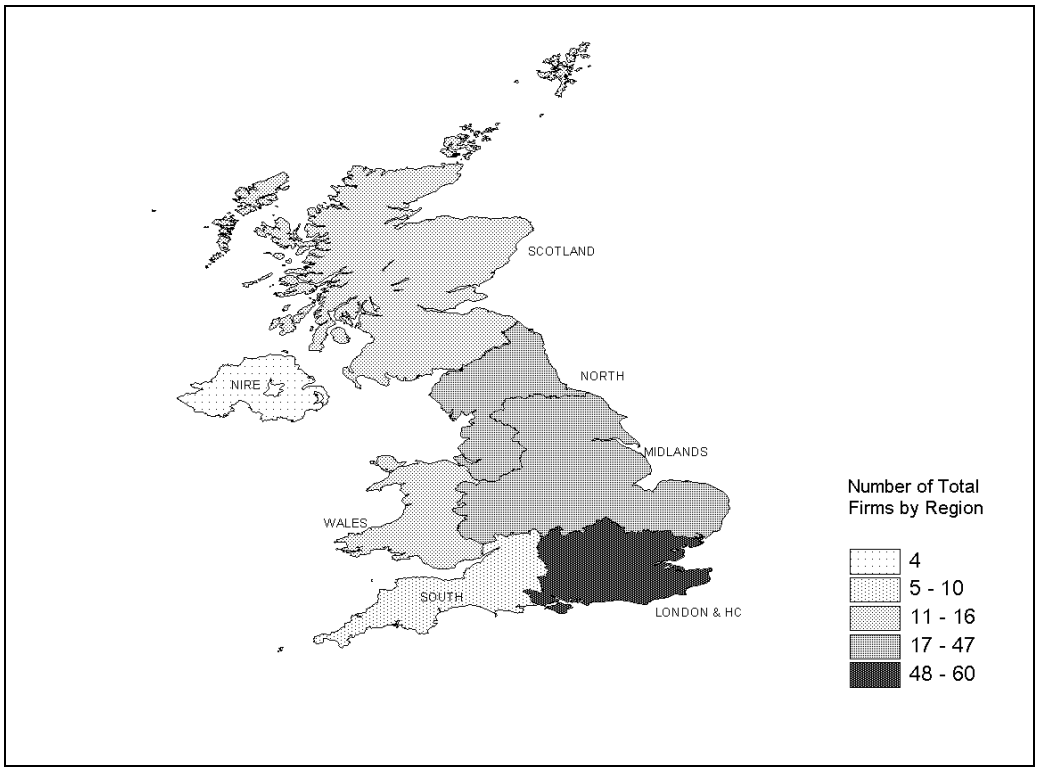
Concerning the regional breakdown of the UK, this was based on common classification of UK National Statistics, with the exception that we merged some of the neighbouring regions. UK National Statistics distinguishes among twelve regions however, with 189 respondents it would be difficult to obtain deterministic results at least for some regions especially in the framework developed in the previous section. Consequently, we decided to unite some of them resulting in seven broad regions. These regions comprise London and Home Counties, Midlands, Northern Ireland, North, Scotland, South and Wales. Both the original and our regional classification are depicted in Table 1, Appendix I.

Data on regional characteristics were obtained from various issues of the "Regional Statistical Yearbook" published by Eurostat.

[4] The only sector that it is not represented in our sample is Textiles.

An illuminating picture in regards to the location of foreign subsidiaries within the boundaries of the seven UK regions is provided in Figure 2 where we map total foreign activity. Not surprisingly, London and the Home-Counties gather the majority of subsidiaries, followed by Midlands and North. The least populated –in terms of subsidiaries- region is Northern Ireland, whilst South, although located very close to London, is the second least preferable region.

Figure 2
Regional Distribution of Firms



Of much interest would be to classify subsidiaries locally by their origin, i.e. whether they come from Europe, America, or the Pacific Rim. London and the Home Counties seem to be dominated by American firms as evidenced in Figure 3 whereas European firms turn out to prefer "North".

Finally, a sectoral distribution is provided in Figure 4. For a lucid presentation, we aggregated them into high-tech and medium-tech, in order to be able to detect any differences in their location patterns[5]. A considerable number of high-tech MNCs is located around the London area, whilst medium-tech subsidiaries are found mostly in "North".

[5] The sectoral classification is as follows: High technology Sectors include Aerospace, Electronics, Instruments, Chemicals and Pharmaceuticals, whilst Medium Technology sectors consist of Automobile, Buildings, Mechanicals, Metals, Rubber, Food and Other industries.

