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# Location Decisions of Multinational Enterprises: The Experiences of Poland, Bulgaria and Romania

**by**

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ABSTRACT

In this paper, we present a simple theoretical framework in order to analyze the decision of a multinational firm to locate either in Poland, Bulgaria, or Romania, conditional on entering the Eastern European market. We also explore empirically whether foreign investors are driven by market seeking or efficiency seeking motives when locating in one of the three countries.

The results of a conditional logit model suggest that both local demand and unit labor costs are important in driving multinational location decisions. The results also show the importance of other factors, such as agglomeration forces, labor market flexibility and the parent's nationality. For instance, while US investors are more likely to locate in markets where the demand for their products is larger, German investors seem to be attracted by low-cost locations.

## 1. Introduction

Central and Eastern European countries (CEECs) have become favorite targets for FDI during the 90s. Evidence suggests that Hungary, Poland and Czech Republic (as well as the former Czechoslovakia) have attracted large inflows of FDI since the early 90s. Bulgaria and Romania have registered substantial FDI inflows only after 1996 (World Bank, 1999). However, considering the share of FDI in gross fixed capital formation, the experiences of Bulgaria and Romania after 1993 are comparable to those of other CEECs (see Figure 1)

*(Figure 1 about here)*

Given this recent success in attracting large inflows of FDI, CEECs offer a unique opportunity to analyze the behavior of multinational enterprises in their decisions to supply the region. Several issues can be addressed; e.g., do multinationals export to Central and Eastern Europe or produce locally? If they decide to produce locally, in which country do they locate? Which regional and industry characteristics are relevant in explaining multinational location decisions? This paper explores some of these issues. Particularly, it focuses on the location decisions of multinationals when entering the Eastern European market.

In the literature, different hypotheses have been formulated in order to explain multinational location decisions. The *proximity-concentration hypothesis* predicts that firms expand production horizontally across borders considering a trade-off between maximizing proximity to customers and concentrating production to achieve scale economies (see Krugman, 1983; Brainard, 1993 and 1997). Thus, a firm would decide to locate production abroad the larger is the local demand for its products, the higher are transport costs and trade barriers, and the lower are investment barriers and the size of scale economies at the plant level relative to the corporate level. The dominant explanation within traditional trade theory, which can be termed *factor-proportions hypothesis*, predicts that firms integrate production vertically across borders to take advantage of factor price differences associated with different relative factor supplies (see, among others, Helpman, 1984; Markusen, 1984; Helpman and Krugman, 1985).

Thus, foreign locations characterized by lower factor costs relative to the country of origin are more likely to attract multinational firms.

Although conceptually distinct, the two explanations are compatible and, indeed, they have been combined in the *OLI framework*[1] as determining factors of multinational location decisions. Within this framework, multinational activity arises for the presence of three types of advantages: *ownership*, *location* and *internalization* advantages.

Assuming that operating across borders is costly, firms would not undertake such activity unless there were some offsetting gains from entering a foreign market. These gains are likely to be related to ownership advantages, such as possession of capital and technology; management and organizational skills; R&D and reputation. In addition, there must be some location advantages, which might explain why a firm decides to locate in one location rather than another. These are likely to be reflected in factor price differences; trade barriers, transport costs and investment incentives; proximity to demand; economies of scale at the plant and at the corporate levels – thus, location advantages in the OLI framework are explained by the same factors relevant for the factor-proportions and proximity-concentration hypotheses. Finally, there must be internalization advantages, which explain the choice mode of foreign penetration: local production instead of exporting, licensing or franchising. Internalization advantages are related to the existence of high transaction costs and information asymmetries as well as the wish to protect the firm's technology or name.

Recently, Haaland *et al.* (2001) have emphasized the importance of two location-specific advantages: government incentives and labor market flexibility. In their dynamic setting, location decisions of multinational firms depend not only on entry costs, but also on exit costs. Particularly, when locating, a multinational firm is likely to take into account the costs of establishing a production facility as well as the costs of dismantling it and firing its workers. The higher the labor market flexibility, the lower the cost of worker dismissal. According to this framework, multinationals are more likely to invest in locations characterized by higher labor market flexibility and higher government incentives.

[1] The original development of the OLI framework is due to Dunning (1977; 1988).

Previous empirical work on the location of multinational production has generally focused on specific issues. Blomström and Lipsey (1993) explore the link between the size of the multinational and the size of its foreign activity. Using data on US multinationals, they find size not to be determinant, although earlier papers (Horst, 1972; and Lipsey *et al*., 1983) found size to be important in investment activity. Head *et al*. (1995) examine the decision of a Japanese firm to locate in a specific US state, when entering the US market. They find agglomeration effects to be important in driving the location decision. The agglomeration effects considered are those arising from the proximity to similar firms in the same industry as well as to other Japanese firms. Using industry level data, Brainard (1997) looks at the choice of a multinational between exporting and producing locally. Comparing the proximity-concentration and the factor-proportions hypotheses, she finds support for the former.

A more general approach is followed by Devereux and Griffith (1998) when they explore the location decisions of US multinationals to enter the European market. In the spirit of Horstmann and Markusen (1992) and consistent with the OLI framework, they develop a model in which firms make production and location decisions sequentially. First, a US firm decides whether or not to supply the European market. Second, since it does, the firm chooses whether to supply the foreign market by exporting or by producing locally. Finally, conditional on being a multinational, the US firm decides where to locate.

In the present study, we propose a simple extension of the model by Devereux and Griffith (1998). Given the nature of our data set, we explore the likely determinants of a Western[2] multinational to locate either in Poland, Bulgaria, or Romania. In terms of the model by Devereux and Griffith (1998), we focus on the last stage of the firms' decision tree. While Devereux and Griffith (1998) focus on the impact of corporate taxes on multinational location decisions, we extend their analysis by considering whether location decisions in Central and Eastern Europe are driven by market seeking or efficiency seeking motives. The latter explanation is related to the

[2] The term Western is used to identify firms whose country of origin is not a country of the former Soviet Union (see Table 3 for details).

purpose of creating an export platform in a lower cost location in order to supply other markets[3].

We also explore whether multinational location decisions are driven by agglomeration effects – production, R&D and foreign firms agglomeration - labor market flexibility, and the parent's nationality. Results of a conditional logit model suggest that both local demand and unit labor costs are important in driving multinational location decisions. However, there are differences according to the parent's nationality. For instance, while US investors are more likely to locate in markets where the demand for their products is larger, German investors seem attracted by low-cost locations.

In addition, we find that agglomeration of economic activity, the proximity to other firms with similar characteristics as well as labor market flexibility are positively associated with the probability to locate.

