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Agglomeration Economies and the Location of Foreign Direct Investment: Empirical Evidence from Romania

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Abstract

We exploit the large inflow of FDI into Romania, after the revolution in 1989, to study the determinants of FDI location in transition economies. Using a conditional logit setup and choice-specific fixed effects, we find that external economies from service agglomeration are the main determinant of FDI-location. An increase in service employment density by 10 percent makes the average Romanian county 11.9 percent more likely to attract a foreign investor. Industry specific foreign and domestic agglomeration economies and labor conflicts also impact FDI-location. A comparison with findings of other studies suggests that service agglomeration economies may be geographically quite localized.

Keywords: Agglomeration economies, foreign direct investment, transition economies.

Les économies d'agglomération et la localisation de l'Investissement direct étranger: des preuves empiriques provenant de la Roumanie.

Cet article approfondit le flux important d'Ide à destination de la Roumanie, suite à la révolution de 1989, afin d'étudier les déterminants de la localisation de l'Ide dans les économies de transition. A partir d'un modèle du type logit conditionnel et des effets spécifiques aux choix, il s'avère que des économies externes dues à l'agglomération des services sont les principaux déterminants de la localisation de l'Ide. Une hausse de la densité de l'emploi tertiaire de 10 pourcent rend le comté roumanien moyen plus susceptible d'attirer un investisseur étranger. Des économies d'agglomération intérieures et extérieures, spécifiques à l'industrie, et les conflits du travail influent aussi sur la localisation de l'Ide. Une comparaison avec les résultats des études antérieures laisse supposer que les économies d'agglomération du secteur tertiaire pourraient s'avérer assez localisées du point de vue géographique.

Economies d'agglomération / Investissement direct étranger / Economies de transition

Agglomerationswirtschaften und der Standort von ausländischen Direktinvestitionen: empirische Belege aus Rumänien

Wir nutzen den großen Zustrom von ausländischen Direktinvestitionen nach Rumänien in der Zeit nach der Revolution von 1989 zur Untersuchung der Determinanten für die Standorte von ausländischen Direktinvestitionen in Übergangswirtschaften. Mit Hilfe konditionaler Logit-Modelle und einer auswahlspezifischen Festeffekt-Analyse stellen wir fest, dass externe Wirtschaften einer Dienstleistungsagglomeration den wichtigsten Determinanten für den Standort ausländischer Direktinvestitionen darstellen. Eine 10-prozentige Zunahme der Beschäftigungsdichte im Dienstleistungssektor erhöht in einem durchschnittlichen rumänischen Bezirk die Wahrscheinlichkeit, dass ein ausländischer Investor angezogen wird, um 11,9 Prozent. Auch branchenspezifische ausländische und

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einheimische Agglomerationswirtschaften und Arbeitskonflikte wirken sich auf den Standort ausländischer Direktinvestitionen aus. Ein Vergleich mit den Ergebnissen anderer Studien lässt darauf schließen, dass Dienstleistungsagglomerationswirtschaften in geografischer Hinsicht recht lokalisiert ausfallen können.

Keywords:
Agglomerationswirtschaften
Ausländische Direktinvestitionen
Übergangswirtschaften

Economías de aglomeración y ubicación de la Inversión Directa Extranjera: evidencia empírica de Rumania

Analizamos la entrada de Inversión Directa Extranjera (IDE) en Rumania tras la revolución de 1989 con la finalidad de estudiar los determinantes de la ubicación de IDE en las economías de transición. Con ayuda de una estructura condicional de un modelo logit y efectos fijos específicos de opción, observamos que las economías externas de una aglomeración de servicios son el principal factor para determinar la ubicación de IDE. Un aumento de un 10 por ciento en la densidad del empleo de servicios incrementa en un 11,9 por ciento la probabilidad de atraer un inversor extranjero en un condado medio rumano. Las economías de aglomeración específicas para la industria tanto nacionales como extranjeras y los conflictos laborales también influyen en la ubicación de la IDE. En comparación con los resultados de otros estudios se observa que las economías de aglomeración de servicios pueden estar geográficamente bien localizadas.

Keywords:
Economías de aglomeración
Inversión directa extranjera
Economías de transición

JEL classification: P33, R3.

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1 Introduction

The role of agglomeration economies – economies that are external to a firm but internal to a small geographic area – for the location choice of firms and economic growth is one of the most vital questions in urban, regional and international economics. Various theoretical concepts suggest that clustering of economic activities in one form or the other results in cost savings and productivity gains for firms, thereby influencing their location decisions.

In this paper we focus on the importance of different types of agglomeration economies for FDI location outcomes in a *transition economy*. Specifically, we investigate location decisions of foreign manufacturing plants in Romania between 1990 and 1997, the period following the overthrown of Ceausescu and his communist regime in 1989. Before the 'Romanian Revolution' the country has had exceptionally autarchic policies, thus being completely unattractive to FDI. Only after the fall of the communist regime in 1989 the country *de facto* opened up to foreign investors leading to a large influx of foreign capital over a relatively short period of time. We exploit this setting to explore *whether* agglomeration economies (and other local characteristics) are relevant for location choices of foreign investors in a transition economy and *what types* of agglomeration economies are most important. Specifically, we consider the impact of industry specific domestic and foreign economies, service economies and economies arising from diversification as well as the border-county variants of these four agglomeration variables.

Transition economies differ from developed countries in many respects and findings of FDI-location studies for developed countries may therefore not apply to transition economies. For example, economies arising from *service agglomeration* are often ignored in location choice studies. However, easy access to – and competition among – various local service businesses (e.g., accountants, lawyers, consultants, translators, banking and communication) may be particularly important in transition economies, where foreign investors often face vital

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problems related to opaque and corrupted bureaucracies, incoherent and unstable legal systems, local contractors, unreliable communication infrastructure, immature financial institutions and cultural issues and conflicts (see e.g., BITZENIS, 2006). A high service employment density can facilitate solving these issues.

The main purpose of this study is to assess the relative importance of the various types of agglomeration economies for the location of foreign firms in a *transition economy* and to reconcile our findings with those of the existing literature. In doing so, our study may provide useful guidance for the design of effective regional policies aimed at attracting FDI to transition economies and at addressing regional inequalities.

Our empirical setting and rich data also allow us to *simultaneously* address many drawbacks identified in previous research. In particular, we consider only greenfield plants and use a geographical unit of observation – a Romanian county[1] – that coincides reasonably well with MARSHALL's (1898) notion of agglomeration.[2] At the same time, we use a conditional logistic model that controls for unobserved location characteristics by including choice specific (county-level) fixed effects; and, we address the issue of separating (unobservable) endowment effects from agglomeration economies.

Romania provides an ideal empirical setting for a number of reasons. The country holds a top position in Eastern Europe in terms of the number of foreign start-ups established since the beginning of the 1990's (see e.g., UNCTAD, 2004; PUSTERLA and RESMINI, 2007). Almost 50,000 establishments with foreign participation (including joint ventures) were set up in Romania between 1990 and 1996 alone (VOICU, 2000). This number includes 1540 foreign-owned greenfield plants in the manufacturing sector – the sample used in our empirical analysis. The availability of detailed data for individual plant establishments and small localities on an annual basis, coupled with the use of fixed-effects, allows us to estimate the impact of different types of agglomeration economies on location decisions more

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precisely than is possible with less detailed information. Finally, the large inflow of FDI over a relatively short time period (between 1990 and 1997) ensures that foreign investors' location decisions are made under relatively similar conditions. This setting has one important advantage over an alternative setting where location decisions of foreign investors are made over longer time periods; namely, unobservable determinants of location choices – which may vary significantly over decades – may be relatively constant over a relatively short time period. Hence, while location fixed effects in our setting control for *time-invariant* unobservable characteristics, the 'concentrated character' of FDI inflow into Romania alleviates the omitted variable bias-problem associated with *time-variant* unobservable characteristics that change only slowly and are essentially fixed during our sample period.

