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The Impact of Locating Production Abroad on Activities at Home

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The Impact of Locating Production Abroad on Activities at Home: Evidence from German Firm-Level Data ⋆

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Abstract

We analyze whether firms that establish their first affiliate in a foreign country have a different pattern of growth in output, employment, capital and productivity than firms that remain national. We use firm-level data on German multinational activities and appropriate matching techniques to compare the performance of German multinational firms with their national counterparts. We do not find a negative effect of firm's decision to establish a foreign affiliate on growth in its employment at home. There is also no significant effect of the internationalization decision of German firms on other measures of activities at home.

Keywords: multinational firms, employment, matching.

JEL classification: F23, F12, C21

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1 Introduction

The rapid engagement of German firms in Eastern European countries has received a lot of attention in German medias. It has been often argued that this internationalization process might explain the slow down of economic growth in Germany and the increase in unemployment. This view contrasts with the empirical picture presented in Becker *et al.* (2005). They show that the expansion of foreign activities of German firms has been accompanied by an increase in these firms output and employment in Germany. Becker *et al.* (2005) report that the increase of 56% in employment of German multinational firms' *foreign* affiliates has gone along with an increase of 50% in *domestic* employment of German multinational firms between 1996 and 2001.

From a theoretical point of view, it is not clear whether engaging in production abroad should have a positive or a negative effect on a firm's activities at home. According to Hanson *et al.* (2005), the positive or negative correlation depends on the degree of complementarity between foreign and domestic stages of production. If foreign production substitutes partly domestic stages of production, then engaging in Foreign Direct Investment (FDI) reduces firm's domestic activity. However, many foreign activities aim at enlarging the market of domestic firms. In this case, foreign and domestic productions share complementarities.

Moreover, increasing activities abroad might effect firm's productivity at least for three reasons. First, the relocation of production stages might increase productivity through a better allocation of resources. Second, specialization might increase productivity through scale economies and/or learning. Third, activities abroad might expose the firm to new technologies, ideas and knowledge which can be used at home as well. For all of these reasons, sales of

the firm increase. This raises factor demand which may overcompensated the reduction in factor demand which stems from the relocation of production stages to the foreign country.

In this paper, we use detailed firm-data to analyze whether the internationalization of German firms has altered their activities at home. We compare activities of firm that have engaged in FDI (henceforth, multinational firms) to activities of domestic firm that do not have affiliates abroad (henceforth, national firms). Yet, activities of national and multinational firms are not easily comparable since the group of multinational firms is not a random draw from the whole population of firms. According to Helpman *et al.* (2004), a firm self-selects into this group when it reaches a certain threshold level of productivity. National and multinational firms differ thus *ex-ante*. Differences in their performance can therefore not only be related to their internationalization decision.

We tackle this problem by applying a matching approach. We identify all national firms that become multinational in our sample period and find their *closest neighbors* among the group of national firms that do not switch. Therefore, switchers and their closest neighbors do *not* differ *ex-ante*. The differences in their *ex-post* performance can be directly related to their foreign activities. We combine this matching approach with a difference in difference estimation methodology proposed by Heckman *et al.* (1997). This estimation methodology allows comparing the change in performances of a switcher with the change in performances of a national firm during the sample period.

The combination of both techniques to analyze the effect of locating production abroad on firm-level performance at home has been used in the empirical literature before. Barba Navaretti and Castellani (2003) do not find a negative effect of the decision of Italian firms to locate production abroad on their

domestic employment. This result is also found by Hijzen *et al.* (2006) using French firm-level data. Both papers report a significant and positive effect of becoming a multinational firm on domestic productivity and on employment of these firms. Egger and Pfaffermayr (2003) have investigated the channel through which this increased productivity might have occurred. They show in a study of Austrian firms that investing abroad has a positive impact on investment in intangible assets and on R&D. Finally, Barba Navaretti *et al.* (2006), analyzing the behavior of French and Italian firms, differentiate the impact of locating their production abroad according to the countries of destination. They do not find any evidence for a negative effect of FDI in developing countries on activities at home.

