Determinants of German FDI: New Evidence from Micro-Data

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Abstract

This paper provides new evidence on the foreign direct investment stocks of German firms. We use firm-level data for the years 1990-2000 to describe the regional and sectoral patterns of German FDI through gravity-type equations. We provide evidence on the patterns of FDI by sector, by size of the foreign affiliate, and by the number of affiliates per host country. While market size and geographic distance have a significant impact on FDI stocks, we also find differences in the determinants of FDI between sectors as well as between the size of foreign affiliates and the number of foreign affiliates.

Keywords: distance coefficients, gravity equations, foreign direct investment
JEL-classification: F0, F21

(99 words)

Zusammenfassung

Dieses Papier untersucht die Direktinvestitionsbestände deutscher multinationaler Unternehmen im Ausland auf drei verschiedenen Aggregationsniveaus. Dafür nutzen wir einen reichhaltigen Datensatz auf Unternehmensebene, der sektoral und auf Länderebene aggregiert und als Mikrodatensatz analysiert wird. Unsere Analyse bezieht sich auf die Jahre 1990 bis 2000. Mittels eines Gravitätsansatzes beschreiben wir die sektoralen und regionalen Muster deutscher Direktinvestitionen im Ausland und diskutieren die Unterschiede, die sich für die verschiedenen Aggregationsniveaus ergeben.

Contents

List of Tables and Figures

Tables

Figures

Determinants of German FDI: New Evidence from Micro-Data*

1 Motivation

The globalization of markets has heightened interest in the determinants of firms' foreign direct investment (FDI) decisions. From a theoretical point of view, FDI decisions have been analyzed based on the eclectic paradigm (Dunning 1977), which distinguishes ownership, location, and internalization advantages of foreign investments.[1] The new trade theory, which essentially focuses on the ownership and location advantages, provides a more formal framework for analyzing FDI decisions. Part of this literature uses game theoretical approaches to explain the presence of multinationals by the existence of economies of scale and oligopolistic market structures (Horstmann and Markusen 1992, Brainard 1993, Raff and Srinivasan 1998, Raff and Kim 1999). Activities of multinationals have also been modeled endogenously in general equilibrium models in which the activities of multinationals are driven by country size, relative endowments, firm- and plant-level costs, and trade costs (Markusen and Venables 1998, 2000, Kleinert 2001). These 'microeconomic' theoretical models are based on the decision of companies, which are all symmetric. This symmetry assumption allows analyzing a representative firm in each country in order to derive implications for aggregate FDI.

One way to test these models empirically has been to derive gravity models, which have proven very useful in explaining patterns of international investments (see, e.g. Carr et al. 2001 and Egger 2003). Most empirical applications are based on macroeconomic or aggregated data even though theoretical work has focused on explanations of international investments that use microeconomic approaches and that stress aspects of industrial organization. However, analyzing foreign direct investment decisions on the basis of aggregated data does not allow a number of interesting aspects to be studied. It is not possible,

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1 For a survey of the literature see Markusen (1995).

for instance, to distinguish between firm-level and country-specific determinants of FDI, or to analyze the behavior of small versus large foreign affiliates.

In this sense, there has been a widening gap between the empirical and the theoretical literature on the internationalization of firms. There are only few studies on FDI that use firm-level data (Andersson and Fredrikson 2000, Head and Ries 2001). For reasons of data availability, these papers mostly use Swedish or Japanese data. Firm-level data on the foreign direct investment activities of firms recently made available by the Deutsche Bundesbank can thus contribute to closing the gap in the literature. (See Lipponer (2002a) for a detailed description of the database.)

This paper uses this database and provides regression-based descriptive statistics. We proceed in three main steps. The following second part describes the database and our set of explanatory variables. Part three gives our own empirical results from panel and cross-section regressions. The empirical model underlying our estimations is a gravity-type equation. Inter alia, our results allow drawing inference with regard to sectoral differences in the importance of distance and to differences in the determinants of foreign investment for the size of foreign affiliates and the number of firms investing in a given host country. One main finding is that some determinants of FDI have a different impact on aggregated FDI than on the size of the foreign affiliate. Small foreign affiliates, for instance, are located in geographically close and bordering regions while the reverse holds true for larger foreign affiliates. The number of foreign affiliates being established in nearby regions is larger than that of distant regions, which explains the negative link between distance and aggregated FDI. Part four summarizes the results and maps the future research agenda.

2 The Data

In this section, we describe both the FDI database that we use in this paper as well as the set of explanatory variables, and we provide stylized facts on the regional and sectoral structure of German outward FDI.

2.1 Foreign Direct Investment

The dependent variables used in the regression analysis of Section 3 are drawn from the micro-database *International Capital Links* of the Deutsche Bundesbank. The database provides a detailed breakdown of the foreign assets and liabilities of German firms. For the purpose of the present paper, we focus on direct and indirect foreign direct investment (*pbum1* = Mittelbare und unmittelbare über Holding gehaltene Direktinvestitionen) of German firms'

abroad. This variable gives the sum of equity capital of the foreign affiliate, capital reserves, and retained earnings which is hold by a German company. The data are end-of-period stocks.

We use this variable at two different levels of aggregation and as count variable:

- First, we aggregate the data at the country and at the sectoral level. We run regressions both pooled across sectors as well as for each sector separately.

- Second, we explicitly use the firm-level evidence that the database provides. The firm-level evidence allows studying the size of an individual affiliate in a given host country, rather than FDI of a given sector in a given country.

- Finally, we use the number of foreign affiliates in a country, i.e. a count variable, as the dependent variable. This allows distinguishing to what extent effects found in aggregated data are driven by the size of affiliates and to what extent by the number of affiliates abroad.

Aggregating our dependent variable at different levels is not problematic even in cases where several companies report on the same foreign investment object. This is because our endogenous variable gives the investment of a specific German company in a foreign affiliate. In most of the cases, one German company holds the entire ("German") equity capital of an affiliate, but about 5% of the foreign affiliates in the database are held by more than one German company. However, since, in some affiliates, a foreign (non-German) investor might hold an equity share, it is difficult to interpret *pbum* as the equity capital of an affiliate. Rather, it should be interpreted as the investment of a German company. This might be a disadvantage if the object under study is the affiliate. However, it has the advantage that there is no double counting when the data are aggregated.

Generally, the dataset allows analyzing different measures of foreign activities of German companies. FDI is often used as proxy for the internationalization of production because of its relative broad availability. Data on foreign affiliates' sales or employment are usually more difficult to obtain. The Bundesbank database enables us to use different measures of firms' foreign activities.

The database furthermore allows aggregating the data by sector of the reporting firm and by the host country of its foreign affiliate. Generally, sectors and countries are defined as in Lipponer (2002b). There are two exceptions. First, banks are defined as an additional sector and are not combined with other financial institutions. Second, some smaller financial centers such as Gibraltar have not been included in the data for the U.K. but have rather been entered

as individual countries. Overall, the dataset includes 238 host countries and 38 sectors. However, due to missing explanatory variables or small sector sizes, we do not use the full cross-sectional dimension of the dataset.

Table 1 gives some aggregated descriptive statistics for our dependent variable for the most recent year (2000). The data are sliced both according to the geographical distribution of German firms' FDI (Panel a) and the sectoral structure (Panel b). The Table shows, first of all, the dominance of German firms' FDI held in other industrialized countries, which account for a share of 79-90% of all foreign direct investments. This distribution is also relatively consistent across sectors.

Perhaps somewhat surprisingly, the share of the EU countries in all industrialized countries is only about one half, and it is sometimes even smaller than the share of the United States. The importance of the U.S. relative to intra-European FDI is particularly striking for the automobiles sector (72 versus 14%) and the financial services sector (51 versus 36%). For most other sectors, the U.S. is of smaller importance as a destination of FDI than Europe.[2]

Panel b of Table 1 shows the importance of each sector by region. For most regions covered, manufacturing accounts for around 40% of total FDI. The exception is China, where the manufacturing sector has a share of 74% of the total, which clearly exceeds the average for other emerging markets. Within the manufacturing sector, automobiles are the most important sector, accounting for almost one half of the total. Interestingly, this sector has a below-average share of less than 6% of its FDI in EU countries. Table 1 also reveals a short-coming of the sectoral classification of our data: About one third of German firms' FDI is classified as holding companies. Hence, these investments cannot be allocated to any specific sector with regard to the investing company.

2.2 Explanatory Variables

With regard to explanatory variables, our analysis is restricted mainly to macroeconomic determinants of FDI. (For similar approaches see Wheeler and Mody (1992), Barrell and Pain (1996), or Lipsey (1999).) While the reporting requirements of the Bundesbank are quite encompassing with regard to the specifics of the foreign affiliate, little information is provided on the reporting firm itself. Essentially, the information on the reporting firm is restricted to the sector in which it is active. Moreover, most of the information that we have on the foreign affiliates is highly correlated with our dependent variable.

