WHERE DO FOREIGN FIRMS LOCATE IN TRANSITION COUNTRIES? AN EMPIRICAL INVESTIGATION[(*)]

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Abstract

In this paper, we utilize firm-level data on foreign firm manufacturing plants in four Central and Eastern European Countries, in order to trace their location and estimate the determinants of their choice processes. At this purpose, we use a nested logit model as developed by McFadden (1974). Several reasons explain the need for mapping FDI. First of all, this would help to understand the real competitiveness of regions and countries in providing location advantages able to complement MNEs' organisational and internalisation advantages. Secondly, it would directly show the distribution of the benefits usually associated with FDI. Finally, an understanding of FDI location decisions is important for policy makers who believe that MNEs may offer a positive contribution to the economic development of disadvantage areas and thus correct potential regional imbalances. Main results show that sector specific factors affect the choice of final location. These unobserved characteristics influence both the determinants and the structure of MNEs location choice process.

Key words: foreign direct investment, location choice, transition countries
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1. Introduction

Foreign direct investments (FDI) are a factor movement which affects the international location of production, patterns of trade, and the way national firms internationalize. Concerning this latter issue, two complementary approaches have been developed, both at theoretical and empirical level. The first is to identify what influences the choice of producing abroad, while the second focuses on firms' international location choice. While the literature has extensively analysed *why* firms become multinational, in depth analyses on *where* firms locate are very scarce, despite the recent renewal of interest in spatial economic geography.

In this paper we utilize firm-level data on manufacturing plants in four Central and Eastern European Countries (CEECs), namely Bulgaria, Hungary, Poland and Romania, between 1995 and 2001 in order to trace the location of multinational enterprises (MNEs) and estimate the determinants of their location choice. At this purpose, we use a nested logit model, a probabilistic choice model particularly flexible and robust for handling interrelated choice situations (McFadden, 1974; Train, 1986).

Since the beginning of the transition process, CEECs have received a constantly increasing amount of foreign direct investments, which being made not only by financial capitals but also by fixed assets, knowledge (both codified and tacit) and technology played an active and dynamic role in enhancing the industrial restructuring process and driving the (re)integration of CEECs into the world economy. Several studies provide in-depth analyses on the contribution of MNEs to the different phases of transition processes.[1] Despite all this interest, very little is known about the factors influencing multinational location choice.

Several reasons explain the need for mapping FDI and understanding their behaviour in location choice processes. First of all, this would help to identify which location advantages make more profitable for firms to produce abroad, provided that they possess organisational and internalisation advantages (Markusen, 1995; Dunning, 1977); secondly, it would directly show the spatial distribution of the benefits generated by FDI, though the mechanism is far from being automatic. These benefits are very well known, given the extensive literature produced up to now on this topic: they range from

[1] See, among many other, UN-ECE (2001) for a survey on macro and micro effects of FDI on growth and domestic firms' productivity and Resmini (2003 and 2004) for an analysis of the impact of foreign firms on regional structural changes.

job creation to backward and forward linkages with domestic firms, to the introduction of new technologies and knowledge (Blomstrom and Kokko, 1997). Finally, a better comprehension of FDI location decisions may help policy makers – at local, regional, national and supra-national level – to design and implement appropriate policies to fully exploit benefits generated by MNEs, and thus correcting potential regional imbalances.

The remainder of the paper is organized as follows. Section 2 provides an overview on the related literature; section 3 describes the dataset and illustrates the distribution of FDI across countries and regions over the late 1990s. Section 4 describes the theoretical hypothesis concerning industry location choice and the model used for the estimations. Section 5 discusses the empirical results, and section 6 concludes.

2. Related Literature

Most of empirical studies on industry location choice rely on discrete choice methodology. The popularity of this approach resides on the fact that the econometric specification is obtained directly from the random utility maximization framework developed by McFadden (1974). Carlton (1983) was the first to perceive the great adaptability of this kind of models to firm location decision.[2] After his pioneering study, several other works have been developed. A first group appeared in the late 1980s (Bartik, 1985; Hansen, 1987; Schmenner et al., 1987; Coughlin et al., 1991 and Friedman et al., 1992), as a direct consequence of the popularity got by discrete choice analysis at that time; a second group of studies bridge the 2000s (Guimaraes et al., 2000b and 2002; Disdier and Mayer, 2003; Basile et al., 2003; Bekes, 2004; Hogenbirk and Narula, 2004; Head, et al., 1999; Braunerhjelm and Svennson, 1996; Barrios et al., 2003, Chung and Alcacer, 2002 and Mucchielli and Puech, 2004). This new revival in the interest for firm behaviour in geographical location choice problems can be ascribed to several reasons. First of all, recent theoretical advances in international economics, allowing for increasing returns to scale internal to firms and non zero transportation costs, have made the spatial allocation of the economic activities a non trivial problem (Ottaviano, 2003). Secondly, the increasing availability of reliable databases at firm-

[2] Discrete choice models have been used in numerous contexts, such as housing demand analysis (McFadden, 1974), transportation mode selection (Train, 1980 and 1986), recreation site selection (Herriges and Klings, 1995), and telecommunication service selection (Lee, 1999; Train et al., 1987). For a theoretical survey of discrete choice model in spatial analysis see Nijkamp and Fischer (1987).

level has surely stimulated scholars to explore more in details this field of research. Last but not least, the improvements in the existing computational techniques have substantially reduced the complexities of individuals' choice models.

Since all the above mentioned studies rely on the same theoretical and methodological framework, they allowed accumulating a sufficient knowledge based on experience to deal with their behavioural and empirical strengths and limitations.

