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Network and Border Effects: Where Do Foreign Multinationals Locate in Germany?

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Abstract

This study assesses the determinants of location choices of foreign multinational firms at the level of German federal states. Adjacency and existing firm networks are assumed to influence the investors' profits in a given location by overcoming informational disadvantages when entering the new market. A nested logit model resembles the structure of the location choice process well, since it allows foreign investors to have differing perceptions about the substitutability among East and West German federal states. By using affiliate-level data between 1997 and 2005, the results confirm that firms react positively to local demand, a common border and existing firm networks, while unit labor costs exhibit the expected negative impact. In the sectoral estimations, it is shown that these effects vary in their relevance across manufacturing and service affiliates, and between upstream and downstream activities and that intersectoral linkages play an important role.

Keywords: Location choice, multinational firms, nested logit model
JEL: F23, R39

1. Introduction

The reunification of the formerly separated East and West German federal states in 1990 entailed exceptional interregional differences within one country. Today, almost 20 years after the fall of the Berlin wall, a huge rift persists along various characteristic lines: low productivity, high unemployment and low network effects keep drawing down the attractiveness of the East German federal states for private investment in general, and for Foreign Direct Investment (FDI) in particular (see Uhlig, 2008). Over the period 1997-2005, only around 10% of all Multinational Enterprises' (MNE) affiliates were established in East Germany, half of which in Berlin (by contrast, its share of overall business registrations and taxpaying units nearly amounts to the double (see Table A.1)). Buch and Toubal (2009) confirm a low integration of East Germany into international markets with respect to trade and migration as well. Although these measures report a considerable dispersion also across West German federal states, it seems fair to state that multinational activity has not yet contributed to closing the East-West gap.

In response to the New Economic Geography (NEG) framework by Krugman (1991), a range of empirical studies emerged investigating the regional and urban determinants in the location decisions of firms (see e.g. Crozet et al., 2004 for France; Barrios et al., 2006 for Ireland and Basile, 2004 for Italy). In Germany, media and academic research have been heavily concerned with firms shifting their production facilities to low cost countries while staying comparably silent about the determinants and effects of inward FDI. Although recent papers find a significant positive impact of inward FDI on domestic firms (see e.g. Javorcik, 2004) and on the local economy (see e.g. Bitzer and Görg, 2008), there exists – to the best of my knowledge – no study investigating the regional determinants of the location choices of foreign multinationals in Germany.

In accordance with advances in location choice theory, this study adopts a monopolistic competition framework and assumes that a firm decides for a certain location if the achievable profits outweigh the profits that can be gained in all other available locations

(for similar approaches compare also Head and Mayer, 2004; Inui et al., 2008 and Mayer et al., 2007). Among the variables influencing a firm's profit, special attention is laid on the fixed costs of market entry. Helpman et al. (2004) note that the fixed costs of establishing an affiliate abroad involve a plant- and a country-(or region-)level part. Fujita and Thisse (1996) point out that the location choice of an MNE might depend crucially on information spillovers arising from industry clusters.[1] Although the authors originally thought of spillovers as improving the production function, they can – if specific to each German federal state – drive a wedge between the entry costs into the potential markets. In addition to network effects, adjacency to the source country may drive down fixed costs through information advantages. Thus, if fixed costs are a decisive parameter for market entry of foreign multinationals and vary across German federal states, they might explain part of the regional dispersion of the locations of MNEs' affiliates. Hence, this study lays some importance on identifying these costs.

The fixed costs specification through national industry clusters and common borders suggests that the determinants of inward FDI vary among investors from different countries of origin as well as across sectors. Recent studies support a more differentiated examination of MNE activity. In particular, the distinct role of trade affiliates (as opposed to foreign production plants or to other export modes) has called a lot of attention in the theoretical (Krautheim, 2007) and the empirical literature (Hanson et al., 2001). Interregional differences may, consequently, also translate into a distinct sectoral composition of multinational activity.

This study aims at explaining the regional dispersion of foreign multinationals' affiliates by exploiting the firm-level Micro database Direct Investment (MiDi) of the Deutsche Bundesbank. The MiDi is a full sample survey of foreign firms' affiliates in Germany.[2]

[1] Starting with Head et al. (1995), network effects have been identified in numerous empirical studies as a main determinant of MNEs' location choices (see e.g. Head et al., 1999, Guimaraes et al., 2000 and Crozet et al., 2004).

[2] Investment enterprises with a balance sheet total below a certain threshold do not need to be

Merging the FDI data at the level of individual affiliates with information on German federal states extracted from the Federal Statistical Office gives a very rich database that allows assessing the impact of the theoretically derived regional drivers of inward FDI. The conditional logit and the nested logit model are employed to estimate the relative probability with which a multinational investor chooses a certain location. By relaxing the restrictive Independence of Irrelevant Alternatives (IIA) property, the nested logit is able to account for expected differences between East and West German federal states as location alternatives.

The analyses of this study add to the existing literature in three aspects: first, the combination of FDI data at the affiliate-level with regional data at the level of German federal states allows for a thorough assessment of the determinants of location choices of MNEs within Germany. Second, by explicitly modeling the fixed costs of firm entry, a border dummy and agglomeration variables are formally included into the empirical set-up. Third, the empirical evidence equips policy makers with useful information on how to attract MNEs in general and MNEs that have specific home countries and that operate within certain sectors.

The paper proceeds as follows: Section 2 lays out the theoretical model which motivates the empirical specification. Section 3 describes the estimation strategy with the conditional and the nested logit model. After presenting some descriptive statistics on the dependent variable in Section 4.1, the independent variables are explained in Section 4.2. Section 5 discusses the results of the empirical examination. Section 6 concludes.

2. Theoretical Background

This section derives an empirically testable equation of firm's location choices (Section 2.1) and discusses the particularities of different sectors (Section 2.2).

reported. Since 2002, this threshold corresponds to a balance sheet total up to and including three million €.

2.1. Deriving a Testable Equation

Multinational firms face a set of location options when deciding to undertake an investment abroad. The selection of a particular location depends on the potential profits associated with that location exceeding the potential profits associated with all other available locations. This study follows Redding and Venables (2004), Amiti and Javorcik (2008) and Mayer et al. (2007) in adopting a Dixit-Stiglitz-type monopolistic competition model and extends it with regard to the specification of fixed costs and internal market access. The total profits of a single representative firm located in federal state i but selling in all federal states j can be described as[3]

$$\Pi_i = \sum_j \left[(1 - t_i) \left(p_{ij} - c_i \phi_{ij} \right) x_{ij} \right] - f_{ik} \tag{1}$$

with p_{ij} representing the prices at which the firm sells its output x_{ij} in the j available federal states. The firm's profits are reduced by the taxes t_i a firm has to pay in federal state i, by the marginal costs of production $c_i = w_i^{\alpha} r_i^{\beta}$ (with labor and land as the two production factors and wages and land rents as their prices), by the iceberg-type transport costs ϕ_{ij} and by the sunk fixed costs of the investment, f_{ik}. According to Helpman et al. (2004), fixed costs are higher for foreign than for domestic firms, because the former face an informational disadvantage when entering a new market.[4] The fixed costs

$$f_{ik} = \left(N_{ik} Z_i^{1-\sigma} \right)^{1/1-\sigma} \tag{2}$$

depend on the inverse of the costs of entry into a foreign market Z_i and on the costs

[3]Firm heterogeneity in the spirit of Melitz (2003) cannot be assessed with the available information in the MiDi. For this reason, the simple model assumes one representative firm.

[4]In contrast to the proximity-concentration literature, firms have to cover fixed costs only when setting up an additional affiliate abroad; exporting the output to any other market is only subject to variable transport costs.

of duplicating overhead production N_{ik}. Variables in Z_i are federal state- and origin country-specific, whereas the number of firms, N_{ik}, may also vary among industries (the index of the source country is omitted for the sake of simplicity). Both variables are assumed to reduce the informational disadvantage of foreign firms and facilitate thereby the entry into a specific federal state i.[5] In line with the propositions of Fujita and Thisse (1996), N_{ik} is an agglomeration variable that entails spillovers among firms from the same sector and the same country of origin.[6] In the present set-up, a high elasticity of substitution $\sigma\,(\sigma > 1)$ and thus, intense competition will, however, reduce each firm's willingness to share information with new entrants. Hence, the positive externalities among firms in a certain location decrease with σ.

$$x_{ij} = \frac{E_i P_i^{\sigma-1}}{\phi_{ii}^{\sigma-1} p_i^{\sigma}} + \sum_l \frac{E_l P_l^{\sigma-1}}{\phi_{il}^{\sigma-1} p_i^{\sigma}} \tag{3}$$

is the effective demand level for the products sold by an affiliate in all federal states depending positively on the expenditure shares E_i and E_j and negatively on the mill price p_i. It is assumed that a multinational firm can either sell its output in the chosen federal state i or in all other federal states $L\,(l \in L)$, but not abroad. In either case, goods face iceberg-type trade costs $\phi_{ii}\,(\phi_{il})$ before reaching their final destination. With the underlying demand curve, a firm will charge the prices

$$p_{ii} = \frac{c_i \sigma}{\sigma - 1} \phi_{ii} \text{ and} \tag{4a}$$

$$p_{ij} = \frac{c_i \sigma}{\sigma - 1} \phi_{il} \tag{4b}$$

[5] A high number of firms in an industry also reflects low plant-level economies of scale. This interpretation corresponds more closely to Helpman et al. (2004)'s definition of the plant-level part of fixed costs.