The structure of the paper is as follows. Section 2 presents the theoretical framework and section 3 describes the data. While section 4 derives the specification for our empirical analysis, section 5 discusses some estimation issues and reports the results. Section 6 concludes.

[3] In our analysis, we consider one particular aspect of the proximity-concentration hypothesis: we look at the role of local demand in attracting multinational activity. In addition, since we compare alternatives analyzing location-specific characteristics, cost advantages in our analysis are reflected in lower unit labor costs, which are specific to each location, and not in the wage gap between the country of origin of the multinational and the destination country. Therefore, we do not consider the standard factor-proportions hypothesis as formulated in the literature.

## 2. A Theoretical Framework

### 2.1 A general approach

Consider $N$ firms, each operating in at most $K+1$ markets, one called *home* market and the other $K$ called *foreign* markets, with $k$ denoting a generic foreign location[4]. All markets are segmented in the sense that consumers in each market are immobile and they can buy goods only from the market in which they are located.

Consider the profit-maximizing behavior of a representative firm $i$, which engages in Cournot competition with its rivals and produces a single differentiated good. Firms behave as multinational enterprises: they produce and sell in the home market and produce and sell in one or more foreign locations. In the foreign markets, firms face a fixed cost $F$ of entry, which might reflect the acquisition cost of an existing firm or the costs related to the establishment of a new subsidiary in location $k$. As suggested in section 1, we focus on two possible determinants of multinational location decisions: serving the local demand (market seeking motive), and producing in a specific location, presumably for cost advantages, in order to export goods to other locations (efficiency seeking motive). If firms export, they support a unit transport cost $\tau$. Firms are also characterized by increasing returns to scale in location $k$. Given the fixed cost $F$, this is achieved assuming constant marginal costs in each location.

Within this framework, the representative firm $i$ has already decided to invest abroad and become a multinational. However, firm $i$ faces the decision of where to locate its foreign production. As designed, the model might well reflect the choice of a Western multinational that considers the possibility of locating either in Poland, Bulgaria, or Romania, after having decided to enter the region. When choosing the location, the multinational firm compares alternatives considering the possibility of producing in a large and unexplored market and that of reducing production costs (see Figure 2).

[4] In the following analysis, we use the words market and location interchangeably.

*(Figure 2 about here)*

If a firm $i$ decides to produce in the foreign location $k$ $(k = 1,2,...,K)$ and export to all other locations, which are denote by $q$ ($q$ = 1,2,...$k$-1, $k$+1,…$K$+1), i.e. $q$ refers either to other foreign locations or to the home market, it will gain the profit $\Pi_{i,k}$:

$$\Pi_{i,k} = p_k y_{i,k} + \sum_q p_q y_{i,q} - T_{i,k} \quad (1)$$

where $p_k$ and $p_q$ denote the output prices[5] in markets $k$ and $q$, respectively; $y_{i,k}$ and $y_{i,q}$ are the output quantities of the good produced by firm $i$ and sold in markets of types $k$ and $q$. $T_{i,k}$ denotes the total costs for firm $i$ of producing in location $k$ and exporting in locations of type $q$. These costs are equivalent to the sum of a fixed production cost ($F_{i,k}$), variable production costs ($c_{i,k}\, y_{i,k}$), and variables sales costs ($s_{i,q}\, y_{i,k}$). In symbols, total production costs can be expressed as:

$$T_{i,k} = F_{i,k} + c_{i,k}\, y_{i,k} + \sum_q s_{i,q}\, y_{i,q} \quad (2)$$

where $s_{i,q}$ denotes the per unit sales cost of selling firm $i$ production abroad, which is equivalent to the sum of the marginal cost of producing in location $k$ ($c_{i,k}$) plus a unit transport cost $\tau_q$. In symbols:

$$s_{i,q} = (c_{i,k} + \tau_q) \quad (3)$$

### 2.2 An example

In order to identify the effects of market seeking or efficiency seeking motives, it might be useful to consider a 2-country case. For instance, we can think of a Western multinational choosing to locate production either in Poland or Romania and derive useful implications for our analysis.

[5] Prices in each market depend on the quantity sold in that market, although this is not explicitly set out in the expressions.

We assume that there are differences across countries. Since Poland and Romania are in different stages of development, variable costs of production are likely to be higher in Poland than in Romania. Foreign investors in Poland might have access to a more skilled labor force or to better infrastructure. For the same reasons, fixed costs of production are also likely to be higher in Poland than in Romania. Both countries are large and highly populated. However, given the higher standards of living and more openness to trade of Poland relative to Romania (EBRD, 2000), it might be reasonable to assume that local demand would be also higher in Poland than in Romania. Introducing parameters $\alpha$ and $\beta$, with $0 < \alpha < 1$ and $\beta > 1$, we can express this set of assumptions as:

$$\begin{cases} c_{i,R} = \alpha\, c_{i,P} \\ F_{i,R} = \alpha\, F_{i,P} \\ y_{i,P} = \beta\, y_{i,R} \end{cases} \tag{4}$$

where *R* and *P* refer to Romania and Poland, respectively. These assumptions hold for all firms *i* investing in the region.

Under the set of assumptions summarized in (4), we analyze the choice of firm *i* to locate in one of the two countries considering the possibility of exporting to the other. This is a simplification with respect to the more general framework presented in equation (1). In reality, firms can export to many other countries, home market included, depending on the size of transport costs. However, given the nature of our sample, which covers subsidiaries of multinationals and not the decisional corporate units, our empirical analysis will be restricted to compare location and export decisions within the region. We will compare the decision to invest in Poland or Bulgaria relative to Romania, being Romania arbitrary chosen as the reference category. Therefore, this example best describes the empirical analysis presented in section 5.

We recall from equation (2) the definition of total transport costs and derive corresponding equations for Poland and Romania:

$$T_{i,P} = F_{i,P} + c_{i,P}\, y_{i,P} + (c_{i,P} + \tau)\, y_{i,R} \tag{5}$$

$$T_{i,R} = F_{i,R} + c_{i,R}\, y_{i,R} + (c_{i,R} + \tau)\, y_{i,P} \quad (6)$$

where the unit sales cost is equal to the marginal cost that firm *i* faces in each location ($c_{i,P}$, $c_{i,R}$) plus a common unit transport cost $\tau$. Since we measure transport costs by distance between locations and not by other forms of trade barriers, it is possible to assume that the transport cost of moving goods from Poland to Romania is equal to that of moving goods back from Romania to Poland.