The main findings of our study are fourfold. Firstly, service agglomeration economies and – to a lesser extent – industry-specific foreign and domestic agglomeration economies play an important role for the location of foreign manufacturing plants in Romania. Secondly, the impact of within-country differences in labor market conditions is less important than might be expected, perhaps because these conditions vary more *noticeably* across countries. Only labor conflicts have a statistically significant negative effect and the effect is not very important economically. Thirdly, our findings imply that results are sensitive to the inclusion of locational fixed effects. Finally, a comparison of our findings with those of other recent studies tentatively suggests that our results of the effects of service and industry-specific agglomeration are representative of other transition economies of Central and Eastern Europe.

2 Background

Understanding the location of foreign direct investment (FDI) is of importance for two main reasons. First, it is often asserted that FDI benefits domestic firms, particularly in developing or transition economies, and increases the welfare of the citizens by accelerating

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economic growth in the host country.[3] To the extent this is true, FDI distribution within national borders may play an important role in influencing regional economic disparities.

Second, the location decisions of *foreign* firms may differ significantly from their *domestic* counterparts, and, consequently, the location determinants or their effects may differ between foreign and domestic investors and need to be investigated separately. For example, uncertainty with regard to locational quality and subsequent information and search costs are much higher for foreign investors (CAVES, 1996). Since an existing concentration of foreign firms facilitates the gathering of information on the local environment, economies from foreign agglomeration may be very important for international investors but less so for domestic ones (e.g., MARIOTTI and PISCITELLO, 1995; GUIMARÃES *et al.*, 2000). More generally, a number of studies have found that foreign firms value various location factors differently than domestic firms (e.g., GLICKMAN and WOODWARD, 1988 and 1989).[4]

The role of multinational firm activity in the global economy and the general determinants of FDI are well documented. See for example the various theoretical and empirical surveys in BARBA NAVARETTI and VENABLES (2004). Similarly well documented are the micro-foundations of agglomeration economies (e.g., QUIGLEY, 1998; ROSENTHAL and STRANGE, 2001) and the dynamic process generating industrial clusters (e.g., BAPTISTA and SWANN, 1999).

More relevant to the focus of this paper, a number of empirical studies use discrete choice models to investigate the role of agglomeration economies and other factors for the location of FDI. Most of the earlier studies focus on developed countries, mainly the United States. Among the more prominent studies, COUGHLIN *et al.* (1991), WOODWARD (1992) and WHEELER and MODY (1992) all find evidence for the importance of agglomeration economies for the location of FDI in the United States. However, all three studies are based on crude measures of agglomeration economies. COUGHLIN *et al.* (1991) and

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WOODWARD (1992) use manufacturing employment density and total manufacturing establishments, respectively, as proxy for agglomeration economies that should be at least in part industry-specific. WHEELER and MODY (1992) use agglomeration benefit indices based on measures of infrastructure quality, degree of industrialization and level of FDI.

HEAD *et al.* (1995) also focus on the location of FDI in the United States. However, compared to the earlier studies, their methodology is more persuasive. Specifically, their empirical model includes *direct* measures of *different types* of agglomeration economies (domestic and foreign industry-specific ones) and it distinguishes between industry-level agglomeration economies and endowment effects, thereby preventing potentially biased estimates of the impact of agglomeration economies. Endowment effects represent an alternative mechanism through which localization can arise. Specifically, traditional trade theory suggests that firms in a given industry will cluster in regions with favorable factor endowments for that industry.[5] However, firm-specific cost savings associated with an endowment-rich location diminish with the number of firms; as firms congregate, the location becomes less appealing since competition for a scarce input among users bids up the price of the input. Finally, HEAD *et al.* (1995) include choice-specific fixed effects in the empirical setup, thereby controlling for unobservable location characteristics which may cause omitted variable bias. Using a conditional logit setup, the main finding of HEAD *et al.* (1995) is that industry-level agglomeration benefits play an important role in location decisions, even when controlling for endowment and choice specific effects. A 10 percent increase in the number of Japanese plants in a particular industry and region implies a roughly 6 percent increase in the likelihood that a Japanese firm in that industry chooses the region. This effect is roughly 4 times larger than our estimates of foreign industry-specific agglomeration effects. This discrepancy is consistent with findings in other studies, discussed below, which suggest that industry-specific agglomeration economies are comparably less important in transition

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economies. One shortcoming of the study by HEAD *et al.* (1995) is that it relies on a choice set that consists of very large regions – US states – which stretch the MARSHALLian (1898) concept of agglomeration. While large regions may be particularly inappropriate for a study of agglomeration economies, they may also be inadequate in accounting for labor market conditions and other factors that may, too, apply locally.

A number of empirical studies investigate the determinants of FDI location within Europe. Among the European studies spanning several nations, HEAD and MAYER (2004) examine the location choices of Japanese firms within 9 Western European countries. Their results imply that an increase in market potential (i.e., the summation of markets accessible to a point divided by their distances from that point) raises the chance of a region being chosen. However, agglomeration variables retain a robust influence. The estimated effect of industry-specific foreign agglomeration economies is larger than that estimated by HEAD *et al.* (1995), suggesting that a 10 percent increase in the number of Japanese plants increases the probability that a Japanese firm chooses a particular region by roughly 8 percent. One limitation of this study – similar to HEAD *et al.* (1995) – is that it relies on a location choice set of very large (NUTS 1) regions.[6]

Some FDI location studies focus on specific Western-European countries and location choice sets that consist of small areas. For example, MARIOTTI and PISCITELLO (1995) analyze the location decisions of foreign investors among Italian provinces. Their main finding is that spatial distribution of FDI is mainly governed by information costs. One drawback of the study is that it only considers foreign acquisitions. However, firms have much more discretion regarding the location of new plants (greenfield investments) than with other types of investment. GUIMARÃES *et al.* (2000) investigate the location decisions of foreign-owned manufacturing plants in the urban areas and outlying regions of Portugal –

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using small regions (concelhos) as location choices – and conclude that agglomeration economies, especially urban service agglomeration economies, are decisive location factors.

Most relevant to the focus of our paper, a growing number of studies investigate the role of agglomeration economies for the location of FDI in Central and Eastern European countries (CEECs). To begin with, DISDIER and MAYER (2004) compare agglomeration economies for Eastern and Western Europe inward FDI. Focusing on the location choices of French multinationals and using countries (and country-combinations) as locational choices, they find quite strong agglomeration effects; a country that experiences a 10 percent rise in the number of French firms in a particular industry increases the probability of being chosen in the future between 4.5 and 4.9 percent. Their estimations also indicate weaker agglomeration effects in CEECs than in Western European countries. The authors speculate that this finding may be due to stronger competition between firms in CEECs or due to the fact that affiliates in CEECs rely heavily on immediate products from EU countries. Their results also indicate that high labor costs deter FDI location. However, similar to our findings, the unemployment rate has a statistically insignificant effect.