[6] Head et al. (1999) argue that foreign investors may only receive signals about the profitability of a certain location and therefore simply mimic other investors' choices. Following that argumentation, empirical studies, like e.g. Crozet et al. (2004), include the number of foreign firms of the same nationality present in the region as an explanatory variable.

in the home state i and in all other federal states L respectively; the mark-up over the marginal costs depending negatively on the elasticity of substitution. A few mathematical transformations lead to the testable equation

$$\Pi_i = (1-t_i)\,\frac{\left(w_i^{\alpha} r_i^{\beta}\right)^{1-\sigma}}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}\left(\frac{E_i P_i^{\sigma-1}}{\phi_{ii}^{\sigma-1} p_i^{\sigma}} + \sum_l \frac{E_l P_l^{\sigma-1}}{\phi_{il}^{\sigma-1} p_i^{\sigma}}\right) - f_{ik} \qquad (5)$$

which motivates the following log-linear empirical specification where variables are allowed to vary over time

$$\begin{aligned}\ln \Pi_i = \gamma_0 + \gamma_1 \ln t_{it} + \gamma_2 \ln w_{it} + \gamma_3 \ln r_{it} + \gamma_4 \ln MA_{it} + \gamma_5 \ln \phi_{iit} \\ + \gamma_6 \ln \sum_l \frac{MA_{lt}}{\phi_{il}} + \gamma_7 \ln N_{ikt} + \gamma_8 Z_i + \nu_i + \epsilon_{ikt}. \qquad (6)\end{aligned}$$

Equation (6) subsumes the demand and the price indices into an internal and an external market access variable (MA_{it} and MA_{lt}). It also includes region dummies to account for unobserved heterogeneity among location alternatives such as the elasticity of substitution σ.

2.2. Sector-Specific Effects

Although equation (6) describes the profits of a representative firm, the influence of the independent variables may in fact vary for investors from different countries and operating in different sectors. In an empirical paper, Hanson et al. (2001) emphasize that the motives underlying the establishment of wholesale and manufacturing affiliates differ and propose, therefore, a distinction of distribution- from production-related FDI activities. In this spirit, Krautheim (2007) shows that the decision between various entry modes (in particular, these are exports and FDI through wholesale affiliates or through production plants) depends on their distinct cost structures. Although the present analysis assumes that the fundamental investment decision has already been

taken, and that the only choice that has to be made is the affiliates' location, a sectoral view seems appropriate.

A simple discrimination of manufacturing from service industries misses out the specific role of wholesalers and retailers. In line with Defever (2006), this study additionally distinguishes upstream and downstream activities. Downstream activities correspond to the post-production distributional activities of wholesalers and retailers. Upstream activities subsume the pre-production stage activities of R&D centres and headquarters. Weichenrieder and Mintz (2007) argue that, apart from taxes, the economically efficient bundling of activities in one country motivates the existence of holding companies. In this sense, holdings act as local or third country headquarters and can be perceived as undertaking upstream management or coordination activities for the corporate group.[7] Despite of the notion of Weichenrieder and Mintz (2007), their classification as a pre-production service is, however, at best an approximation of upstream activities. In fact, the heterogeneous nature of holdings would require more detailed information about actual occupations and tasks for which data is not available in the MiDi.

Very recently, the interdependence of the location choices of different FDI activities has called the attention of researchers.[8] Defever (2006) and Nefussi and Schwellnus (2007) provide evidence of complementarity between service and manufacturing acitivities within firms and across firms, respectively. In contrast, the linkages between the manufacturing and the wholesale and retail sector seem much weaker. Nefussi and Schwellnus (2007) further argue that the complexity of business services introduces a consumption bias of manufacturers towards service providers from the same country. Hence, the authors

[7] There is neither a legal definition of the term "holding", nor is it consistently used in the economic literature. Some authors suggest understanding a holding company as an organizational form, dedicated at holding a long-term participation in another legally independent firm. In this sense, a holding company undertakes management functions for the corporate group without being involved in the operational business (Lutter, 1995). Other authors explain the existence of holdings as a means to save taxes, since they allow MNEs to make use of differing tax treaties between countries ("treaty shopping") (Weichenrieder and Mintz, 2007).

[8] I am grateful to one of the anonymous referees for raising the issue.

model the intersectoral linkages as country-specific.

In a nutshell, this study assumes fixed costs to play a predominant role in the profit maximizing location choice of a firm. The adopted specification assumes that existing firm networks and adjacency to the country of origin mitigate the information disadvantages of foreign over domestic firms and facilitate thereby the entry into a specific federal state. The theroretically derived location choice determinants are expected to vary across different source countries and across sectors. Against the background of a recently raising interest in occupational and sectoral differences in firm internationalization, manufacturing and services and upstream and downstream activities will separately be examined.

3. Empirical Methodology

While the actual profits associated with each location cannot be observed, information about the location choice and regional characteristics is available. The conditional (fixed effects) logit model describes a firm's location decision by estimating the relative probability of choosing a certain location i in dependence of its own characteristics x_i and of the characteristics x_l of all alternative locations L (see e.g. Train, 2003 for a detailed description),

$$P_i = \frac{\exp(\gamma x_i)}{\sum_l \exp(\gamma x_l)}. \tag{7}$$

The error terms follow an extreme value distribution which ensures the somewhat restrictive IIA property. Equation (7) reveals that the ratio of probabilities of investing in two locations is independent of the characteristics of the other alternatives. Hence, all alternatives exhibit the same degree of substitutability. This property is likely to be violated with data on location decisions of MNEs in Germany since the motives for undertaking a direct investment in distinct regions could differ. E.g., investors may

take advantage of the persistent gap between Eastern and Western federal states to pursue differing strategies with affiliates in the two regions. Hence, it seems apt to assume that these investors do not perceive all German federal states as being equal substitutes one to another. If this assumption was true, the standard conditional logit model would, due to its IIA property, underestimate the probability of investing in some states and overestimate the probability of investing in other states. Although region-specific fixed effects help to mitigate unobserved correlations among alternatives, the strategy is costly and does not resolve problems associated with cross-sectoral, cross-country or intertemporal differences in the perceived attractiveness of German federal states (see Section 5.1 for a discussion).

The nested logit model relaxes the IIA property by partitioning the set of alternatives into subsets. Within the specified nests, the unobserved factors ϵ_i are allowed to be correlated while independence continues to hold across nests. For the present analysis, it appears plausible to assume that foreign investors choose between East and West Germany in the upper level and between federal states within the two subsets in the lower level model.[9] Consequently, the probability of choosing federal state i depends on the product of two probabilities: the probability of choosing federal state i conditional on having decided for nest n $\left(P_{i|n}\right)$ times the marginal probability of choosing nest n (P_n). This can formally be expressed as

$$P_{in} = \frac{\exp\left(\gamma x_{in}\right)}{\sum_{l \in n} \exp\left(\gamma x_{ln}\right)} \frac{\exp\left(\rho z_n + \lambda_n IV_n\right)}{\sum_m \exp\left(\rho z_m + \lambda_m IV_m\right)} \tag{8}$$

where $IV_n = \ln\left[\sum_{l \in n} \exp\left(\gamma x_{ln}\right)\right]$ is called the Inclusive Value (IV) and gives the expected profit an average investor receives from choosing a location i within nest n.

[9]The division into an upper and a lower level decision does not imply a sequential decision making process. Even when investors have decided for a certain nest, they still have some probability to choose a federal state from another nest, although this probability decreases in the preference towards the chosen nest.

Its estimated parameter λ_n reflects the degree of independence between the unobserved portions of the profit functions. For $\lambda_n = 1$, the alternatives are completely independent and the nested logit model collapses into the conditional logit model described above. For $\lambda_n = 0$, alternatives within nests are perfect substitutes and only the nest choice matters for the location decision. McFadden (1978) shows that the nested logit specification is consistent only with random utility maximization if λ_m is significantly estimated to lie in the range of [0;1] $\forall m$.