Profit-maximizing firms make decisions comparing expected profits associated with each location and choose the location that yields the highest level, i.e. $\Pi^{*}_{i,k} = \max (\Pi_{i,P}, \Pi_{i,R})$. Since firms face prices as given in each location, the profit maximizing problem of the typical firm *i* can also be expressed as a cost minimization problem. Thereby, the firm *i* chooses to locate in Poland instead of Romania, if the total costs in Poland will be lower than those in Romania, i.e. $T_{i,P} < T_{i,R}$ . Comparing equations (5) and (6), Poland would be chosen as the preferred location, the higher is the local demand in Poland and the lower are the marginal and fixed costs of production in Poland relative to Romania. In fact, the larger the local demand in Poland, the higher the costs of supplying the Polish market by exporting goods produced in Romania.

According to the assumptions presented in equations (4), firm *i* faces a trade-off between larger local demand and higher costs of production, when deciding to locate in Poland. The opposite dilemma the firm faces when considering to locate production in Romania. Within this framework, local demand and production costs emerge as the determining factors in the location decisions of multinational activity. Firms make investment decisions evaluating which variable is more relevant in their specific case.

It may be suggested that firms whose country of origin is close to Central and Eastern Europe, such as Germany, Austria or Italy, are more likely to be driven by efficiency motives. Being transport costs negligible, they invest in the region for taking advantage of lower factor costs, namely cheaper labor. Firms whose countries of origin is not close to the region may evaluate more the possibility of entering an unexplored market. In order to investigate the effects of the firm's nationality on the locational choice, we explore the impact of local demand and labor costs according to differences in nationality, i.e. US versus Germany.

We also consider agglomeration effects. As suggested by Head *et al*. (1995), agglomeration effects may arise from locating in close proximity to other firms in the same industry as well as to other firms with similar characteristics. In addition to any impact of factor costs, agglomeration benefits can also affect other types of costs. For example, accessible supply of labor with the relevant skills might reduce firms' search costs for specialized workers. Finally, we introduce a measure of labor market flexibility which might capture the extent to which multinational firms discount their costs of exit if economic conditions deteriorate (Haaland *et al.*, 2001).

The profit function as described in equation (1) reflects a static framework in which current profit depends only on current values of prices, output and costs. It does not depend on choices made in any other periods, but the current one. This is an important simplification. As a consequence, equation (1) is likely to describe the initial decision of a multinational firm to invest abroad and not the decision of switching between locations. However, in our empirical analysis this does not necessarily represent a limitation. Since CEECs have only recently opened to the West, we might indeed analyze the initial decisions of Western firms to invest in Central and Eastern Europe. Nevertheless, it should be noted that the profit function in equation (1) can be interpreted as the present value over the life of an investment project and the parameters of the model can be considered as expect values over that life. Thus, we can think of the firm's strategic choices as not depending only on current values. In the empirical application, however, we make the simplifying assumption of static expectations of all parameters.

## 3. Data

Data are available from several sources. Annual data on Polish, Bulgarian and Romanian manufacturing firms are retrieved from the Amadeus CD-ROM (Dec. 1999)[6]. The data are in panel form covering the period 1994-1997 and give information on a number of variables, such as firm employment, sales, R&D intensity, equity ownership position, 3-digit NACE industry classification and the region in which the firm is located.

Data from national statistical offices are used in order to reliably measure industry activity at the 3-digit industry level. Trade flows data at the 3-digit industry level between Poland, Bulgaria, or Romania, and the European Union (EU)[7] are retrieved from EUROSTAT *Trade Statistics*[8]. Industry wages, employment and value added statistics at the 2-digit NACE industry level are collected from the *Industrial Structure Statistics* (OECD, 1999) for Poland and from the *International Yearbook of Industrial Statistics* (UNIDO, 1999 and 2000) for Bulgaria and Romania. For some years, information has been completed using the *ILO, Yearbook of Labour Statistics* (1999 and 2000)[9].

The Amadeus database consists mainly of medium and large enterprises, whose average size is around 600 employees (see Table 1). However, it covers a substantial fraction of the country manufacturing activity: the sales coverage ratio between Amadeus firms and total country firms, computed over the sample period, is on average 75%, 62% and 61% for Bulgaria, Poland and Romania, respectively.

*(Table 1 about here)*

Data on firm equity participation are provided by Amadeus only once during the reference period. The ownership information has been collected during the years

[6] Amadeus database is a Pan European financial database, provided by Bureau van Dijk Electronic Publishing SA, Belgium.

[7] The share of manufacturing exports to the EU in total manufacturing exports in 1996 is approximately 42%, 60% and 73% for Bulgaria, Romania and Poland, respectively (United Nations Trade Statistics, 1999).

[8] EUROSTAT Trade Statistics are reported according to the NACE-CLIO branch and product classification. We have constructed a conversion table in order to convert trade data at the 3-digit level from NACE-CLIO to NACE Rev.1.

[9] See appendix A for details on different data sources.

1997 and 1998. In addition, there is no information on the ownership history of the firm. In this paper, we identify foreign owned firms as those in which a single foreign investor holds at least 10% of the shares of the enterprise, thus applying the standard definition of foreign direct investment (FDI) used by the OECD and the IMF[10].

The majority of foreign-owned firms in our sample are the result of foreign acquisition, rather than creation of newly established subsidiaries. Presumably the entry of foreign investors in Central and Eastern Europe has coincided with the various privatization processes that have characterized the region over the 90s (see Roland, 2000, chap. 10). Moreover, it is likely that the best firms, in terms of current and future profitability, have been sold to foreign investors. Therefore, we cannot consider the sector and regional distribution of foreign firms in Poland, Bulgaria and Romania as completely exogenous.

The structure of the sample according to foreign ownership is provided in Table 2. Even if ownership information for Polish firms is less accurate than for the other countries, foreign owned firms in Poland represent about 42% of the total number of firms which report some ownership information. In Bulgaria and Romania, firms with foreign participation are about 8% and 20%, respectively, of those reporting ownership information.

In all countries, foreign investors tend to detain a majority of equity participation. However, they prefer to invest in existing plants and not establish new ones. Firms with total foreign participation represent only the 11.8% of all foreign firms in Bulgaria. In Poland and Romania, the same percentage is about 25.4%.

*(Table 2 about here)*

Despite some differences across countries, foreign-owned firms in manufacturing are mostly concentrated in traditional sectors, such as food & beverages, wearing apparel, non-metallic products and furniture & miscellaneous (see Table 3). There is also high presence of foreign firms in chemicals.