BUCH *et al.* (2005) examine the determinants of the activities of German multinational firms in various host-countries – including CEECs. They use the sales of German firms' foreign affiliates as dependent variable rather than locational choices. Despite this different approach, they also find positive agglomeration effects stemming from the number of other German firms in the manufacturing and services industries in a given foreign market. The contribution of the variance of the agglomeration variables to the overall variance of the dependent variable is 5 to 7 percent. They find that other factors are more important; market access motives dominate but cost-saving motives are important for some manufacturing sectors and, particularly, for investments in CEECs. This contrasts our results in that we find that agglomeration forces are more relevant determinants of FDI-location than labor costs. We

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speculate that this discrepancy arises from the fact that BUCH *et al.* (2005) investigate the determinants of FDI across countries, while we look at within country differences.

PUSTERLA and RESMINI (2007) study the location choices of foreign manufacturing plants in Bulgaria, Hungary, Poland and Romania using a nested logit model and NUTS 2 regions as locational choices. Using Hoover-localization indexes to measure agglomeration economies, they also find that agglomeration forces matter. However, contrary to our results, their estimates indicate that foreign agglomeration effects are significantly larger than domestic ones. Moreover, they find that both measures appear to be more important for the low than the high tech sector and foreign investors prefer locations with lower labor costs but not necessarily with higher skill levels.

A few studies focus on specific transition countries. CIESLIK and RYAN (2004) investigate the location determinants of Japanese companies within Poland, with a focus on the effects of Special Economic Zones (SEZ). Using a choice set of 16 NUTS 2 regions and controlling for a number of regional characteristics (but not choice fixed effects) they find no evidence that SEZs attract inward Japanese FDI. Similarly, urbanization, industrial agglomeration and service agglomeration economies do not appear to be important factors. However, two follow-up studies by CIESLIK (2005a and 2005b), which use a similar setting but a larger choice set of 49 smaller regions, find positive and significant impacts of service and industry agglomeration on FDI location. CIESLIK (2005a) additionally controls for 'large region' effects, while CIESLIK (2005b) controls for country-specific border effects (though neither study includes choice specific fixed effects). Interestingly, the effect of service agglomeration on FDI location is highly significant in both studies, not just in a statistical but also in a quantitative sense. Among dissimilarities to our study, both studies find negative effects of labor costs and unemployment rate. Finally, BEKES (2005) analyzes decisions by foreign firms about their location within Hungary using both discrete choice and count data

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models and using – like our study – NUTS 3 regions (Hungarian counties) as locational choices. Interestingly, the existence of agglomeration effects (measured only indirectly by location dependent, non-wage factors and by some access variables) is one of the few robust results. Moreover, using a fixed-effects specification similar to ours, the author finds that higher local average labor costs make a location more attractive to foreign investors, perhaps because the study does not control for skill levels or service agglomeration. However, locations with higher wages in the foreign investors' own industry are less attractive choices. Adding a capital dummy for Budapest to the specifications without fixed effects changes results little. We too find that adding a capital dummy for Bucharest has little impact.

To sum up, industry-specific agglomeration economies appear to be common determinants of FDI location within transition countries, although the magnitudes of foreign and domestic agglomeration effects tend to be weaker than in developed countries and the importance of agglomeration effects varies across countries. Studies that include measures of service agglomeration tend to find insignificant effects if the location choices are large areas but statistically significant and highly meaningful effects if the location choices are small areas, suggesting that service agglomeration economies are a very important determinant of FDI location outcomes but are geographically quite localized. This result does not appear to be confined to transition economies but also applies to developed countries. In fact, our findings are most comparable to those by GUIMARÃES *et al.* (2000) for Portugal, a study that, like ours, focuses on relatively small areas as location choices. GUIMARÃES *et al.* (2000) also find that service agglomeration has the strongest impact on FDI location, implying that perhaps service agglomeration is an important location determinant for foreign investors but the impact of the variable may only be appropriately measured when using small areas as location choices. Another common finding in studies on transition economies is that measures of diversity or urbanization externalities either have no effect or a negative impact

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on FDI-location, suggesting that JACOBS-type externalities may be rather irrelevant for the location choice of foreign investors in transition economies. The evidence whether labor market conditions affect FDI-location in transition economies is mixed. Most studies (but not ours) find that labor costs play an important role, with higher wages acting as a deterrent for FDI. In contrast, studies that focus on Western Europe or the US typically find insignificant or even positive effects of wages on FDI-location (e.g., HEAD *et al.*, 1999; GUIMARÃES *et al.*, 2000; CROZET *et al.*, 2004). Most studies on transition economies (including ours) find no effect of the unemployment rate and of skills and education of the workforce.

3 Methodology

We model the location decision of foreign manufacturing plants using a conditional logistic setup where the dependent variable is the county chosen by each investor. Following McFADDEN (1974), we assume that at time t, investor i selects the county j that would yield the highest profit. The conditional logit model stipulates that the profit can be decomposed into the sum of a measured term, M_{ijt}, and an unmeasured term, ε_{ijt}. If ε_{ijt} is distributed independently and according to a Weibull distribution, the probability that any particular county is chosen out of the choice set of size K is

$$\text{Prob}_{ijt} = \frac{e^{M_{ijt}}}{\sum_{k=1}^{K} e^{M_{ikt}}} \tag{1}$$

Previous theoretical work summarized above implies that M_{ijt} is influenced by a set of location characteristics. Consequently, we can estimate the effect that these characteristics have on location choice. The empirical specification can be formulated as follows:

$$M_{ijt} = \sum_{l=1}^{L} \beta_l X_{ijt}^{l} + \sum_{k=1}^{K} \gamma_k D_k , \tag{2}$$

where X_{ijt}^{l} denotes the lth location specific independent variable. Relevant factors for the site selection decision usually include agglomeration effects, prices of inputs (land, labor, and

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capital), market demand, and availability of infrastructure. In the section below we describe the set of explanatory variables for our empirical analysis in detail.

Since it is unlikely that the variables we use adequately capture all location characteristics which influence profits, our specification also includes a set of county-specific dummy variables, D_k, to control for any unobserved time-invariant county features that may affect location decisions. The inclusion of these fixed effects alleviates omitted variable bias in the coefficient estimates of the included regressors. Moreover, these choice-specific effects also control for the existence of unobservable correlation across choices, thus alleviating concerns that the Independence of Irrelevant Alternatives (IIA) assumption of the conditional logit model may be violated (see TRAIN, 1985).

Endowment-driven localization suggests that industry-specific agglomeration variables may be correlated with unobserved industry-county specific factor conditions which are not captured by the county fixed-effects and thus are part of the error term, ε_{ijt} (see HEAD *et al.*, 1995 for a detailed discussion of this possibility). As a result, the agglomeration coefficient will incorporate both agglomeration economies and endowment effects.

To separate the two types of effects, we follow the approach suggested by HEAD *et al.* (1995), which exploits the fact that domestic firm clustering in the United States preceded the investment of Japanese firms, starting only in the 1980s. Similarly, in our empirical setup Romania was de facto closed to FDI prior to 1989, so in our case too, domestic firm clustering preceded foreign investment. The basic idea of the approach is that domestic firms originally allocate themselves across space reflecting the distribution of endowments (i.e., the geographical distribution of domestic establishments in a particular industry incorporates all the relevant information on the abundance of endowments and the intensity of resource-use in that industry). Then foreign firms choose locations and presumably don't affect endowments but they do create new opportunities to agglomerate. Consequently, to the extent that prior

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domestic investments indeed proxy for endowments, a significant and positive coefficient on the *foreign* agglomeration variable, after controlling for the domestic pattern, should provide evidence for the existence of agglomeration economies.