Using the same methodology and German firm-level data, we also find a positive effect on domestic employment performance for firms that become multinationals. However, we argue that this result might be partly driven by an unappropriate matching technique. Comparing as in the previous literature a switcher active in the textile industry in 1998 to a local firm active in machinery and equipment in 2002 is obviously not convincing even if the algorithm finds that the latter is the closest match with respect to all observable characteristics including time and sector dummies. We propose therefore a novel methodology that allows to control for the panel structure of our data. We split the sample into eighty sector-year combinations to make sure, that the matched national firms are active in the same industry and are compared in the same year. This matching technique takes thereby into account also effects that can be related to business cycles and market structure.

Controlling for these effects allows estimating an unbiased impact of the location of production abroad on firm-level domestic performances. We do not find any significant impact of locating production abroad on firm-level employment

as it is taken for granted in the public debate.

This paper has four additional sections. In Section 2, we discuss the rational behind the effect of locating production abroad on firm-level domestic performance. In Section 3, we explain the estimation methodologies. In Section 4, we present and discuss the results. We conclude in Section 5.

2 Theoretical Background

The theoretical literature on FDI views multinational firms as the integration of different functions that can be separated and located in different countries. The firm is represented by a production or a cost function that describes a process of at most three stages that leads to the production of one single good. The economy is described by a static framework without productivity changes. The reallocation of production stages in the foreign country necessarily yield a reduction of firm-level employment at home, when firms that relocate are vertical in nature. In horizontal firm models, foreign affiliate production replaces exports and reduces the labor demanded by the parent firms at home. In both cases, more labor might be necessary to coordinate the activities at the level of the headquarter but these gains in employment can not fully compensate for the losses at the production stages.

Yet, the relocation of some stages of production in foreign countries does not necessarily reduce value added of a firm at home. Suppose for example a firm relocates a production stage which accounts for 15% of the value added to a foreign affiliate. All else equal, this reduces its value added at home by 15%. But let the relocation reduce the price of the good produced by the firm by 5%. Suppose the price elasticity of demand is 3 at home and 4 in other countries. Suppose further, that the firm exports half of its output. Falling prices yield

17.5% higher demand of the good which yields 14.875% higher value added at home. Higher demand for the good which is induced by the lower price almost compensates for the 15% loss of value added at home due to the relocation of production in this example. The gains might be much higher, if the lower prices allow for instance to enter a new export market. Thus, value added and therefore employment does not need to fall in reaction to the relocation of production.

That is even more true if the benchmark is a different one. Suppose the firm has decided not to relocate production to the foreign countries but a competitor did. Increased price competition would lead to falling market shares of the non-relocating firm. Hence, value added and employment fall. Some firms might even exit the market. Compared to this benchmark, positive effects of relocation of production are more likely.

There are also other kinds of activities abroad than production. Many firms invest abroad to expand in foreign markets. About a third of all foreign affiliates of German multinational firms, for instance, are classified in retail and wholesale. Investments abroad in these activities directly increases activities at home. Similarly, investment in other service sectors abroad, such as business services or finance might be export enhancing activities.

We look at effects of a firm's engagement abroad on its own activities at home. That allows to evaluate the average effects of relocations with respect to the acting firm. It does not include effects on competitors and general equilibrium effects through changes in aggregate income. We therefore abstain from any welfare considerations.

3 Econometric Methodology

The aim of the analysis is to estimate the average (treatment) effect of switching to foreign production on a firm's performance at home, defined as

$$ATE = E(Y|D = 1) - E(Y|D = 0) \tag{1}$$

The outcome variable Y represents the firm's domestic outcome: employment, investment and output. While $D = 1$ indicates that the firm has switched to become a multinational, $D = 0$ indicates that the firm has not switched. The average treatment effect ATE in equation (1) is the difference between the performance paths of a switcher and the analogous outcome of the same firm if it would have chosen to remain national. Of course, this is not observable. Thus, we need to find an approximation for the unobservable performance outcome $Y|D = 0$. The main problem is to estimate equation (1) with a random sample on Y and D, where D is a dummy variable that contains the information whether the firm is a multinational or a national firm if, as in our case, D is not independent of Y.

3.1 Estimation Strategy

The matching technique is a way of construct this missing counterfactual by drawing comparisons conditional on a vector X of observable firm-level characteristics. The underlying assumption for the validity of the procedure is that conditional on the observable characteristics, the treated (switching firms) and non-treated firms (those remaining national) would exhibit a similar performance under the same circumstances.