Figure 3
Regional Distribution of Firms by Country of Origin

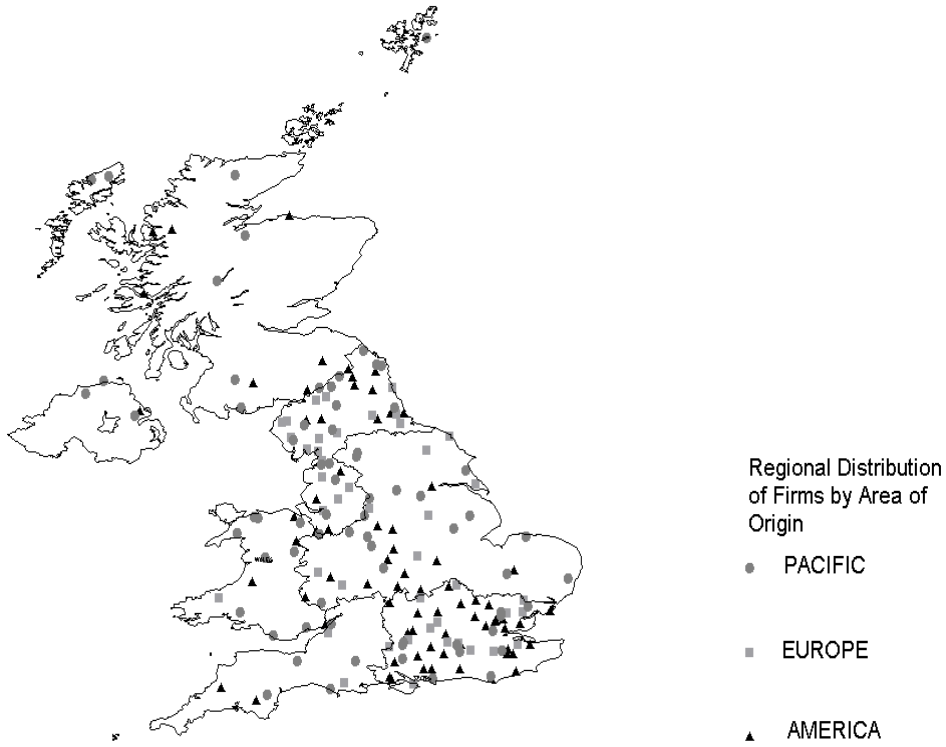


Figure 3a
Regional Distribution of Firms by Country of Origin

Figure 3b
Regional Distribution of Firms by Country of Origin

Figure 4
Regional Distribution of Firms by Sector

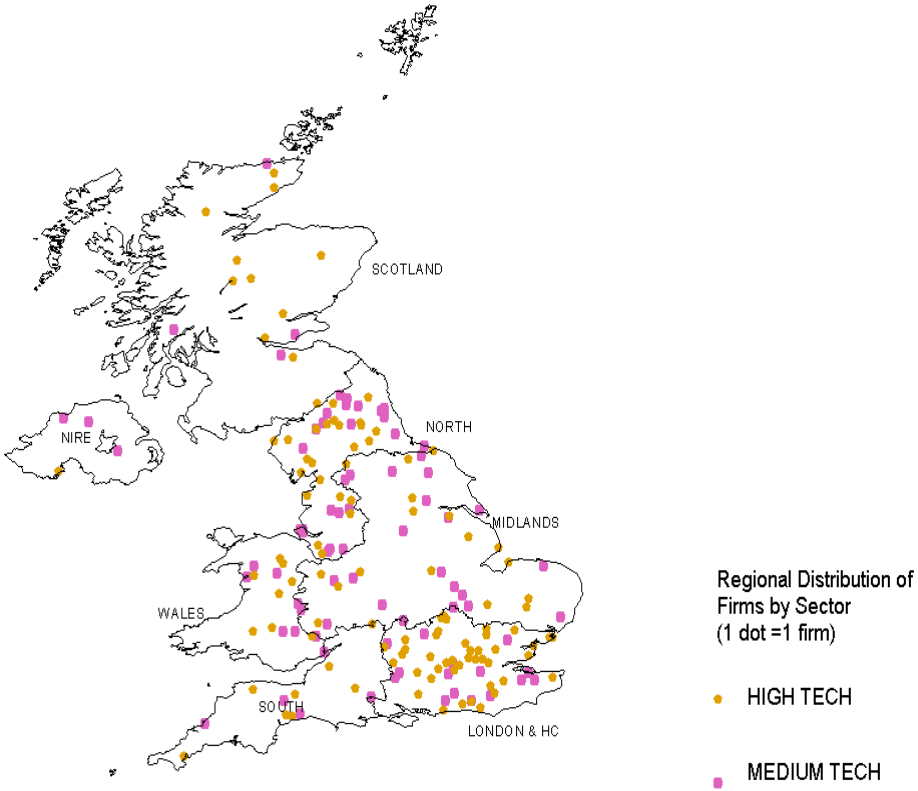


Figure 4a
Regional Distribution of Firms by Sector

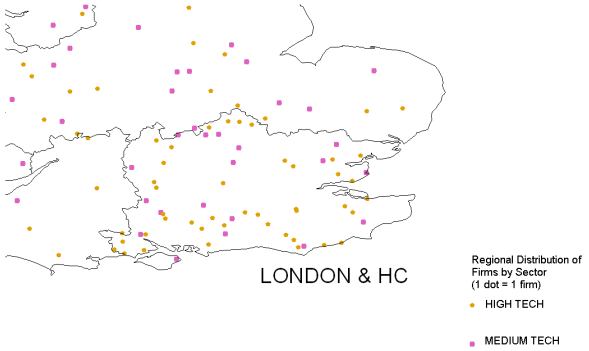
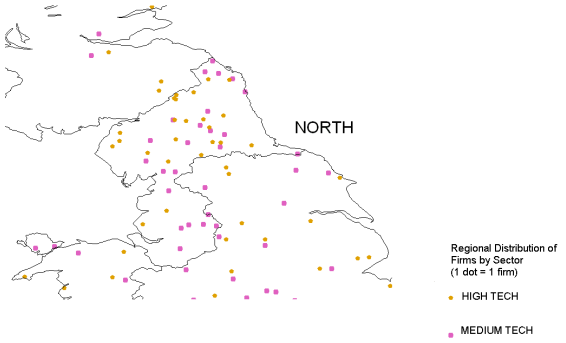


Figure 4b
Regional Distribution of Firms by Sector



For an exact distribution of subsidiaries in our sample, Tables 1-3 in Appendix II are illuminating, whilst Table 4 in the same Appendix provides an aggregate distribution of firms both by sector and region of origin.

3.2 Econometric Methodology and Model Specification

In this paper we adopt the econometric methodology developed by Crozet et al., (2002), Head et al., (1999) and Friedman et al., (1992). The use of discrete choice frameworks to model location behaviour stretches back to the 1970s, when Carlton (1979) adapted and applied McFadden's (1974) Random Utility Maximisation framework to firm location decisions. They are the most appropriate methods to identify determinants of particular location choices of firms[6].

Thus, the present model assumes that investors, once they have already decided to build a manufacturing plant in the U.K., maximize an intertemporal profit function subject to uncertainty with respect to location selection. The profit function consists of a deterministic part typically called the attributes of the choices and a random component arising from maximization errors, other unobserved characteristics of choices or measurement errors in the exogenous variables. Hence, the profit function of an investor *i,* locating in region *j* may be written in the following form:

$$\pi_{ij} = U_{ij} + \varepsilon_{ij} \tag{1}$$