Concerning the latter, the definition of the spatial choice set poses a lot of concerns. The set should be exhaustive, and include a finite number of alternatives, mutually exclusive (Train, 1986). This implies the choice of very narrowly defined locations. However, the complexity of the estimations increases exponentially with the size of the alternative set. This trade-off between complexity and exhaustiveness can be solved in different ways. Most of authors have adopted a large region approach, thus assuming that MNEs choose the best location at a very aggregate level, such as U.S. states (Bartik, 1985; Schmenner et al., 1987; Coughlin et al., 1991; Head et al., 1999, Friedman et al., 1992 and Chung and Alcacer, 2002) or independent countries, usually but not necessarily belonging to well identified regions, such as EU member states or candidate countries (Disdier and Mayer, 2003 and Braunerhjelm and Svensson, 1996). Large geographical units, though suitable for testing some theoretical hypothesis, might not completely account for those local factors which MNEs rely on in location choice processes. In order to partially overcome these problems, some authors have chosen a small region approach, thus including in the alternative set more narrowly defined locations, such as regions (usually at NUTS I level), counties and sometimes even smaller administrative units (Mucchielli and Puech, 2004; Basile et al., 2003; Bartik, 1985; Hansen, 1987; Carlton, 1983; Guimaraes et al., 2000b and 2002; Bekes, 2004 and Hogenbirk and Narula, 2004).[3]

The second relevant limitation faced by some discrete choice model specifications is the Independence of the Irrelevant Alternatives (IIA), which implies that the relative choice probability of any two alternatives depend exclusively on the systematic component of their own utility, regardless of the availability of other alternatives or what the attributes of the latter are. This property can give rise to erroneous predictions when the

[3] If the alternative set became intractable because of the large number of choices, some authors have restricted the estimation on a sub-set of alternatives randomly selected from the original dataset, as suggested by McFadden (1978). See, for example, Guimaraes et al. (2000b).

alternatives are close substitute. This fact is quite common in location choice problems. Adjacent locations – mainly if they belong to the same region or country – may be so similar that their utilities share many unobserved attributes and, therefore, the assumption of the independence of the random components of these utilities is not valid. Many approaches have been developed both at theoretical and empirical level, in order to accommodate some patterns of similarity among location alternatives. In particular, Bartik (1987) and Head et al. (1999) introduced dummy variables for larger regions in order to absorb part of the correlation across locations, while Schmenner et al. (1987) preferred to use a two stage conditional logit model in order to understand whether criteria driving firm location choice differ at different stages of the decision process. The most diffused approach in relaxing the IIA hypothesis, however, seems to be the estimation of a nested logit model, which allows to partition the alternative choices in mutually exclusive groups which seem to share the same characteristics (Hansen, 1987; Disdier and Mayer, 2003; Basile et al., 2003; Guimaraes et al., 2000b; Bekes, 2004; Barrios et al., 2003; Mucchielli and Puech, 2004). More recently, Guimaraes et al. (2002a) demonstrated that in some circumstances coefficients of the conditional logit model can be equivalently estimated using a Poisson regression, which is by far more tractable in the case of large choice set. Another interesting alternative is given by mixed logit (Train, 2004) which allows for not only correlation across alternatives but also heterogeneity among decision makers in assessing location characteristics (Chung and Alcacer, 2002). However, this more behaviour "realism" occurs at the expenses of additional computational complexity (Louviere et al., 2000).

Central and Eastern Europe has been only marginally considered in the empirical literature on firm location choice. A number of difficulties have impeded empirical analysis on this issue in transition countries. In particular, data on foreign firm location and economic and social characteristics of narrowly defined locations have not been readily available since recent times. This explains why among the works quoted above, only two of them focus on multinational firm location choice in CEECs, though from a very limited perspective. In particular, Disdier and Mayer (2003) test how French firms choose the location (at country level) for their production plants abroad within a set of 14 Western European countries and six CEECs. They found that the East-West structure effectively influence French firms location choice in Europe, suggesting that competition for FDI attraction is stronger among CEECs than between Eastern and Western European countries. This difference, however, decreases over time, indicating that CEECs are perceived by French firms as more and more similar to EU countries. The main determinant of this convergence pattern is the European integration process. Bekes (2004) concentrates on Hungary and considers as elemental alternatives NUTS III regions. In order to deal with the violation of the IIA hypothesis, he nests elemental alternatives in three large geographical regions (East, West and Central Hungary). The nested structure is supported by the data, but the small number of regions included in the alternative set does not allow a more sophisticated analysis

We extend the previous empirical works by allowing for a wider range of location alternatives, delineated at a more disaggregate level. We consider, in fact, multinational firms' location choice in NUTS II regions belonging to four CEECs. Two of them, i.e. Hungary and Poland, advanced faster on the way to EU membership than the other two, namely Bulgaria and Romania, which still are candidate countries. Moreover, we compare two small with two large countries, thus implicitly considering potential biases deriving from country size. The composition of the set of location alternatives is particularly important, since it allows a better comprehension of multinational firms' location patterns in transition countries, a world whose extremely diversified economic realities have been able to accommodate a large number of multinational firms pursuing different strategies of internationalization.

3. The distribution of FDI in transition countries

Before starting with the econometric analysis, we present the FDI data used in this paper as well as some stylized facts about the geographical and sectoral distribution of FDI in the selected countries.

The dataset we use in this work includes information on about 4,103 manufacturing foreign investments which have been undertaken in Bulgaria, Hungary, Poland and Romania during the 1990s. For each investment transaction the database lists four digit Nace Rev. 1 industry codes, name and country of origin of the foreign owner(s), location by cities and regions, and the date of incorporation. Despite the high level of disaggregation of the information available, we had to confine our analysis on NUTS II regions and two digit manufacturing sectors, further aggregated into high and low tech industries, in order to keep computational complexity tractable in each step of the analysis.[4]

Figure 1 shows the distribution of foreign firms by regions in 2001. The number of foreign firms has been normalized by the number of inhabitants (millions) in the same year in order to control for regions' economic size. Generally speaking, the spatial distribution of FDI is rather concentrated. At country level, Hungary shows the highest penetration of FDI, which concentrate the most in three regions, located in the North-Western part of the country, between Budapest (HU01) and the border with Austria. At the opposite, there is Bulgaria, with the least concentration of FDI in terms of inhabitants. Foreign firms are almost exclusively located in Sofia and its surroundings (BG04). Other regions, included those bordering with Greece (BG05), lag behind. In Poland and Romania, the largest countries of the sample, the distribution of FDI among regions seems to be more uniform, with a few exceptions. In Poland, most of FDI locate in two regions, Mazowieckie (PL07), hosting Warsaw, and Wielkopolskie (PL15), hosting the city of Poznan. The regions penalized the most in terms of FDI are those located along the Eastern border, while regions bordering with the EU show a concentration of FDI per million of inhabitants quite similar to that of other internal Polish regions. In Romania foreign firms established their production plants mainly around Bucharest (RO08) and in the North Western regions of the country. In terms of FDI concentration, these regions seem to be more similar to Hungarian regions than to other Romanian regions. Moreover, this distribution seems to confirm that proximity to the EU plays a role as a determinant of FDI location choice.