4 Data and Variables

4.1 Data

To estimate the model outlined above, we obtained unique data from four Romanian sources. First, the "Statistical Abstract of Romania" provides detailed information on many of the county-level characteristics that are expected to play a role in the firms' location decisions (e.g., employment and average net monthly earnings by economic sector, unemployment rate, number of labor conflicts, school population of various levels of education, railway lines in operation, public roads, land area). Second, we obtained data from the Romanian Development Agency (RDA). The RDA maintains the most complete and reliable list of establishments with foreign participation for Romania, as it registers each and every establishment with foreign participation, which opened in the country. Specifically, the RDA provided us with information on the date of establishment, county of location, partners, amount of foreign and total capital invested, and relevant industry for all foreign manufacturing subsidiaries with at least $10,000 in foreign capital which were established in Romania between 1990 and 1997. In order to ensure that the sample of foreign plants used in the analysis includes only greenfields, we eliminated all establishments in which the Romanian partner was a juridical person (i.e., a firm). RDA staff indicated to us that some of these establishments with a firm as domestic partner may represent joint ventures or acquisitions. Third, we supplemented our data with plant-level information from the Chamber of Commerce and Industry of Romania (CCIR), including the county of location and two-digit industry code for all domestic manufacturing plants with at least 20 employees for 1994 and 1996. Finally, we derived sector specific regional annual employment and GDP data from the National Institute of Statistics.

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Table 1 shows the spatial distribution of the 1540 foreign-owned greenfield plants in our sample.[7] The majority of these investments (61.2 percent) are concentrated in Bucharest. Other popular locations include counties in Transylvania (Arad, Bihor, Brasov, Cluj, Sibiu, and Harghita), on the Western border (Timis), and one on the Black Sea Coast (Constanta).

Table 2 describes the FDI temporal trends for our study period, 1990-1997. Post World War II, Romania was among the first East-European countries to (re-)open the door to FDI. (Prior to 1945, quite a few foreign firms were doing business in Romania. However, they were all taken over by the state as a result of the communists' nationalization policy.) In 1972, a law was passed that allowed the establishment of international joint ventures with no more than 49 percent of foreign ownership. However, the effective outcome of this policy was very meager for reasons such as Western companies' natural suspicion of communist governments and fears of new changes of the political situation, bad regulations, bureaucratic inefficiency, etc. *De facto* our study period – which starts with year one after the overthrown of the communist regime – captures the very beginning of FDI in Romania. Several things are apparent in Table 2. First, the FDI activity had a slow start following the events that led to the overthrown of the communist regime in 1989; only 21 foreign-owned greenfield plants were established in 1990, and less than 100 were set up in each of the following three years. The foreign investors' initial reluctance to invest can be attributed, at least in part, to Romania's political and economic instability during that period, as well as to a very slow start of the economic reforms. Second, starting in 1994 and continuing over the next few years, there was a strong surge in the number of foreign start-ups; for example, in 1994, 360 new greenfield establishments were established – over four times more than in 1993. This sharp increase was likely driven by the beginning of macroeconomic stabilization in 1994. Finally, in 1997 there was a significant drop in the number of new foreign establishments. We speculate that the beginning of a recession and the slower than expected pace of economic reform played an important role in explaining this decline.

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The distribution of FDI by industry is presented in Table 3 and shows priority towards food (40.0 percent) and light industry (24.6 percent), which includes textile, clothing, leather, and shoes. These are all labor intensive industries with a long tradition in Romania. They likely captured the attention of foreign investors through a promise of cheap but skilled labor force.

4.2 Explanatory Variables

Various local characteristics affect a firm's revenues or costs, influencing the probability that a foreign firm selects a particular county. Table 4 defines and summarizes the county-specific factors which we use as explanatory variables in the conditional logit model.

Agglomeration Variables and Border Effects

The focal variables of our model are four measures that capture different types of agglomeration economies. Our first measure is the log of the number of plants with foreign participation in the same industry as the investor per km^2. This variable captures industry-specific foreign agglomeration economies, a form of localization economies. Foreign firms may be attracted to counties with close geographical proximity of foreign-owned firms in the same industry due to technological or pecuniary externalities. Pecuniary externalities from foreign agglomeration may include not only economies from specialized labor-pooling and the existence of intermediate suppliers but also substantial reductions in information and search costs associated with foreign investors' high uncertainty about the local environment.

Our second agglomeration measure is the log of the number of domestic plants in the same industry as the investor per km^2. This variable captures industry-specific domestic agglomeration economies (another form of localization economies), but – as outlined in the methodology section – also endowment effects. Given the availability of data on the number of domestic plants for two years, 1994 and 1996, foreign investments until 1994 are matched to 1994 domestic counts; later investments are matched to 1996 domestic counts.[8]

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The benefits of industry-specific firm clustering may be offset by pecuniary externalities such as increased land rents and wages due to increased competition between firms as well as increased transport costs due to congestion effects. Without any controls on such cost factors, we would measure net effects and the predicted signs of the coefficients of our two industry-specific agglomeration variables could be positive or negative, depending on whether the positive agglomeration forces or dispersion forces prevail. However, because we control for labor costs and arguably land costs (see discussion below), we would expect the signs on the coefficients of our industry-specific agglomeration measures to be positive, although a negative sign is conceivable if foreign investors attach relatively strong weight to dispersion forces *and* our controls do not adequately account for them.

Our third measure is the log of total employment in the tertiary sector (business and financial services) per km^2. This variable captures service agglomeration economies. As RIVERA-BATIZ (1988) demonstrates in a formal setting, such economies should positively affect firm location. This is because, in equilibrium, the larger the number of service sector firms in the market, the more specialized the producer services that they can provide, the smoother the industrial production that can be sustained and the higher therefore the productivity of the industrial sector. WOODWARD (1992) argues that economies arising from urban service agglomeration may be particularly important for foreign investors as professional services and a diverse range of cultural amenities are crucial input factors in production for them. As argued in the introduction, this reasoning may be particularly applicable to transition economies, as the various non-core business problems that require professional services are more pronounced in these countries.

Like in the case of industry-specific agglomeration, the benefits of urban service agglomeration can be offset by costs such as increases in land rents and wages, as well as congestion-related increases in the commuting time for workers. If these factors have an

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important weight in location decisions and are not appropriately accounted for, the expected sign on the service agglomeration coefficient could also be negative.

We should note that the tertiary sector may be characterized by a significant foreign presence. Hence ideally we would like to distinguish between foreign and domestic service agglomeration economies. Unfortunately, such detailed information is not available from public sources for Romania.

The fourth variable is the log of a Herfindahl index of the diversity of the counties' industrial structure. The index equals $\sum_{i=1}^{n} E_i^2$, where n is the number of economic sectors and E_i is the proportion of county employment that is located in the ith sector.[9] A decrease in the index implies an increase in diversity. The measure is included to account for inter-industry knowledge spillovers and diversity externalities (economies arising from cross-fertilization of ideas across industries). JACOBS (1969) suggested that large diversified cities should be more attractive to firms than less diversified locations. CANTWELL and PISCITELLO (2005) provide evidence for four Western European countries that diversity externalities make a region indeed more likely to attract foreign-owned technological activities. We would not expect, however, these externalities to play a major role for the location of foreign investors in labor-intensive production processes in transition economies.

The recent empirical literature on agglomeration effects has provided evidence that they cross administrative borders (e.g., HEAD *et al.*, 1995; CANTWELL and PISCITELLO, 2005). Thus, we add border-county variants of the four agglomeration variables to capture inter-regional spillovers. The two border-county measures of industry-specific agglomeration are computed by summing the number of firms in adjacent counties and dividing this number by the total land area of the adjacent counties. The border-county service agglomeration measure is obtained by dividing total employment in the tertiary sector in all adjacent counties

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by the total land area of these counties. Finally, the border-county Herfindahl index measure is computed using the same formula as for the within-county measure.