where $U_{ij} = (\ln X_{i1}, \ln X_{i2}, ..., \ln X_{ik})$, U_{ij} stands for the utility of the firm *i* locating in region *j* with X_{im} representing a set of *m* observable characteristics of alternative locations *i,* and ε_{ij} is a random variable associated with unobserved location attributes potentially influential to investor's choice. Investor *i* will choose to locate in region *j* (and continue to operate there afterwards), rather than choosing location *k*, if the following expression holds:

$$\pi_{ij} > \pi_{ik}, \forall k, k \neq j \tag{2}$$

Since the profit function contains a stochastic part, the probability that location *j* is selected among alternative choices (*k*) by investor *i* may be then defined as:

$$P_{ij} = \Pr ob(\pi_{ij} > \pi_{ik}), \forall k, k \neq j \tag{3}$$

Under the assumption that the *j* disturbances are independent and identically distributed with Weibull distribution, the probability takes the following form (McFadden, 1984):

[6] Cluster analysis could group together firms with similar locating patterns and could then identify determinants if such similar behavior. However this is beyond the scope of this paper. This paper tries to identify determinants of location choices irrespective of clusters.

$$P_{ij} = \frac{e^{U_{ij}}}{\sum_{k=1}^{n} e^{U_{ik}}} \tag{4}$$

This is the conditional logit model or McFadden's choice model that we use in this analysis, where P_{ij} is the probability that firm i chooses the location j based on its utility U_{ij} over all other alternative locations k. Using equation 4 and assuming that U_{ij} is a linear combination of the explanatory variables, estimation of relevant coefficients is obtained using maximum likelihood. To further test the validity of our results, we performed a test for controlling the Independence of Irrelevant Alternatives (IIA) property. This property states that the ratio of probabilities of choosing two locations, P_j / P_k, is independent of the characteristics of any third location, or, in other words, the choices must be equally substitutable to investors (See Table 2 in Appendix III).