[insert figure 1 about here]

From a sectoral perspective, some interesting features emerge from figures 2 and 3. Hungary keeps on being the country with the highest concentration of FDI, whatever the technological intensity of the products. The sectoral patterns are quite similar to the general trend previously depicted, with FDI mainly concentrated in the North Western regions of the country. In Bulgaria, low tech foreign firms are more concentrated than

[4] For further details on the origin of data and sector's classification into high and low tech sectors see the appendix.

high tech firms, which, however, are less numerous than the former. The opposite happens in Poland and Romania: high tech foreign firms concentrate almost exclusively in the capital regions, while manufacturing labour intensive firms distribute more uniformly across regions, with a slight preference for the Western border.

[insert figures 2 and 3 about here]

A final consideration before turning to the empirical analysis concerns the reliability of our dataset: does it reflect true patterns of FDI in the selected countries? Table 1 compares the number of foreign affiliates recorded in our database with official data by Unctad, while Figure 4, shows annual growth rates of foreign owned firms in our sample by countries with the growth rate of inflows of FDI as registered by Unctad over the same period (Unctad, 2004). These distributions are very similar, thus indicating that our database is a good representation of inward FDI flows in the selected countries.

[insert table 1 and figure 4 about here]

4. The econometric model

4.1 From conditional to nested logit models

In order to explain the previously mentioned location patterns of FDI within and across countries, we need to specify an econometric model on the location determinants of foreign firms. The most used estimation technique for this kind of problems is the conditional logit model proposed by McFadden (1974, 1984).

This framework assumes that decision makers' evaluation of available alternatives may be represented by a utility function and that the decision maker chooses the alternative with the highest utility. Moreover, it is assumed that the attributes that determine the value of the utility assigned to each alternative are not completely observable. This means that the utility function includes a deterministic part, made up of observable characteristics and a random part, which instead includes the unobserved characteristics of each alternative. The random components of the utility function are independently and identically Weibull distributed (McFadden, 1974). This implies that random taste variation among decision makers does not exist and the effects of unobserved characteristics of alternatives and decision makers are uncorrelated across alternatives and individuals, as stated by the IIA assumption.

Plugging this theoretical framework into firms' location decision process, let us suppose that each foreign investor i (i.e. the decision maker) faces a finite set L of mutually exclusive location l among which to choose where to set a production plant, with $l = 1, 2, \ldots, L$. Eventually, the investor will choose the location that yields the maximum profit, that is,

$$\pi_{il} > \pi_{ik} \quad \forall \; k \neq l \text{ and } k = 1,2,...L \tag{1}$$

Random utility (profit) based choice model assumes that the utility (profit) functions are linear in the parameters and additive in the variables:

$$\pi_{il} = x_{il}\beta + \varepsilon_{il} \tag{2}$$

where x_{il} is the systematic component of utility, while ε_{il} is the random component. The stochastic nature of the profit function and the error structure imply that the probability that location l is selected by investor i is:

$$\begin{aligned} P_{il} &= \Pr ob(\pi_{il} > \pi_{ik}) = \Pr ob(\varepsilon_{il} - \varepsilon_{ik} > x_{ik}\beta - x_{il}\beta) = \\ &= \frac{\exp(x_{il}\beta)}{\sum_k \exp(x_{ik}\beta)} \quad \forall\, k \neq l, k = 1,2,...L \end{aligned} \tag{3}$$

where P_{il} is the probability that foreign firm i locates at l. This equation can be estimated by maximum likelihood.

As stated before, the major shortcoming of conditional logit model is the IIA assumption, which does not allow patterns of correlation across regions. In order to partially relax and test this implausible hypothesis, the conditional logit model can be generalized by *nesting* elemental alternatives according to their degree of similarity. The independence of the irrelevant alternatives, thus, holds across nests but not within them.

In nested logit models, the decision process assumes a hierarchical structure: the decision maker chooses first the nest and then a specific alternative within this nest. Therefore, the utility each alternative can offer to the decision maker depends on the characteristics of both levels. It is worth noticing that, first of all, this hierarchical structure does not imply a sequential decision process: choices can be partitioned but they still represent a simultaneous decision since the decision maker (the firm) makes one choice, namely an alternative (location) out of the available set (Green, 2003); secondly, the two levels are not independent: the choice of an alternative is conditional to the choice of the nest, and in choosing the latter the decision maker considers not only nest's own characteristics, but also the characteristics of the alternatives in each nest.

Suppose that the L alternatives can be grouped into N nests. Thus, the probability of firm i to locate in region l belonging to nest n is:[5]

$$P_{nl} = P_{l|n} * P_n \tag{4}$$

where:

$$P_{l|n} = \frac{exp(x_{ln}\beta)}{\sum_{l \in n} exp(x_{ln}\beta)} \text{, and} \tag{5}$$

$$P_n = \frac{exp(z_n\gamma + \sigma_n IV_n)}{\sum_n exp(z_n\gamma + \sigma_n IV_n)} \tag{6}$$

where x_{ln} and z_n are the vectors of characteristics specific to the l location in nest n, and the n upper nest, respectively. $IV_n = ln\left[\sum_{l \in n} exp(x_{ln}\beta)\right]$ is the "inclusive value" and represents the average utility that a decision maker can expect from the alternatives within each nest n. Its estimated coefficients, σ_n, reflects the degree of independence among the unobserved portions of utility, with lower σ_n indicating less independence.[6] However, in order to be consistent with utility maximization, the parameters σ_n should lie inside the unit interval (McFadden, 1974; Daly and Zachary, 1979), that is:

$$0 < \sigma_n \leqslant 1 \;\; \forall\, n = 1,2,...,N \tag{7}$$

If this is the case, alternatives within the same nest are more similar that alternatives outside the nest. When $\sigma_n = 1$, alternatives in the nest are not correlated. In this case the model collapses to conditional logit, indicating that the nest structure is not necessary, and decision makers perceive alternatives as perfect substitute.[7]

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[5] For sake of clarity we drop the subscript identifying the decision maker.

[6] Some authors (Mucchielli and Puech, 2004; Disdier and Mayer, 2003) impose the assumption that $\sigma_n = \sigma \;\; \forall n$. However, this restriction, which implies that correlation among alternatives is the same in each nests, is not necessary and can be easily relaxed.

[7] When $\sigma_n > 1$ consistency with utility maximizing behaviour might be still respected, but only at local level, i.e. for certain values of the explanatory variables. See Herriges and Kling (1995, 1996) for the conditions under which local consistency can be proved and test. Negative values of σ_n are not consistent with utility maximization behaviour and the nested structure has to be considered as misspecified.