Some researchers have adopted more sophisticated econometric methods to account for spatial dependence and test more accurately for border effects. Notably, DRIFFIELD (2006) provides an in depth analysis of externalities from inward FDI using spatial econometric techniques, demonstrating that these externalities are more localized than has previously been believed. Carrying out such an analysis, however, is beyond the scope of this paper.

Other Location Factors

Our empirical model includes a number of additional factors that are expected to affect the location decisions of foreign firms. On the cost side of the profit function, labor market conditions quickly come to mind - they affect the prices of local inputs including labor itself, as well as any locally supplied intermediate goods. Wages, the labor-management environment, and the availability of labor are important labor market characteristics – and those which are usually employed in location studies. When measuring wage costs, one needs to account for unit labor costs since workers differ in skills and level of qualification (WOODWARD, 1992). To address this issue, we include the average manufacturing monthly real wage (in logs), as well as the log of numbers of high-schools and vocational/ apprentice schools per total manufacturing employment as proxies for educational and skill levels of the local workforce. Higher wages are expected to deter FDI. However, empirical evidence on the impact of labor costs is mixed. For example, BARTIK (1985) or COUGHLIN *et al.* (1991) found that higher wages make a location less attractive to foreign investors; on the other hand, for example ONDRICH and WASYLENKO (1993) or GUIMARÃES *et al.* (2000) did not find a statistically significant relationship. We expect the two measures of educational and skill levels to be positively related to the probability of locating a new plant in a county – a usual finding in the literature (see, for example, COUGHLIN and SEGEV, 2000).

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The extent of unionized labor is the most widely used indicator of the labor-management environment. Since we lack unionization data, we employ the number of labor conflicts (computed per total manufacturing employment and expressed in logs), which is largely believed to be closely associated with union strength. COUGHLIN *et al.* (1991) and COUGHLIN and SEGEV (2000) notice that officials tout low regional unionization rates in an attempt to promote economic development. The argument is that such an environment allows foreign firms to introduce new managerial practices and, more generally, to pursue profit maximization unhindered. This view has found empirical support in some studies (e.g., BARTIK, 1985). However, other more recent studies found that the unionization rate does not matter (HEAD *et al.*, 1995; COUGHLIN and SEGEV, 2000) or that it is conducive to FDI (COUGHLIN *et al.,* 1991). Nonetheless, as a working hypothesis we expect a large number of labor conflicts to be a deterrent for FDI location.

The last labor market characteristic we explore is the unemployment rate (in logs). The expected effect of this variable is ambiguous. A high unemployment rate may be conducive to FDI if it indicates labor availability. Findings by HEAD *et al.* (1995) and COUGHLIN *et al.* (1991), among others, are consistent with this hypothesis. However, higher unemployment can also signal less competitive conditions and a lower quality of life that tend to discourage foreign investors (see WOODWARD, 1992, for empirical support).

Land costs represent another potential location determinant on the cost side. Direct information on this factor is not usually available. Some authors have used the log of population density to proxy for industrial land costs (BARTIK, 1985; GUIMARÃES *et al.*, 2000), arguing that population density reflects land costs because residential and industrial users compete for land. We do not include this variable in our final model because county-level population density in Romania changes very slowly over time and, thus, is essentially

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captured by the county fixed effects.[10] (When adding population density to the model, the coefficient on the variable is completely statistically insignificant.)

Capital costs, proxied by the interest rate, represent yet another cost component. However, since they are usually invariant across locations, they are generally not included in location choice models. We also do not include taxes because in Romania, those related to capital costs are set at the national level and thus do not vary across counties.

On the revenue side, GDP is a usual measure of market size that proxies for the market access as a major determinant of the location of economic activities. It is often argued in the literature that the market served by foreign firms is rarely limited to a 'location', especially if the 'location' is small, like the Romanian counties in our study (e.g., COUGHLIN and SEGEV, 2000 and MARIOTTI and PISCITELLO, 1995). Hence, we include the (log of the) broader regional GDP rather than the county-level GDP in order to more accurately measure market potential. Regional GDP is not available for all years and had to be imputed. Details on the imputation method are reported in the notes of Table 4.

Infrastructure availability is often considered a factor of relevance in firms' location decisions, as well-developed infrastructure leads to higher regional productivity. The empirical evidence usually supports the expectations of a positive relationship between infrastructure variables and FDI (e.g., BARTIK, 1985; COUGHLIN *et al.,* 1991; COUGHLIN and SEGEV, 2000). Infrastructure is captured in our models with two variables measuring the road and railway densities (in logs). Note, however, that we exclude the two variables in our fixed effects models. This is because the two variables remained unchanged over our study period and therefore are perfectly collinear with the county dummy variables.

For all other time-variant explanatory variables, we use average values over the two years immediately preceding the year of the foreign plant set-up.[11] We believe that the use of lagged variables is justified for at least four reasons: 1) location choices are important strategic

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decisions which firms make, and thus require a thorough preliminary study of the local markets; 2) it takes some time to register and open the business once the location choice is made, given the logistic and bureaucratic hurdles associated with this process (which in a transition country like Romania may be quite significant); 3) agglomeration economies with pre-existing foreign direct investment will only start to occur with firms that have been present for some time; and 4) lagging of variables alleviates potential endogeneity bias.

For some of the explanatory variables, data was not available for the beginning of our study period: employment in the tertiary sector (service agglomeration) and unemployment rates were not available for 1990; the number of labor conflicts was not available for 1990 and 1991; and wage rates were not available for 1990-1992. Given that all these factors, except wages, changed very little in the few years immediately following the collapse of communism, we imputed the missing values of these variables with their values for the first available year of data. We imputed the missing wage values via extrapolation of the available years of data based on the average annual wage growth during these years.

Some of the pair-wise correlations among our explanatory variables – as is common in FDI-location choice studies – are reasonably high. Analyzing pair-wise correlations is a common first check to detect potential multicollinearity problems. One (imperfect) rule of thumb suggests that correlation coefficients in excess of 0.8 indicate a serious problem (see GUJARATI, 2003). While such high correlations are not present in our regression sample, still, our measure of industry-specific foreign agglomeration is relatively highly correlated with our measures for industry-specific domestic agglomeration and service agglomeration (with correlation coefficients of around 0.6), raising some concerns. The problem arising from multicollinearity is that the regression coefficients – although being determinate – cannot be measured with great precision, that is, they possess large standard errors and may have abnormal magnitudes (see again GUJARATI, 2003). The fact that we find statistically

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significant effects with reasonable magnitudes for the three agglomeration variables in question is reassuring in this context.

5 Empirical Findings

5.1 Estimation Results for Base Specifications

Our main goal is to obtain consistent estimates of the agglomeration effects, and we believe that the inclusion of county fixed effects along with other observed time-variant location factors in the econometric model helps us in this pursuit. However, we begin by presenting results for a baseline specification without county fixed effects – only with a dummy for Bucharest to account for the unique status of the city as Romania's capital and principal city. This specification is similar to the ones used in many previous empirical studies. Starting with such a model, we can check whether the results for Romania differ significantly from estimates that have been found previously for other countries. Additionally, estimating this typical specification enables us to assess the role that the inclusion of location-specific fixed effects plays in alleviating omitted variable bias.