Detection of high correlation among certain variables led us to orthogonalise *RMS*, *RCE*, *TRANSP* and *RPAT* in order to avoid problems associated with multicollinearity and spurious regression (Greene, 2002). The correlation table and eigenvalues may be found in Appendix III, Tables 3 and 4 respectively.

From the aforementioned analysis, it is evident that we model the probability of a plant's location and prolongation of operations in any given region at period t as a function of a set of explanatory variables related to the choice variable. In this case the choice reflects one of the 7 UK regions.[7] We then formulated 2 models:

In the basic model, we solely explore location choices attributed to regional characteristics for the whole sample of subsidiaries. The model takes the following form:

$$choice_{ji} = \beta_1 RMS_i + \beta_2 GDPC_i + \beta_3 RCE_i + \beta_4 TRANSP_i + \beta_5 RPAT_i + \beta_6 BASICRES_i \tag{5}$$

where $choice_{ji}$ corresponds to the choice of region j by subsidiary i. Hence, $choice_{ij}$ takes the value of 1 for the selected region and 0 for the rest regions (A detailed presentation of variables and their descriptive statistics and sources may be found in Appendix III, Table 1).

An augmented version of the above, detects idiosyncratic agglomeration patterns both in terms of country of origin and in terms of sectoral orientation. Thus, the augmented specification becomes:

$$\begin{aligned} choice_{ji} = {} & \beta_1 RMS_i + \beta_2 GDPC_i + \beta_3 RCE_i + \beta_4 TRANSP_i + \beta_5 RPAT_i + \\ & + \beta_6 BASICRES_i + \beta_7 AGGLOHO_i + \beta_8 AGGLOSE_i \end{aligned} \tag{6}$$

where again $choice_{ij}$ corresponds to the choice of region i by subsidiary j. AGGLOSE measures the existence of other firms in the particular region that belog to the same sector while AGGLOHO captures agglomeration effects regarding home country, i.e., measures the existence in the region of other firms that come form the same home country. Information on AGGLOSE and AGGLOHO was extracted from the survey.

[7] The specification of the McFadden technique does not allow the usage of attributes that are not associated with the dependent variable. Thus, incorporation of subsidiary characteristics would make the model unspecified.

A Likelihood-Ratio (LR) test for the difference between the simple and the augmented model always provides evidence in favour of the latter.

Further, we split our sample in the two sub-samples: one, containing information on TMRs and SMRs (merged together, as SMRs are a sub-category of TMRs) and one on WPMs. An alternative would be to use interaction variables between the two different roles (WPM and TMR) and the regional characteristics (Greene, 2002, p.391). In that case the interaction variables would capture the specific impact of each variable on each subsidiary role, i.e. increasing or decreasing the possibility of locating a subsidiary with a specific role in a location and would thus define the regional mix. The results obtained prove the consistency and robustness of our original estimation method and are presented in Appendix IV.

4. Econometric Results and Interpretation

Results on various models are presented in Tables 1 and 2.

Table1
Econometric Results on the location choice of MNCs subsidiaries in U.K. regions
Dependent Variable: Choice of Location

(Orthogonal RMS – RCE – TRANSP – RPAT)

	Model 1	**Model 2**
GDPC	0.124*	0.099+
	(1.790)	(1.440)
RMS	0.206	-0.421
	(0.550)	(-1.060)
RCE	-0.701***	-0.400*
	(-3.330)	(-1.850)
TRANSP	0.836**	0.624*
	(2.450)	(1.820)
RPAT	-0.233	-0.259
	(-1.250)	(-1.380)
BASICRES	6.575***	3.985+
	(2.580)	(1.540)
AGGLOHO		0.049***
		(3.470)
AGGLOSE		0.174***
		(4.750)
N	189	189
Pseudo R2	13.38	18.09
LR X2	98.75***	133.58***
LR Test	34.83***	

z-statistics in parenthesis
Denotes probability at : ***p<0.01, **p<0.05, *p<0.10, +p<0.15

Table 2

Econometric Results on the location choice of MNCs subsidiaries in U.K. regions by role of subsidiary, Dependent Variable: Choice of Location