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2 FDI of private households is an exception. However, this sector accounts for only 1% of German FDI.

Generally, FDI can be expected to respond to variables such as market size and market development, geographical, cultural and economic distance between countries, the degree of macroeconomic stability, and the degree of regulations of countries. We capture these factors as follows:

(i) Market size and development:

- *Gross Domestic Product* (GDP) controls for market size, and it is measured in current USD. GDP data have been obtained from the 2002 CD-rom *Global Development Indicators* of the World Bank. We expect this variable to influence positively German FDI outward stocks.

- *Income dummies* are included to control for the state of development of the host country. Low-income countries are defined as those with a per-capita GDP below 760 USD, lower-middle income countries as those with a per-capita GDP between 761 and 3000 USD, upper-middle income countries: 3001-9300 USD, and high income countries as those with a per-capita GDP above 9300 USD. Since these groups do not overlap, we exclude the low income dummy in the regression. All coefficients must therefore be interpreted as effect relative to the benchmark of the group of countries with a per-capita GDP below 760 USD.

- *Bilateral trade* is included as an alternative measure for the size of the foreign market. One problem with including trade as a regressor in a gravity equation explaining FDI is the potential multicollinearity between trade and the remaining explanatory variables. Hence, we use the residual of a regression of trade on a border dummy, log distance, an EU dummy, log GDP, and log risk instead.[3] The expected coefficient is positive (negative) if FDI and trade are complements (substitutes). Both effects are conceivable from a theoretical point of view. Brainard (1993) and Markusen and Venables (1998) argue that trade and FDI are substitutes. Conditions under which trade and FDI are complements are discussed in Helpman (1984) and Kleinert (2003). The bilateral trade data have been obtained from the Deutsche Bundesbank in D-mark or euro (after 1999) and have been converted into USD.

[3] We also instrumented trade through lagged foreign trade to account for its potential endogeneity. Results were qualitatively unchanged.

(ii) Geographic, cultural, and economic distance:

- Greater *distance* as measured by geographical distance in km is expected to lead to lower stocks of FDI abroad. Larger distance could be an impediment to FDI because it leads to higher communication and information costs and restricts face-to-face communication and networking. Moreover, a greater distance also reflects differences in culture, language, and institutions, which is also likely to decrease FDI.[4]

- *Tariffs* are average tariff rates taken from the World Bank.[5] High tariffs increase the costs of bilateral trade and may thus make FDI as a mode of entry into a foreign market relatively more attractive if exports and production abroad are substitutes. Hence, we would expect a positive relationship between tariffs and FDI if trade and FDI are substitutes. If, in contrast, trade and FDI are complements, the expected impact of tariffs on FDI would be negative.

- The presence of a *common border* is included as one proxy for distance costs. The expected coefficient of this 0/1-dummy is positive since foreign activities are generally higher in neighboring countries to which economic, political, cultural and personal relations are much more intense.

- A 0/1-dummy for countries in which German is an official language is likewise expected to have a positive impact on FDI since speaking a *common language* eases communication and also captures cultural similarity in a broader sense.

- We also include a 0/1-dummy variable *EU* which is set equal to one for countries that are members of the European Union. The expected sign is positive, since the creation of a Single Market should have promoted cross-border entry.

(iii) Stability and regulations:

- Risk as a composite index of country risk, is the political risk index taken from various issues of Euromoney. It is defined as the risk of non-payment or non-servicing payments

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4 The data have been taken from http://www.wcrl.ars.usda.gov/cec/java/capitals.htm. Distances are calculated with the following formula where **lat** $_i$ and **long** $_i$ are respectively latitude and longitude of Berlin and **lat** $_j$ and **long** $_j$ those of the main economic center of country j (usually its capital).
dist = 6370 * ARCOS(COS (**lat** $_j$ / 57.2958) * COS (**lat** $_i$ / 57.2958) * COS (MIN (360 - ABS (**long** $_j$ - **long** $_i$) , ABS (**long** $_j$ - **long** $_i$)) / 57.2958) + SIN (**lat** $_j$ / 57.2958) * SIN (**lat** $_i$ / 57.2958))

5 These data can be obtained from: http://www1.worldbank.org/wbiep/trade/data/TR_Data.html

for goods or services, loans, trade-related finance and dividends and the non-repatriation of capital. This variable takes values from 10 (no risk of non-payment) to 0 (no repayment expected). This risk index has a higher score when country risk is small. Since lower risk should encourage FDI, the expected coefficient is positive.

- Freedom is an index running from 1 through 7, whereby a value of 1 indicates the highest degree of political freedom and liberty. The data have been obtained from Freedom House (www.freedomhouse.org). As companies are expected to be drawn to countries with a more liberal environment, we expect to find a negative link between freedom and FDI.

- Two variables are included to capture the severity of regulations on cross-border capital flows. *Capital control* is a 0/1-dummy, which is set equal to one if countries impose controls on cross-border financial credits. In addition, we control for the presence of regimes of *multiple exchange rates*. Both dummy variables are expected to enter with a negative sign. The data are based on the IMF's *Annual Survey of Exchange Rate Restrictions*. Data prior to 1996 have kindly been provided by Gian-Maria Milesi-Ferretti, data after 1996 have been obtained from the IMF publications.

3 Empirical Results

We use different empirical models to analyze the determinants of German firms' foreign direct investment abroad. In a first step, we estimate quasi-panel regressions using data which have been sectorally aggregated across all firms being active in a given host country in a given year. In a second step, we study the sectoral dimension of the data estimating these quasi-panels separately for each sector. Hence, we are able to analyze whether determinants of FDI differ across sectors. Finally, we use micro-data. In addition, we use the number of German firms that are active in a given country as the dependent variable in order to explain possible differences in the determinants of aggregated FDI, on the one hand, and the size of foreign affiliates, on the other hand.

3.1 What Determines German FDI?

This section presents new evidence from gravity equations for the stocks of foreign direct investments of German firms. Using data that have been aggregated across individual firms for each year, host country, and sector, we estimate a quasi-panel of the following form:

$$\log\left(FDI_{ijt}\right) = \beta_0 + \beta_1 \log\left(GDP_{jt}\right) + \beta_2 \log\left(dist_j\right) + \beta_3\left(control\ variables_{jt}\right) + \varepsilon_{ijt} \qquad (1)$$

where subscripts *i, j* and *t* denote the sector, the host country, and the year respectively. Time fixed effects are included to capture possible trends. We also include a set of sectoral fixed effects. The dependent variable (FDI) as well as GDP, GDP per capita, distance and risk are entered in logs[6]. Hence, the resulting coefficients can be interpreted as elasticities. Before estimating a full-fledged panel model, we use a quasi-panel, because in standard fixed effects models, the impact of time invariant variables such as distance cannot be measured.

In addition to quasi-panel OLS results, we also present a fixed effects panel estimation which accounts for the clustered structure of the data. The cluster option implemented in STATA allows controlling for heteroscedasticity and autocorrelation of the residuals while exploiting the panel dimension of our data. It computes a robust variance estimator based on a specific cluster structure and a calculated covariance matrix. The routine produces an estimator for clustered data (data are assumed not to be independent within groups, but independent across groups). The resulting coefficients of the regression are unbiased.

Table 2 presents results for the entire dataset, using eight different OLS specifications. We vary the set of explanatory variables that we include. In all specifications with the exception of specification 2, we include sectoral dummies. In the second and third column, we report regressions that include country-specific sectoral dummy variables. In the fourth and in the fixed effects specification (column 9), we include dummies for low-to-middle, middle-income, and high-income countries. Cut-off values for the income levels have been taken from the World Bank's *Global Development Indicators* database. In columns 5 and 7, the trade residual is included to control for the size of the foreign market. We use the residual of a regression of trade on the other exogenous variables to avoid the problem of multicollinearity. Columns 6 and 7 include a tariff variable as additional variable measuring economic distance of the foreign market for German companies. Due to missing observations for the tariff variable, however, our sample size drops to two-thirds for this specification. Column 8 gives the results of a regression in which we control for labor productivity.[7] The last specification shows the results of a fixed effects regression which takes the panel dimension of our dataset into account.

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6 We believe that the effect of distance on FDI is better modeled by constant eleasticities given by the logarithmic form than by a constant change of FDI in Euro per km as implied by a linear regression in levels. The logarithmic form implies a decreasing effect of an additional km on FDI measured in Euro. That might stem from fixed costs. Moreover, the logarithmic form fits the data better.