Let the subscripts 0 and 1 indicate the time before and after switching, respectively. The matching approach yields unbiased estimates, if the switch-

ing is independent of the mean of the outcome Y, or $E(Y_0|D) = E(Y_0)$ and $E(Y_1|D) = E(Y_1)$. To see this, we rewrite equation (1):

$$\begin{aligned} E\left(Y|D=1\right) - E\left(Y|D=0\right) &= E\left(Y_0|D=1\right) - E\left(Y_0|D=0\right) \\ &\quad + E(Y_1 - Y_0|D=1) \\ &= \left[E\left(Y_0|D=1\right) - E\left(Y_0|D=0\right)\right] + ATT \end{aligned} \tag{2}$$

ATT stands for the average treatment effect on the treated, i.e. the switching firms. That is exactly the difference we are interested in. However, mean independence is a strong assumption. Firm self-select into the group of multinational firms on the basis of criteria that are not independent of our outcome Y. Hence, D and Y are not independent as necessary for equation (2) to deliver an unbiased estimator for the ATT. Fortunately, we can find observable characteristics, X, to wipe out the correlation between D and Y. If the variables in X determine switching, Y is mean independent of D, conditional on X (Rosenbaum and Rubin (1983)).

$$\begin{aligned} E\left(Y_1 - Y_0|D, X\right) &= \left(E\left(Y_1|D=1, X\right) - E\left(Y_0|D=0, X\right)\right) \\ &\quad - \left(E\left(Y_0|D=1, X\right) - E\left(Y_0|D=0, X\right)\right) \end{aligned} \tag{3}$$

The second difference in equation (3) is the selection bias from above, which is assumed to be zero conditional on X. It represents the difference between the outcome of multinational firms, before they have switched, and those firms that remained national firms. If the selection bias represented by the second term is zero for given realizations of the vector X, then we are left with only the partial effect of switching. In other words, the difference in performance between multinational firms and the selected control group of national firms is a consistent estimate of the causal effect under the matching assumption. Hence, if our matching process is successful, we can give a causal interpretation to the average performance difference between treatment and control firms.

A negligible selection bias requires the ex-ante difference in performances of

switching firms and control group firms to be small. Thus, we look for twins of each switching firm among all domestic firms that have not switched. By twin, we mean a firm that has very similar characteristics along all observable criteria. We can then compare the ex-post performance of the switching firm with those of the twin national firm that has not switched.

3.2 Data

In order to build both groups, we merge information from two databases. The first one, the *MiDi (MIcro data base Direct Investment)*, contains panel information on the foreign activity of German multinational firm since 1996. The second one, *Dafne* contains information on the balance sheet and income statement of 50,018 German firms since the early eighties.

We start by coding all firm that establish their first foreign affiliate from the firm-level Midi database of the *Deutsche Bundesbank* (see Lipponer, 2002 for a comprehensive description of the database). *MiDi* provides a detailed breakdown of the foreign assets and liabilities of German multinational firms abroad. German foreign direct investment is defined as the direct or indirect ownership or control by a single German entity of at least ten percent of the voting securities of an incorporated foreign firm or the equivalent interest in an unincorporated foreign firm. The database comprise information on all foreign affiliates of German multinational firms from 1996 to 2004.

We find 936 switching firms over the period 1997-2003. Unfortunately, only 402 of them are included in the *Dafne* database. [1] *Dafne* holds information on the year of establishment of the firm, several categories of its assets, its sales, profits, expenses and the number of employees. To these variables we add the

[1] About 30% of the German parent firms in the *MiDi* database are also listed in the *Dafne* database.

information whether a firm is a (i) multinational over the whole period or a (ii) national firm over the whole period or a (iii) firm that switches during the period. *Dafne* does not cover all information for each firm every year. Table 1 summarizes information on the number of national, switchers and multinational firms in our sample for each year between 1997 and 2003.

Table 1
Number of switchers

Year	1997	1998	1999	2000	2001	2002	2003
Switchers	44	48	67	85	76	46	36
Multinationals	547	647	862	978	1169	1612	1749
National firms	3220	4846	7518	8174	11062	20777	26835

In sum, our sample covers information on 2,766 multinational firms. The control group has been constructed from a large set of 47,252 German national firms. On average, national firms, switchers, and multinational firms have different characteristics. In terms of factor input for instance, multinational firms are larger than switchers which are themselves larger than national firms. Table A1 in Appendix provides some descriptive statistics.