(Orthogonal RMS – RCE – TRANSP – RPAT)

	WPM		**TMR**	
	Model1	**Model2**	**Model1**	**Model2**
GDPC	0.170	0.151	0.180*	0.151+
	(1.130)	(1.000)	(1.690)	(1.410)
RMS	0.064	-0.749	-0.259	-0.970*
	(0.080)	(-0.900)	(-0.460)	(-1.610)
RCE	-1.000**	-0.666+	-0.720**	-0.385
	(-2.240)	(-1.470)	(-2.230)	(-1.160)
TRANSP	1.143+	0.927	1.045**	0.807+
	(1.540)	(1.250)	(1.970)	(1.510)
RPAT	-0.310	-0.354	-0.507*	-0.517*
	(-0.780)	(-0.880)	(-1.780)	(-1.810)
BASICRES	8.335*	5.502	7.383**	4.454
	(1.600)	(1.050)	(1.990)	(1.180)
AGGLOHO		0.054***		0.075***
		(2.170)		(3.400)
AGGLOSE		0.225***		0.166***
		(3.280)		(2.950)
N	68	68	84	84
Pseudo R2	17.98	24.14	9.86	15.76
LR X2	46.19***	61.99***	35.52***	51.97***
LR Test	15.80***		19.45***	

z-statistics in parenthesis

Denotes probability at : ***p<0.01, **p<0.05, *p<0.10, +p<0.15

In Table 2 we provide evidence on the significance of regional factors that affect the presence of MNC subsidiaries for the full sample for both the basic and the augmented models. As it is evident *GDPC*, which represents sophistication of demand and advanced development level, acts as a stimulus to the choice of location in conformity with our perception. On the other hand *RMS*, as captured by the Gross Value Added *(GVA)* of the region lacks significance in the decision-making process of setting up a production facility in the region. At the same time the strong negative sign of wages *(RCE)* suggests that conditions in local labor markets have a strong impact on the decision to invest and it is obvious that lower wages encourages FDI. Basic or general infrastructure *(TRANSP)* also has a positive impact whilst only one of our two variables capturing specialized conditions i.e. *BASICRES* turns out to be statistically significant. The positive sign underlines the importance of the R&D potential of a region to act as a strong agglomerative factor. Mariotti and Piscitello (2001) obtain similar results and provide sound evidence for those variables that create a "marshallian atmosphere" in particular areas in Italy. Hansen, (1987) provided evidence of the role played by both factor inputs and agglomeration economies in the interurban location behavior of 360 branch and transfer plants in Sao Paolo, Brazil. Similarly, Henderson and Kuncoro, (1996) suggest that firm location decisions

respond to the built-up stock of local information in regards to institutions, linkages and technology, in Java, Indonesia.

When we add the two idiosyncratic agglomeration factors, i.e., *AGGLOSE* and *AGGLOHO* (Model 2), our results remain significant with these new variables playing the most prominent role, suggesting that the presence of other subsidiaries of the same sector and nationality respectively performs as a major magnetizing aspect to investors (both are statistically positive at 1%). Similarly Mudambi and Cantwell (2006) in their analysis of a 1995 questionnaire survey on foreign subsidiaries operating in the Midlands - the most successful region at the time in FDI attraction rates - confirm the existence of agglomerating forces especially for companies with sectoral similarities.

As already mentioned above, in order to test for the additive explanatory power of the two idiosyncratic variables, we estimated a Likelihood Ratio (LR) test. Likelihood ratio tests the difference between two models, where the null model is specified by a parameter vector $\theta = (\theta_1, \theta_2, .., \theta_k)$ and the alternative model shares the same parameters with the null but it also contains additional parameters. In our case, the value of 34.83 in the LR-test between the complex and the simpler model provides sound support to the augmented estimation. Head and Ries, (1996) and Cheng and Kwan (2000) studying Chinese regions, confirmed the self-reinforcing effect of FDI on itself. However, Holm et al (2003, p.400) found that their measurement of "subsidiary impact on the local economy" (i.e. subsidiary functioning as an actor attracting new investments to the local economy) did not prove that influential. Benito et al (2003) provided support for their EU-Member variable and not for their cluster variable.