7 We compute labor productivity as annual turn-over (*pk04*), converted into real USD, over the number of employees (*pk05*) in the given sector.

There are a couple of results which are fairly robust across different specifications. GDP is positive and significant with an elasticity of around 0.7. As usual in gravity equations, GDP as proxy for the size of the foreign market has a significant positive effect on German FDI.

The proxies for risk, regulations, economic and cultural distance mostly have the expected signs and are also significant: a common border and a common language increase FDI, low country risk and a high degree of freedom increase FDI (note that the two variables are defined in an opposite way), and capital controls discourage FDI. The EU dummy, for instance, is positive and significant. It is only for one variable that we find insignificant coefficients or unexpected signs: Regimes of multiple exchange rates seem to encourage rather than deter foreign direct investment. One explanation would be that FDI is used as a means to overcome barriers that multiple exchange rate regimes create.

Trade has, on average, a positive effect of German FDI in foreign countries. The coefficient is large and significant. A 10% increase in bilateral trade increases the FDI stock of German companies by about 7.5%. The specifications suggests a positive (i.e. complementary) relationship between (aggregated) trade and FDI. The result is also robust with regard to the use of foreign sales (not reported) as the dependent variable. The complementary relationship is also supported by the negative coefficient we obtain for the impact of tariffs on FDI.

Generally, our RHS variables are able to explain a little over 50% percent of the variation of German foreign direct investment stocks across countries. The explanatory power drops considerably though if sectoral dummies are not included. In this case, the adjusted R^2 does reach a value of only 0.33. This can be taken as a first indication that sectoral differences matter. Results are relatively insensitive, in contrast, with regard to including dummies for countries from different income groups.

With regard to the effect of distance on German FDI, we obtain a statistically and economically significant coefficient of –0.2 to –0.35, depending on the specification chosen. These estimates are somewhat at the lower bound of the findings of the earlier literature on foreign trade. (Frankel (1997) and Leamer and Levinsohn (1995) review the literature on gravity-type equations for foreign trade which finds a coefficient of around –0.6.) Our results indicate that FDI declines by about 25% if distance doubles. The negative effect of distance on German FDI in foreign countries is completely picked up by the trade variable if trade is included (Column 7).

3.2 Do Determinants of FDI Differ Across Sectors?

The results of Table 2 point to sectoral differences in the data since the sectoral dummies that we have included are typically significant. Hence, one obvious question to ask is whether the effect of some of the exogenous variables of interest, notably of the distance coefficient, differs among sectors. In other words, we are interested in the question to what extent aggregation over the different sectors might be influencing our results.

Essentially, our sample contains information on almost 30 economic sectors, covering manufacturing, services, and agriculture. However, for some of these sectors, sample sizes are relatively small if, in addition, we are interested in the regional and the time pattern of their international expansion. Therefore, rather than estimating individual cross-section regressions at a sectoral level, this section looks at quasi-panel estimates for the entire time period.

Results for the entire sample are reported in Table 3. We present results for the largest 12 sectors. In addition to the results reported here, we have tested the robustness of these results also by including interaction terms between distance and the time dummies and by including tariffs and a proxy for labor productivity. Generally, results were fairly insensitive to these changes.

The sectoral results show, first of all, that there is quite some heterogeneity in the determinants of FDI at a sectoral level. Market size (GDP), for instance, has a relatively large impact on the chemicals industry, the automobiles industry, machinery, and the information technology sector (elasticity of around 0.90 with respect to GDP). The high costs of setting up a foreign affiliate in those sectors can explain this high elasticity. For other sectors such as financial services, construction, or textiles, the coefficient on GDP is only about half that size.

Sectors also seem to differ in their sensitivity to regulations and cultural proxies. It is difficult, however, to trace a clear pattern in the data since many coefficients become insignificant or even switch signs as we run different specifications of our baseline model. Interestingly, the EU dummy is often significant and also carries a positive sign, suggesting that the Single Market Program has stimulated German FDI. The only exception is the construction sector, where the EU dummy has a negative impact.

It is interesting to note that the impact of distance differs quite significantly among sectors. Graph 1 plots the distance coefficients we obtain for 25 sectors for which we had a reasonable number of observations. The number of observations varies considerably across sectors, hence results should be taken as being indicative of trends rather than being precise point estimates.

A couple of results are interesting. On average, the marginal effect of distance for the whole sample is around –0.3. Distance has a negative impact on German FDI in most sectors. It has an above-average importance (in absolute terms) for the electricity sector, glass and ceramics, plastic products, retail trade, manufacturing of coke and refined petroleum products, and paper products. However, multinationals in the chemicals industry and hotels and restaurant are particularly attracted to distant markets. Finally, there is a group of sectors for which distance does not seem to be important (e.g. construction, financial services, information technology, housing, wood processing, agriculture).

3.3 What Determines the Size of Foreign Affiliates?

Finally, we explicitly use the microstructure of the database. Although we lack information on the balance sheets and income statements of the reporting firms, this exercise can provide us with additional information on the determinants of FDI. Results are reported in Table 4. Technically, we estimate equation (2) but the dependent variable is not aggregated across sectors but rather captures each individual investment into a foreign affiliate.[8] We indirectly account for the size of the reporting company by including the number of its foreign affiliates worldwide as an explanatory variable. This variable *size* is always positive and significant (Table 4, panel b), which implies that companies that maintain more foreign affiliates also have foreign affiliates which are of above-average size.

Table 4 reports two sets of regressions. In a first specification (panel a), we regress the size of the foreign affiliate on the set of regressors used above. In a second specification (panel b), we additionally include the number of foreign affiliates of the reporting company to control for firm size, and we include aggregated trade between Germany and the recipient country. In all regressions, we include sectoral dummies as well as dummies for the income level of the recipient country. In addition, we have run a number of robustness checks (results not reported), on which we will comment below. We run the two different specifications presented in Table 4 for each of the years 1990-2000 individually. This allows studying changes in the determinants of FDI over time. The main reason why we do not estimate a full-fledged panel model is that the codes of the companies have been changed in 1996. Hence, we cannot trace a particular reporting company through the 10 years under study. The number of foreign affiliates on which we have information has doubled during the observation period from 10,847 entries for the year 1990 to 21,285 entries for the year 2000.

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8 We equate the size of the foreign affiliate with the share in equity capital hold by one German company. The interpretation of our results might be biased if German companies hold smaller shares of total equity in those foreign affiliates which are located in nearby markets.

Running the same regressions for the micro-data as those presented in Section 3.2 for the sectorally aggregated data gives a much poorer statistical fit. In terms of explanatory power, our regressions explain at most 16% of the cross-country variation in the size of firms' foreign direct investment. The main reason is that we have generally not included any firm-specific explanatory variables. The adjusted R^2 even increases to over 30% if we additionally include interaction terms between the explanatory variables and a dummy for the size of the German multinational company (results not reported). For this purpose, small multinational companies have been defined as companies which total number of affiliates is smaller than three.

When comparing the results for the regressions using micro-data to those using aggregated data (i.e. comparing Tables 2 and 4), there is only one variable for which we obtain a result which is robust across specifications: GDP has a positive and significant impact on FDI across the different specifications that we use.

For some variables, we do obtain results that are similar across specifications although the picture is more mixed. For these variables, we also obtained quite a few insignificant coefficient estimates. *Risk* and *freedom*, for instance, tend to have a positive and negative impact on the size of foreign affiliates, respectively. Also, the dummies for current and capital account restrictions have relatively consistent signs, i.e. the presence of *capital controls* lowers FDI while the presence of *multiple exchange rates* increases FDI. While, if significant, the common language dummy is positive, it is significant in only a few of the specifications. The EU dummy tends to be negative in contrast, suggesting that relatively small affiliates are set up in these countries.

The variable for which we obtain the largest differences between the quasi-panel regressions (Table 2) and the regressions using the micro-data (Table 4, Panel a) is the distance variable. While we obtain a statistically significant negative link between distance and FDI for the aggregated data, the effect of distance is often positive for the micro-data. Our second proxy for proximity, the common border dummy, also has a different effect. In contrast to the aggregated equations (Table 2), where we generally obtain a positive effect, we often obtain a negative sign in the micro-data regressions (Table 4).

The positive effect of distance even survives in some cases if we additionally control for the level of total foreign trade between Germany and the recipient country (Table 4, Panel b). At the same time, the effect of trade is negative and not, as for the aggregated data, positive. This result could partly be seen as a mirror-image of the different results obtained for distance. Since gravity models for trade overwhelmingly find that aggregated trade and distance are negative correlated, a negative link between a given variable and trade should be associated with a positive link between this variable and distance. The negative border effect remains

even if we control for the level of foreign trade. The interpretation of this result is that it is the smaller foreign affiliates which are set up in neighboring countries, as has also been suggested by the negative EU dummy.