4.2 Model specification and variable description

As outlined in the description of the model, the probability that a foreign firm locates in a particular region depends on how the characteristics of that region affect firm's profitability relative to the characteristics of other regions. Therefore, only region specific characteristics able to affect profits – from both the demand and the supply side – should be considered as explanatory variables. At this purpose, we consider a set of explanatory variables that captures four dimensions of each region: market size and attractiveness, cost of production factors, agglomeration economies and policy effectiveness in attracting FDI.

1) **Market size and attractiveness**. Market demand is usually proxied by total or per capita regional GDP (Chung and Alcacer, 2002; Coughlin et al., 1991, Braunerhjelm and Swensson, 1996; Head et al., 1999). However, multinational firms' have a market horizon which is by definition larger than the regional one. In order to capture the true size of the market each foreign firm can serve from locating in region *i*, we consider as a proxy for market demand the index of market potential, as defined by Harris in his seminal paper of 1954.

$$POT_i = \Sigma_j \frac{GDP_j}{D_{ij}}$$

where GDP represents the size of location j and D_{ij} the distance between i and j.[8] We expect that the larger the market potential, the higher the probability of attracting foreign firms. Another characteristic that may improve the potential attractiveness of a location is its infrastructural endowment. A highly developed transportation network may exert a positive influence on foreign firms looking for a new location for their production plants (Bartik, 1985; Coughlin et al., 1991 and Hogenbirk and Narula, 2004), provided that it implies a good accessibility to surrounding markets. We measure the latter as kilometres of public roads per capita. A high value of this index indicates a low connectivity: road infrastructures are oversized with respect to the population, thus the region is relatively isolated (Chung and Alcacer, 2002).

[8] In order to take into consideration the "self-potential", the internal distance of each region, i.e. D_{ii}, has been computed as follows (Head and Mayer, 2000): $D_{ii} \approx 0.376\sqrt{A_i}$, where A_i denotes the area of region i.

2) **Agglomeration variables**. The idea that firms may benefit from locating close to other firms is not new in economic theory. Such benefits may come from Marshallian technological externalities as well as pecuniary externalities, as recently stressed by Krugman (1991) and Fujita, Krugman and Venables (2000) among many other scholars belonging to the New Economic geography. Agglomeration economies may work between domestic and foreign firms as well as among multinationals only. Foreign firms have imperfect information of foreign potential sites. Therefore, they rely on the presence of other multinational firms to uncover the expected profitability of each location (Head et al., 1999). In order to account for all potential benefits generated by the geographical proximity with other firms – regardless of the fact that they can be potential competitors, customers and or suppliers – we have computed Hoover's localization indexes separately for domestic and foreign firms.[9] In our view, these variables capture the importance and the relative strength of support systems and networks within industries. Thus, if the estimated coefficients turn out to be positive, they suggest that foreign investors prefer to locate in regions with a high concentration of domestic and/or foreign firms producing in the same sector. The relative magnitude of the two estimated coefficients should allow to detect whether and to what extent agglomeration externalities are foreign-specific.[10]

3) **Cost of production factors.** Two variables reflect the cost of production factors in each region: per capita wages (normalized by the country average), and percent of population employed in manufacturing. The level of education of the labour force – measured by the number of third level students over total population – has been introduced in order to control for labour productivity. To the extent that foreign firms

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[9] Hoover localization coefficient is computed as follows: $H_i^j = \dfrac{N_i^j}{\sum_i N_i^j} \Big/ \dfrac{\sum_j N_i^j}{\sum_i \sum_j N_i^j}$ where N_i^j is the number of foreign firms in industry i and region j. If $H_i^j > 1$ region j has a share of foreign firms in industry i higher than other regions. If $H_i^j = 0$ foreign firms in industry i are completely dispersed across regions.

[10] Several measures of agglomeration have been used in previous studies. Regardless of the unit of measure (employment, number of firms, etc.), most of them prefer to use absolute measures, such as the total number of firms, rather than relative measures as those introduced in this work. In our opinion, relative measures allow to control for other relevant effects that can determine a high concentration of firms in the same territorial units, such as the size of the industry and/or the territorial units. See for example Braunerhjelm and Svensson (1996).

establish a production plant abroad in order to gain in efficiency, we expect that the probability of a region of being chosen as a location depends negatively on labour costs and positively on the availability and expected skills of the labour force.

4) **Policy incentives.** Economic policies may affect the location of FDI directly, through financial and fiscal incentives granted at local level, and indirectly by offering foreign investors a sound business environment, made of macroeconomic and political stability, legal enforcement, property rights, etc. In order to take into account both these effects, we supplement our data, first of all, with a measure of country risk, the ICRG rating. This index comprises 22 variables in three subcategories of risk: political, financial and economic. It ranges from 0 (very high risk) to 100 (very low risk). The long term nature of FDI makes them very sensitive to each risk component. Thus, we expect that a reduction in the country risk – i.e. an increase in the ICRG index – makes host countries more attractive for foreign investors.[11] Finally, we include a dummy variable for those regions that created special economic zones and/or industrial parks to attract FDI. A positive and significant coefficient would indicate foreign firms' preference for location offering fiscal or financial incentives.

The dependent variable is the location choice of foreign investors at NUTS II region level. . It takes the value of one for the region chosen by foreign firm *i*, and zero for all other alternatives. Overall, the elemental alternative set includes 37 possible locations. We have considered only foreign firms established between 1995 and 2001 because of the lack of reliable figures at regional level for some explanatory variables in the early 1990s. Thus, the total number of foreign manufacturing investments included in the database amounts at 2,269.

Explanatory variables have been lagged one year in order to avoid potential simultaneity problems and expressed in log form. This specification makes the comparison of the quantitative impact of each explanatory variable easier. This is due to the fact that estimated coefficients can be easily interpreted as proportional to the change in the probability of foreign investment in a region that results from a one percent change in the independent variable.[12]

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[11] Needless to say, regions belonging to the same country share the same risk factor.
[12] The derivatives that describe the covariation of regional characteristics (x) and probabilities are:

5. Econometric results

In order to accommodate some amount of difference in the structure of the random components of utility, we partition the location choice set into groups of alternatives that are likely to share common unobserved components. Since the choice of the nesting structure is in some way arbitrary (Louviere et al., 2000), several hierarchical structures have been estimated and compared. Results are presented in Table 2.