A potential problem arises with respect to the availability of data. First, the firm-level database MiDi contains information about the federal state, in which an MNE's affiliate is located, but not about the foreign investor. Hence, the location choice is assumed to be made upon regional characteristics only. While this limitation inhibits the assessment of a Melitz-type firm heterogeneity, heterogeneous responses to differing location characteristics could be accomodated within a random parameters model like the mixed logit model (for an application, see e.g. Basile et al., 2008). The choice of the less flexible nested logit model seems nevertheless justified here by the valuable insights it provides into East-West disparities within Germany. Second, by construction, the sample is restricted to multinational firms and excludes domestic firms and exporters. Hence, it is not possible to model a discrete choice process with a first step decision on the entry mode and a second step decision on the chosen location as proposed by Mayer et al. (2007). As Basile et al. (2008) point out, however, this shortcoming does not affect the explanatory variable coefficients if the error terms of the two nests (entry mode and location choice) are uncorrelated. In this case, changes in the profitability of one entry mode entail proportional changes in the profitability of each location choice without affecting the odds ratios.

4. Data and Variables

Section 4.1 provides a short description of the MiDi and how the dependent variable has been extracted from the database. It continues with giving some descriptive evidence of the distribution of MNE affiliates across German federal states. Section 4.2 explains the construction of the explanatory variables measuring the location choice determinants.

4.1. The Dependent Variable

The data on inward FDI come from the firm-level MiDi provided by the Deutsche Bundesbank (for details on this database see Lipponer (2008)). The MiDi is an annually conducted full sample survey of foreign firms' affiliates in Germany. Direct investment enterprises with a balance sheet total below a certain threshold (currently three million € with a participation share of 10%) need not be reported, and the reporting limits have changed over time. To avoid changes in the explanatory variables resulting from changes in reporting limits, all observations that are not covered by the most restrictive reporting requirement are dropped. At the regional level, this study distinguishes FDI projects into 16 German federal states which correspond to the Nomenclature des unités territoriales statistiques (NUTS) I regions of the European Union (EU).[10] Yet, the location of the firms' affiliates may not coincide with the state in which they have their main production units. While this fact may lead to incorrect inferences with respect to the intensive margins of FDI activity, the extensive margin is less affected. Hence, this study focuses on the location choices of MNEs' affiliates and refrains from making statements about sales or employment levels.

In addition to the chosen federal state, information on the sector groups of the affiliates can be retrieved from the MiDi. The over 100 NACE Rev. 1 sectors are, for

[10] First-tier investments (direct) are recorded if the reporting enterprise is majority-owned. Lower-tier investments (indirect) are recorded if the majority-owned reporting enterprise or its 100% affiliates hold at least 10% in other resident enterprises. While the MiDi comprehends all investment enterprises, it does not contain information about individual operating establishments.

the purpose of this study, aggregated into 37 broader industries. In order to capture the initial location choice, each affiliate enters the estimation sample only once – in the founding year. Thus, if an affiliate has parents from several countries, it is attributed to the country of origin of the first investor.[11] For this reason, the original worldwide country sample reported in the MiDi reduces here to 79 countries that have established an affiliate in Germany within the considered time frame 1997-2005. In principle, the MiDi is a panel dataset since 1996. To ensure, however, that only newly established affiliates are considered, affiliates already present in 1996 are excluded from the calculations.

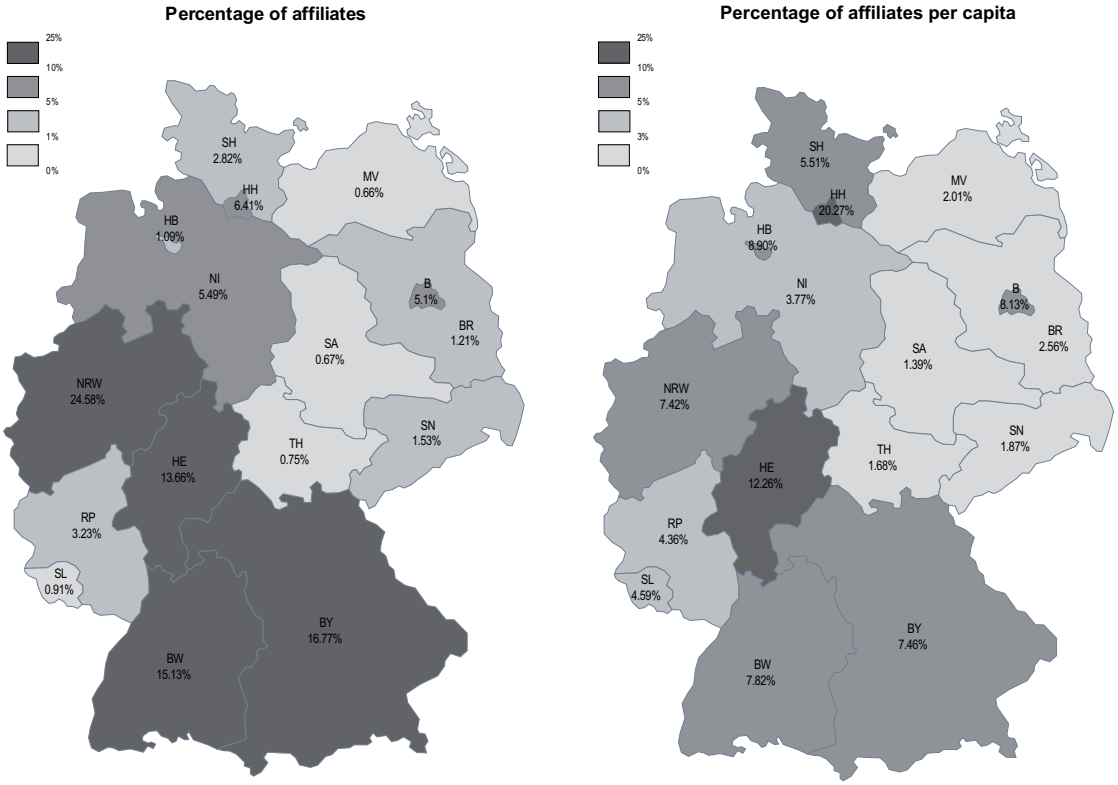
Figure 1 gives an overview of the distribution of foreign affiliates within Germany. The left map plots the percentage of affiliates established in each federal state over the period 1997-2005. Three regional groups can be distinguished. North Rhine-Westphalia, Bavaria, Baden-Wurttemberg and Hesse hosted over 70% of all foreign multinationals' between 1997 and 2005. In contrast, the nine lowest ranked states together did not even attract 10% of all investment objects. Although there is some variation also within the Eastern and the Western part of Germany, the geographical distribution of affiliates translates into an East-West disruption.[12] While foreign investors established 766 affiliates in an average West German federal state between 1997 and 2005, they founded during the same time only 141 affiliates in an average East German federal state.[13] This observation holds generally true for the percentage of per capita investments, plotted in the map on the right. With the exception of Berlin, each East German federal state hosted less MNEs' affiliates per capita than each West German federal state between 1997 and 2005.

[11] Less than 10% of all investments are subject to multiple country ownership at the time of their sample entry. In these cases, the affiliate is attributed to the country appearing first in the database. Since countries have not been sorted alphabetically, the allocation of these multiple country affiliates is random, and hence, not systematically affecting the results.

[12] Note that Berlin is attributed to East Germany throughout the analysis.

[13] Buch and Toubal (2009) report similar gaps for the degree of trade openness and immigration. Table A.1 shows that MNE's activities are underrepresented in East German federal states (negative coefficients in columns (4) and (5)) with respect to private investment in general.

Figure 1: Spatial Distribution of Affiliates (1997-2005)



Note: NRW: North Rhine Westphalia; BY: Free State of Bavaria; BW: Baden-Wurttemberg; HE: Hesse; HH: Hamburg; NI: Lower Saxony; B: Berlin; RP: Rhineland Palatine; SH: Schleswig-Holstein; SN: Free State of Saxony; BR: Brandenburg; HB: Bremen; SL: Saarland; TH: Thuringia; SA: Saxony-Anhalt; MV: Mecklenburg-Western Pomerania.