Since, for most other variables, we obtain results that are relatively consistent in sign when comparing regressions for aggregated and disaggregated data, the differential effect of trade and "proximity" obviously warrants an explanation. Two explanations, which are not mutually exclusive, are conceivable:

The first explanation for the negative link between trade and the size of foreign affiliates is that, in countries with which Germany conducts a lot of foreign trade, the average size of the foreign affiliate is smaller. One interpretation would be that these affiliates are set up to facilitate trade and not as foreign production units. Even if they are production units, the share of imported inputs might be higher than in affiliates which are far away from Germany. Thus, the value added in these affiliates might be low, which requires less capital. To explore this relationship is beyond the scope of this paper but an interesting task for further research.

The second explanation for the positive link between distance and the size of foreign affiliates is that firms set up smaller foreign affiliates on average in nearby countries, because it is profitable to do so even for smaller units. Set-up costs of establishments in remote countries, in contrast might be too high for small affiliates. If this explanation was correct, then the negative effect of distance on FDI found in aggregated data must be due to a decline in the number of affiliates as distance increases which overcompensates the size effect of the average single affiliate.

We test whether this explanation is confirmed by the data by running regressions, using the number of German firms' foreign affiliates as the dependent variable. Results are reported in Tables 5a and 5b. These results are consistent with the hypothesis that proximity (measured through the presence of a common border or through distance) has a different effect on the size of the foreign affiliate than on the number of firms abroad. As for the aggregated data, the number of firms is relative negatively (positively) to distance (common border). The mirror-image of this finding is that the effect of trade differs. Hence, nearby countries, with which Germany conducts a lot of trade, attract many small foreign affiliates whereby remote countries, with which Germany conducts little foreign trade, attract few large foreign affiliates. Since the impact of proximity and trade on the number of foreign affiliates dominates, we obtain the aggregated effect of a negative (positive) link between total FDI and distance (trade).

Graph 2 shows descriptive statistics which confirm that affiliates located in bordering and nearby countries are smaller on average than affiliates located in more remote countries. Graph 2 shows the means of employment, sales, and FDI of affiliates in bordering countries over time. Overall, affiliates in bordering countries are smaller in terms of employment, sales, and the sum of equity capital invested than affiliates in more remote regions. These differences have remained relatively stable over time. While all affiliates have grown in the past ten years on average, the gap between the size of affiliates in the two regions considered has remained almost unchanged.

The regression analysis reported above has also shown that smaller foreign affiliates are set up in countries with which Germany conducts a lot of foreign trade. This results can be interpreted as smaller affiliates being used for distribution rather than production. Since our dataset provides us with information on the sector of the foreign affiliate, we can check whether this hypothesis is confirmed by the data. Table 6 shows differences in the importance of wholesale trade for firms of different size in terms of employment and in different regions. The most important individual sector of the foreign affiliates is wholesale trade, which accounts for more than one third of all foreign establishments of German firms.

With regard to the importance of wholesale trade activity, the size of employment in the foreign affiliates matters most. Whereas wholesale trade is the main line of business for 36% of the firms in the sample, it accounts for 43% of the activities of affiliates with less than 50 employees and only 18% for those with more than 50 employees. This difference also remains if we break up the sample into bordering and nearby countries, on the one hand, and more distant countries, on the other hand. Hence, less employees are needed *ceteris paribus* in affiliates being engaged in distribution as opposed to production abroad. Breaking up the sample into reporting companies that have only 1 or 2 foreign affiliates and those that have more than 2 foreign affiliates shows that wholesale trade and thus distribution is somewhat more important for those having more affiliates abroad. Looking at differences between nearby and remote countries also shows that wholesale trade is somewhat more important in the nearby regions.

4 Avenues for Future Research

This paper has provided a first assessment of the determinants of German firms' foreign direct investment activities, using a comprehensive firm-level dataset. We have looked at the data at different levels of aggregation. In a first step, we have aggregated the data by country and sector. In a second step, we have focused the analysis on the sectoral differences in the determinants of FDI. In a final step, we have used the size of foreign affiliates and thus firm-level data as the dependent variable.

Interestingly, there are only two results which are fairly robust against changes in the specification. As shown by the positive impact of GDP and the negative impact of risk on FDI, German firms are drawn to large and safe markets. Other traditional determinants of FDI have more heterogenous effects, and their impact differs according to the sector and the size of the foreign affiliate under study.

One interesting result of this study has been that regional and cultural proximity have a differential effect on the size of the foreign affiliate and the number of firms being present in a given host country. More specifically, many small affiliates tend to be set up in nearby markets whereas few but, on average, larger affiliates tend to be set up in distant markets. This is shown by the negative (positive) link that we find between the border dummy (distance) and the size of the foreign affiliate. Opposite effects of these variables are found for the total number of affiliates. For aggregate FDI, the effect of proximity on the number of firms dominates. Hence, we find that there is more FDI in geographically close countries with which Germany shares a common border.

Different effects of distance on the number and the size of foreign affiliates are a mirror-image of the differential effect of aggregated bilateral trade on these two measures of German firms' FDI. Whereas there is a positive link between aggregated FDI (and the number of German affiliates in a given market) and trade, the link is negative for the size of the affiliate. One interpretation of this result is that affiliates which are production units and therefore substitute trade are larger in size. An affiliate set up for distribution can be smaller (with regard to the equity investment it requires) than a production unit.

This interpretation of the link between trade and FDI also shows one potentially interesting direction for future research. It would be of interest to test in more detail to what extent foreign affiliates are set up to facilitate trade or production abroad. The sector classifications of the foreign affiliate and the parent company might help to distinguish sales units from production units. Another way of discriminating between the two purposes might be to compare equity-sales-ratios or employment-sales-ratios for the affiliates. In general, sales units show lower ratios than production units.

A second extension of this work would be to try and explain the differences in the determinants of FDI for different sectors. Controlling for sector-specific factors such as the degree of competition, the intensity of regulations, or the relative importance of fixed versus variable costs of entry would be one step into this direction.

Finally, it would be of interest to shed more light on the question to what extent FDI and other modes of integration are linked. Results of this study suggest that aggregated FDI and trade

are complements. In addition, it would be of interest to analyze links between FDI and other factors flows. For instance, business services, as an important intermediary input in affiliates' production might be interesting to analyze. A study on the relationship of business services and FDI can shed light on the choice between licensing and FDI, because intra-firm information flows are one likely candidate for the internalization decision of MNEs.

Our results also hold some interesting implications for future theoretical work on the determinants of FDI. Typically, theoretical models assume the existence of firms that do not differ in size. This helps to derive implications on aggregate FDI on the basis of the analysis of a representative firm. This approach has the disadvantage, however, that differences in the size of affiliates cannot be analyzed. The number of affiliates, in turn, is endogenous in these models and depends only on the size of the country. However, our results show that these assumptions may not reflect reality sufficiently. Rather, proximity seems to have an impact both on the size of the affiliate and on the number of affiliates being set up abroad. Proximity may have differential effects on aggregate FDI. Moreover, modeling differences in the foreign investment behavior of different sectors seems promising (see, e.g., Helpman et al. (2003) for a recent contribution). All this is left to future research.

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Table 1 — Regional and Sectoral Breakdown of German FDI, end of 2000.