First of all, it is worth noticing that the Likelihood Ratio (LR) test of homoscedasticity allows us to reject the hypothesis of regions equally substitute across countries. Therefore, conditional logit model does not suffice. Then we test several nesting structures by partitioning regions according to their location within the country or along the borders (column 1 and 2), on whether they belong to the EU or not (column 3) [13] and according to the national boundaries (column 4). The only nesting structure consistent with random utility maximization is that shown in column (3). According to the inclusive value parameters, foreign investors searching for a location for their production plants perceive Polish and Hungarian regions more similar to each other than to Bulgarian and Romanian regions. This result indicates that competition for FDI is tougher within EU regions than between EU and non EU regions. Despite the fact that regions belonging to the same country usually share a lot of unobserved characteristics, such as business practices and cultural and historical specificities, national borders do not seem to play any role in foreign investment location decisions. The inclusive value parameters, in fact, indicate that changes in location are more likely to happen between countries rather than between regions belonging to the same country.

Concerning the determinants of foreign firm location choice, specification (3) shows that all of them are statistically significant with the expected signs, with two exceptions, i.e. the country risk index and the dummy for special economic zones and industrial parks. Both these variables show a negative sign, indicating that markets compensate

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$$\frac{\delta \ln P_{ln}}{\delta \ln(x_{ln})} = \left[(1 - P_{l|n}) + \sigma_n (1 - P_n) P_{l|n} \right]\beta$$

For further details on the interpretation of estimated coefficients in discrete choice models see MacFadden (1984).

[13] Although the EU enlargement officially took place on May 2004 only, it was clear since the beginning of the negotiation process that Bulgaria and Romania would not have joined the EU in the first wave of the enlargement because they lag behind in the transition process.

higher risks with higher profits and special economic zones are not effective in attracting foreign firms, respectively.[14]

Agglomeration variables are both positive and statistically significant, indicating that the probability of a region to be chosen as a location by foreign firms increases the higher the concentration of firms operating in the same manufacturing sector. However, the impact on the probability that a foreign firm chooses a particular region as a location for its production plants is almost twofold in the case of foreign firms. This result is consistent with many other previous studies, thus confirming that foreign firms play an important role in indicating the most profitable locations to other potential foreign investors.

As far as labour market conditions are concerned, our results indicate that foreign firms prefer locations with abundant and cheaper labour force, while skills do not seem able to exert any effect on the probability of attracting foreign firms.

Finally, preferences of foreign firms go, *ceteris paribus*, to regions with a higher market potential and a good connectivity with surrounding markets. Preferences for fewer public road kilometres per capita reflect high-density locations that are proximate with other high-density locations. This implies that urbanization externalities rather than congestion costs drive foreign firm location processes.

[insert table 2 about here]

These results hold, on average, for all multinationals, regardless of the manufacturing sector they belong to. However, section 3 has shown that patterns of location of high tech foreign firms are different from those of low tech foreign firms. Thus, constraining coefficients to be the same across sectors may not be correct. In order to understand whether and to what extent sector specific effects may in some way affect the probability of foreign firms to locate in a specific region, we have re-estimated all nested structures for low and high tech foreign firms separately.[15]

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[14] In order to better understand this counterintuitive result it is worth noticing that most of the Polish special economic zones have been created in the least developed regions of the North –Eastern part of the country in order to enhance the modernization process and help the redistribution of the labour force across sectors. Moreover, special zones have been designed to attract mainly greenfield investments and large multinational firms (Wisniewski, 2004). In Hungary, instead, many of the industrial parks established in laggard regions are mostly empty because of the lack of basic business services, such as internet, legal services, consultancy and custom administration services (Szalavetz, 2004).

[15] This allows us to account for some firm heterogeneity without facing the computational complexity associated with mixed logit estimations.

Results are shown in tables 3 and 4, respectively. It is immediately apparent that multinational location choice processes are driven by low tech foreign firms, which represent more than 70 per cent of the whole sample. The structure and the determinants of low tech foreign firms are almost unchanged with respect to estimates of the whole sample.

[insert table 3 about here]

Results for high tech sectors show much more variation with respect to the sample average. This variation concerns both the determinants and the structure of the decision process. The latter implies that high tech foreign firms in choosing their location distinguish among capital regions, border regions and other regions. Capital districts are perceived as perfect substitutes, as suggested by the inclusive value parameter very closed to one for this nest (table 4, column 1). Regarding the determinants of the location process, the probability of attracting high tech foreign firms is positively related to market potential, accessibility to surrounding markets, agglomeration economies generated by already established foreign firms, and country risk. The costs of labour as well as the possibility of taking advantage of linkages with domestic firms and incentives are not able to affect foreign firm location choice.[16]

[insert table 4 about here]

6. Summary and main conclusions

This paper provides an original contribution to the analysis of the location decisions of multinational firms. We use nested logit estimation techniques and an extensive firm level database of manufacturing foreign investment transactions entering the CEECs between 1995 and 2001.

We addressed two basic questions. First of all, we analysed what determines foreign firm location choice in transition countries and whether these patterns vary across manufacturing sectors. Secondly, we tried to understand how foreign firms select a final location within a large set of alternatives.

Concerning the first issue, our results are consistent with previous studies. On the one hand, they confirm the importance of FDI-driven agglomeration forces; on the other hand, they indicate that the probability of a foreign firm to locate in transition countries

[16] It is worth noticing, however, that the sign of the dummy variable for special economic zones is now positive.

is mainly affected by demand rather than cost factors. Policy factors play a marginal role, only. Foreign firms investing in the CEECs are not risk-adverse and do not seem to take advantages of special economic zones and industrial parks, which allow them to exploit several kind of financial and fiscal incentives. Not surprisingly, high-tech foreign firms do not follow these behavioural rules. They are in fact more attracted by foreign-specific localized economies and factor demand, while cost advantages and linkages with domestic firms do not influence their location choice process.

Also the structure of the decision process varies between high and low tech foreign firms. The latter perceive two large groups of similar regions: those belonging to countries well advanced in the transition process – and thus very close to loose the status of candidate countries – and those belonging to laggard countries. The former, instead, choose the final location among three groups of similar regions: capital regions, regions bordering with the EU and other regions.

Overall, these results are interesting since they confirm that the EU integration process is eliminating national boundaries and making regions more similar. On a policy perspective, this implies that each region will compete to attract FDI with other regions or groups of regions, while country specific effects no longer represent a factor of attraction for foreign firms (Basile et al., 2004). At this purpose, it is interesting to observe that in the 2000s Hungary and Poland FDI promotion policies have been decentralized and are now targeted to each region's needs. This turning point fits well with our results that question the effectiveness of FDI promotion policies aimed at national economic objectives.