3.3 Propensity Score Matching

As argued above switching is not random. We therefore construct a control group with includes firms that have the same characteristics as the switchers to minimize the differences in observed heterogeneity among both groups. The matching approach requires comparing switching firms and national firms across a number of observable pre-switching characteristics. It is desirable to perform the matching on the basis of a single index that captures all the information from the vector X of observable characteristics to reduce the dimensionality problem. Rosenbaum and Rubin (1983) have shown that all the information of the observable variables in the X vector is included in one propensity score when using a probit estimation. The same applies to a logit

estimation. We use the probability to be a multinational firm as matching criteria. The endogenous variable in our logit estimation is one if a firm is a multinational firm in a particular year and a zero otherwise. We use profits, age, age squared, employment, physical capital, and the debt equity ratio of the firm and sector and year dummies to predict whether a firm is a multinational or not. The results of the logit model are given in Table 2.

Table 2
Probability to be a multinational firm

Variable	Coefficient	Robust Std.Error
ln(profit)	0.037***	0.011
ln(output)	0.039	0.044
age	0.004*	0.002
age^2	1.42 10^{-6}	9.07 10^{-6}
ln(physical capital)	0.713***	0.034
ln(fixed assets)	-0.418***	0.032
debt-equity ratio	-0.001	0.001
ln(wage bill)	0.154***	0.052
Observations	68072	
Pseudo R^2	0.42	

We use the estimated coefficients to predict the probability of a firm to become multinational and match switchers and non-switcher according to this propensity. For the matching, we can chose between three different methodologies: nearest neighbor matching, kernel matching, and local linear regressions. In simulation studies, kernel matching (KM) and local linear regressions (LLR) outperform nearest neighbor matching approaches (Fröhlich, 2004). This is particularly the case when the control group is large, as in our case. The KM and LLR techniques use the whole distribution of firms' performance instead of an ex-ante defined subsample of the control group. Thereby, an endogenous weight is given to each firm in the control group that depends on its distance from the treated (i.e. switching) firm. We present estimates from LLR to compare our results to the studies using data from France and Italy.

We also use the nearest neighbor methodology. We thereby always match *one* switching firm to the *three* firms from the control group which are closest to the switcher according to the propensity score, i.e. we use three nearest neighbor matching. We decided to use three nearest neighbor matching because the control group to our switchers is large enough to guarantee several very near neighbor to each switching firm. Using three nearest neighbors reduces the influence of outliers in the sample of the control group. We use three nearest neighbor methodology additional to local linear regressions, because when applying the nearest neighbor matching algorithms we can match switchers to control group firms in 80 subsamples separately and recombine the subsamples again afterwards. Thus, outcomes are compared for the same year and between firm from the same sector.

3.4 Reliability of the Propensity Score Matching

The propensity score matching method provides a reliable and robust method for estimating the effect of locating production abroad on domestic employment if, conditional on the propensity score, the potential outcomes $Y_0|D = 1$ and $Y_0|D = 0$ are independent of the incidence of switching. Under the assumption of independence conditional on observable variables, the pre-investment variables should be balanced between the multinational and the national firms. We follow Rosenbaum and Rubin (1983) and Smith and Todd (2005) in verifying whether the balancing condition is satisfied by the data.

We use two ways to show that conditional on the propensity score, the outcomes Y are independent on the decision to switch. One way is to show that switching firms and the firms in the control group are ex-ante not statistically different. To show that switching firms and firms in the control group are not statistically different after matching, we compare various characteris-

tics for equality of the means. The comparisons are given in Table A2 in the Appendix.

The other way is to show that conditional on the propensity score (PS) the dummy variable D containing the information whether a firm is a switcher does not hold any information for the variables in the X vector. We test this by regressing the propensity score, some polynomial of higher order, and the interaction of the propensity score and a dummy variable (D) indicating a switching firm on the variable of the X vector. We used regression (4) to test for independence of the switching decision from the X vector variables.

$$\begin{aligned} x_j = &\beta_0 + \beta_1 PS + \beta_2 (PS)^2 + \beta_3 (PS)^3 \\ &+ \beta_4 D + \beta_5 PS * D + \beta_6 (PS * D)^2 + \beta_7 (PS * D)^3 + \eta \end{aligned} \tag{4}$$

x_j denotes a variable from the vector X of observable characteristics. D takes the value one if the firm is a switcher and zero otherwise. η denotes the error term. The control group is properly chosen in the sense that the switching decision is independent from the outcome variable y_0 if the coefficients β_4, β_5, β_6 and, β_7 are jointly insignificant. Table (3) reports the F values of joint significance of the coefficients β_4, β_5, β_6 and, β_7 from regression 4 for the variables x_i from the X vector.