	All sectors	Manufacturing					Retail & car repair	Financial institutions	Insurances	Holding companies	Private households
		Total	Chemicals	Machinery	Electrical machinery	Automobile					
a) Regional breakdown											
All countries	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Industrialized countries	85.9	85.5	83.0	84.7	83.6	90.1	78.7	88.9	90.7	87.3	90.5
EU countries	41.1	31.8	41.0	45.4	38.8	13.6	51.5	35.5	44.1	55.2	22.1
Other industrialized countries	44.8	53.7	41.9	39.3	44.7	76.5	27.3	53.4	46.6	32.1	68.4
USA	37.9	46.1	34.6	28.2	25.0	72.2	18.8	50.9	31.7	25.3	44.3
Transition economies	5.6	6.3	3.6	7.4	9.0	5.2	14.2	2.9	0.9	4.6	4.4
China	0.9	1.7	1.3	2.4	4.2	1.5	0.2	0.1	-	0.5	X
Developing countries	8.6	8.2	13.4	8.0	7.4	4.7	7.0	8.2	8.3	8.1	5.1
Africa	0.8	0.9	0.8	1.1	0.7	1.1	0.7	0.2	2.0	0.5	2.2
America	4.5	3.7	6.2	3.1	3.4	2.9	3.4	4.3	4.1	5.3	2.1
Asia and Ozeania	3.2	3.6	6.4	3.7	3.3	0.7	2.9	3.8	2.2	2.2	0.8
b) Sectoral breakdown											
All countries	100.0	39.1	7.9	2.7	4.3	17.3	1.8	17.7	2.5	32.5	1.1
Industrialized countries	100.0	38.9	7.6	2.7	4.2	18.1	1.6	18.3	2.6	33.1	1.1
EU countries	100.0	30.3	7.9	3.0	4.1	5.7	2.2	15.2	2.6	43.7	0.6
Other industrialized countries	100.0	46.9	7.4	2.4	4.3	29.5	1.1	21.0	2.6	23.3	1.7
USA	100.0	47.6	7.2	2.0	2.9	32.8	0.9	23.7	2.1	21.7	1.3
Transition economies	100.0	44.7	5.1	3.6	7.0	16.3	4.6	9.2	0.4	27.2	0.9
China	100.0	74.1	11.3	7.2	19.7	27.8	0.5	2.3	-	17.2	X
Developing countries	100.0	37.4	12.4	2.5	3.7	9.4	1.5	17.0	2.4	30.7	0.7
Africa	100.0	44.0	8.0	3.6	3.5	24.0	1.6	3.3	6.0	21.8	2.9
America	100.0	31.8	10.8	1.9	3.3	11.0	1.4	16.9	2.2	38.4	0.5
Asia and Ozeania	100.0	43.5	15.7	3.2	4.4	3.6	1.6	20.6	1.7	22.2	0.3

Source: Deutsche Bundesbank (2002).

Table 2 — Quasi-Panel Regressions

Time fixed effects included. Dependent variable (FDI) and the explanatory variables GDP, GDP per capita, distance, and risk are in logs. *, **, *** significant at 10%, 5%, and 1% level, respectively.

Specification	**1** OLS Sectoral dummies	**2** OLS Country-spec. sectoral dummies	**3** OLS Contry-spec. sectoral and sect. dummies	**4** OLS Income dummies, sect. dummies	**5** OLS Sectoral dummies	**6** OLS Sectoral dummies	**7** OLS Sectoral dummies	**8** OLS Sectoral dummies	**9** Fixed Effects Panel Income and sect. dummies
Log gdp	0.61***	0.69***	0.97***	0.62***	0.65***	0.65***	0.71***	0.62***	0.84***
	(40.43)	(3.58)	(6.22)	(40.81)	(42.70)	(36.86)	(39.56)	(41.03)	(5.58)
Log distance	–0.16***	–0.45	–0.92**	–0.16***	0.04	–0.25***	–0.02	–0.20***	
	(–6.42)	(–0.90)	(–1.99)	(–6.66)	(1.51)	(–8.41)	(–0.66)	(–7.98)	
Common border	0.45***	–0.17	–0.81	0.38***	1.16***	0.32***	1.15***	0.52***	
	(6.34)	(–0.24)	(–1.41)	(5.36)	(14.50)	(3.92)	(12.01)	(7.41)	
Log Risk	0.68***	0.47	–0.11	0.61***	0.22***	0.47***	0.03	0.71***	0.35***
	(8.54)	(0.26)	(–0.68)	(6.38)	(2.64)	(4.89)	(0.28)	(8.79)	(2.62)
Freedom	–0.18***	–0.07*	–0.08**	–0.16***	–0.21***	–0.13***	–0.19***	–0.17***	–0.08***
	(–15.79)	(–1.74)	(–2.43)	(–11.62)	(–18.41)	(–8.45)	(–12.02)	(–14.52)	(–2.60)
Capital controls	–0.24***	–0.11	–0.13**	–0.33***	–0.27***	–0.17***	–0.24***	–0.20***	–0.17***
	(–4.88)	(–1.34)	(–2.22)	(–6.24)	(–5.65)	(–2.75)	(–3.84)	(–4.05)	(–3.08)
Multiple exchange rates	0.20***	–0.23**	–0.30***	0.23***	0.19***	0.16*	0.20**	0.22***	–0.25***
	(3.04)	(–2.27)	(–3.46)	(3.46)	(2.79)	(1.92)	(2.35)	(3.24)	(–3.00)
EU	–0.03	1.41**	1.69***	0.15**	0.05	–0.14**	–0.06	–0.17***	
	(–0.48)	(2.18)	(2.79)	(2.54)	(0.80)	(–2.06)	(–0.91)	(–2.96)	
Common language	0.82***	1.62**	2.45***	1.00***	0.64***	0.76***	0.56***	0.76***	
	(10.08)	(2.48)	(3.96)	(12.11)	(7.91)	(7.62)	(5.68)	(9.46)	
Tariffs						–0.02***	–0.01***		
						(–7.44)	(–4.25)		
Log labor productivity								0.00	
								(0.07)	
Trade					0.73***		0.78***		
					(17.43)		(15.65)		
Low-mid income				–0.09					
				(–0.99)					
Up-mid income				0.55***					
				(5.64)					
High income				0.00					
				(0.03)					
R^2	0.50	0.33	0.60	0.51	0.52	0.51	0.53	0.52	0.15
N	9265	9265	9265	9265	9265	6503	6503	8644	11436

Table 3 — Sectoral Regressions

OLS estimates on pooled data for the years 1990-2000. Dependent variable (FDI) and the explanatory variables GDP, GDP per capita, distance, and risk are in logs. Time dummies included. *, **, *** significant at 10%, 5%, and 1% level, respectively.

	Bank	Textiles	Chemicals	Plastic products	Machinery	Automobiles	Construction	Wholesale	Transport and communi-cation	Financial services	Business services	ICT
Log gdp	0.65***	0.40***	0.99***	0.74***	0.95***	0.93***	0.50***	0.64***	0.55***	0.37***	0.65***	0.87***
	(9.29)	(7.37)	(24.05)	(11.04)	(21.23)	(15.12)	(5.85)	(14.82)	(11.85)	(5.81)	(9.64)	(17.17)
Log distance	–0.15	–0.31***	0.47***	–0.64***	–0.42***	–0.08	0.17	–0.32***	–0.26***	0.12	–0.07	–0.10
	(–1.22)	(–4.20)	(7.11)	(–6.26)	(–5.44)	(–0.76)	(1.51)	(–5.16)	(–3.10)	(1.13)	(–0.57)	(–1.29)
Common	0.03	0.27	1.02***	–0.06	0.39**	0.80**	1.47***	0.93***	0.88***	0.40	0.68**	0.20
border	(0.11)	(0.95)	(5.39)	(–0.29)	(2.19)	(2.59)	(4.86)	(6.37)	(3.56)	(1.31)	(2.56)	(1.21)
Risk	1.31***	0.86***	1.42***	0.70*	–0.31	0.20	0.60	0.85***	0.49*	0.51	1.39***	2.16***
	(2.67)	(3.26)	(4.97)	(1.69)	(–0.94)	(0.45)	(1.23)	(3.20)	(1.91)	(1.21)	(2.90)	(6.55)
Freedom	–0.03	–0.04	–0.14***	–0.03	–0.21***	–0.17**	–0.07	–0.18***	–0.04	–0.22***	–0.34***	–0.20***
	(–0.48)	(–0.74)	(–3.44)	(–0.44)	(–3.71)	(–2.25)	(–1.37)	(–4.56)	(–1.09)	(–5.02)	(–5.98)	(–3.86)
Capital	–0.89***	–0.11	–0.09	–0.19	–0.50***	–0.39	–0.42	–0.25	–0.03	–1.71***	–0.74***	0.09
controls	(–4.14)	(–0.55)	(–0.58)	(–0.95)	(–2.98)	(–1.48)	(–1..40)	(–1.55)	(–0.21)	(–6.07)	(–2.73)	(0.58)
Multiple	0.33	–0.50**	0.57***	–0.27	0.20	0.46	0.13	–0.08	0.21	1.31***	1.07***	0.29
Exch. Rates	(–0.95)	(–2.22)	(3.45)	(–0.83)	(0.76)	(1.15)	(0.46)	(–0.48)	(1.24)	(3.55)	(3.72)	(1.29)
EU	0.35	0.63***	1.35***	0.75***	0.19	0.55**	–0.68***	0.55***	–0.00	1.31***	0.85***	0.71***
	(1.23)	(3.18)	(9.12)	(3.76)	(1.01)	(1.98)	(–2.64)	(3.70)	(–0.01)	(4.21)	(3.40)	(4.37)
Common	0.90***	1.38***	0.98***	1.15***	0.73***	0.48	0.50	0.60***	1.05***	0.81***	1.20***	1.23***
language	(2.93)	(4.83)	(4.06)	(5.53)	(4.57)	(1.57)	(1.04)	(4.19)	(3.55)	(2.73)	(4.09)	(6.83)
Low-mid	0.27	0.13	0.65***	–0.50	–0.65**	–1.38***	–0.43	0.20	–0.97***	–0.30	–0.45	0.20
income	(0.89)	(0.31)	(3.76)	(–1.42)	(–2.35)	(–3.21)	(–0.84)	(0.89)	(–5.25)	(–0.80)	(–1.55)	(0.67)
Up-mid	0.83**	0.19	0.69***	0.20	0.63**	0.78	–0.41	0.73***	–0.74***	–0.13	–0.16	0.81**
income	(2.50)	(0.39)	(3.26)	(0.62)	(2.24)	(1.62)	(–0.71)	(2.62)	(–3.51)	(–0.31)	(–0.51)	(2.58)
High income	0.28	–0.58	–0.16	–0.41	0.22	–0.44	–0.03	0.11	–0.62**	0.37	–1.84***	–0.33
	(0.61)	(–0.94)	(–0.52)	(–1.03)	(0.53)	(–0.72)	(–0.05)	(0.33)	(–2.00)	(0.70)	(–3.75)	(–0.78)
R^2	0.55	0.42	0.77	0.59	0.69	0.55	0.38	0.68	0.50	0.55	0.58	0.69
N	433	465	717	373	545	439	392	699	619	460	444	625