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Table 1. Number of foreign affiliates by country (latest available year)

country	number		percentages	
	WIR	database	WIR	database
Bulgaria	7153	149	5%	3%
Hungary	26645	1143	19%	26%
Poland	14469	1327	10%	31%
Romania	89911	1697	65%	39%
total	138178	4316		

Spearman's rho: 0.9; Sgnigicance level: 0.037

Source: Unctad (2004) and own database

Table 2. Econometric results: all sample

	(1)	(2)	(3)	(4)
% of pop. employed in manufacturing	0.700 (.148)[a]	0.181 (.137)	0.507 (.079)[a]	1.144 (.220)[a]
relative wage	-2.308 (.429)[a]	-2.432 (.407)[a]	-0.740 (.249)[a]	0.460 (.601)
% of pop. with a 3rd level degree	0.028 (.050)	-0.220 (.055)[a]	0.008 (.025)	0.531 (.112)[a]
market potential	2.076 (.244)[a]	0.513 (.177)[a]	1.072 (.145)[a]	0.176 (.426)
Public road km per capita	-0.279 (.073)[a]	-0.769 (.104)[a]	-0.131 (.039)[a]	-0.265 (.128)[b]
Hoover index (dom.)	0.429 (.092)[a]	0.381 (.082)[a]	0.207 (.053)[a]	0.328 (.112)[a]
Hoover index (for.)	0.721 (.078)[a]	0.592 (.057)[a]	0.412 (.056)[a]	0.779 (.116)[a]
country risk	-12.780 (1.308)[a]	-9.284 (0.722)[a]	-7.669 (.695)[a]	-7.931 (.701)[a]
SEZs & industrial parks	-0.421 (.089)[a]	-0.446 (.079)[a]	-0.122 (.045)[a]	-1.426 (.204)[a]
Inclusive value par.				
Capitals	1.833 (.207)[a]			
EU borders	1.932 (.335)[a]			
other regions	1.275 (.123)[a]			
EU capitals		3.417 (.380)[a]		
Non EU capitals		1.188 (.117)[a]		
EU borders		1.584 (.172)[a]		
External borders		1.173 (.114)[a]		
Internal borders		1.463 (.113)[a]		
internal regions		1.619 (.157)[a]		
CC border		0.832 (.067)[a]		
Eu member			0.684 (.093)[a]	
Non EU member			0.680 (.075)[a]	
Bulgaria				0.780 (.155)[a]
Hungary				2.110 (.340)[a]
Poland				1.622 (.265)[a]
Romania				1.877 (.206)[a]
LR test (IV=1)	84.27[a]	283.45[a]	13.10[a]	304.19[a]
Log Likelihood	-6733.379	-6633.787	-6768.962	-6623.42
N. of observations	83953	83953	83953	83953

[a] Significant at 1%; [b] significant at 5% and [c] significant at 10%. Standard errors in parenthesis.

Table 3. Econometric results: Low tech sectors

	(1)	(2)	(3)	(4)
% of pop. employed in manufacturing	0.950 (.194)[a]	0.297 (.145)[b]	0.622 (.100)[a]	1.921 (.353)[a]
relative wage	-2.439 (.523)[a]	-2.218 (.451)[a]	-1.011 (.318)[a]	-0.522 (1.041)
% of pop. with a 3rd level degree	0.043 (.062)	-0.196 (.056)[a]	0.005 (.031)	0.921 (.211)[a]
market potential	2.378 (.310)[a]	0.747 (.185)[a]	1.213 (.168)[a]	-1.263 (.695)[c]
Public road km per capita	-0.274 (.094)[a]	0.602 (.101)[a]	-0.120 (.048)[b]	-0.539 (.199)[a]
Hoover index (dom.)	0.431 (.120)[a]	0.340 (.093)[a]	0.200 (.066)[a]	0.448 (.200)[b]
Hoover index (for.)	0.793 (.106)[a]	0.540 (.066)[a]	0.430 (.066)[a]	0.959 (.181)[a]
country risk	-16.059 (1.777)[a]	-10.440 (.881)[a]	-9.506 (.785)[a]	-10.169 (.896)[a]
SEZs and industrial parks	-0.575 (.116)[a]	-0.459 (.081)[a]	-0.214 (.059)[a]	-0.056 (.151)
Inclusive value par.				
Capitals	2.013 (.251)[a]			
EU borders	2.317 (.424)[a]			
other regions	1.401 (.152)[a]			
EU capitals		2.951 (.413)[a]		
Non EU capitals		1.067 (.121)[a]		
EU borders		1.393 (.179)[a]		
External borders		1.116 (.114)[a]		
Internal borders		1.288 (.114)[a]		
internal regions		1.453 (.153)[a]		
CC border		0.700 (.064)[a]		
Eu member			0.762 (.100)[a]	
Non EU member			0.735 (.080)[a]	
Bulgaria				1.159 (.312)[a]
Hungary				3.383 (.581)[a]
Poland				2.610 (.433)[a]
Romania				2.653 (.374)[a]
LR test (IV=1)	66.76[a]	225.88[a]	8.69[b]	300.00[a]
Log Likelihood	-5135.340	-5055.780	-5164.373	-5018.720
N. of observations	66045	66045	66045	66045

[a] Significant at 1%; [b] significant at 5%; [c] significant at 10%.
Standard errors in parenthesis.