Table 3
Balancing Test: *nearest neighbor* matching

Matching	3 Nearest	Neighbor	Nearest	Neighbor
	F-Test		F-Test	
Variable	(p-value)	Balanced	(p-value)	Balanced
Profits	0.50	yes	0.79	yes
Output	0.60	yes	0.99	yes
Age	0.00	no	0.00	no
Age squared	0.05	no	0.00	no
Physical capital	0.13	yes	0.45	yes
Tangible assets	0.41	yes	0.30	yes
Debt equity ratio	0.92	yes	1.00	yes
Wage Bill	0.11	yes	0.88	yes

Table 3 shows that our control group does not differ in observable characteristics from the group of switching firms. With respect to the chosen firm characteristics we have found twins to the group of switching firms. The partial effect of switching is not biased by firm characteristics. Thus, both tests indicate that the balancing condition is satisfied in our matched sample. The propensity score specification we have chosen is effective in accounting for factors that determine selection into the group of multinational firms.

3.5 Evaluation: Event Study and Difference in Difference Analysis

We follow the microeconomic evaluation literature (Heckman *et al.* (1997); Dehejia and Wahba (2002)) and compare the average in the performance change of the switchers and the non-switchers. We apply two approaches to estimate the partial effect of switching on the performance of firms at home. First, we use the event study technique and compare average differences in the performance of the two groups after the event of switching.

$$\beta_{ES} = 1/N_i \sum_i \Delta Y_i - 1/N_j \sum_j \Delta Y_j \tag{5}$$

ΔY_i and ΔY_j stand for the growth rate of the performance measure after switching for the switching firms and of firms from the control group, respectively. N_i denotes the number of switching firms, N_j the number of firms in the control group.

Second, we use a difference in difference estimator comparing average differences in pre- and post-event performances of both groups. This techniques requires more information on the status of the firm before it switches. However, the difference in difference analysis controls for unobserved heterogeneity. Having controlled for the non-random switching decision, unobserved hetero-

geneity could still bias our results. Such unobserved heterogeneity might result from firm specific organizational structures, special market condition or management skills. The difference in difference estimator allows controlling for all non-random elements of the switching decision that are time invariant and persistent over time (Smith and Todd, 2005). The remaining unobserved heterogeneity is averaged out by the large sample.

The DID estimator compares the difference β between changes between the average pre- and the post-investment performance of the two groups.

$$\beta_{DiD} = 1/N_i \sum_i \Delta Y_{i1} - \Delta Y_{i0} - \sum_j \Delta Y_{j1} - \Delta Y_{j0} \tag{6}$$

ΔY_{i0} and ΔY_{i1} denote the growth rate of the performance of switching firms before and after switching, respectively.

4 Results

4.1 Matching using the whole sample of national firms as control group

First, we present results from event studies and difference in difference estimations of a sample in which switching firms are matched to all firms with endogenous weight. The advantage of using LLR over the nearest neighbor regressions techniques is that it generates the correct standard errors through bootstrapping. The results of the LLR are very close to the nearest neighbor matching with 3 or 5 nearest neighbor when we use the best matches according to the propensity score from the whole sample.

Our findings on employment changes at home are comparable to the results from other studies using Italian firms (Barba Navaretti and Castellani, 2004) or French firms (Hijzen et al. 2006). The results are given in Table 4.

The results with respect to employment are similar to the other studies. The decision to establish a first foreign affiliate affects employment at home positively. In contrast to the other studies, we find no significant results for output and productivity growth.

Table 4
Growth of domestic activities: Local linear regressions, standard matching

Period	Employment	Output	Capital	TFP
t+1	0.059**	0.036	0.075***	0.030
	(0.023)	(0.037)	(0.027)	(0.022)
t+2	0.096**	-0.020	0.037	-0.048
	(0.042)	(0.057)	(0.064)	(0.047)
Switchers $t+1$	99	188	191	89
Controls $t+1$	9,048	42,011	42,272	8,319
Switchers $t+2$	82	143	146	71
Controls $t+2$	5,723	20,226	20,700	5,077
1000 replication bootstrapped standard error in parentheses.				