Graph 1 — Sectoral Distance Coefficients

This graph plots the distance coefficients obtained from a baseline regression of the types reported in Table 3. Data were entered in logs, and time dummies are included. Insignificant coefficients are entered as zeros.

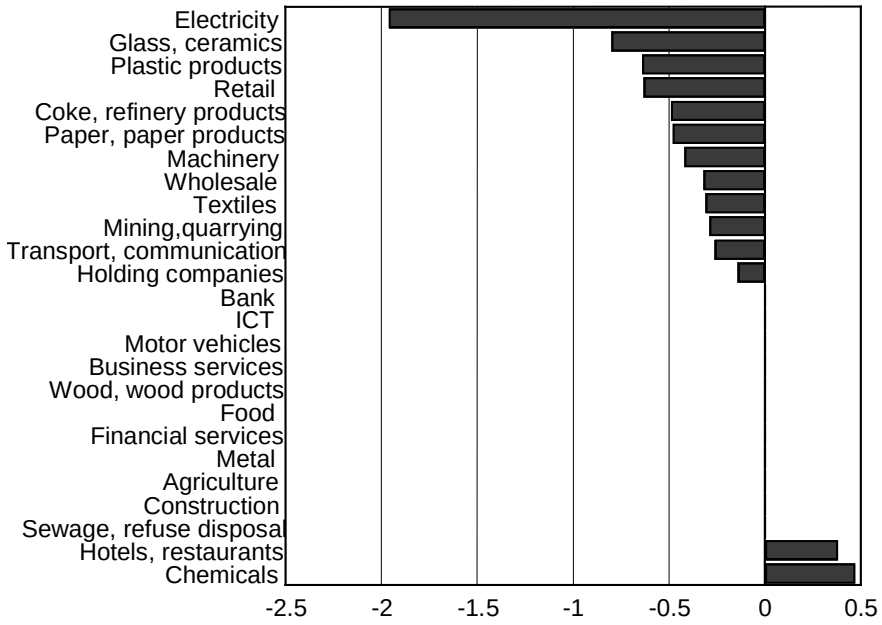


Table 4 — Regressions Using Micro-Data

OLS estimates. Dependent variable (FDI) and the explanatory variables GDP, GDP per capita, distance, and risk are in logs. *, **, *** significant at 10%, 5%, and 1% level, respectively. White-heteroscedasticity robust standard errors have been used. In Panel (b) and (c) 'size' is measured as the total number of foreign affiliates worldwide owned by the reporting company, and 'trade' gives the aggregated volume of foreign trade (sum of exports and imports divided by two) between Germany and the host country. In panel (c), the smallest and largest 10% of the observations have been dropped. Sectoral dummies are included.

a) Baseline, Not Including Size and Trade Effects

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Log gdp	–0.02	–0.00	0.01	0.03	0.06***	0.07***	0.08***	0.16***	0.13***	0.14***	0.12***
	(–1.05)	(–0.01)	(0.51)	(1.53)	(4.48)	(5.24)	(6.53)	(11.48)	(11.53)	(11.73)	(10.45)
Log distance	–0.04	0.09***	0.11***	0.03	0.04*	0.02	0.03	0.05**	0.04*	0.03	0.07***
	(–1.25)	(2.95)	(4.67)	(1.39)	(1.74)	(1.19)	(1.64)	(2.48)	(1.91)	(1.23)	(3.61)
Common	–0.14**	0.04	–0.01	–0.04	–0.08	–0.05	–0.06	–0.18***	–0.15***	–0.20***	–0.16***
border	(–2.22)	(0.66)	(–0.21)	(–0.71)	(–1.45)	(–1.10)	(–1.38)	(–3.99)	(–3.46)	(–4.68)	(–3.81)
Risk	0.11	0.09	0.03	0.53***	–0.41***	0.35***	0.51***	0.16	0.00	–0.01	0.40**
	(0.66)	(0.47)	(0.18)	(3.44)	(–2.62)	(2.69)	(3.12)	(0.94)	(0.02)	(–0.04)	(2.53)
Freedom	–0.10***	–0.11***	–0.12***	–0.05***	–0.00	–0.02	0.01	0.01	0.01	0.02*	0.02**
	(–4.61)	(–5.31)	(–5.40)	(–3.03)	(–0.07)	(–0.93)	(0.75)	(0.89)	(0.51)	(1.84)	(2.03)
Capital	–0.04	0.20**	–0.30***	–0.36***	–0.34***	–0.05	–0.05	–0.32***	–0.25***	–0.32***	–0.31***
controls	(–0.47)	(2.44)	(–4.16)	(–4.18)	(–4.64)	(–0.87)	(–0.82)	(–6.56)	(–5.32)	(–6.26)	(–4.87)
Multiple	0.25**	0.19**	0.08	0.24***	0.30***	0.96***	0.89***	–0.00	0.51*	–0.10	–0.04
exch. rates	(2.42)	(2.09)	(1.01)	(2.91)	(3.82)	(11.55)	(11.48)	(–0.00)	(1.80)	(–0.62)	(–0.25)
EU	–0.27***	–0.02	–0.17***	–0.20***	–0.27***	–0.26***	–0.21***	–0.07*	–0.15***	–0.21***	–0.19***
	(–2.82)	(–0.26)	(–3.59)	(–4.14)	(–6.36)	(–5.93)	(–4.82)	(–1.71)	(–3.69)	(–3.70)	(–4.49)
Common	–0.06	–0.21***	–0.01	0.04	0.11**	0.07	0.04	0.29***	0.20***	0.19***	0.10**
language	(–0.60)	(–3.10)	(–0.11)	(0.73)	(2.10)	(1.38)	(0.79)	(5.31)	(3.84)	(3.15)	(2.04)
Low-mid	0.13	0.40***	0.37**	0.33**	–0.32**	–0.28**	–0.18	0.15	0.35***	0.13	0.11
income	(0.80)	(2.66)	(2.48)	(2.45)	(–2.59)	(–2.43)	(–1.64)	(1.48)	(3.29)	(1.28)	(1.11)
Up-mid	0.76***	0.42**	0.51***	0.04	0.31**	0.05	0.08	0.22**	0.39***	0.27***	0.14
income	(4.54)	(2.54)	(3.19)	(0.26)	(2.34)	(0.43)	(0.75)	(2.56)	(3.72)	(2.62)	(1.36)
High income	0.67***	0.62***	0.30	–0.27	0.48***	0.29**	0.24*	0.21*	0.57***	0.47***	0.25*
	(3.46)	(2.89)	(1.48)	–(1.36)	(3.05)	(2.03)	(1.77)	(1.96)	(4.07)	(3.23)	(1.79)
R^2	0.13	0.11	0.11	0.11	0.12	0.13	0.13	0.13	0.12	0.11	0.12
N	10847	11590	13172	13190	16673	16726	17859	19034	20260	19008	21285