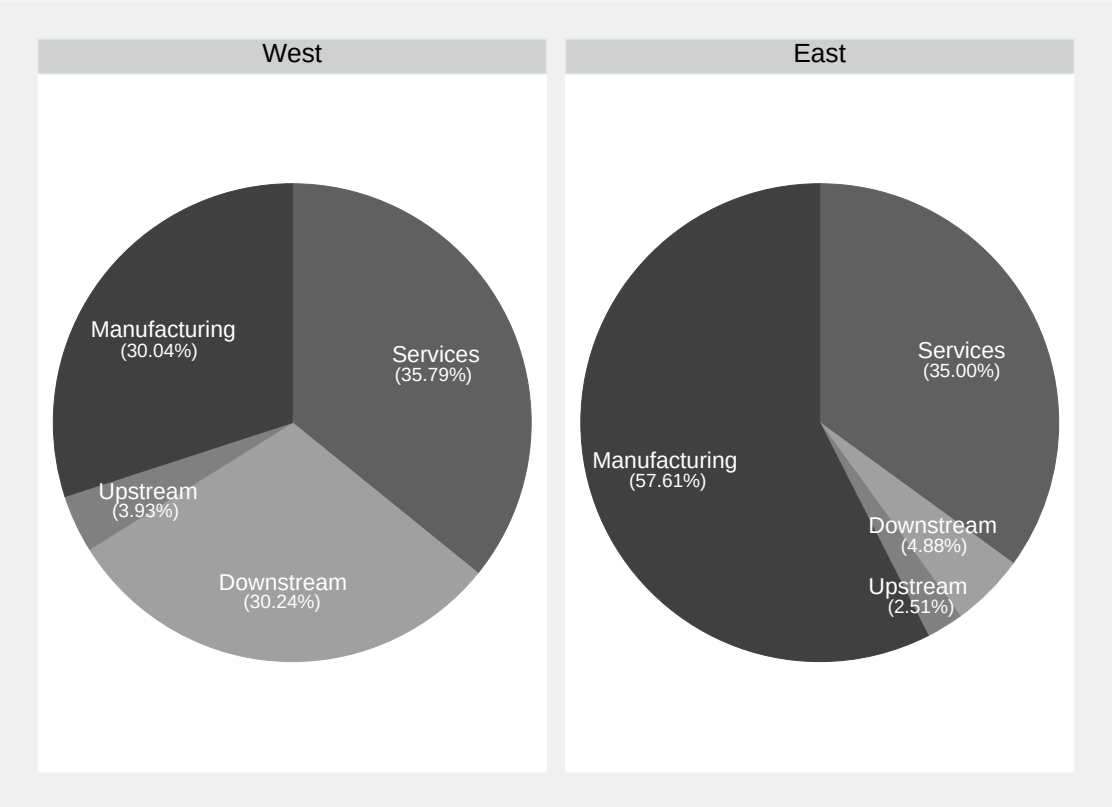
Source: Own calculations. Data from Deutsche Bundesbank.

The regional distribution looks similar for the five most important countries of origin (see Figure A.1), which account for 67% of all affiliate set ups in Germany over the period 1997-2005. It is striking that Switzerland and the Netherlands invest disproportionately into the adjacent federal states of Baden-Wurttemberg and North Rhine-Westphalia, respectively. In contrast, out of the six East German federal states, only Berlin and Saxony appear among the top ten locations of the biggest investors.

East and West German federal states do not only differ in terms of the total number of established MNE affiliates but also in terms of the sectoral composition of inward FDI. Four sectoral groups are considered in this paper: service affiliates, manufacturing affil-

iates and as complementing the latter, upstream (R&D and holdings) and downstream (wholesale and retail) activities. Figure 2 indicates that manufacturing activities make up for a larger part of inward FDI into East Germany, while services and especially downstream activities such as wholesale and retail affiliates are a major factor in West Germany. This seems surprising at first sight since one might expect high-tech manufacturers to be located close to high-skilled human capital in West German industry clusters and downstream activities that do not rely on a specialized labor force to be spread across the country. However, the discussion of Section 2.2 suggests that market access is of predominant importance for downstream activities, which is arguably higher in the West German federal states.

Figure 2: Sectoral Composition of the Total Number of Affiliates in East and West Germany (1997-2005)



Note: The service sector is defined as excluding wholesale, retail and R&D affiliates as well as holdings.
Source: Own calculations. Data from Deutsche Bundesbank.

The descriptive analyses support the theoretically derived location choice determinants. Investors prefer large federal states in the West, where a common border and existing firm networks also facilitate their entry. The tendency towards investing where the sales potential is high gets support from the sector composition of investments. Downstream activities make up for a large part of total foreign investment in the West, while the East hosts mainly manufacturing affiliates.

4.2. The Explanatory Variables

Information on German federal states is extracted from the Federal Statistical Office.[14] In a first set of regressions, the variables derived from equation (5) are considered. The taxes t_{it} are expected to lower a firm's profit in a location. For the present analysis, only those tax rates that vary at the federal state level are included – namely the real estate and the business tax. Wages and land rents are the prices of the two input factors. Following the critique by Bellak et al. (2008), gross wages are not an adequate measure for labor costs, so that unit labor costs are defined instead as

$$ulc_{it} = \left(\frac{w_{it}/emp_{it}}{gva_{it}/emp_{it}} \right) \tag{9}$$

with emp_{it} as the total employment and gva_{it} as the gross value added in federal state i at time t. The unit labor cost measure bears the advantage of being more directly linked to the profitability of FDI.[15] Regions lose competitiveness (and are therefore expected to attract less FDI) if wages are high and/or productivity is low. Market access in the chosen location i, a pull factor for foreign investors, is represented by the GDP of federal state i. Low internal transport costs guarantee a good attainability of potential customers. ϕ_{iit} is therefore approximated by a local infrastructure index, constructed out of the relative

[14] For a complete list of explanatory variables, see Table A.2.

[15] In the absence of a regional price deflator, the unit labor costs are measured in nominal terms. Profitability therefore depends also on a firm's ability to pass on increasing labor costs to the consumer.

length of highways, roads, rivers and the number of airway passengers. Not only the local sales potential, but also the access to other markets influences the location choice of a foreign investor. The external market potential is calculated in accordance with Harris (1954), as the inverse distance-weighted sum of incomes,

$$MP_{lt} = \sum_{l} \frac{MA_{lt}}{\phi_{il}} = \sum_{l} \frac{GDP_{lt}}{dist_{il}}.^{16} \tag{10}$$

With respect to the fixed cost specification, two variables are employed. As it is assumed that investing in an adjacent federal state entails informational advantages, a border dummy serves as a proxy for the regional-level part of fixed costs. The number of affiliates from the same country of origin within an industry approximates the plant-level part of fixed costs. Empirical studies in the spirit of Head et al. (1999) frequently find nation- and industry-specific firm counts to exhibit positive effects on location choices of foreign investors. In order to test whether these positive network externalities are still present among competitors from different countries of origin, a non-nation specific agglomeration variable will additionally be included. Both cluster variables are expected to facilitate the market entry and attract new investors, but to different extents as information fluctuates better within nation-specific networks. In addition to intra-sectoral linkages, this study also analyzes intersectoral linkages to unfold potential complementarities between industries. For that purpose, the sector-specific regressions are repeated including cross-sectoral counts.[17]

[16] Harris (1954) assumes the price indices to equal zero. Redding and Venables (2004) propose a market potential measure that is more rigorously derived from theory. Their approach requires the estimation of a trade equation to obtain the trade cost parameters. Since data on bilateral trade flows among German federal states is not available, market potential is here calculated according to Harris (1954). Head and Mayer (2004) stress that Harris' measure outperforms the approach by Redding and Venables (2004), particularly if national borders do not matter.

[17] To avoid an endogeneity bias in the empirical estimations, variables measuring the costs of the production factors, the market potential and the clustering of firms are lagged by one period. The count of affiliates is then increased by one unit in order to avoid loosing many observations by taking the log of zero.

In a second set of regressions, a number of control variables are added to the baseline specification. With these policy variables, the possibilities of federal state governments to actively undertake measures in order to attract foreign multinationals can be assessed. One important policy field, which remains conducted under the governance of the federal states in Germany, is education policy. Regions compete for the best educational system and substantial differences in the performances are regularly confirmed by the OECD's Programme for International Student Assessment (PISA) study (compare e.g. Heller and Ziegler, 2007). Specifically, I include public R&D expenditures, the share of university graduates and the share of school leavers without a degree to evaluate the importance of research and education for the attractiveness of a federal state. It has to be noted that the ongoing emigration of young skilled East Germans to the West (see e.g. Buch and Toubal, 2009) might considerably weaken the tool of education policy to attract investors. Since the causality between migration, education and employment opportunities is, however, not clear ex-ante, it seems worthwhile to assess these additional controls. Finally, a variable measuring the population density of a federal state will be included. Even more than for the whole sample, this variable is, in the light of the discussion of Sections 2.2 and 4.1, expected to provide new insights at the sector level. Investors seeking for new sales opportunities may prefer to locate their wholesale and retail affiliates in highly populated areas. Manufacturers, in contrast, could even be deterred by a high degree of urbanization.

5. Results

This section presents the results of the conditional and nested logit estimations of the location choices of MNEs in Germany. First, the estimations on the whole sample will be discussed (Section 5.1). Second, the four sector groups will be assessed individually in order to account for potential differences and linkages across them (Section 5.2). Third, the regressions will be run for the five most important countries of origin (Section 5.3).

The continuous variables are throughout taken in logs, which permits an interpretation of the estimated coefficients as the approximate elasticities of the probability of an average investor choosing federal state i (Train, 2003).[18]

5.1. Estimations on the Whole Sample

The results from the nested logit estimation are displayed in Table 1. The Likelihood Ratio (LR) test rejects the null hypothesis of the IIA, hence, the conditional and the nested logit model cannot be perceived as equivalent.[19] For the regressions in columns (1)-(5), the IV parameters are significantly estimated to lie in the range of [0;1].[20] Note that across all specifications, the IV parameters 'East' lie below the IV parameters 'West', suggesting that investors perceive Eastern federal states as more closely substitutable than Western federal states. Given that foreign investors are underrepresented in East Germany also with respect to the overall firm distribution (compare Table A.1), this finding suggests a rather diffuse image of East German federal states as potential foreign investment locations.