The estimates show that the average effect of the decision to locate activities abroad on domestic employment is positive. The average growth rate of employment at home is higher than the average growth rate of the national firms in the control group. This difference is significant at the 5% level. Concerning the second year, the differences is also positive and significant at the 5% level. Growth in capital is significantly positive in the first year after switching and insignificant in the second. There is no significant effect of the internationalization decision on output, capital used or total factor productivity (TFP). [2]

The results confirm the findings by Barba Navaretti *et al.* (2006) for French and Italian firms. The employment effect found for French and for Italian firms are significantly positive. Additionally, in Barba Navaretti *et al.* there is also evidence that Italian firms' total factor productivity and output are positively affected by the decision to establish the first affiliate abroad.

Controlling for unobserved time invariant effects by applying a difference in

[2] Total factor productivity is computed using the methodology of Olley and Pakes (1996).

difference estimator changes the results quite a bit. Using this technique, we can be sure that any effect that might bias the results is canceled by double differentiating growth rates. We present the results in Table 5. Notice that we are interested in change of growth rates of the outcomes between both groups. Moreover, the two groups are no random draws but matched groups that include ex ante twins. The mean comparison of the two groups show significantly negative effects on the change in capital growth in both periods. Productivity growth is positively affected in the first period while change of employment and output growth remain unaffected.

Table 5
Growth of domestic activities: Local linear regressions, difference in difference

Period	Employment	Output	Capital	TFP
t+1	0.099	-0.065	-0.253***	0.113**
	(0.130)	(0.082)	(0.063)	(0.047)
t+2	0.146	-0.080	-0.330***	-0.087
	(0.170)	(0.062)	(0.100)	(0.110)
Switchers $t+1$	56	118	124	50
Controls $t+1$	4,899	19,611	20,120	4,416
Switchers $t+2$	47	100	106	41
Controls $t+2$	3,271	11,512	11,935	2,831
1000 replication bootstrapped standard error in parentheses.				

The effect of the decision to establish a first affiliate abroad on employment is insignificantly positive for both years. We can therefore rule out a negative effect on employment at home in our sample. Recall that the sample includes a significant fraction of all firm that decided to become multinational firms over the period of analysis. The *MiDi* database comprises *all* German firms that hold FDI, 30% of these firms are also in the *Dafne* database. We are therefore confident that the estimated effect is the average effect of the establishment of the first foreign affiliate of German firms on their employment at home. The effect is non-negative. We do not find any job export from switchers. This result is in line with the evidence presented for France and Italy.

To get an impression how large are the "globalization gains" in employment

implied by the results from the standard matching we look at the absolute numbers of the group averages. The average switcher in our sample has 2152 employees. After becoming a multinational firm, employment of this group has grown by 3.1% while employment of the control group, which was shown to be statistically identical prior to the switching, has fallen by 2.7% in the first year after switching. The growth difference of 5.9% points amounts to an absolute average increase of 127 employees per firm. We analyze 99 firms with employment data for the year of switching and the following year. The total number of employment growth in the first year in our sample amount thus to 12,573 employees resulting from the decision to become a multinational firm. In the second year, the additional employment has grown to 206.6 employees per firm on average, or total employment of 20,453. Assuming that this growth difference applies to all switching firms, the decision to establish the first affiliates abroad increases employment in all 936 German parent firms by 118,872 employees in the first year after the decision. This number rises to 193,378 in the second year, which is an impressive number.

4.2 Matching within groups: Controlling for business cycle and sector specific effects

We present the results from event studies and difference in difference estimation from a sample in which firms are matched using a different matching procedure. We construct 8 sectors (light industries, heavy industries, machinery, utilities, retail & wholesale, finance, business services, real estate) and split the sample into 10 years from 1995 onward. Within each sector and for each year, we match the switcher to their nearest neighbors and recombine the matches to estimate the average treatment effects on the treated. We apply a *3 nearest neighbor* matching. Using one or five neighbors instead does not

change qualitatively the results.[3] We report the results of the event study analysis in Table 6.

Table 6
Growth of domestic activities: *3* Nearest neighbor matching in 80 groups, standard matching

Period	Employment	Output	Capital	TFP
t+1	0.023	-0.014	0.019	-0.028
	(0.041)	(0.045)	(0.035)	(0.036)
t+2	0.097	-0.065	-0.026	-0.086
	(0.065)	(0.065)	(0.073)	(0.055)
Switchers $t+1$	99	188	191	89
Controls $t+1$	263	505	514	230
Switchers $t+2$	82	143	146	71
Controls $t+2$	212	383	392	184
bootstrapped standard error in parentheses.				