b) Baseline, Including Size and Trade Effects

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Size	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***	0.00***	0.00***
	(17.73)	(20.27)	(20.32)	(22.53)	(18.74)	(19.62)	(20.93)	(22.18)	(16.26)	(13.89)
Log gdp	0.00	0.01	0.03	0.08***	0.08***	0.09***	0.17***	0.14***	0.15***	0.12***
	(0.03)	(0.32)	(1.59)	(5.76)	(6.01)	(7.26)	(12.46)	(12.57)	(12.58)	(10.66)
Log distance	0.10***	0.09***	–0.00	0.01	0.01	0.03	0.02	0.02	–0.01	0.06***
	(3.23)	(3.96)	(–0.09)	(0.70)	(0.55)	(1.40)	(0.97)	(0.92)	(–0.43)	(2.96)
Common	0.06	–0.02	–0.13**	–0.14***	–0.09*	–0.08*	–0.24***	–0.19***	–0.24***	–0.19***
border	(1.05)	(–0.38)	(–2.23)	(–2.68)	(–1.86)	(–1.71)	(–5.47)	(–4.33)	(–5.39)	(–4.36)
Risk	0.59***	0.52***	0.58***	–0.26*	0.49***	0.81***	0.73***	0.15	0.03	0.67***
	(2.94)	(3.02)	(3.78)	(–1.65)	(3.74)	(4.76)	(3.96)	(1.48)	(0.20)	(4.02)
Freedom	–0.08***	–0.09***	–0.02	–0.01	–0.03*	–0.01	0.02	–0.00	0.02	0.02*
	–(3.81)	(–4.00)	(–1.04)	(–0.41)	(–1.66)	(–0.33)	(1.15)	(–0.39)	(1.40)	(1.81)
Capital	0.25***	–0.22***	–0.35***	–0.33***	–0.04	–0.04	–0.29***	–0.20***	–0.29***	–0.30***
controls	(3.08)	(–3.08)	(–4.18)	(–4.59)	(–0.65)	(–0.71)	(–6.11)	(–4.26)	(–5.70)	(–4.87)
Mult. exch.	0.47***	0.53***	0.41***	0.37***	0.90***	0.86***	–0.36	0.12	–0.20	–0.01
rates	(4.95)	(5.74)	(5.05)	(4.76)	(10.64)	(10.69)	(–1.34)	(0.43)	(–1.15)	(–0.09)
EU	0.20**	0.04	0.01	–0.19***	–0.20***	–0.16***	–0.02	–0.14***	–0.27***	–0.15***
	(2.21)	(0.64)	(0.24)	(–4.35)	(–4.59)	(–3.61)	(–0.45)	(–3.41)	(–4.62)	(–3.55)
Common	–0.01	0.21***	0.35***	0.28***	0.17***	0.12**	0.46***	0.27***	0.31***	0.18***
language	(–0.13)	(3.28)	(5.67)	(5.07)	(3.20)	(2.27)	(8.16)	(5.31)	(4.68)	(3.48)
Trade	–0.35***	–0.36***	–0.42***	–0.26***	–0.16***	–0.11***	–0.31***	–0.18***	–0.10***	–0.16***
	(–5.07)	(–5.70)	(–7.39)	(–5.19)	(–3.57)	(–2.60)	(–7.74)	(–4.80)	(–2.70)	(–4.94)
Inc_lowmid	0.68***	0.74***	0.56***	–0.10	–0.13	–0.07	0.31***	0.47***	0.24**	0.26**
	(4.41)	(4.74)	(3.94)	(–0.76)	(–1.13)	(–0.62)	(3.05)	(4.22)	(2.24)	(2.48)
Inc_upmid	0.68***	0.76***	0.44***	0.59***	0.30**	0.22**	0.51***	0.63***	0.46***	0.34***
	(4.13)	(4.74)	(2.98)	(4.36)	(2.42)	(2.03)	(5.73)	(5.63)	(4.18)	(3.14)
Inc_high	0.79***	0.59***	0.06	0.67***	0.42***	0.22	0.19*	0.63***	0.62***	0.25*
	(3.65)	(2.96)	(0.31)	(4.27)	(2.91)	(1.59)	(1.75)	(4.50)	(4.08)	(1.76)
R^2	0.15	0.15	0.16	0.16	0.16	0.16	0.16	0.15	0.13	0.13
N	11590	13029	13190	16673	16726	17859	19034	20260	19008	21285

Table 5 — Number of Foreign Affiliates

The dependent variable is the number of foreign affiliates of German companies in a given host country. OLS estimates. Dependent variable (FDI) und the explanatory variables GDP, GDP per capita, and distance are in logs. *, **, *** significant at 10%, 5%, and 1% level, respectively. White-heteroscedasticity robust standard errors have been used. Sectoral dummies are included. Trade are the residuals of a regression of trade on a number of exogenous variables. See text for details.

a) Baseline, Not Including Trade Effects

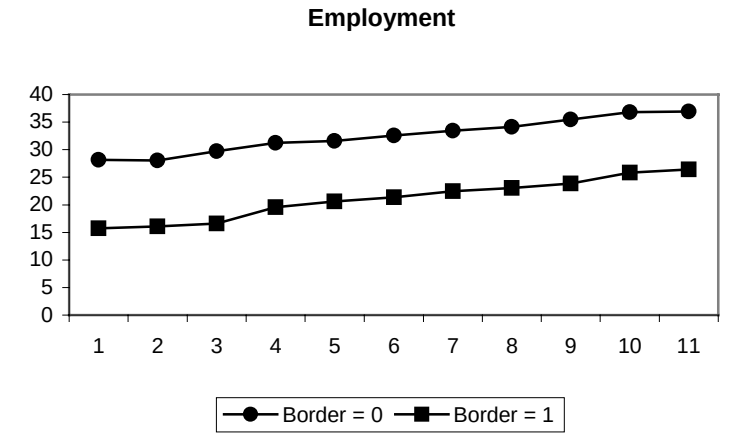
	Panel	OLS	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Log gdp	–0.16	0.73***	0.63***	0.70***	0.60***	0.67***	0.69***	0.76***	0.73***	0.74***	0.82***	0.83***	0.81***
	(–0.67)	(36.44)	(6.95)	(6.76)	(7.15)	(10.92)	(9.96)	(11.47)	(11.77)	(11.60)	(13.49)	(11.83)	(12.00)
Log distance		–0.18***	0.38*	0.03	0.14	–0.07	–0.20*	–0.30***	–0.30***	–0.34***	–0.39***	–0.39***	–0.38***
		(–5.35)	(1.68)	(0.14)	(0.96)	(–0.53)	(–1.84)	(–3.00)	(–3.15)	(–3.52)	(–4.01)	(–4.28)	(–3.85)
Common border		0.70***	0.88*	0.63	0.94**	0.89***	0.66**	0.47	0.54*	0.63**	0.60**	0.51*	0.57**
		(7.04)	(1.92)	(1.60)	(2.29)	(2.91)	(2.15)	(1.64)	(1.88)	(2.38)	(2.38)	(1.80)	(2.04)
Risk	0.54***	1.27***	1.36***	1.27***	1.71***	1.82***	1.93***	1.44***	1.77***	1.48***	0.66**	1.17**	1.15*
	(3.33)	(10.23)	(2.98)	(3.58)	(3.68)	(4.53)	(4.84)	(3.66)	(4.09)	(3.46)	(2.24)	(2.27)	(1.94)
Freedom	–0.10*	–0.19***	–0.18***	–0.13**	–0.19**	–0.22***	–0.17**	–0.18***	–0.17***	–0.18***	–0.19***	–0.18**	–0.21***
	(–1.71)	(–10.67)	(–2.76)	(–2.06)	(–2.66)	(–3.74)	(–2.48)	(–3.08)	(–2.88)	(–2.87)	(–3.01)	(–2.58)	(–3.15)
Capital controls	–0.06	–0.04	–0.15	–0.12	–0.13	–0.23	0.14	–0.11	0.04	0.09	0.39*	0.43*	0.38*
	(–0.95)	(–0.55)	(–0.51)	(–0.42)	(–0.45)	(–0.73)	(0.54)	(–0.45)	(0.17)	(0.34)	(1.77)	(1.71)	(1.89)
Mult. exch. rates	–0.13	0.16*	0.21	0.07	0.29	0.31	0.25	0.36	0.38*	–0.11	–0.41	–0.25	–0.33
	(–1.06)	(1.84)	(0.70)	(0.24)	(1.01)	(1.31)	(0.94)	(1.50)	(1.90)	(–0.44)	(–1.54)	(–0.64)	(–0.65)
EU		0.47***	1.20**	0.82*	1.13***	0.47	0.56*	0.37	0.36	0.27	0.12	0.14	0.30
		(4.57)	(2.51)	(1.77)	(2.75)	(1.26)	(1.70)	(1.15)	(1.14)	(0.80)	(0.38)	(0.38)	(0.81)
Common language		0.99***	1.37***	1.18***	1.31***	1.02***	0.95***	0.86***	0.84***	0.85***	0.72***	0.74***	0.83***
		(10.44)	(3.65)	(5.05)	(2.72)	(3.89)	(2.96)	(3.31)	(3.24)	(3.16)	(3.06)	(3.05)	(2.83)
Inc_low	–0.33	0.21**	–0.08	–0.19	–0.14	0.18	0.38	0.39	0.43	0.52*	0.31	0.31	0.23
	(–1.55)	(2.20)	(–0.16)	(–0.49)	(–0.42)	(0.50)	(1.06)	(1.08)	(1.33)	(1.73)	(1.00)	(1.03)	(0.75)
Inc_upmid	0.18	0.21**	0.25	–0.07	–0.37	–0.11	0.30	0.47*	0.29	0.27	0.39	0.23	0.18
	(1.08)	(2.36)	(0.72)	(–0.20)	(–0.90)	(–0.31)	(1.10)	(1.76)	(1.11)	(1.08)	(1.33)	(0.94)	(0.66)
Inc_high	0.09	–0.83***	–0.55	–1.04**	–1.44**	–1.52***	–0.80*	–0.56	–0.64	–0.61	–0.60	–0.95**	–1.02*
	(0.44)	(–6.16)	(–1.05)	(–2.14)	(–2.53)	(–2.87)	(–1.85)	(–1.33)	(–1.63)	(–1.48)	(–1.23)	(–2.07)	(–1.93)
R^2	0.36	0.83	0.81	0.83	0.81	0.85	0.86	0.86	0.87	0.86	0.86	0.85	0.86
N	949	949	71	70	80	86	90	91	92	93	93	90	93