[10] The definition of a foreign investment as a direct one requires that a single foreign investor holds at least 10% of the shares of the enterprise or that it is for other reasons clear that the foreign investor aims at having a lasting interest in the enterprise. The foreign investor is a resident entity and may be a person or an enterprise.

In Poland, there is also a relatively high concentration of foreign firms in capital-intensive sectors, like electrical machinery and machinery & equipment. In Romania, a high percentage of foreign firms (42.3%) are operating in labor-intensive sectors, like textiles, wearing apparel and leather & footwear.

*(Table 3 about here)*

Not surprisingly, foreign investors in our sample mainly come from Germany, the US, the UK, Switzerland, the Netherlands and France (see Table 4). However, there are differences across destination countries. While Poland has attracted larger amounts of capital from Germany and the US, Romania has become the favorite target of Italian firms. Since Italian investors operate in textile industries, this finding might also explain the larger concentration of foreign firms in textiles and related industries reported for Romania in Table 2. In addition, given the proximity of Romania and Bulgaria to the Mediterranean and Arabic regions, both countries have attracted capital from Greece, Israel and Cyprus. Romania has also attracted investors from Turkey, Lebanon, Libya and Iraq.

*(Table 4 about here)*

## 4. Empirical formulation

Applying fully the theoretical framework as described by equation (1), it would require the availability of data on Western multinationals. The data at our disposal are data on foreign affiliates of Western multinationals located in Poland, Bulgaria and Romania. We have firm level data on subsidiaries, not on parent companies, which are the decisional corporate units. As a consequence, we cannot observe the levels of profits, sales and exports of Western multinationals, but we can observe factors, which varies across locations, that might influence the decision of multinationals to locate in one of them.

Data on parent companies and their subsidiaries are related, but their implications are not precisely equivalent. Using data on subsidiaries, it is possible to analyze how characteristics of the destination market and industry determine the choice of location across different options. Using data on parent companies, it would be possible to analyze how characteristics of the home market, industry and firm itself determine the mode of foreign penetration, i.e. either exporting, licensing, franchising or producing locally, and to identify which characteristics favor one home-base than another, given the destination market (see, for a discussion, Brainard, 1997).

Consider firm $i$ that chooses across different locations. Profit-maximizing firms make decisions by comparing the levels of profits associated with each location $k$ and choosing the one for which the level of profits is higher. We do not observe directly the level of profits of firm $i$, $\Pi_{i,k}$, but we can observe a latent variable $z_i$:

$$\begin{cases} z_i = k & \text{if } \Pi_{i,k} = \max\,(\Pi_{i,1}, \Pi_{i,2}, \Pi_{i,3}, \ldots, \Pi_{i,K}) \quad (k=1,2,\ldots K) \\ z_i = 0 & \text{otherwise} \end{cases} \tag{6}$$

Since we consider an unordered set of possible alternatives, the location strategy will be naturally estimated using a conditional logit model. Thereby, we estimate the probability of choosing location $k$ among a set of alternatives, when $k$ is the location that yields the highest level of profits, $\Pi_{i,k}$:

$$P(z_i = k) = P[\Pi_{i,k} = \max\,(\Pi_{i,1}, \Pi_{i,2}, \Pi_{i,3}, \ldots, \Pi_{i,K})] \tag{7}$$

In our empirical specification, we consider only three alternatives, $k$ = P, B, R, which correspond to the three locational choices. The probability of a Western multinational to locate either in Poland, Bulgaria, or Romania, conditional on investing in Central and Eastern Europe, depends on location-specific variables. They include the size of the foreign market, the local unit cost of labor, the degree of flexibility of the labor market and the industry concentration of foreign activity, production as well as R&D intensity.

From equation (1), we can express $\Pi_{i,k}$ as a linear approximation of observables:

$$\Pi_{i,k} = \beta_1 y_k + \beta_2 c_k + \beta_3 Ag_k + \beta_4 fx_k + \varepsilon_{i,k} \qquad (8)$$

where $y_k$ denotes the local demand, $c_k$, refers to the unit labor cost of producing in location $k$, $Ag_k$ refers to three types of agglomeration effects, i.e. production, R&D, and foreign firms agglomeration. $fx_k$ denotes labor market flexibility. $\varepsilon_{i,k}$ is an error term.

Substituting equation (8) in (7), we can express the probability of choosing location $k$ as:

$$\begin{aligned} &P(z_{i,} = k / \; y_k, \; c_k, \; Ag_k, \; fx_k) = \\ &P[(\beta_1 y_k + \beta_2 c_k + \beta_3 Ag_k + \beta_4 fx_k + \varepsilon_{i,k}) > \\ &\quad \max \; (\beta_1 y_s + \beta_2 c_s + \beta_3 Ag_s + \beta_4 fx_s + \varepsilon_{i,s})] \end{aligned} \qquad (9)$$

Equation (9) holds $(\forall s \in K, s \neq k)$.

Neither the conceptual framework nor the econometric specification of the model permits a firm to choose more than one location. Even if in practice some firms do so, careful consideration of the data set at our disposal indicates that very few foreign affiliates have common parent companies. This seems to suggest that multinational enterprises choose, at least initially, only one location when investing in Central and Eastern Europe. Therefore, our econometric specification seems to capture the characteristics of the sample.

## 5. Estimation issues

### 5.1 Description of the variables used in the estimation

According to the empirical specification derived in equation (9), we describe the variables used in the estimation.

*Local demand*: we measure local sales by taking the value of (output + imports - exports) in each industry *j* country *k* time *t* as a proportion of total sales for that industry across all *k.* Industries are defined at the 3-digit NACE industry level[11].

*Unit labor costs:* we use industry level values of unit labor costs for each country *k* instead of raw wage costs in order to account for differences in productivity. Unit labor costs at the 2-digit industry level are defined as real wage costs per employee as a proportion of value added per employee.

*Labor market flexibility*: we measure labor market flexibility in terms of excess job reallocation rate. This is a measure proposed and extensively used in the literature on job flows (see Davis and Haltiwanger, 1992 and 1999), because it proved useful for understanding the sources of job reallocation and, particularly, the role played by shifts in the sectoral composition of labor demand. We compute excess job reallocation rates according to the 2-digit industry classification for each country, using the Amadeus database.

*Agglomeration effects*: We investigate three forms of agglomeration effects that may be important: proximity to other foreign firms, concentration of production and concentration of R&D activity.

If FDI concentrate in particular sectors, it is likely that there are spillovers in terms of informational externalities among foreign investors. Wheeler and Mody (1992) and Head et. al. (1995) find that the local stock of foreign investment is a positive factor influencing the location decision of multinationals. This finding is consistent with the idea that multinationals consider the local stock of foreign investment as a signal of potential gains reducing the uncertainty of entering in a foreign market.