The number of firms in the control group is much lower in *3* nearest neighbor matching than in LLR. Thus, the standard errors in Table 6 are larger than in Table 4. The differences in the coefficient result from the fact that the group average of the control group firms differs. The effect of the internationalization decision of employment is positive but insignificant using the *3* nearest neighbor group specific matching. There are no significantly differences between the groups for any of the other outcomes. This results from the group specific matching. *3* nearest neighbor matching using the nearest neighbors from the whole sample yields results very similar to the LLR above.

In Table 7, we report the results of the difference in difference analysis. The advantage of this analysis is that it controls for unobserved time constant characteristics that might be correlated with the internationalization decision. The disadvantage is that the data requirements is higher, since controlling for unobserved characteristics requires pre-decision data. Unfortunately, these data are not available for all firms. Hence, the number of firms in both groups drops considerably.[4] The estimates show that the average causal effect of

[3] The results are available upon request

locating production abroad on employment is positive but not significant in the first and in the second year after locating activities abroad. Output and capital growth are significantly negative, in contrast. Total factor productivity is not significantly affected by the internationalization decision.

Table 7
Growth of domestic activities: Difference in Difference Analysis

Period	Employment	Output	Capital	TFP
t+1	0.085	-0.152*	-0.314***	0.062
	(0.158)	(0.087)	(0.086)	(0.083)
t+2	0.097	-0.217*	-0.408***	-0.140
	(0.215)	(0.117)	(0.116)	(0.141)
Switchers $t+1$	56	118	124	50
Controls $t+1$	201	350	363	173
Switchers $t+2$	47	100	106	41
Controls $t+2$	168	289	298	146
bootstrapped standard error in parentheses.				

Applying group specific matching changes the results of our analysis. The effects of the decision to establish a first foreign affiliate is less positive. Positive employment effect turn insignificant and negative effects on output growth and capital growth emerge. While non-positive effects on capital growth have also been found in the Italian and French firms' samples, we find a negative effect on capital and output growth using the German sample. We believe that this results is driven by the new matching technique and not by difference in country characteristics.

Looking at the "globalization gains" in employment again, we find lower numbers. The first year after becoming a multinational firm, employment of switchers has grown by 3.5% while employment of the control group, which was shown to be statistically identical prior to the switching, has grown only by 1.2% in the first year after switching. The growth difference of 2.3% points

[4] The difference in the results stems partly from the difference in the methodology any partly from the change in sample size that results from limitations in the data. Employing event studies on the smaller sample of the Diff-in-Diff analysis yields results in between the two presented.

amounts to an absolute average increase of 49.5 employees per firm. We analyze 99 firms with employment data for the year of switching and the following year. The total number of employment growth in our sample amount thus to 4,900 employees resulting from the decision to become a multinational firm. For all switcher, this amounts to an employment increase of 46,332. In the second year, this increase rises to additional 195,384 employees in German parent firms.

5 Sensitive Analysis

In the first subsection, we split the sample with respect to the sector classification of the foreign activity. We expect the domestic post-investment performance of firms that established a wholesale affiliate or a service unit to differ from a firm that established a production plant. In the second subsection, we examine the outcome for switchers that locate activities in Central and Eastern European countries (CEECs) and those that locate activities in Western European countries (EU) separately.

5.1 Sample-split with respect to the sector of the foreign affiliate

We expect different post-investment performances for different activities located abroad. For instance, we expect output and employment growth to be positive for switchers that establish a wholesale affiliate or a service unit because these activities are linked to after-sales activities. In contrast, we would expect a negative effect on output and employment changes for switchers that establish affiliates in manufacturing. Relocation of production is likely to be related to lower employment growth at home.

In Table 8, we present the marginal effects of the decision to become a multi-

national firm on employment and output growth for the three groups of firms: firms with affiliates in manufacturing, in wholesale and in services. The small size of the samples does not allow for bootstrapped standard deviations in the difference in difference case. We therefore present only the results of the standard matching approach.