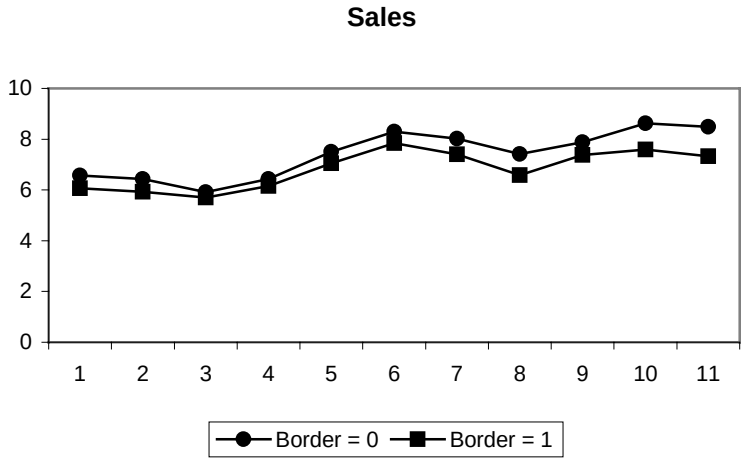
b) Baseline, Including Trade Effects

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Log gdp	0.79***	0.71***	0.72***	0.71***	0.76***	0.76***	0.76***	0.83***	0.85***	0.80***
	(7.86)	(9.15)	(12.28)	(11.96)	(11.81)	(11.86)	(10.69)	(13.38)	(12.97)	(12.73)
Log distance	–0.10	0.05	–0.05	–0.18*	–0.26***	–0.26***	–0.29***	–0.33***	–0.31***	–0.23***
	(–0.63)	(0.37)	(–0.38)	(–1.83)	(–2.84)	(–2.90)	(–3.23)	(–4.35)	(–4.48)	(–3.03)
Common	0.47	0.85***	0.95***	0.69***	0.65***	0.72***	0.72***	0.69***	0.72***	0.81***
border	(1.42)	(3.01)	(3.40)	(2.66)	(2.68)	(2.91)	(3.03)	(3.24)	(3.73)	(4.16)
Risk	0.89**	0.90**	1.39***	1.69***	1.16***	1.29***	1.18***	0.78***	0.92**	0.72*
	(2.53)	(2.24)	(3.58)	(5.04)	(3.36)	(3.44)	(3.07)	(2.96)	(2.33)	(1.90)
Freedom	–0.16***	–0.18***	–0.22***	–0.21***	–0.18***	–0.16***	–0.17***	–0.17***	–0.14***	–0.19***
	(–2.81)	(–2.82)	(–4.21)	(–3.60)	(–3.64)	(–3.15)	(–3.27)	(–3.35)	(–2.71)	(–3.51)
Capital	–0.25	–0.17	–0.29	–0.11	–0.06	0.06	0.04	0.11	0.37	0.46***
controls	(–0.89)	(–0.61)	(–0.99)	(–0.44)	(–0.27)	(0.25)	(0.19)	(0.49)	(1.62)	(2.85)
Mult. exch.	–0.07	0.15	0.29	0.45*	0.46*	0.40*	–0.15	–0.06	–0.39	–0.02
rates	(–0.25)	(0.60)	(1.37)	(1.81)	(1.83)	(1.84)	(–0.73)	(–0.25)	(–1.05)	(–0.07)
EU	0.53	0.82*	0.36	0.31	0.19	0.13	0.03	–0.03	0.01	0.19
	(1.16)	(1.99)	(1.06)	(1.03)	(0.69)	(0.49)	(0.11)	(–0.10)	(0.03)	(0.65)
Common	0.96***	0.96**	0.72***	0.56**	0.59***	0.53**	0.52**	0.46**	0.45***	0.50**
language	(6.12)	(2.58)	(3.44)	(2.52)	(2.88)	(2.58)	(2.14)	(2.23)	(2.86)	(2.35)
Trade	0.90***	1.03***	0.82***	0.94***	0.79***	0.81***	0.78***	0.89***	0.86***	0.89***
	(3.93)	(5.07)	(4.24)	(6.11)	(4.41)	(4.73)	(4.06)	(5.02)	(5.81)	(6.68)
Inc_low	0.01	–0.14	0.16	0.46	0.38	0.18	0.44	0.19	0.02	–0.04
	(0.04)	(–0.47)	(0.50)	(1.59)	(1.19)	(0.58)	(1.63)	(0.58)	(0.08)	(–0.15)
Inc_upmid	0.21	0.07	0.05	0.20	0.49**	0.26	0.26	0.22	0.15	0.29
	(0.69)	(0.22)	(0.13)	(0.85)	(2.09)	(1.11)	(1.11)	(0.98)	(0.72)	(1.34)
Inc_high	–0.66	–0.56	–0.93*	–0.49	–0.09	–0.18	–0.16	–0.40	–0.65*	–0.48
	(–1.37)	(–1.03)	(–1.81)	(–1.29)	(–0.23)	(–0.50)	(–0.41)	(–0.97)	(–1.72)	(–1.16)
R^2	0.87	0.87	0.88	0.90	0.89	0.90	0.89	0.90	0.89	0.90
N	70	79	86	90	91	92	92	92	89	93

Graph 2 — Average Size of Foreign Affiliates

This graph plots the means of employment, sales, and foreign direct investment (*pbum*) in bordering and non-bordering countries. Data are in million USD for sales, and 1,000 USD for FDI.





Foreign Direct Investment

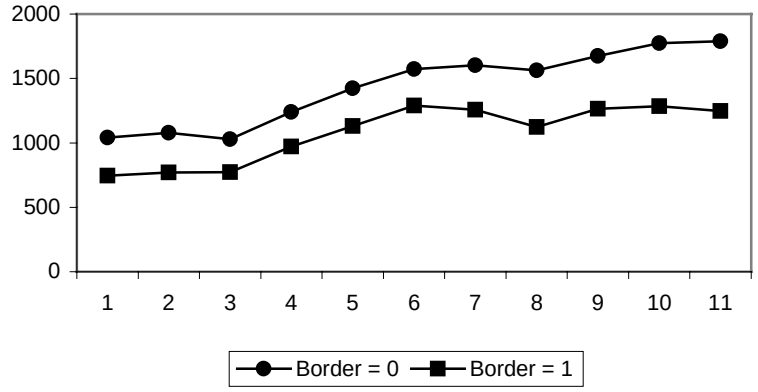


Table 6 — Foreign Affiliates and Wholesale Trade

	All affiliates	Number of employees		Number of foreign affiliates of reporting firm	
		< 50	> 50	< 2	> 2
	Number of affiliates				
	103301	87965	15336	24607	78694
	Percent of total				
All countries	36.23	43.18	18.83	32.12	37.73
Border = 0	33.98	41.67	17.67	27.71	35.84
Border = 1	39.28	45.00	20.95	36.36	40.67
Distance > 1000 km	31.89	39.38	16.69	25.53	33.82
Distance < 1000 km	39.79	45.95	21.17	36.33	41.25

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***** Available in German only.

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