Table 4. Econometric results: High tech sectors

	(1)	(2)	(3)	(4)
% of pop. employed in manufacturing	-0.020 (.178)	-0.517 (.347)	-1.219 (.691)[c]	0.254 (.253)
relative wage	-0.951 (.604)	-1.637 (.901)[c]	-1.256 (3.288)	1.429 (.786)[c]
% of pop. with a 3rd level degree	0.036 (.064)	-0.071 (.145)	0.520 (.409)	0.317 (.136)[b]
market potential	1.069 (.261)[a]	0.003 (.484)	0.889 (.876)	0.924 (.348)[a]
Public road km per capita	-0.247 (.080)[a]	-1.109 (.348)[a]	-3.988 (1.465)[a]	-0.170 (.159)
Hoover index (dom.)	0.220 (.144)	0.251 (.207)	1.8649 (.662)[b]	0.303 (.170)[c]
Hoover index (for.)	0.546 (.106)[a]	0.717 (.128)[a]	2.722 (.617)[a]	0.684 (.215)[a]
country risk	-4.405 (1.049)[a]	-5.254 (1.331)[a]	-4.775 (2.461)[c]	-3.733 (1.153)[a]
SEZs and industrial parks	0.007 (.102)	-0.224 (.212)	-0.563 (.598)	0.251 (.142)[c]
Inclusive value par.				
Capitals	1.006 (.209)[a]			
EU borders	0.692 (.303)[a]			
other regions	0.793 (.130)[a]			
EU capitals		3.854 (.1.054)[a]		
Non EU capitals		1.371 (.332)[a]		
EU borders		2.072 (.555)[a]		
External borders		1.214 (.435)[a]		
Internal borders		1.836 (.385)[a]		
internal regions		1.963 (.542)[a]		
CC border		1.209 (.267)[a]		
Eu member			6.322 (1.967)[a]	
Non EU member			6.256 (1.968)[a]	
Bulgaria				0.702 (.288)[b]
Hungary				1.266 (.369)[a]
Poland				0.931 (.304)[a]
Romania				1.265 (.292)[a]
LR test (IV=1)	12.41[a]	61.56[a]	12.95[a]	34.65[a]
Log Likelihood	-1529.620	-1505.047	-1529.348	-1518.502
N. of observations	17908	17908	17908	17908

[a] Significant at 1%; [b] significant 5%; [c] significant at 10% level.
Standard errors in parenthesis.

Figure 1. Distribution of FDI by regions (n. of foreign firms per millions of inhabitants)

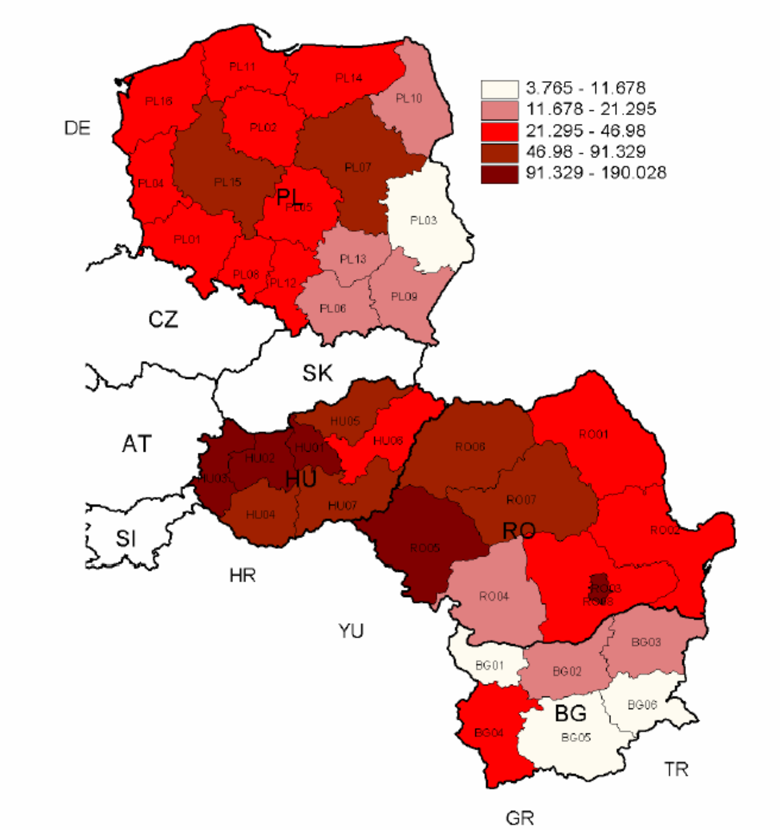


Figure 2. Distribution of FDI by regions (n. of low tech foreign firms per million of inhabitants)

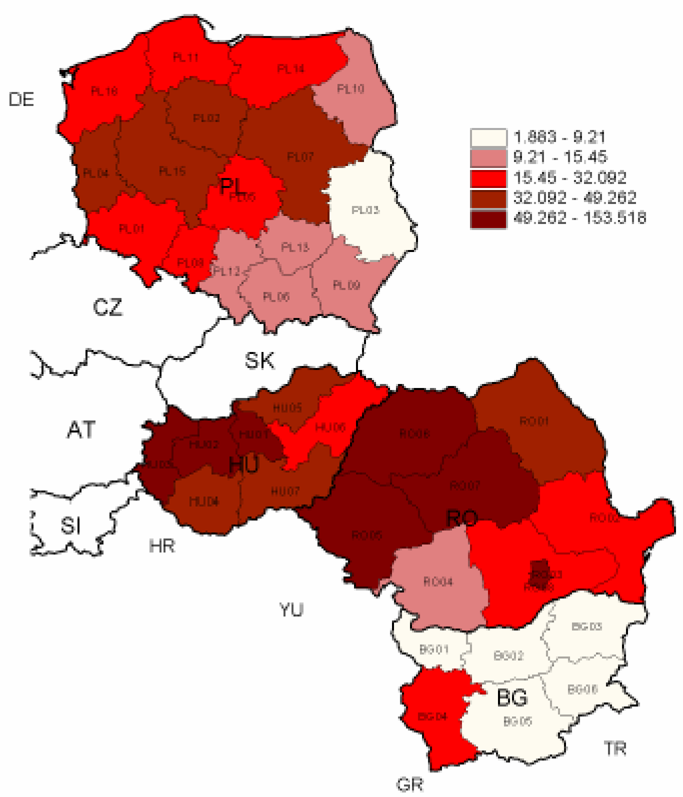


Figure 3. Distribution of FDI by regions (n. of high tech foreign firms per million of inhabitan)