Column (1) contains the results for the basic equation without land prices, business taxes and unit labor costs due to the fact that these were not available for the entire sample. The real estate tax shows a surprisingly significant positive impact. Internal market access as well as – although to a lesser extent – Harris' external market potential,

[18] In fact, the presented coefficients are slight overestimates of the elasticities of location choice probabilities. It can be shown that $\frac{\partial P_i}{\partial x_i}\frac{x_i}{P_i} = \gamma\left(1 - P_i\right)$ for the conditional logit model and $\frac{\partial P_{in}}{\partial x_i}\frac{x_i}{P_{in}} = \gamma\left[\left(1 - P_{i|n}\right) + \lambda_n\left(1 - P_n\right)P_{i|n}\right]$ for the nested logit model. Hence, the higher the number of alternatives (and nests), the closer is the estimated coefficient to the actual elasticity.

[19] I report the conditional logit estimates in Table A.3 as a robustness check. Note that overall the nested logit coefficients seem to be equal in sign, but smaller in magnitude and less statistically significant than their conditional logit counterparts. This finding suggests that inside East and West Germany the push and pull forces of the explanatory variables are weak compared to the situation where the federal states are chosen independently of the nests.

[20] One possibility to mitigate the IIA problem characteristic to the conditional logit model is to include federal state dummies as is done in column (7) of Table A.3. This strategy is valid as long as investors have uniform perceptions about the attractiveness of regions. Table A.3, column (7) reveals that the inclusion of federal state dummies leads to substantial changes in the significance levels of the estimated coefficients. This result is not entirely surprising as many variables have a larger cross-sectional than time variation. Crozet et al. (2004) provide a similar finding for inward FDI into French departments.

Table 1: Nested Logit Estimations

Dependent variable: choice between federal states					
	(1)	(2)	(3)	(4)	(5)
ln business tax		-0.60	-0.53	-0.40	-1.27**
		(0.37)	(0.39)	(0.43)	(0.60)
ln real estate tax	0.29***	0.30	0.28	0.10	0.61
	(0.06)	(0.20)	(0.21)	(0.25)	(0.51)
ln unit labor cost *(t-1)*		-1.51***	-1.55***	-1.68***	-0.91*
		(0.33)	(0.34)	(0.37)	(0.48)
ln land price *(t-1)*		0.12***	0.12***	0.09**	0.14**
		(0.03)	(0.03)	(0.04)	(0.06)
ln market access *(t-1)*	0.55***	0.46***	0.42***	0.44***	0.51***
	(0.02)	(0.03)	(0.03)	(0.03)	(0.08)
ln infrastructure	-0.19***	0.23*	0.21	0.23	0.36
	(0.06)	(0.14)	(0.14)	(0.15)	(0.25)
ln market potential *(t-1)*	0.19***	0.06*	0.06	0.04	-0.02
	(0.03)	(0.04)	(0.04)	(0.04)	(0.06)
ln nat. cluster *(t-1)*	0.59***	0.51***	0.37***	0.39***	0.37***
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
ln cluster *(t-1)*			0.12***	0.13***	0.13***
			(0.02)	(0.02)	(0.02)
border	0.13***	0.17***	0.24***	0.26***	0.26***
	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)
berlin				0.25*	
				(0.14)	
ln R&D					-0.08
					(0.07)
ln univgrads					0.11*
					(0.06)
ln nongrads					0.18
					(0.14)
ln popdensity					-0.03
					(0.08)
IV parameters					
East	0.47***	0.44***	0.48***	0.55***	0.48***
	(0.03)	(0.04)	(0.05)	(0.14)	(0.06)
West	0.85***	0.77***	0.78***	0.83***	0.80***
	(0.02)	(0.03)	(0.03)	(0.04)	(0.04)
LR test (IIA)	152.30***	63.87***	51.53***	29.85***	45.02***
Observations	136128	91204	91204	91204	83700
Investments	8508	6049	6049	6049	5580

Note: This table presents the estimation results of equation (6). The regressions are based on the nested logit estimator. The IV parameters in the [0;1] interval and the significant LR test statistic confirm the nesting structure with East and West Germany as two nests. The dependent variable is the discrete choice of multinational firms to locate in one of 16 German federal states. The independent variables are as described in Section 4.2 and as listed in Table A.2. Based on the specification of column (1), columns (2), (3), (4) and (5) successively introduce business taxes, land rents and unit labor costs, non-nation-specific industry clusters, a dummy for Berlin and R&D expenditure, university graduates, school leavers without a degree and population density as additional control variables. Standard errors are in parentheses with significance at the *** p<0.01, ** p<0.05, * p<0.1 level.

Source: Own calculations.

help attracting foreign investors. The negative coefficient for the local infrastructure is against the presumption that a better attainability of potential consumers in the periphery positively influences the location decision of MNEs' affiliates.

The results slightly change with the inclusion of the prices for the two production factors and business taxes in column (2). The local infrastructure now has the expected positive sign. The tax rates are not estimated as being significantly different from zero. The positive impact of land prices is striking in this context. Together with the positive coefficient of the real estate tax rate in column (1), the result suggests a density effect in metropolitan areas, which attracts investors despite of the relatively high prices. High unit labor costs decrease the probability for a federal state being chosen as an FDI location. The other coefficients remain stable in terms of sign, magnitude and significance level.

The estimations confirm the fixed cost specification of equation (2). Both a higher number of existing affiliates with the same source country and within the same industry and the existence of a common border reduce the costs of entering a foreign market and induce investors to decide for that particular federal state.[21] In column (3), in addition to the number of affiliates in the same sector and with the same country of origin (nat. cluster), the total number of affiliates in the same sector aggregated over all foreign countries of origin (cluster) is included. As expected, the positive influence of the aggregate cluster variable is smaller than the impact of the country-specific cluster variable. The finding corroborates that firms particularly benefit from national networks, where no language or cultural barrier impedes informational interchanges (Buch et al.,

[21] In order to test for the conjecture that the border variable is closely related to the higher level East-West choice, I ran two robustness checks. First, I omitted the border variable and second, I replaced it with a variable measring the great-circle distances between the capitals of the source countries and the target states of the investments normalized by the source country's distance to the geographical center of Germany. With the exception of a slightly dropping unit labor cost coefficient, the results remain highly stable in sign, magnitude and significance level. The results of this exercise are not presented here, but can be made available upon request.

2006). Interestingly, the coefficient of the cluster variable has decreased as compared to columns (1) and (2). This result corresponds well to the theoretical prediction of intense competition lowering positive network externalities.

The inclusion of a Berlin dummy in column (4) that captures the effect of the capital does not largely affect the other results. From the additional control variables in column (5), only the share of university graduates has a statistically important impact. While the availability of a highly qualified workforce matters for the location decision of MNEs, non-skilled workers, public R&D expenditures and population density do not seem to play a role. The theoretical discussion of Section 2.2 and the descriptive statistics presented in Section 4.1 suggest, however, to look at sectors and activities individually. Especially, distribution-related functions of trade affiliates might react to regional conditions differently than production-related activities of manufacturing affiliates.

5.2. Sector-Specific Estimations

Table 2 reports the estimates for the manufacturing and the service sector as well as for pre- and post-production activities. The first columns contain the results for the baseline specification (compare Table 1, column (3)); the second columns introduce the policy control variables (compare Table 1, column (5)).

Columns (1) and (2) report the location choice determinants of service affiliates, excluding wholesale, retail and R&D affiliates as well as holdings. In contrast to the comparable regressions for the whole sample, taxes and the local infrastructure are relevant for service affiliates. Furthermore, the coefficient of the common border dummy is slightly higher. This last finding may be due to the complexity of some services that necessitate the adjacency to the parent company. In general, the results are robust to the inclusion of the additional control variables in column (2), although the evidence for land rents and tax rates is somewhat ambiguous.

The heterogeneity of the service sector requires, however, a differentiated analysis. To

this end, columns (3) and (4) contain the results for downstream activities, like wholesale and retail trade and columns (5) and (6) report the estimates for upstream activities, like R&D and holdings. Taxes and local infrastructure do not seem to matter for wholesale and retail affiliates. This result is plausible against the finding of a large, positive coefficient of population density in column (4).[22] Direct customer proximity rather than the accessibility of potential consumers is crucial for the location of downstream activities at the regional level. The large positive effect of local market access (and also the positive coefficient of land prices in column (3)) supports this interpretation and is also in line with Hanson et al. (2001). The authors find that US wholesale affiliates have higher sales in high-income countries.