Parameter estimates and elasticities for the baseline model (Model 1) are reported in the first two columns of Table 5. To begin with, as expected, we find that the coefficients on the industry-specific (foreign and domestic) and service agglomeration variables have a positive sign and are statistically significant at the 1 percent level. Surprisingly, the sign of our variable capturing economies arising from diversification is negative and significant, implying that diversification positively affects the location decisions of foreign investors. However, perhaps this is an artifact of strong omitted variable bias. The estimates of the border-county agglomeration effects suggest that only domestic agglomeration externalities cross county borders. Service agglomeration border effects are also statistically significant, albeit with a negative sign, perhaps too an artifact of omitted variable bias. Among the other location variables only a few are statistically significant; the ones on unemployment rate, high-schools,

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railway density, and the Bucharest dummy. The negative effect of the unemployment rate on the county's attractiveness seems to suggest that higher rates are indicative of lack of competition and/or lower quality of life. But, again, it may be a result of omitted variable bias. Contrary to our expectations, the coefficients on labor costs, labor conflicts and regional GDP are all statistically insignificant. Nonetheless, these findings may, too, be driven by omitted variable bias. Finally, the coefficient on the Bucharest dummy is negative and statistically significant at the 5 percent level, suggesting that it is not the unique status as the capital which explains why such a large share of the countries' FDI is directed towards Bucharest. Instead, it might be largely the result of strong positive agglomeration effects. It is also worth noting that removing the Bucharest dummy from Model 1 has little impact on results.

We turn next to our preferred Model 2, which adds county-specific fixed effects. Coefficient estimates for this model, which are reported in column (3) of Table 5, clearly indicate that the inclusion of county fixed effects strongly affects results. First, there are very noticeable changes in the estimates of the agglomeration effects. While the coefficient on the industry-specific foreign agglomeration variable is still positive and statistically significant at the 6 percent level, the magnitude drops notably compared to that from the baseline model. The average probability elasticities, shown in column (4) of Table 5, indicate that if the foreign plant-density and domestic plant-density in a given industry within the average county increase by 10 percent, the probability that a subsequent investor in that industry will locate in that county increases by 1.5 percent and 3.5 percent, respectively. In contrast, the magnitude of the effect of economies arising from service agglomeration substantially increases when county fixed effects are accounted for. The effect of service agglomeration is statistically highly significant (with a p-value of 0.018) and the elasticity estimate implies that a 10 percent increase in service employment density in a county increases the probability that a foreign investor chooses that county by 11.9 percent (compared to 7.2 percent in the

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specification that does not include fixed effects). No other determinant of FDI-location is similarly meaningful in economic terms. These findings suggest that positive spillovers arising from industry-specific agglomeration and service agglomeration are sufficiently important to more than offset potential adverse effects of spatial clustering on firms' profits. Finally, the coefficient on the industry diversity measure now becomes statistically insignificant, consistent with expectations. The estimates of the border-county agglomeration effects again suggest that only industry-specific domestic agglomeration externalities cross county borders. The elasticity estimate implies that a 10 percent increase in that measure makes the average Romanian county 5.8 percent more likely to attract a foreign investor. Interestingly, this effect is larger than the corresponding within-county effect of industry-specific domestic agglomeration. Overall these results suggest that industry specific and service agglomeration economies do affect FDI-location locally but only *domestic* industry specific agglomeration economies appear to cross county borders.

Second, notice the changes for some of the labor market characteristics. The coefficient on the labor conflicts variable now has a negative sign, as hypothesized. The effect is statistically significant but not economically meaningful. A 10 percent increase in the measure decreases the likelihood that a foreign investor chooses the county only by 0.8 percent. In contrast to the results reported for Model 1, the unemployment rate now no longer has a statistically significant impact on FDI location. All other labor market related variables and regional GDP – a measure of market potential – remain statistically insignificant.

The substantial differences in estimates between Model 1 and Model 2 underscore the potential for omitted variable bias in models that do not include choice-specific fixed effects.

5.2 Robustness Tests

The empirical specifications reported in this paper use industry-specific *plant-density* measures similar to, for example, GUIMARÃES *et al.* (2004). However, there are alternative

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ways to measure agglomeration economies. In order to check the robustness of our results we have re-estimated our model specifications using measures based on (i) *plant-counts* and (ii) *industry shares*. Due to space constraints we only briefly summarize the findings of these robustness checks but detailed results are available from the authors.

As pointed out by a referee, *plant count* measures are subject to the criticism that they may proxy more for the size of the county rather than for agglomeration mechanisms. (Hence, our decision to use a plant-density measure, which proxies more clearly for the geographical proximity of firms and not the size of the county.) Despite this critique, most location choice studies, which we reviewed in Section 2 (including a previous version of this article) use *plant counts* to proxy for various industry-specific agglomeration economies.

When we re-estimate our Model 1 (without choice specific effects) using a plant-count measure, the results are qualitatively similar compared to the specification with the plant-density measure. However, the magnitudes of the effects change noticeable in some cases. When we re-estimate Model 2 (with fixed effects) using plant-count measures we get identical results compared to the ones reported in this article for Model 2. This is because the county boundaries do not change over our sample period and, thus, the fixed effects capture the (time-invariant) size differences across counties.

Other researchers have advocated the use of relative measures such as *industry shares* or localization indexes capturing concentration (e.g. PUSTERLA and RESMINI, 2007). In a further attempt to check the robustness of our results we have therefore re-estimated our models using a measure of industry shares. Findings are again similar, both, in terms of statistical and quantitative significance. For example, a 10 percent increase in industry-specific foreign plant-density (or plant-count) in a Romanian county is associated with a 1.5 percent increase in the probability that a foreign investor chooses the county. Based on industry share-measures, the equivalent increase in probability is 1.4 percent.

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6 Conclusion

This study investigates the magnitude of different types of agglomeration economies and assesses their importance for location decisions of foreign firms in Romania. Using a conditional logit model which controls for choice-specific effects, we find evidence of service agglomeration effects as well as industry-specific foreign and domestic agglomeration effects, and demonstrate that these effects are economically meaningful. Service agglomeration effects are particularly strong; a 10 percent increase in the service employment density in the average county increases the likelihood that a subsequent foreign investor will choose that county by 11.9 percent. We find no evidence however that increased diversity of the industry structure attracts foreign investors. Moreover, we only find partial support for the hypothesis that agglomeration effects cross Romanian county borders. Consistent with the view that most foreign investors outsource *labor-intensive* production processes into Romania, we find some evidence that local labor conflicts deter foreign investors, however, we find no evidence that there is any impact of within-country differences in wages on FDI location decisions.

Controlling for choice-specific effects has an important impact on our estimates. For example, the elasticity for industry-specific foreign agglomeration drops from 0.45 to 0.15 when adding fixed effects, while the elasticity for service employment density increases from 0.72 to 1.2. This suggests that previous studies that did not control for choice-specific effects may have underestimated the impact of service agglomeration economies. Moreover, a comparison with other FDI location choice-studies suggests that (i) economies arising from service agglomeration may be geographically quite localized and (ii) our qualitative results of the effects of service agglomeration and industry-specific agglomeration are likely representative for other transition economies in Central and Eastern Europe.