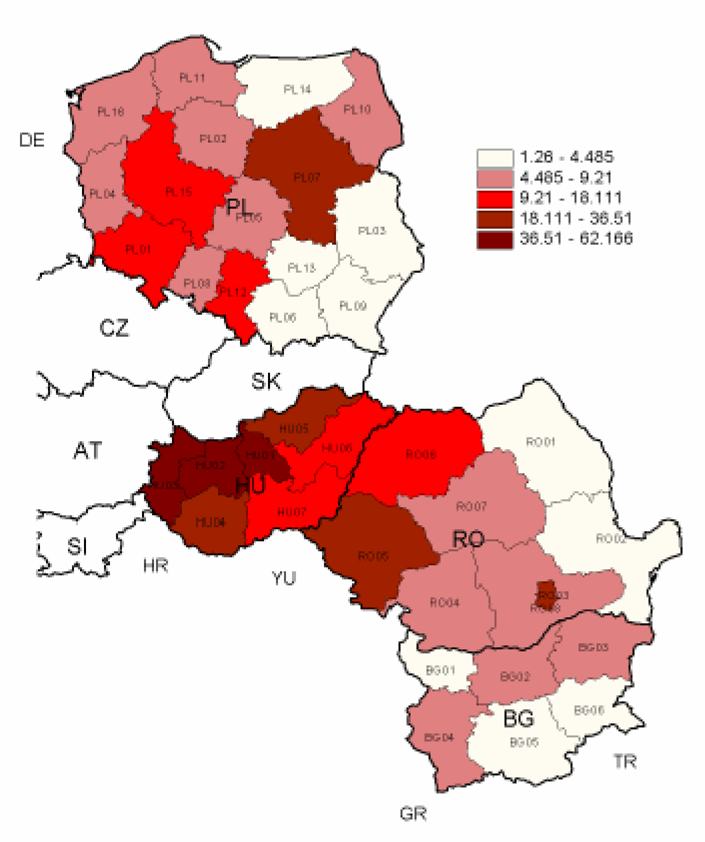
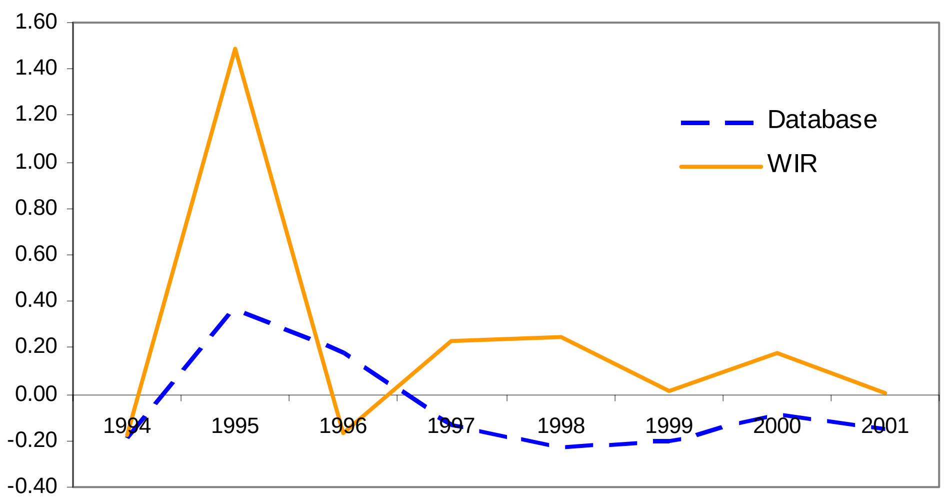


Figure 4. Distribution of FDI over time: growth rates (1993-2001)



Person correlation: 0.721; Significance level: 0.043

Source: Unctad (2004) and own database

Appendix. Data description.

The dataset we use in this paper has been created by the Centre of research on Latin America and transition countries (ISLA), of Bocconi University, Milan (Italy). Two main sources have been used, i.e. PECODB database and AMADEUS. The former has been developed by ISLA in 1998 with the financial aid of the European Commission (Ref. SUB/96/83328/U.B.) and updated in 2003 within a VI framework program research project. The latter is a product of Bureau Van Djik Electronic Publishing, which collects information on the location, employment, industry code, turnover, ownership structure and other financial and accounting items at firm level in all European countries.

We extract from both databases information on foreign investment transactions entered in Bulgaria, Hungary, Poland and Romania between 1990 and 2001. After having eliminated double counting, data have been cross-checked for accuracy by using individual firm web sites, when available, lists of foreign firms provided by local FDI promotion Agencies and Privatization Agencies as well as National Institute for Foreign Trade and Chambers of Commerce.

Other data for the study came from REGSPEC, a unique database including demographic, labour force and several other socio-economic variables (GDP, infrastructures, wages, employment by economic activity, public expenditures, etc.). See Traistaru and Iara (2003) for further information. Region and sector classifications used in this work are shown in the following tables.

Table A.1. Classification of Manufacturing Industries (Nace Rev. 1 codes in parenthesis*)*

High-Technology Industries	Low-Technology industry
Aircrafts and Spacecrafts (353)	Building and repair of ships and boats (351)
Office, accounting and computing machinery (30)	Rubber and plastic products (25)
Radio, TV and communications equipment (32)	Coke, refined petroleum products and nuclear fuel(23)
Medical, precision and optical instruments (33)	Other non-metallic mineral products (26)
Electrical machinery and apparatus n.e.c. (31)	Basic metals and fabricated metal products (27-28)
Motor Vehicles, trailers and semi-trailers (34)	Manufacturing n.e.c., recycling (36-37)
Chemicals (excluding pharmaceuticals) (24)	Wood, pulp, paper prod., printing and publishing (20-22)
Railroad and transport equipment (352, 353, 354)	Food products, beverages and tobacco (15-16)
Machinery and equipments n.e.c. (29)	Textiles, textile products, leather and footwear (17-19)

Table A.2. NUTS II Regions

Bulgaria		Hungary		Romania		Poland	
BG01	North West	**HU01**	**Kozep-Magyarorszag**	RO01	Nord-Est	PL01	Dolnoslaskie
BG02	North Central	HU02	Kozep-Dunàntùl	RO02	Sud-Est	PL02	Kujawsko-Pomorskie
BG03	North East	HU03	Nyugat-Dunàntùl	RO03	Sud	PL03	Lubelskie
BG04	**South West**	HU04	Dél-Dunàntùl	RO04	Sud-Vest	PL04	Lubuskie
BG05	South Central	HU05	Eszak-Magyarorszag	RO05	Vest	PL05	Lodzkie
BG06	South East	HU06	Eszak-Alfold	RO06	Nord-Vest	PL06	Malopolskie
		HU07	Dél-Alfold	RO07	Centru	**PL07**	**Mazowieckie**
				RO08	**Bucuresti**	PL08	Opolskie
						PL09	Podkarpackie
						PL10	Podlaskie
						PL11	Pomorskie
						PL12	Slaskie
						PL13	Swietokrzyskie
						PL14	Warminsko-Mazurskie
						PL15	Wielkopolskie
						PL16	Zachodniopomorskie

Regions hosting the capital city are in bold.