Table 3 distinguishes between the two distinctive subsidiary roles. Results in Table 3 support the argument that diverse roles of subsidiaries have diverse priorities in regards to what they take into consideration once they decide to select a location. More independent subsidiaries (WPMs), with more advanced competences seem to rely less on local environment. This result contradicts previous findings by Holm et al. (2003) that provide support to a positive link between a subsidiary's environment and its competences. One possible explanation for this outcome is that the majority of previous studies on the roles of subsidiaries and local economy characteristics are conducted at a national level. In our case herein, the study is carried out at a much narrower basis, i.e. that of a region within a country. At this level of analysis, we also may claim that general regional characteristics do not matter that much for sophisticated subsidiaries with world or regional mandates. However, it does matter how successful the region has been in creating similar industrial clusters and attracting other foreign investors. This creates a "safe neighborhood" feeling. We thus observe that in the case of WPMs the two idiosyncratic agglomerative factors behave as indices of a region's previous success in attracting FDI and play the most pertinent role in their choice of location[8]. Holt et al. (2003) in their study on location choice of regional headquarters also verify that "home-base similarity" is one of forefront location decision priorities in technology sector firms.

On the other hand the immediate local environment does matter more (one way or the other) for less independent subsidiaries, i.e. TMRs. More specifically, TMRs seem to be deterred by the existence of a strong business local environment as this is embodied in the *RMS* and *RPAT* variables. Domestic rivalry is considered as a

[8] The value of 15.80 in the LR-test provides strong support to the aforementioned result.

negative element for those subsidiaries with low competences (Porter, 1990; Holt et al. 2003). Or to rephrase it by applying Birkinshaw and Hood's (1998) argumentation on their finding of a negative relationship between the "contributory role" of a subsidiary and local competition, it is evident that subsidiaries with low contributory roles feel uneasy in highly competitive environments.

What seem to attract TMRs, is the region's developmental stage and its sophisticated consumers along with availability of local infrastructure. It is noteworthy that these two variables are totally insignificant in the WPM integrated model. However, in accordance with the WPM model, the two idiosyncratic variables gain the greatest significance conforming to Maskell and Malmberg's findings (1999)[9].

In summarizing our results, it is evident that external regional characteristics strongly influence the choice of location among subsidiaries resulting in a variation of distribution of subsidiary types across UK regions. The divergence becomes evident when it is addressed directly to the two distinctive subsidiary roles. WPMs, which are more autonomous and competent, do not really respond warmly to either general or specialized regional conditions. TMRs though respond positively to demand conditions and basic infrastructure whilst competitive supply conditions and market size apparently do not always act as a stimulus. At the same time strong industrial clusters, which substantiate the availability of *specific expertise and advantages*, as well as home country affinity enhances that region's prospects to attract FDI.

5. Concluding Remarks - Drawing Strategic and Policy Implications

Do regional characteristics matter in location choice of MNC subsidiaries? Are different types of subsidiaries more eclectic towards certain regional factors? These two questions constitute the twofold scope of the present analysis. Results as displayed and discussed above provoke a "yes" answer to both these questions. Looking closer at the empirical evidence it is striking that all regional variables (with the exception of *RPAT*) work remarkably well for the full sample. This suggests that subsidiaries in the UK do take into consideration cost factors (negative sign for *RCE*) as well as agglomerative factors such as size of local market, good physical infrastructure and R&D. When the two idiosyncratic variables are added (*AGGLOSE* and *AGGLOHO*) the model continues to perform well although these two factors emerge stronger compared to the regional ones. Thus, it seems that there exists a "join the club" element, which embodies a signal for the availability of suitable resources for a subsidiary's operations. At the same time the existence of a potential competitor does not alienate other subsidiaries of the same sector or nationality as this element of affinity apparently contributes to the attractiveness of a region.

The second major value added of this paper regards the introduction of an "Asset Specificity" framework that relates subsidiary asset competence to regional asset competence. In this respect, we estimate separately the basic and augmented models for WPMs and TMRs. Affiliates with high innovatory abilities and hence technological contributory roles are primarily driven to regions with a developed knowledge base, though they are not totally indifferent to other aspects especially to existing clusters. On the side of the spectrum, we find subsidiaries with low

[9] The LR-test equals 19,45 which is in favor of this effect.

competencies, in search of cost-effective resources and large demand for the product range of the MNC group that they replicate. Even though we cannot rule out *ad hoc* the possibility that they may also be attracted by local technological capabilities, the probability that this may occur is very low and it is by no means substantiated in our results.