[11] Under central planning, manufacturing firms were typically very large and were operating in multiple markets. We consider here the primary market as the firm relevant market. For an explanation of the underlying difficulties to such an approximation, see Nickell (1996).

Technological spillovers between foreign and domestic firms have recently received attention by the literature (see, e.g., Aitken and Harrison, 1999; Blomström, and Sjöholm, 1999; Fosfuri *et al*., 2001), the analysis of spillovers among foreign investors is behind the scope of this study. However, it is worth asking whether there is a collusive or competitive behavior among foreign investors operating in the same industry and country. Thus, we compute a measure of geographical concentration of foreign activity, which is defined as the share of industry *j* country *k* employment hired by foreign-owned firms in country *k* employment as a proportion of the share of total industry *j* employment hired by foreign-owned firms in total manufacturing employment. In the definition, total industry *j* foreign employment and total manufacturing employment refer to the sum of all three countries.

This measure is computed using the Amadeus data set, since it provides employment information by country, industry and ownership. For avoiding simultaneity problems, it excludes the firm from which the observation is taken. In addition, it controls for situations in which an industry has a high proportion of foreign firms just because the industry is large and highly populated. The proposed measure is similar to those used in the empirical literature on economic geography and on FDI spillovers (Aitken *et al*., 1996; Aitken and Harrison, 1999).

In order to quantify properly the agglomeration effect due to the proximity to other foreign firms, we should distinguish between agglomeration of total economic activity and agglomeration due to foreign firms' proximity, because foreign firms are also likely to concentrate in industries where the level of activity is higher. Therefore, we include two measures that capture the industry concentration of economic activity: industry production and industry R&D intensity, which may reflect advantages due to the proximity to other firms of a similar nature, not necessarily of foreign origin. These could include, for instance, access to a pool of skilled workers or advantages from infrastructure development. These measures are defined as the share of industry *j* country *k* time *t* output (R&D activity) in total industry *j* output (R&D activity) across the three countries (see appendix B for details).

### 5.2 Estimation results

Conditional logit estimations of the model described in equation (9) are presented in Tables 5 and 6. The coefficients represent the marginal impact on the *odds ratio* (or *relative risk ratio*) of the probability of a firm going to Bulgaria or Poland relative to Romania, conditional on the firm having chosen to invest in Central and Eastern Europe. All specifications report robust standard errors corrected for heteroskedasticity. Since we use panel data over the period 1994-1997, it is likely that the observations are independent across firms, but not necessary within the same unit. The model adjusts for clustering on firms.

All specifications include a constant specific to the location, which captures unobservable fixed effects associated with that location relative to the base category, i.e. Romania. They might include relative differences in language, culture, proximity to financial centers, geographical position within the region, or corporate tax regimes. All specifications also include time dummies to control for common macroeconomic shocks.

Looking at Table 5, we first investigate the impact of unit labor costs and local demand in isolation from other factors. As predicted by the model, local demand in location $k$ is strongly positively correlated with the probability of choosing that location. In column (1), the labor costs variable is not significant. However, when we explore whether variables have different effects on different outcomes (column 2, Table 5), unit labor costs are significantly and negatively correlated with the probability of choosing Poland or Bulgaria, as expected. The variable seems to have no impact on the probability of choosing Romania.

In columns (3) to (6), we add agglomeration variables - agglomeration of production in column (3), R&D activity in column (4), and foreign activity in column (5). All variable are positive and significant, i.e. higher agglomeration of economic activity in a given location increases the probability of choosing that location. The results are also consistent with those reported in previous studies (Head *et al.*, 1995 and Devereux and Griffith, 1998) which look at the experiences of multinationals locating in the US or Europe.

Since foreign-owned firms tend to locate where economic activity is also higher, we include two measures of agglomeration – other foreign firms' proximity and R&D agglomeration - in the estimation (see column 6, Table 5)[12]. Results indicate that multinational firms tend to cluster in proximity to each other, even when R&D agglomeration effects are taken into account. Perhaps existing multinational activity gives a positive signal to potential entrants. Alternatively, positive informational and technological spillovers among foreign firms might provide an explanation.

The impact of local demand and unit labor costs on the probability of choosing one particular location are unaffected by the inclusion of agglomeration variables, although the significance of local demand coefficients is somewhat reduced, particularly when foreign agglomeration is included (see columns 5 and 6, Table 5).

Finally, we investigate the impact of labor market flexibility and parent's nationality on the probability to locate (see Table 6). As suggested by Haaland *et al.* (2001), multinationals are more likely to establish production facilities in less regulated labor markets which permit the firm to adjust its employment level more easily if economic conditions require. Their modeling framework suggests that multinational firms concern themselves not only with entry costs, but also with the potential costs of downsizing and closure. We provide a test of this hypothesis in columns (1) to (3).

Results suggest that the probability of choosing a location *k* is higher when the location is characterized by higher labor market flexibility. This positive relationship seems robust to the inclusion of R&D agglomeration effects (see column 2, Table 6). By including foreign agglomeration effects, the coefficient on the labor market variable retains its sign, but it loses significance (see column 3, Table 6).

In columns (4) to (6), we try to detect whether there are differences in enterprise behavior with respect to the country of origin. We ask whether US and German multinationals are more likely to be driven by market seeking or efficiency seeking motives, when investing in Central and Eastern Europe. We investigate the behavior of US and German firms, being other Western multinationals in the benchmark category. Results indicate that US multinationals are more likely to be

[12] Given that production agglomeration and R&D agglomeration are highly co-linear (0.82), we choose to include only the R&D measure in the estimation. Very similar results are obtained using the other measure (not shown).

driven by market seeking purposes when entering the Eastern market. They seem to be attracted by the prospects to invest in large and unexplored markets and, thus, to reach potential consumers for their products. German multinationals seem to concern themselves more with entering in a low-cost location presumably for efficiency reasons (see column 4, Table 6). While the importance of local demand for US investors is unaffected by the including of agglomeration variables, the impact of labor costs for German multinationals loses its significance when our measure of foreign agglomeration is included (see column 6, Table 6).

*(Table 5 and 6 about here)*

## 6. Conclusions

This paper explores the extent to which multinational location decisions might be explained by local demand (market seeking motives) or cost considerations (efficiency seeking motives). In the first part, we develop a simple theoretical framework suited for our data in order to investigate the relevance of the two hypotheses. In the second part, we conduct a conditional logit estimation in order to identify the likely determinants of multinational location decisions in three countries of Central and Eastern Europe. Results of the estimation give some support to both hypotheses. Foreign investors seem to be also driven by other agglomeration forces, such as industry concentration of production, R&D activity and foreign firms.