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Summary Statistics and Regression Tables

TABLE 1
Distribution of Manufacturing Establishments with Foreign Participation by County, 1990-1997

County Name	Major City/Cities in County	Number	Percent
BUCHAREST	**Bucharest**	942	61.2
TIMIS	**Timisoara**	82	5.3
BIHOR	*Oradea*	56	3.6
CLUJ	**Cluj-Napoca**	45	2.9
CONSTANTA	**Constanta**	45	2.9
ARAD	*Arad*	35	2.3
HARGHITA	Gheorghieni, Odorheiu Secuiesc, Miercurea-Ciuc	35	2.3
BRASOV	**Brasov**	33	2.1
SIBIU	*Sibiu*	33	2.1
MURES	*Tirgu Mures*	22	1.4
DOLJ	**Craiova**	21	1.4
BACAU	*Bacau*	20	1.3
IASI	**Iasi**	20	1.3
PRAHOVA	**Ploiesti**	19	1.2
ARGES	*Pitesti*	16	1.0
COVASNA	Sfantul Gheorghe, Targu Secuiesc	15	1.0
MARAMURES	*Baia Mare*	10	0.7
SUCEAVA	*Suceava*	8	0.5
DIMBOVITA	Targoviste	8	0.5
BISTRITA-NASAUD	Bistrita	7	0.5
HUNEDOARA	Deva	7	0.5
GALATI	**Galati**	7	0.5
NEAMT	*Piatra Neamt*	7	0.5
VALCEA	*Rimnicu Vilcea*	7	0.5
BRAILA	*Braila*	6	0.4
VRANCEA	*Focsani*	6	0.4
GIURGIU	Giurgiu	6	0.4
CARAS-SEVERIN	Resita	6	0.4
SATU MARE	*Satu Mare*	6	0.4
ALBA	Alba Iulia	5	0.3
IALOMITA	Slobozia, Fetesti	5	0.3
TOTAL		*1540*	*100.0*

Notes: The statistics in this table include all manufacturing establishments with at least $10,000 in foreign capital which are either 100 percent foreign-owned or have a physical person as a domestic partner. *Source*: Authors' calculations based on data from the Romanian Development Agency. Cities in **bold** have a population >250.000. Cities in *italic* have a population between 100,000 and 250,000. All other cities have a population between 50,000 and 100,000.

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TABLE 2
Distribution of Manufacturing Establishments with Foreign Participation by Year of Establishment

Year	Number	Percent
1990	21	1.4
1991	30	2.0
1992	57	3.7
1993	78	5.1
1994	360	23.4
1995	377	24.5
1996	359	23.3
1997	258	16.8
Total	*1540*	*100.0*

Notes: The statistics in this table include all manufacturing establishments with at least $10,000 in foreign capital which are either 100 percent foreign-owned or have a physical person as domestic partner. *Source*: Authors' calculations based on data from the Romanian Development Agency.

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TABLE 3
Distribution of Manufacturing Establishments with Foreign Participation by Industry, 1997

Industry	Number	Percent
Metal products, machinery & equipment	73	4.7
Electronics & electric apparatus	121	7.9
Chemicals	163	10.6
Wood	163	10.6
Light industry [i)]	378	24.6
Food	616	40.0
Publishing & printing	18	1.2
Nonmetallic minerals	8	0.5
Total	*1540*	*100.0*

Notes: The statistics in this table include all manufacturing plants with at least $10,000 in foreign capital. [i)] Includes textile, clothing, leather & shoes. *Source*: Authors' calculations based on data from the Romanian Development Agency.

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TABLE 4
Description of Explanatory Variables

Variable	Definition	Expected Sign	Source	Descriptive Statistics of the Untransformed Variable	
				Mean	Std. Dev.
Industry-specific foreign agglomeration	Log of number of plants with foreign participation in the same industry as the investor per km^2	+	RDA, yearly data from 1990 to 1996	0.04	0.05
Industry-specific domestic agglomeration	Log of number of domestic plants with 20 or more employees in the same industry as the investor per km^2	+	CCIR, 1994 and 1996	0.03	0.03
Service agglomeration	Log of total employment in the tertiary sector (business and financial services) per km^2	+	Annual Statistical Abstract of Romania, yearly data, 1991 to 1996	35.16	27.41
Diversity of the economy	Log of Herfindahl index[1]	-	TEMPO database (https://statistici.insse.ro/shop/?lang=en), yearly employment data, 1991-1996	0.19	0.04
Border industry-specific foreign agglomeration	Log of sum of number of plants with foreign participation in the same industry as the investor in all counties bordering the county of choice per km^2	+	RDA, yearly data from 1990 to 1996	0.0004	0.0008
Border industry-specific domestic agglomeration	Log of sum of number of domestic plants with 20 or more employees in the same industry as the investor in all counties bordering the county of choice per km^2	+	CCIR, 1994 and 1996	0.003	0.002
Border service agglomeration	Log of total employment in the tertiary sector (business and financial services) in all counties bordering the county of choice per km^2.	+	Annual Statistical Abstract of Romania, yearly data, 1991 to 1996	0.98	0.65
Border diversity of the economy	Log of border Herfindahl index [2]	-	TEMPO database, yearly employment data, 1991 to 1996	0.20	0.02
Labor costs	Log of manufacturing monthly real wage (in 1990 lei)	-	Annual Statistical Abstract of Romania, yearly data, 1993 to 1996	1,960.15	278.89
Unemployment rate	Log of unemployment rate (as share)	?	Annual Statistical Abstract of Romania, yearly data, 1991 to 1996	0.06	0.03
Labor conflicts	Log of number of labor conflicts per 100,000 employees in the manufacturing sector	-	Annual Statistical Abstract of Romania, yearly data, 1992 to 1996	15.18	8.95
High-schools	Log of number of high-schools per 100,000 employees	+	Annual Statistical Abstract of Romania, yearly data, 1990 to 1996	15.73	5.93

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TABLE 4—*Continued*

Variable	Definition	Expected Sign	Source	Descriptive Statistics of the Untransformed Variable	
				Mean	Std. Dev.
Vocational/apprentice schools	Log of number of vocational/apprentice schools per 100,000 employees	+	Annual Statistical Abstract of Romania, yearly data, 1990- 1996	8.59	3.48
Regional GDP	Log of regional real GDP (in billion 1990 lei)	+	Territorial Statistics, 1997, (https://statistici.insse.ro/catalog/?page=publD&lang=en&publ_id=162) yearly regional GDP data for 1995 and 1998, and Annual Statistical Abstract of Romania, yearly national GDP data from 1990 to 1996	165.96	60.30
Railroad density	Log of (railroad length/county area)	+	Annual Statistical Abstract of Romania, 1990	0.13	0.06
Road density	Log of (road length/county area)	+	Annual Statistical Abstract of Romania, 1990	0.38	0.07

Notes: As indicated in the Source column, for some variables, data was not available for the beginning of our study period. We imputed the missing values of all these variables, except labor costs (wage) and regional GDP, with their values for the first available year of data. We imputed the missing labor cost values via extrapolation of the available years of data based on the average annual wage growth during these years. We imputed the missing GDP values as follows: first, we computed the share of each region in total GDP for 1995 and 1998, and the annualized change in these shares between 1995 and 1998 (i.e., (share1998-share1995)/3); second, we applied the annualized change in shares to the 1995 shares, to impute the shares for 1990-1996; finally, we used the imputed regional shares and the total GDP to compute the regional GDP for1990-1996. The untransformed variables, for which the statistics are shown, represent average values over the two years immediately preceding the year of the foreign plant set-up. The numerators of the density measures for the industry-specific foreign and domestic agglomeration variables are computed respectively as one plus the average number of foreign plants in the establishment's industry over the previous two years and domestic establishments in that industry, to avoid taking the log of zero for counties with no prior investment. This specification follows HEAD *et al.* (1995), and is consistent with the idea that prospective agglomeration includes the prospective investor. For the same reason, the Unemployment Rate variable is computed as log of 0.001 plus the average unemployment over the previous two years; and the Labor Conflicts variable is computed as log of 0.1 plus the average number of conflicts per 100,000 employees over the previous two years.