Above and beyond our main findings, it is worth to discuss even further obtained results and expose some interesting insinuations. At the first place, the performance of the basic TMR model is really striking and rather beyond expectations! Nonetheless, we may infer that in a developed country such as the UK investors seek to satisfy practically all their needs even for a more standardized type of production. This is the conventional explanation. Another possible explanation is that TMRs do not remain for long TMRs (in such a host country), therefore it is imperative that necessary conditions exist in order to facilitate their evolution into more sophisticated production units, i.e. WPMs (see Papanastassiou and Pearce, 1999 for their discussion on *creative transition*). This element becomes clear from figure 1 i.e. the dynamic nature of the regional mix. Subsidiaries do not have static mandates (Birkinshaw, 1996). The contribution of the local environment becomes crucial to the evolution of such mandates, thus through a process of creative or destructive transition *mandates can be gained or lost* (Birkinshaw, 1996).

What are the policy implications? Regions should continue to design their FDI attracting policies relying on a policy mix that takes into consideration both costs and quality. Foreign investors are sensitive towards both these factors. At the same time it is important to realize that MNCs shape their external environment with their presence *per se*. One likely recommendation would then be the targeting of specific sectors and specific companies. The World Investment Report in 2002 calls this sort of targeted pro-active policies as third generation FDI promoting policies and they are not unknown to some nations like Israel or Ireland. Thus, policy-making agents, if they want to be effective in pulling good quality FDI, should do both: upgrade their regions and target specific sectors and companies.

Future research may emphasize key characteristics of the external business environment, such as the presence of suppliers and that of local R&D performing institutions in a more dynamic context. Finally, disintegration of the analysis at a sectoral level would also be informative.

Appendix I

Table 1
Regional Breakdown of the United Kingdom as used in the study

LONDON&HC	Bedfordshire, Essex, Hertfordshire, Greater London, Berkshire, Buckinghamshire, East Sussex, Hampshire, Isle of Wight, Kent, Oxfordshire, Surrey, West Sussex
MIDLANDS	North, South & West Yorkshire, Humberside, Derbyshire, Leicestershire, Lincolnshire, Northamptonshire, Nottinghamshire, Hereford and Worcester, Shropshire, Staffordshire, Warwickshire, West Midlands, Cambridgeshire, Norfolk, Suffolk
NIRE	Northern Ireland
NORTH	Cleveland, Durham, Northumberland, Tyne & Wear, Cumbria, Cheshire, G. Manchester, Lancashire, Merseyside
SCOTLAND	North Eastern Scotland, Eastern Scotland, South Western Scotland, Highlands and Islands
SOUTH	Avon, Cornwall, Devon, Dorset, Gloucestershire, Somerset, Wiltshire
WALES	West Wales and the Valeys, East Wales

Source: United Kingdom National Statistics on-line.

Table 2
Regional breakdown of the United Kingdom according to National Statistics

LONDON	Greater London
EAST MIDLANDS	Derbyshire, Leicestershire, Lincolnshire, Northamptonshire, Nottinghamshire,
WEST MIDLANDS	Hereford and Worcester, Shropshire, Staffordshire, Warwickshire, West Midlands
YORKSHIRE AND HUMBERSIDE	North, South and West Yorkshire, Humberside
EAST OF ENGLAND	Cambridgeshire, Norfolk, Suffolk, Bedfordshire, Essex, Hertfordshire
NIRE	Northern Ireland
NORTH EAST OF ENGLAND	Cleveland, Durham, Northumberland, Tyne & Wear, Cumbria,
NORTH WEST OF ENGLAND	Cheshire, G. Manchester, Lancashire, Merseyside
SCOTLAND	North Eastern Scotland, Eastern Scotland, South Western Scotland, Highlands and Islands
SOUTH EAST OF ENGLAND	Berkshire, Buckinghamshire, East Sussex, Hampshire, Isle of Wight, Kent, Oxfordshire, Surrey, West Sussex
SOUTH WEST OF ENGLAND	Avon, Cornwall, Devon, Dorset, Gloucestershire, Somerset, Wiltshire
WALES	West Wales and the Valeys, East Wales

Source: United Kingdom National Statistics on-line.

Appendix II

Table 1
Regional Characteristics of Selected Variables

AREA	VARIABLE							
	GDPC	GDPCR*	RCE	RMS	TRANSP	TRANSPR**	RPAT	BASICRES
LONDON&HC	103.00	117.05%	165247	190779	925	28.38%	761	16.06%
MIDLANDS	82.75	94.03%	121796	137125	901	27.65%	313	21.66%
NIRE	71.00	80.68%	10552	10625	113	3.47%	0	40.24%
NORTH	78.50	89.20%	68574	83341	634	19.45%	375	15.88%
SCOTLAND	86.00	97.73%	41891	44648	269	8.25%	131	40.19%
SOUTH	84.00	95.45%	34359	40400	299	9.17%	138	10.52%
WALES	74.00	84.09%	18883	24024	120	3.68%	62	39.57%