Turning to the upstream activities (columns (5) and (6)), we find that only few of the standard location choice determinants exhibit importance. It is noteworthy, however, that the agglomeration variables have a lower impact on upstream activities. If holdings provide headquarter services it is reasonable to believe that they act independently from potential competitors. Interestingly, a high level of public R&D expenditure detracts MNEs from locating their R&D and holding activities in a certain federal state. One possible explanation for this might stem from the actual low number of R&D affiliates within this category. They make up for only around 5% of all affiliates conducting upstream activities. Since holdings are, except for serving as a local headquarter, also established for tax reasons (see Weichenrieder and Mintz, 2007), they might have claims at odds with usual pre-production activities.

The results for the manufacturing sector are reported in columns (7) and (8). Three main differences with respect to the service sector in general and with respect to down-

[22]Note that in column (4), the LR test cannot reject the IIA property. As a robustness check, the regression has been repeated using the conditional logit model. The results confirm the relevance of urbanization for downstream activities as indicated through a positive significant coefficient of population density and market access. The results of this exercise are not presented here, but can be made available upon request.

Table 2: Nested Logit Estimations for Different Sectors and Activities

Dependent variable: choice between federal states								
	(1) Other services	(2) Other services	(3) Services: Downstream activities	(4) Services: Downstream activities	(5) Services: Upstream activities	(6) Services: Upstream activities	(7) Manufacturing	(8) Manufacturing
ln business tax	-1.02	-2.10*	-0.70	-0.96	-1.36	-3.31	-0.65	-1.39
	(0.79)	(1.11)	(1.10)	(1.85)	(1.47)	(2.16)	(0.57)	(1.01)
ln real estate tax	0.95**	1.08	0.29	-2.07	1.05	1.98	-0.06	0.77
	(0.44)	(0.92)	(0.60)	(1.38)	(0.84)	(1.72)	(0.31)	(0.88)
ln unit labor cost *(t-1)*	-3.52***	-3.12***	-1.92**	-1.54	-1.82	0.87	0.44	1.49
	(0.66)	(0.80)	(0.92)	(1.25)	(1.18)	(1.67)	(0.57)	(0.91)
ln land price *(t-1)*	0.20***	0.15	0.34***	0.07	0.09	0.30	0.02	0.12
	(0.07)	(0.10)	(0.11)	(0.17)	(0.11)	(0.18)	(0.05)	(0.09)
ln market access *(t-1)*	0.45***	0.56***	0.43***	1.05***	0.62***	0.98***	0.48***	0.58***
	(0.06)	(0.16)	(0.08)	(0.38)	(0.11)	(0.27)	(0.05)	(0.11)
ln infrastructure	0.61**	0.79*	0.59	-0.55	0.75	0.96	-0.02	0.24
	(0.29)	(0.47)	(0.41)	(0.71)	(0.53)	(0.86)	(0.21)	(0.42)
ln market potential *(t-1)*	0.09	-0.04	-0.02	0.02	0.08	-0.17	-0.01	-0.11
	(0.08)	(0.11)	(0.11)	(0.16)	(0.14)	(0.20)	(0.06)	(0.11)
ln nat. cluster *(t-1)*	0.33***	0.29***	0.42***	0.43***	0.33***	0.22**	0.30***	0.34***
	(0.05)	(0.05)	(0.06)	(0.07)	(0.1)	(0.11)	(0.05)	(0.07)
ln cluster *(t-1)*	0.12***	0.11***	0.07**	0.07**	0.06	0.09*	0.11***	0.12***
	(0.03)	(0.03)	(0.03)	(0.04)	(0.05)	(0.05)	(0.03)	(0.03)
border	0.33***	0.32***	0.40***	0.36***	0.23**	0.30**	0.13**	0.17***
	(0.06)	(0.07)	(0.09)	(0.10)	(0.11)	(0.12)	(0.06)	(0.07)
ln R&D		-0.14		-0.43		-0.46*		-0.10
		(0.14)		(0.28)		(0.23)		(0.11)
ln univgrads		0.11		-0.04		0.04		0.08
		(0.14)		(0.21)		(0.22)		(0.08)
ln nongrads		0.09		0.12		0.11		0.26
		(0.25)		(0.41)		(0.44)		(0.23)
ln popdensity		0.05		0.73**		-0.11		-0.13
		(0.15)		(0.32)		(0.25)		(0.13)
IV parameters								
East	0.56***	0.49***	0.54***	0.65***	0.46***	0.35**	0.40***	0.44***
	(0.09)	(0.10)	(0.11)	(0.19)	(0.13)	(0.14)	(0.07)	(0.10)
West	0.81***	0.75***	0.94***	0.92***	0.82***	0.78***	0.74***	0.81***
	(0.06)	(0.08)	(0.07)	(0.11)	(0.10)	(0.13)	(0.05)	(0.09)
LR test (IIA)	14.18***	10.75***	20.75***	4.53	8.96**	6.57**	15.95***	18.13***
Observations	29738	26970	22135	20535	8772	7620	27188	25380
Investments	1971	1798	1469	1369	580	508	1805	1692

Note: This table presents sector-specific estimation results based on the nested logit estimator. Columns (1) and (2) report results for other services, excluding wholesale, retail and R&D affiliates as well as holdings. Columns (3) and (4) report results for downstream activities of wholesale and retail affiliates and Columns (5) and (6) for upstream activities of holdings and R&D affiliates. Columns (7) and (8) report results for manufacturing affiliates. The independent variables of the respective first columns are as in Table 1, column (3) and of the respective second columns as in Table 1, column (5). Standard errors are in parentheses with significance at the *** p<0.01, ** p<0.05, * p<0.1 level.

Source: Own calculations.

stream activities in particular are striking: first, unit labor costs do not exhibit a negative impact on manufacturing firms' location choices. Given that manufacturers make up for a large share of all foreign investors in East Germany (compare Figure 2) and given that West German unit labor costs are at 94% of East German unit labor costs, the insignificant coefficient appears plausible, though. Second, having a common border with the chosen location is less relevant for manufacturers. Third, the relatively low IV parameter (East) suggests that East German federal states are viewed as especially close substitutes by these investors. All these results seem to describe the particular situation of Germany well, where the main investing countries are Western economies (compare Figure A.1) and where manufacturers make up for a large share of investments in East Germany (compare Figure 2). Education policy, like for the other sectors and activities, does not matter for manufacturers.[23] As noted earlier, the possibilities of local policy makers to gain regional competitiveness might in fact be considerably weakened by a highly mobile East German labor force.

An interesting extension to the sectoral estimations is the evaluation of intersectoral linkages. Table 3 reveals strong input-output-linkages across sectors.[24] While the counts of manufacturing and service affiliates in *t-1* have their biggest impacts on the location choices of upstream activities, the number of downstream affiliates matters more for service and manufacturing firms. In line with the argumentation of Nefussi and Schwellnus (2007), communication-intensive upstream and service activities indeed appear to be country-specific for manufacturing firms. By contrast, less complex downstream activities are easiliy handled across source countries. While the nation-specific cluster variable

[23]To account for the possibility that the employed measure does not capture the relevant aspect of education policy for the manufacturing sector, two alternative measures have been tested. Neither the labor force with tertiary education, nor the percentage of the population having completed an apprenticeship proves to be a significant determinant of manufacturer's location choice decisions. The results of this exercise are not presented here, but can be made available upon request.

[24]The variables are as in Table 1, column (3). However, to save space only the cluster variables are reported here. The full table can be made available upon request.

Table 3: Intersectoral Linkages

Dependent variable: choice between federal states				
	(1) Services	(2) Downstream	(3) Upstream	(4) Manufacturing
ln nat. cluster *(t-1)*	0.33***	0.38***	0.37***	0.37***
	(0.05)	(0.07)	(0.11)	(0.07)
ln cluster *(t-1)*	-0.14***	0.00	-0.30***	-0.18***
	(0.03)	(0.04)	(0.07)	(0.04)
ln sect. links services *(t-1)*		0.10**	0.14**	0.05
		(0.04)	(0.07)	(0.04)
ln sect. links downstream *(t-1)*	0.36***		0.22***	0.41***
	(0.04)		(0.06)	(0.06)
ln sect. links upstream *(t-1)*	-0.04	-0.03		-0.04
	(0.03)	(0.04)		(0.03)
ln sect. links manufacturing *(t-1)*	0.08*	0.16***	0.27***	
	(0.04)	(0.06)	(0.09)	
ln nat. sect. links services *(t-1)*		0.05	0.04	0.15**
		(0.10)	(0.13)	(0.08)
ln nat. sect. links downstream *(t-1)*	-0.03		-0.16	-0.27***
	(0.05)		(0.11)	(0.07)
ln nat. sect. links upstream *(t-1)*	0.04	0.03		0.12*
	(0.05)	(0.08)		(0.06)
ln nat. sect. links manufacturing *(t-1)*	0.08	-0.04	-0.04	
	(0.10)	(0.14)	(0.19)	
IV parameters				
East	0.52***	0.56***	0.33***	0.55***
	(0.07)	(0.12)	(0.09)	(0.13)
West	0.67***	0.97***	0.73***	0.77***
	(0.04)	(0.08)	(0.08)	(0.08)
LR test (IIA)	33.89***	23.66***	13.78***	5.51*
Observations	29738	22135	8772	27188
Investments	1971	1469	580	1805

Note: This table presents estimation results for intersectoral linkages. The IV parameters in the [0;1] interval and the significant LR test statistic confirm the nesting structure. The independent variables are as in Table 1, column (3), but only the cluster variables are listed here to save space. The full estimation results can be made available upon request. Standard errors are in parentheses with significance at the *** p<0.01, ** p<0.05, * p<0.1 level.