Moreover, results suggest that a location characterized by higher labor market flexibility is more likely to be chosen by potential investors. This finding is consistent with the idea that multinational firms concern themselves with entry costs and relative productivity levels as well as exit costs, before entering a potential location (see Haaland et. al., 2001).

Finally, we found that foreign investors seem to behave differently according to their nationality. For instance, US investors are more likely to locate in markets characterized by a larger demand for their products. German multinationals are attracted by low-cost locations presumably for efficiency reasons.

**Appendix A: Data sources**

*Amadeus CD-ROM*, Pan-European financial data set (Dec. 1999), provided by Bureau van Dijk, Electronic Publishing SA.

Polish statistical office; Bulgarian statistical office; Romanian statistical office.

*EUROSTAT trade statistics*, 1993-1997.

Industry wages statistics are taken from various sources:

*Industrial Structure Statistics (ISI),* 1999 edition, issued by the Organization for Economic Cooperation and Development, Paris (OECD). ISI provides detailed annual statistics on number of employees and total wages and salaries for Poland by 2-digit ISIC 3 (which is equivalent to NACE Rev.1) sectors of industrial activity;

*International Yearbook of Industrial Statistics,* 1999 and 2000 editions, issued by UNIDO (United Nations Industrial Development Organization, Vienna) provides information on employees and wages by 2-digit ISIC 3 sector of industrial activity for Bulgaria and Romania. The OECD and the UNIDO wage data are fully comparable: since 1994 both organizations have shared responsibility for the collection and dissemination of worldwide general industrial statistics.

*ILO, Yearbook of Labour Statistics,* 1999 and 2000 editions. For some years, yearly average wages (total earnings) for the manufacturing sector were available only at ILO.

Gross fixed capital formation has been collected from *The Europa World Yearbook*, 1998, 1999 and 2000 editions, London; and from the *International Monetary Fund (IMF) Financial Statistics,* Washington D.C., Yearbook 2000.

**Appendix B: Variable definitions**

*Local demand*: this measure is defined as the share of country industry[b] sales[a] in total industry[b] sales across all three countries. Industry sales are defined as (output[a] + imports[a] – exports[a]), which variables, when available, were provided by the national statistical office of each countries. Bulgarian export flows to the EU are used instead of total exports.

*Unit labor costs*: They are defined as the ratio of country industry[c] wage[a] to country industry[c] labor productivity. Average wage is in turn defined as the ratio of total wages and salaries for employees to total corresponding number of employees; average labor productivity is defined as the ratio of industry[c] value added to total number of employees.

*Labour-market flexibility*: it is defined as the excess job reallocation rate at the industry[c] level for each country. Excess job reallocation equals (gross) job reallocation minus the absolute value of the net employment change. In symbols, $EX_{s,t} = JR_{s,t} - /\Delta N_{s,t}/$ , where *s* and *t* refer to sector and time, respectively; $JR_{s,t}$ refers to the sum of job creation and destruction and $/\Delta N_{s,t}/$ indicates the absolute value of net employment growth in the district. In order to express the job flow measures as rates, they are divided by total employment in sector *s* at time *t-1*.

*Production agglomeration*: this is defined as the share of country industry[b] output[a] in total industry[b] output across all countries.

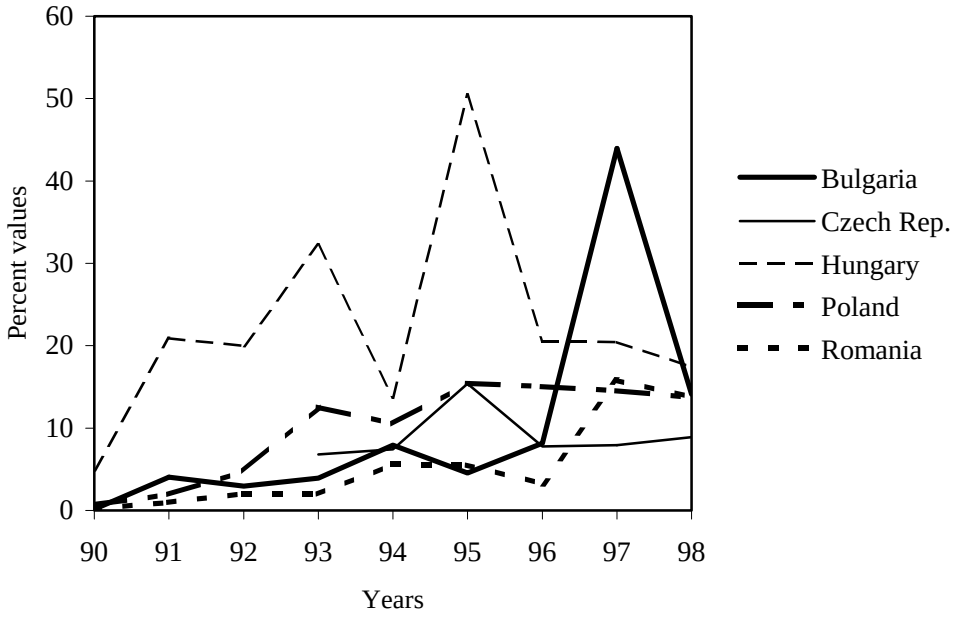
*Foreign activity agglomeration*: this variable is measured as the share of country industry[b] employment hired by foreign firms in total country employment, divided by the share of total industry foreign employment in total manufacturing employment, where total refers to the sum of all three countries. This measure is computed using data retrieved from the Amadeus CD-ROM and it is a net measure in the sense that it uses industry/country employment net of firm employment. It reflects agglomeration of foreign activity due to the proximity of all other foreign firms.

*R&D activity agglomeration*: this measure is also computed from the Amadeus CD-ROM, thus is a net measure. R&D activity at the firm level is defined as firm intangible fixed assets[a]. Thus, industry R&D activity is the sum of all firm R&D within the same industry. The measure is defined as the share of country industry[b] R&D activity in total industry[b] R&D activity.

*Germany and US dummies*: they are two dummy variables equal to 1 if the foreign firms has a German (US) parent company and 0 otherwise.

(a): all financial variables are expressed in US dollars.
(b): NACE 3-digit industry classification.
(c): NACE 2-digit industry classification.

***Figure 1: Share of FDI in gross fixed capital formation***




Source: Author's calculations based on The World Bank Transition Newsletter (1999) and IMF Financial Statistics (2000).