*Refers to UK average relative value,** Refers to UK Total relative value
Source: Eurostat Regional Statistics(Various Years)

Table 2
Regional Distribution of firms by region of origin

AREA	REGION			
	PACIFIC	EUROPE	AMERICA	TOTAL
LONDON&HC	12	14	34	60
MIDLANDS	16	8	13	37
NIRE	3	0	1	4
NORTH	16	18	13	47
SCOTLAND	7	0	8	15
SOUTH	5	3	2	10
WALES	10	1	5	16
Grand Total	**69**	**44**	**76**	**189**

Source: Author's calculations

Table 3
Regional Distribution of firms by sector

AREA	SECTOR		
	MT	HT	TOTAL
LONDON&HC	18	42	60
MIDLANDS	19	18	37
NIRE	3	1	4
NORTH	24	23	47
SCOTLAND	4	11	15
SOUTH	3	7	10
WALES	9	7	16
Grand Total	80	109	189

Source: Author's calculations

Table 4
Distribution of Firms by Sector and Region of Origin

SECTOR	REGION			
	PACIFIC	EUROPE	USA	TOTAL
MT	30	20	30	80
HT	39	24	46	109
TOTAL	**69**	**44**	**76**	**189**

Note: The sectoral classification is as follows: High technology Sectors include Aerospace, Electronics, Instruments, Chemicals and Pharmaceuticals, whilst Medium Technology sectors comprises of Automobile, Buildings, Mechanicals, Metals, Rubber, Food and Other industries.

Source: Author's calculations

Appendix III

Table 1
Description and Source of Variables

Variable	Description	Source
GDPC	GDP per inhabitant, 1992 EUR12=100	Eurostat 'Regions Statistical Yearbook'
GDPCR	GDP per inhabitant relative to United Kingdom, 1992 UK=100	Author's Calculations
RCE	Compensation of employees, 1992 mio ECU	Eurostat 'Regions Statistical Yearbook'
RMS	Gross Value Added at market prices, 1992 mio ECU	Eurostat 'Regions Statistical Yearbook'
TRANSP	Transport Networks, 1992	Eurostat 'Regions Statistical Yearbook'
TRANSPR	Transport Networks relative to UK, 1992 UK=100	Author's Calculations
RPAT	Number of Patent Applications to European Patent Organisation (1992), per mio Inhabitants	Eurostat 'Regions Statistical Yearbook'
BASICRES	R&D Expenditure in Higher Education as percentage of Total R&D Expenditure, 1992	Eurostat 'Regions Statistical Yearbook' and Author's Calculations
AGGLOHO	Number of firms in the same region that come form the same home country	Survey results
AGGLOSE	Number of firms in the same region that belong to the same sector	Survey results

Table 2
Independence of Irrelevance Alternatives (IIA) Test

Category	N. of Groups	Hausman	Degrees of Freedom	Probability*
NIRE	129	1.740	6.000	0.942
SCOTLAND	152	2.490	5.000	0.778
SOUTH	185	-0.260	5.000	1.000
NORTH	143	3.060	5.000	0.691
WALES	174	3.360	5.000	0.644
HC	179	0.630	6.000	0.996
MIDLANDS	173	2.440	5.000	0.786

*Refers to the Probability of accepting H_0: I.I.A. holds.

Table 3
Correlation of variables

	GDPC	RMS	RCE	TRANSP	RPAT	BASICRES	AGGLOMHO	AGGLOMSE
GDPC	1.000							
RMS	0.814*	1.000						
RCE	0.090*	0.000*	1.000					
TRANSP	-0.371*	0.000*	0.000*	1.000				
RPAT	0.277*	0.000*	0.000*	0.000*	1.000			
BASICRES	-0.504*	-0.575*	0.413*	-0.325*	-0.118*	1.000		
AGGLOMHO	0.463*	0.600*	-0.112*	0.000*	0.021*	-0.309*	1.000	
AGGLOMSE	0.468*	0.591*	-0.150*	0.030*	0.088*	-0.351*	0.419*	1.000

* denotes significance at 5%

Table 4
Eigenvalues and Condition Index

Variable	Eigenvalue	Condition Index
GDPC	3.126	1.000
RMS	1.426	1.481
RCE	1.046	1.729
TRANSP	1.000	1.768
RPAT	0.653	2.189
BASICRES	0.573	2.336
AGGLOMHO	0.152	4.536
AGGLOMSE	0.024	11.365
	Condition Number 11.365	

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