Source: Own calculations.

remains stable when considering intersectoral linkages, competetive forces turn overall clusters to distract foreign investors.

5.3. Source Country-Specific Estimations

Sections 5.1 and 5.2 have indicated that a common border is relevant for the probability to decide for a certain location but plays less of a role for manufacturers. This finding may already partly explain the specific situation of the East German federal states. Existing nation-specific firm networks also appeared as a robust location choice

determinant, suggesting that it might be crucial to attract a number of affiliates from one country which spurs then – ideally via a self-reinforcing process – additional investments from the same country.

To see which regional factors actually pull or push investors from the most important source countries, Table 4 displays the individual regression results for the five most important countries of origin. The LR test and the IV parameters support the nesting structure for Dutch, US and British investors. The LR test could not reject the IIA for Swiss, British and French investors. For this reason, only the conditional logit results are reported for these source countries of inward FDI in Germany. At the individual country level, it is remarkable that taxes matter only for Swiss and US investors, while the latter do not respond to unit labor costs. In contrast, US MNEs seem to be located in metropolitan areas where land prices are also high.[25]

When looking at the most important source countries individually, assessing the fixed cost specification is of particular interest. The descriptive analysis of Figure A.1 indicates that affiliates of Swiss and Dutch multinationals are predominantly located in the adjacent federal states of Baden-Wurttemberg and North Rhine-Westphalia. In the empirical results of Table 4, a common border is, accordingly, estimated to exhibit a significant influence on investments from these countries as well as from France. Furthermore, the agglomeration variables indicate that country networks are most important for French investors with a coefficient of 0.49 and least important for US investors (with a coefficient of 0.19). It is remarkable that MNEs from the US, Great Britain and Switzerland, who are assumed to be less affected by language barriers when investing in Germany, are even to a larger extent attracted by industry clusters in general than by industry clusters consisting of firms from the same country. Dutch and French investors, on the contrary,

[25]Using wages instead of unit labor costs and omitting land prices, Crozet et al. (2004) find that US investments even react positively to high wages in French regions. Like in this paper, the authors further estimate a relatively low impact of market access on Dutch investors (column (1)).

Table 4: Conditional and Nested Logit Estimations for the Most Important Countries of Origin

Dependent variable: choice between federal states					
	(1) NL	(2) USA	(3) CH	(4) GB	(5) F
ln business tax	-1.00	1.27	-4.12**	-0.63	0.18
	(0.93)	(1.10)	(1.82)	(2.08)	(1.68)
ln real estate tax	0.31	-1.11*	1.85**	1.05	0.48
	(0.51)	(0.58)	(0.88)	(1.15)	(0.85)
ln unit labor cost *(t-1)*	-2.76***	-0.05	-3.83**	-3.80**	-2.90
	(0.83)	(0.93)	(1.75)	(1.69)	(1.96)
ln land price *(t-1)*	0.13	0.26**	0.24	0.27*	0.13
	(0.09)	(0.10)	(0.18)	(0.15)	(0.17)
ln market access *(t-1)*	0.24***	0.40***	0.22*	0.65***	0.19*
	(0.07)	(0.08)	(0.13)	(0.15)	(0.11)
ln infrastructure	0.60*	-0.30	1.31**	0.34	0.61
	(0.32)	(0.40)	(0.62)	(0.71)	(0.62)
ln market potential *(t-1)*	-0.05	0.16	-0.30*	0.30	0.00
	(0.08)	(0.11)	(0.18)	(0.19)	(0.16)
ln nat. cluster *(t-1)*	0.26***	0.19**	0.28***	0.26**	0.49***
	(0.07)	(0.08)	(0.11)	(0.12)	(0.12)
ln cluster *(t-1)*	0.20***	0.27***	0.31***	0.36***	0.21**
	(0.06)	(0.07)	(0.09)	(0.09)	(0.08)
border	0.37***		0.48**		0.37**
	(0.11)		(0.21)		(0.18)
IV parameters					
East	0.50***	0.39***			
	(0.11)	(0.11)			
West	0.75***	0.67***			
	(0.07)	(0.07)			
LR test (IIA)	8.75**	9.46***			
East-West dummy			Yes	Yes	Yes
Federal states dummies	No	No	No	No	No
Pseudo R^2			0.25	0.29	0.18
Observations	20246	12906	9996	9099	8593
Investments	1343	857	663	604	571

Note: This table presents country-specific estimation results based on the nested and the conditional logit estimator. The IV parameters in the [0;1] interval and the significant LR test statistic confirm the nesting structure for the Netherlands (column (1)) and the US (column (2)); for Switzerland (column (3)), Great Britain (column (4)) and France (column (5)) the conditional logit results are reported instead. The independent variables are as in Table 1, column (3). (Robust) standard errors are in parentheses with significance at the *** p<0.01, ** p<0.05, * p<0.1 level.

Source: Own calculations.

benefit more from nation-specific agglomeration. Hence, the empirical evidence not only for the whole sample and for the sectoral regressions, but also for individual countries of origin validates the adopted fixed cost specification in equation (2).

The importance of network and border effects has implications especially for East Germany. While the lacking adjacency to strong investing countries is an insuperable problem for East German policy makers, they might consider the promotion of industry clusters. This could be an especially promising strategy with regards to investors that do not heavily rely on nation-specific networks.

6. Conclusions

This study examined and identified the main determinants of inward FDI into German federal states during the time span 1997-2005. Three questions were highlighted: first, in the theoretical part, a profit function was derived according to which foreign multinationals choose their locations. Common borders and nation-specific industry clusters were thought of as facilitating market entry. Possible particularities with regard to different sectors and activities as well as interdependencies among them were discussed. Second, the specific situation of East Germany in terms of attracting less MNEs' affiliates and depending largely on the manufacturing sector was accounted for by adopting a nesting structure. The IV parameters of the baseline regressions all point at a higher degree of substitutability among Eastern as compared to Western federal states. Third, the empirical estimations confirm the theoretical presumptions: the theory-consistent specification of fixed costs shows a significant influence in the conditional and the nested logit estimations with the common border and existing firm clusters turning out as very robust determinants of inward FDI. The sector estimates confirm that downstream industries prefer to locate in highly populated, wealthy (West German) federal states and that manufacturers locate close to pre-production service providers from the same country. Finally, the individual country regressions showed that network effects arise from

aggregate industry clusters as well, but are less important for French investors.

The findings are of high interest not only for the scientific community but also for policy makers. The insight that local demand and unit labor costs significantly influence foreign investors in their location choices represents indispensable information for regional policy makers when reflecting about ways to enhance the location attractiveness in general or to allure investors from certain sectors or countries. This latter strategy might be particularly sound, since a critical mass of affiliates from one industry and one country proves to be a reliable pull factor for other investors that operate in the same sector and have the same country of origin. The importance of networks also partly explains the lagging behind of East Germany in attracting multinational activity. To overcome this lock-in, one strategy could be to target investments from emerging East European countries, such as Russia and Poland, to which historical ties exist.

Although insightful, this study is limited by the availability of data. Due to lacking information about the characteristics of foreign multinational firms, a Melitz-type heterogeneous behaviour of firms investing at home or abroad cannot be accounted for. This task has therefore to be left for future research.