## Figure 2: Firms' choice set

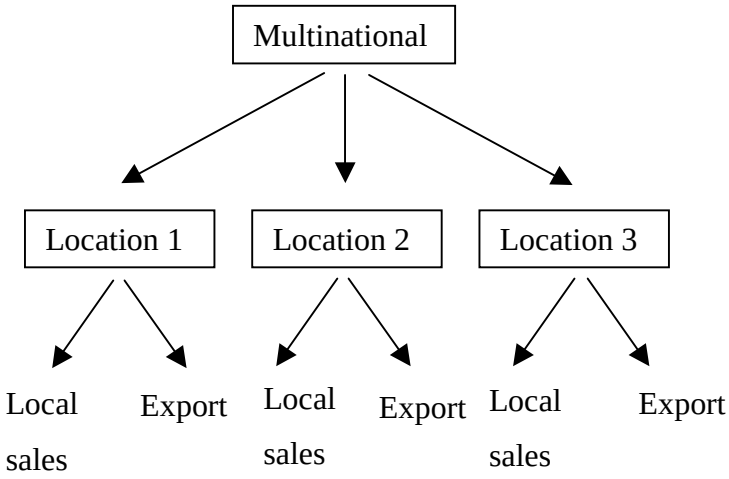


**Table 1: Comparison between Amadeus data and country national statistics**

| | N. of firms in Amadeus | Avg. Sales in Amadeus | N. of firms in National statistics | Avg. Sales in National statistics | Sales coverage ratio |
|---|---|---|---|---|---|
| **Bulgaria** | | | | | |
| **1994** | 999 | 28.9 | 4418 | 8.6 | 0.80 |
| **1995** | 1275 | 25.4 | 7454 | 9.7 | 0.78 |
| **1996** | 1167 | 18.7 | 8292 | 9.2 | 0.70 |
| **1997** | 1196 | 17.3 | 8954 | 7.7 | 0.72 |
| **Poland** | | | | | |
| **1994** | 924 | 18.6 | 18686 | 17.5 | 0.35 |
| **1995** | 2308 | 29.0 | 24932 | 12.1 | 0.66 |
| **1996** | 2267 | 44.6 | 29293 | 10.9 | 0.75 |
| **1997** | 2157 | 41.9 | 32723 | 11.1 | 0.72 |
| **Romania** | | | | | |
| **1994** | 1737 | 16.9 | 32257 | 9.8 | 0.59 |
| **1995** | 1850 | 19.7 | 34404 | 11.2 | 0.64 |
| **1996** | 1927 | 21.7 | 32065 | 12.0 | 0.63 |
| **1997** | 1984 | 24.2 | 35962 | 12.7 | 0.63 |

Note: Coverage ratio = Total sales in Amadeus over total sales in the national statistics by 2-digit NACE industry classification. Sales variables are expressed in millions of US dollars.
Source: Author's calculations from Amadeus CD-ROM, Dec. 1999.

**Table 2: Sample structure according to foreign ownership in 1997**

| | Bulgaria | Poland | Romania |
|---|---|---|---|
| **Total number of firms** | 1395 | 2500 | 1984 |
| **Total number of firms which report ownership information** | 994 | 418 | 1400 |
| **Number of firms which report foreign ownership** | 76 | 177 | 284 |
| **Foreign ownership >50%** | 60 | 114 | 206 |
| **of which: 100%** | 9 | 45 | 72 |
| **Foreign ownership <=50%** | 16 | 63 | 78 |
| **of which: Joint ventures** | 1 | 13 | 15 |

Source: Author's calculations from Amadeus CD-ROM, Dec. 1999.

**Table 3: Sample structure according to foreign ownership and industry classification in 1997**

| 2-digit NACE Industry | Bulgaria | Poland | Romania |
|---|---|---|---|
| **15 Food & beverages** | 23 | 47 | 68 |
| **16 Tobacco** | 2 | 1 | 0 |
| **17 Textiles** | 4 | 2 | 38 |
| **18 Wearing apparel** | 5 | 9 | 54 |
| **19 Leather and footwear** | 2 | 0 | 28 |
| **20 Wood products** | 3 | 2 | 12 |
| **21 Paper products** | 3 | 6 | 1 |
| **22 Publishing and printing** | 0 | 5 | 9 |
| **23 Coke and refined products** | 0 | 0 | 0 |
| **24 Chemicals** | 6 | 15 | 14 |
| **25 Rubber and plastic products** | 0 | 9 | 7 |
| **26 Non-metallic products** | 8 | 19 | 8 |
| **27 Basic metals** | 4 | 2 | 0 |
| **28 Fabricated metal products** | 2 | 11 | 7 |
| **29 Machinery and equipment** | 5 | 8 | 7 |
| **30 Office machinery** | 0 | 2 | 4 |
| **31 Electrical machinery** | 5 | 13 | 7 |
| **32 Communication equipment** | 0 | 5 | 4 |
| **33 Optical instruments** | 0 | 3 | 1 |
| **34 Motor vehicles** | 1 | 6 | 4 |
| **35 Other transport equipment** | 2 | 1 | 4 |
| **36 Furniture and miscellaneous** | 1 | 12 | 12 |

Note: In the Bulgarian and Romanian samples of foreign firms, there are 3 enterprises, respectively, whose country of origin is a country of the former Soviet Union. These firms are excluded.
Source: Author's calculations from Amadeus CD-ROM, Dec. 1999.

**Table 4: Sample structure according to the nationality of the parent company in 1997**

| Parent Company's Nationality | Bulgaria | Poland | Romania |
|---|---|---|---|
| **Austria** | 8 | 2 | 18 |
| **Australia** | 0 | 1 | 1 |
| **Belgium** | 6 | 4 | 2 |
| **Canada** | 0 | 1 | 2 |
| **Cyprus** | 2 | 0 | 8 |
| **Germany** | 17 | 49 | 59 |
| **Denmark** | 2 | 9 | 0 |
| **Finland** | 0 | 8 | 1 |
| **France** | 1 | 10 | 27 |
| **Greece** | 2 | 0 | 3 |
| **Ireland** | 1 | 0 | 0 |
| **Israel** | 1 | 0 | 4 |
| **Iraq** | 0 | 0 | 1 |
| **Italy** | 2 | 3 | 71 |
| **Japan** | 2 | 2 | 1 |
| **Korea** | 1 | 2 | 4 |
| **Lebanon** | 0 | 0 | 1 |
| **Libya** | 0 | 0 | 4 |
| **Luxembourg** | 1 | 0 | 0 |
| **Netherlands** | 3 | 23 | 10 |
| **Norway** | 1 | 1 | 0 |
| **Spain** | 0 | 0 | 3 |
| **Sweden** | 1 | 7 | 1 |
| **Switzerland** | 6 | 10 | 17 |
| **Turkey** | 0 | 0 | 5 |
| **United Kingdom** | 10 | 10 | 20 |
| **United States** | 6 | 42 | 24 |

Source: Author's calculations from Amadeus CD-ROM, Dec. 1999.