[1)] Herfindahl index = $\sum_{i=1}^{n} E_i^2$, where n=the number of economic sectors (up to 17 sectors), and E_i = the proportion of county employment that is located in the ith sector.

[2)] Border Herfindahl index is computed using the same formula as above, where n=the total number of economic sectors in all counties bordering the county of choice, and E_i = the proportion of employment in all counties bordering the county of choice that is located in the ith sector

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TABLE 5
Conditional Logit Estimates

Variables	Location Choice = County					
	Model 1			Model 2		
	Coefficient		Elasticity	Coefficient		Elasticity
	(1)		(2)	(3)		(4)
Industry-specific foreign agglomeration	0.4601	***	0.4452	0.1590	*	0.1538
	(0.0640)			(0.0819)		
Industry-specific domestic agglomeration	0.2941	***	0.2846	0.3632	***	0.3514
	(0.0844)			(0.0927)		
Service agglomeration	0.7450	***	0.7210	1.2344	**	1.1946
	(0.1580			(0.5230)		
Diversity of the economy	-0.7002	***	-0.6777	1.1275		1.0911
	(0.2698)			(1.1756)		
Border industry-specific foreign agglomeration	0.0916		0.0886	0.0374		0.0362
	(0.0783)			(0.0899)		
Border industry-specific domestic agglomeration	0.3854	***	0.3730	0.6032	***	0.5837
	(0.1220)			(0.1305)		
Border service agglomeration	-0.7152	***	-0.6921	0.0481		0.0465
	(0.1717)			(1.0232)		
Border diversity of the economy	0.3426		0.3315	3.4747		3.3626
	(0.4092)			(2.9795)		
Labor costs	0.2136		0.2067	-1.0628		-1.0285
	(0.5272)			(1.2919)		
Unemployment rate	-0.5023	***	-0.4861	0.0828		0.0801
	(0.1177)			(0.1807)		
Labor conflicts	-0.0120		-0.0116	-0.0874	*	-0.0845
	(0.0340)			(0.0514)		
High-schools	1.8924	***	1.8314	-0.5218		-0.5050
	(0.4027)			(1.2583)		
Vocational/apprentice schools	0.3410		0.3300	0.7058		0.6831
	(0.4251)			(0.8672)		
Regional GDP	0.1371		0.1327	-1.7221		-1.6665
	(0.3490)			(2.3776)		
Railroad density	0.5440	***	0.5265			
	(0.1666)					
Road density	-0.2127		-0.2059			
	(0.3096)					
Bucharest dummy	-1.5853	**	-1.5341	-0.5779		-0.5593
	(0.6435)			(3.0816)		
County fixed effects	No			Yes		
Log likelihood	-2853.0			-2772.0		
Number of choices	31			31		
Number of investors	1519			1519		

Notes: *** denotes 1% significance level; ** denotes 5% significance level; * denotes 10% significance level. Standard errors are in parenthesis.

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Notes

[1] Romania consists of 41 counties plus Bucharest. The capital, Bucharest, does not have the formal status of a county but we include it in our choice set because it is an important potential location choice for foreign investors. Our choice set only consists of 30 counties plus Bucharest. Following HEAD *et al.* (1995) we eliminate location choices that received fewer than 4 foreign greenfield investments. A Romanian county has on average a surface area of 5,792 km^2 and a population of 544,637.

[2] While the surface area of the average Romanian county may seem large for the MARSHALLian notion of agglomeration (which has been traditionally associated with the notion of industrial district), the vast majority of counties in our sample consists of one dominant city/district with a clearly identifiable 'agglomeration of industrial activity'. To give a few representative examples: Ploiesti, the dominant city of the Prahova county, is the center of the oil and petroleum industry in Romania and has a strong related textile manufacturing industry. The oil industry alone constitutes almost 50% of the county's industrial production (WIKIPEDIA). Pitesti, the dominant city of the Arges county, is the center of the automotive industry in Romania and one of the most industrialized cities in the country. Finally, Galati, the capital of the Galati county, consists of the country's biggest metallurgical complex and its second biggest shipyard. 55% of Romania's steel is produced in Galati (WIKIPEDIA). Only 3 of the 31 counties do not have one dominant city/district but consist of two or three smaller cities. For details see Table 1. It should be noted that the choice set in our study coincides better with the typical notion of agglomeration than in most other studies.

[3] See DE MELLO (1997 and 1999) for a comprehensive survey on the relationship between FDI and growth and AITKEN and HARRISON (1999) for a critical assessment of the claim. The empirical research on the FDI-growth relationship in transition/developing countries suggests overall that FDI has a positive impact on growth (e.g., BORENSZTEIN *et al.,* 1998, BALASUBRAMANYAM *et al.,* 1999, and VOICU, 2000).

[4] Recent studies suggest that there are also important differences among foreign investors in their valuation of location factors depending on their nationality. For example, CROZET *et al.* (2004) find that Italian firms investing in France are much more sensitive to wage differentials and show little tendency to agglomerate compared to other foreign investors. Unfortunately, we do not have information on the home country of foreign investors, hence, are not able to test the proposition that the relative importance of certain determinants of FDI location varies by the investor's country of origin.

[5] Manufacturing industries in Romania have clustered in resource rich areas (e.g., wood-processing factories are located in wood-rich areas, oil refineries and chemical plants that use oil as inputs have clustered around

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oil fields) even during communism. That is, even though under the communist regime the firms were not maximizing profits for shareholders, they nevertheless tried to minimize transportation costs in order to maximize the revenue that could be used for purposes other than distribution to investors. Post 1989 we can assume that both foreign *and* domestic investors choose the location that yields the highest profit.

[6] NUTS is the official classification for EU regions. NUTS 1 are typically very large regions. Portugal and Ireland are NUTS 1 regions. NUTS 2 are smaller geographical areas but they often still significantly stretch the MARSHALLian notion of agglomeration in the sense of 'industrial district'. Romanian counties are NUTS 3 regions, which appear to be the most accurate geographical area, at least in the case of Romania, most closely reflecting the notion of 'industrial district'.

[7] In the regression models, the number of observations (choosers) is slightly smaller (1519) since we exclude the plants setup in 1990. However, the plants established in 1990 are used in the calculation of the foreign agglomeration variable for all subsequent setups.

[8] Given that the pace of the economic restructuring reform was slow in Romania for much of the 1990s, there was fairly little variation in the number of domestic manufacturing enterprises, especially during the first half of the decade. Therefore, the two years for which the domestic plant counts are available should be enough to adequately capture domestic agglomeration economies over the whole study period.

[9] The 17 economic sectors used to compute the Herfindahl index are: agriculture/hunting/forestry; fishing; forestry; manufacturing; extractive industry; utilities; constructions; trade; hotels/restaurants; transportation; financial intermediation; real estate/renting/business activities; telecom/postal services; public admin/ defence; education; health/social security; other activities. We also computed an *entropy* measure of diversity externalities. Our main findings are virtually unchanged if we use this alternative measure.

[10] In addition, population density is highly correlated with the service agglomeration measure (the correlation coefficient is 0.939). Thus, its inclusion would likely generate a multicollinearity problem.

[11] We use average values over two years to reflect that the various effects may extend over a period of time. For foreign plant set-ups in 1991, we use the 1990 values of the time-variant explanatory variables. Alternatively, we could exclude plant set-ups in 1991 from our analysis. However, this approach would reduce the temporal variation in our data. This would be particularly problematic given that our dataset only includes seven years of data and given that in our county fixed effects specification most coefficients are estimated based solely on the temporal variation exhibited by the explanatory variables (the only exceptions are the industry-specific foreign and domestic agglomeration coefficients which use both temporal and industry variation).

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