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AppendixA. Appendix

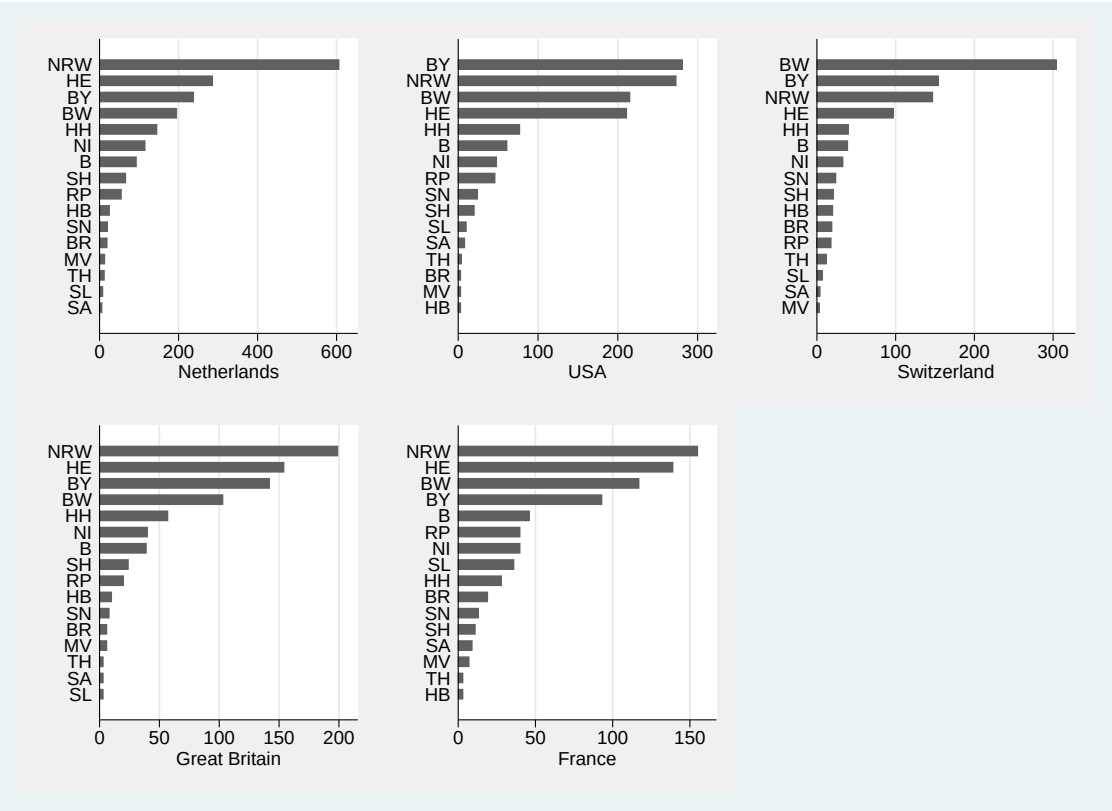
Table A.1: Comparison of Spatial Distributions of Taxpaying Enterprises, New Business Registrations and Foreign Affiliates

Federal State	Taxpaying units (1999-2001)	Business registrations (1998-2005)	Foreign affiliates (1997-2005)	Deviation col. (3)-(1)	Deviation col. (3)-(2)
BW	14.03	12.40	15.13	1.10	2.73
BY	17.38	16.53	16.77	-0.61	0.24
B	3.80	4.66	5.10	1.30	0.44
BR	2.66	3.01	1.21	-1.45	-1.80
HB	0.74	0.70	1.09	0.35	0.39
HH	2.65	2.44	6.41	3.76	3.97
HE	7.90	8.49	13.66	5.76	5.17
MV	1.73	2.00	0.66	-1.07	-1.34
NI	8.51	8.62	5.49	-3.02	-3.13
NRW	21.40	20.86	24.58	3.18	3.72
RP	5.14	4.92	3.23	-1.91	-1.69
SL	1.17	1.09	0.91	-0.26	-0.18
SN	4.65	5.24	1.53	-3.12	-3.71
SA	2.30	2.60	0.67	-1.63	-1.93
SH	2.81	3.73	2.82	0.01	-0.91
TH	3.12	2.82	0.75	-2.37	-2.07

Note: NRW: North Rhine Westphalia; BY: Free State of Bavaria; BW: Baden-Wurttemberg; HE: Hesse; HH: Hamburg; NI: Lower Saxony; B: Berlin; RP: Rhineland Palatine; SH: Schleswig-Holstein; SN: Free State of Saxony; BR: Brandenburg; HB: Bremen; SL: Saarland; TH: Thuringia; SA: Saxony-Anhalt; MV: Mecklenburg-Western Pomerania.

Source: Own calculations. Data from Inkar, Statistisches Bundesamt and Deutsche Bundesbank.

Figure A.1: Total Number of Affiliates by Country of Origin (1997-2005)



Note: In order to retain the confidential nature of the data, country of origin-federal state combinations with less than three observations have been made anonymous and defined to count at least three observations.

Source: Own calculations. Data from Deutsche Bundesbank.

Table A.2: List of Variables

Variable	**Definition**	**Source**
business tax	Business tax in percent	Federal Statistical Office
real estate tax	Real estate tax in percent	Federal Statistical Office
unit labor cost	Unit labor costs measured as the ratio of labor compensation per labor input and labor productivity	Federal Statistical Office
land price	Prices of building land per qm^2	Federal Statistical Office
market access	GDP in federal state i at current market prices	Federal Statistical Office
infrastructure	Infrastructure index calculated from the length of highways, other streets, rivers and the number of airway passengers	Federal Statistical Office
market potential	GDP in federal states l at current market prices weighted by the inverse of Great circle distance between federal state i and federal states l as measured by the haversine formula	Federal Statistical Office; Latitudes and Longitudes from GPS Visualizer
border	Dummy = 1 if federal state i and the source country share a common border	Federal Agency for Carthography and Geodesy
cluster	Number of MNE affiliates in the same industry	MiDi
nat. cluster	Number of MNE affiliates in the same industry and with the same country of origin	MiDi
sect. links	Number of MNE affiliates in manufacturing, services, downstream or upstream activities	MiDi
nat. sect. links	Number of MNE affiliates in manufacturing, services, downstream or upstream activities with the same country of origin	MiDi
berlin	Dummy = 1 if federal state is Berlin	
R&D	Public R&D expenditures	Federal Statistical Office
univgrads	Share of university graduates in the total number of graduates	Federal Statistical Office
nongrads	Share of school leavers without a degree in the total number of graduates	Federal Statistical Office
popdensity	Number of inhabitants per qm^2	Federal Statistical Office

Table A.3: Conditional Logit Estimations

Dependent variable: choice between federal states							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln business tax			-1.05*	-0.86	-0.20	-2.30***	-1.61
			(0.56)	(0.56)	(0.58)	(0.83)	(1.62)
ln real estate tax	0.62***	0.72***	0.86***	0.72**	-0.01	0.49	-0.09
	(0.07)	(0.08)	(0.30)	(0.30)	(0.33)	(0.72)	(1.36)
ln unit labor cost *(t-1)*			-1.95***	-1.96***	-2.06***	-1.04*	1.46
			(0.46)	(0.46)	(0.45)	(0.61)	(2.75)
ln land price *(t-1)*			0.29***	0.27***	0.12**	0.14*	0.05
			(0.04)	(0.04)	(0.05)	(0.08)	(0.12)
ln market access *(t-1)*	0.77***	0.70***	0.61***	0.54***	0.53***	0.86***	5.30**
	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.12)	(2.41)
ln infrastructure	-0.23***	-0.30***	0.37*	0.29	0.27	0.25	-0.67
	(0.08)	(0.08)	(0.20)	(0.20)	(0.19)	(0.36)	(1.90)
ln market potential *(t-1)*	0.35***	0.30***	0.13**	0.12**	0.04	-0.01	9.04*
	(0.04)	(0.04)	(0.06)	(0.06)	(0.05)	(0.08)	(5.34)
ln nat. cluster *(t-1)*	0.71***	0.71***	0.64***	0.45***	0.46***	0.44***	0.44***
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
ln cluster *(t-1)*				0.17***	0.17***	0.17***	0.17***
				(0.02)	(0.02)	(0.02)	(0.02)
border	0.14***	0.13***	0.21***	0.31***	0.32***	0.33***	0.35***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)
berlin					0.82***		
					(0.14)		
ln R&D						-0.22**	-1.07**
						(0.11)	(0.45)
ln univgrads						0.20**	0.10
						(0.09)	(0.12)
ln nongrads						0.51***	-0.28
						(0.18)	(0.27)
ln popodensity						0.23*	-7.22
						(0.13)	(5.17)
East-West dummy	No	Yes	Yes	Yes	Yes	Yes	No
Federal state dummies	No	No	No	No	No	No	Yes
Pseudo R^2	0.23	0.23	0.24	0.25	0.25	0.25	0.25
Observations	136128	136128	91204	91204	91204	83700	83700
Investments	8508	8508	6049	6049	6049	5580	5580

Note: This table presents the estimation results based on the conditional logit estimator. The dependent variable is the discrete choice of multinational firms to locate in one of 16 German federal states. The independent variables are as described in Section 4.2 and as listed in Table A.2. Based on the specification of column (1), columns (2), (3), (4), (5), (6) and (7) successively introduce an East-West (0/1) dummy, business taxes, land rents and unit labor costs, non-nation-specific industry clusters, a dummy for Berlin, R&D expenditure, university graduates, school leavers without a degree and population density as additional control variables and federal state dummies. Robust standard errors are in parentheses with significance at the *** $p<0.01$, ** $p<0.05$, * $p<0.1$ level.

Source: Own calculations.

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