**Table 5: Conditional (fixed-effects) logit estimations: labor costs, local demand and other agglomeration effects**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| **Labor costs** | 0.01 | | | | | |
| | (0.04) | | | | | |
| **Labor costs*Bulgaria** | | -3.22* | -3.23* | -3.44* | -2.99* | -3.05* |
| | | (0.72) | (0.73) | (0.74) | (0.84) | (0.84) |
| **Labor costs*Poland** | | -8.23* | -7.26* | -8.41* | -3.71* | -4.17* |
| | | (0.86) | (0.87) | (0.88) | (0.98) | (0.99) |
| **Labor costs*Romania** | | 0.01 | 0.01 | 0.04 | 0.20 | 0.24 |
| | | (0.04) | (0.04) | (0.06) | (0.27) | (0.28) |
| **Local demand** | 0.31* | | | | | |
| | (0.06) | | | | | |
| **Local demand*Bulgaria** | | 0.28*** | 0.20 | 0.27 | 0.27 | 0.22 |
| | | (0.17) | (0.17) | (0.17) | (0.22) | (0.23) |
| **Local demand*Poland** | | 0.28* | 0.27* | 0.32** | 0.20 | 0.24 |
| | | (0.11) | (0.11) | (0.13) | (0.14) | (0.16) |
| **Local demand*Romania** | | 0.23* | 0.23* | 0.23* | 0.18*** | 0.21** |
| | | (0.09) | (0.09) | (0.09) | (0.10) | (0.11) |
| **Production agglomeration** | | | 2.68* | | | |
| | | | (0.37) | | | |
| **R&D agglomeration** | | | | 1.48* | | 1.23* |
| | | | | (0.15) | | (0.15) |
| **Foreign activity** | | | | | 0.67* | 0.62* |
| **agglomeration** | | | | | (0.06) | (0.06) |
| **Bulgaria** | -1.81* | -0.77* | -0.25 | -0.51** | -0.91* | -0.69* |
| | (0.09) | (0.25) | (0.26) | (0.26) | (0.26) | (0.27) |
| **Poland** | -0.77* | 2.23* | 0.93* | 1.51** | 0.58 | 0.12 |
| | (0.07) | (0.33) | (0.38) | (0.35) | (0.36) | (0.37) |
| **Pseudo R2** | 0.13 | 0.15 | 0.16 | 0.17 | 0.19 | 0.21 |
| **Log-likelihood** | -2154.74 | -2100.88 | -2074.40 | -2037.23 | -1744.22 | -1706.15 |
| **Number of observations** | 4880 | 4880 | 4880 | 4859 | 4380 | 4372 |

Note: Logit coefficients of the probability of choosing Bulgaria or Poland relative to Romania are reported. Robust standard errors corrected for heteroskedasticity are reported in parenthesis. All estimations include year dummies. For Bulgaria and Poland dummies, Romania is the reference category; For the US and Germany dummies, Other Western is the reference category. (*): significant at 1% level, (**): significant at 5% level, (***): significant at 10% level.

**Table 6: Conditional (fixed-effects) logit estimations: labor market flexibility and parent's nationality**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| **Labor costs*Bulgaria** | -2.27** | -2.53* | -2.15* | -3.25* | -3.46* | -2.98* |
| | (0.76) | (0.77) | (0.85) | (0.73) | (0.74) | (0.86) |
| **Labor costs*Poland** | -5.41* | -5.43* | -2.89* | -7.92* | -8.22* | -3.39* |
| | (0.97) | (0.98) | (1.06) | (0.87) | (0.89) | (1.01) |
| **Labor costs*Romania** | 0.07 | 0.08 | 0.45 | 0.04 | 0.06 | 0.23 |
| | (0.11) | (0.10) | (0.29) | (0.06) | (0.07) | (0.31) |
| **Local demand*Bulgaria** | 0.08 | 0.01 | 0.18 | 0.21 | 0.18 | 0.21 |
| | (0.21) | (0.22) | (0.25) | (0.17) | (0.18) | (0.22) |
| **Local demand*Poland** | -0.07 | -0.13 | 0.01 | 0.21*** | 0.24*** | 0.13 |
| | (0.17) | (0.19) | (0.19) | (0.11) | (0.13) | (0.13) |
| **Local demand*Romania** | 0.38* | 0.39* | 0.25* | 0.19** | 0.19** | 0.15*** |
| | (0.11) | (0.11) | (0.11) | (0.08) | (0.09) | (0.09) |
| **R&D agglomeration** | | 1.64* | | | 1.47* | |
| | | (0.17) | | | (0.15) | |
| **Foreign activity** | | | 0.64* | | | 0.68* |
| **agglomeration** | | | (0.06) | | | (0.06) |
| **Labor market flexibility** | 0.05* | 0.05* | 0.02*** | | | |
| | (0.01) | (0.01) | (0.01) | | | |
| **US parent*labor costs** | | | | -0.36 | -0.43 | -0.60 |
| | | | | (0.30) | (0.30) | (0.91) |
| **US parent*local demand** | | | | 1.44* | 1.29* | 1.54* |
| | | | | (0.33) | (0.32) | (0.36) |
| **German parent*labor** | | | | -0.46* | -0.43* | 0.66 |
| **costs** | | | | (0.16) | (0.16) | (0.51) |
| **German parent*local** | | | | 0.19 | 0.24 | 0.16 |
| **demand** | | | | (0.15) | (0.16) | (0.16) |
| **Bulgaria** | -0.79* | -0.64** | -0.89** | -0.72* | -0.47* | -0.87* |
| | (0.26) | (0.27) | (0.27) | (0.25) | (0.26) | (0.26) |
| **Poland** | 1.55* | 0.63 | 0.62 | 2.06* | 1.40* | 0.40 |
| | (0.39) | (0.41) | (0.42) | (0.34) | (0.35) | (0.37) |
| **Pseudo R2** | 0.16 | 0.19 | 0.19 | 0.16 | 0.18 | 0.19 |
| **Log-likelihood** | -1492.62 | -1444.08 | -1431.02 | -2081.97 | -2021.75 | -1734.41 |
| **Number of observations** | 3896 | 3890 | 3893 | 4878 | 4859 | 4380 |

Note: see Note at Table 5.

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