Table 8
Growth of domestic activities: Sample-split with respect to the sector of the foreign affiliate, standard matching

Period	Manufacturing	Wholesales	Services
Employment			
t+1	0.065	0.061	-0.032
	(0.076)	(0.093)	(0.090)
t+2	0.096	0.167	0.066
	(0.134)	(0.133)	(0.120)
Switchers $t+1$	38	42	36
Controls $t+1$	116	96	114
Switchers $t+2$	25	37	34
Controls $t+2$	86	90	86
Output			
t+1	-0.017	-0.032	-0.046
	(0.046)	(0.084)	(0.094)
t+2	0.013	-0.133	-0.093
	(0.098)	(0.101)	(0.124)
Switchers $t+1$	73	76	70
Controls $t+1$	211	214	177
Switchers $t+2$	47	59	57
Controls $t+2$	156	160	136
bootstrapped standard error in parentheses.			

After sample split, the sample size is probably too small to find significant results. Nevertheless, the results are interesting because they show only minor differences between the different sub-sample. The establishment of a manufacturing or a wholesale affiliate has the same (insignificantly) positive effect on firm's performance at home. The effect has about the same size as the positive employment effect found for the whole sample. If anything, the effect is larger for the two sub-samples. The effects on output are also not in line with our expectations. There is only one positive effect on output: the effect

for manufacturing affiliates in the second year. We expected in contrast, the strongest negative effect for firms establishing a foreign manufacturing unit.

5.2 Sample-split with respect to the host country

There are two reasons to analyze sub-samples for different regions separately. First, theoretical considerations suggest that locating activities in transition countries might have very different effects on activities in Germany than locating activities in other OECD countries because the activities located abroad differ. Second, the public debate in Germany and the fear expressed is particularly concentrated on activities in close-by transition countries of Central and Eastern Europe. Hence, we analyze two sub-samples: firms that locate activities in CEECs and those that locate activities to EU-15 countries. The results for employment and output effects are given in Table 9.

The estimates of the effect of internationalization decision do not support the claim that locating activities in CEECs worsens the employment dynamics in Germany. There is no difference in the employment growth of firms that establish an affiliate in CEECs and their control group of national firms. The estimated effect is positive for the first year and negative for the second. Both are not statistically significant. The employment effect is positive in both years and larger in size for activities in EU-15 countries. Thus, the data confirms our expectations concerning differences with respect to host countries but not the expectations concerning the negative effect of establishing an affiliate in CEECs on domestic employment.

Table 9
Growth of domestic activities: Sample-split with respect to the host country, standard matching

Period	CEECs	EU-15 countries
Employment		
t+1	0.042	0.050
	(0.048)	(0.052)
t+2	-0.055	0.138
	(0.096)	(0.110)
Switchers $t+1$	29	55
Controls $t+1$	67	152
Switchers $t+2$	20	56
Controls $t+2$	50	124
Output		
t+1	-0.022	-0.021
	(0.054)	(0.073)
t+2	-0.020	0.005
	(0.105)	(0.110)
Switchers $t+1$	46	102
Controls $t+1$	139	280
Switchers $t+2$	38	82
Controls $t+2$	115	204
bootstrapped standard error in parentheses.		

6 Conclusion

We find no support to the claim that activities of multinational firms abroad exports jobs from Germany to the host countries. If anything, we find a positive effect of the internationalization decision on employment growth at home. This effect is not significant for all sub-samples but robust in size, and certainly it does not result from a small number of outliers. We conclude this from a sample of firms that decided to establish their first affiliate abroad which we matched to statistically identical firms which did not hold a foreign affiliate during the whole period analyzed, i.e. from 1997 to 2003. We made sure that switching firms and control firms from the same year and sector are matched in our analysis. We used 3 nearest neighbor matching.

Our results are in line with studies from other countries. The direct relation-

ship between internationalization decision of firms and the high unemployment in Europe in general and in Germany in particular finds no support in the data. We do not find evidence for job exports of firms establishing affiliates abroad.

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7 Appendix

Table A1: Descriptive statistics (average performance per group)

Group	Multinationals	Switchers	National firms
ln(Profits)	6.65	6.08	1.79
	(4.390)	(3.915)	(3.079)
ln(Output)	11.40	11.34	4.32
	(2.945)	(2.365)	(5.257)
Age	33.0	21.0	17.3
	(36.87)	(20.99)	(21.79)
Productivity (OP)	2.87	3.03	2.6
	(1.390)	(1.583)	(1.637)
ln(Physical capital	11.43	10.11	3.72
	(3.056)	(2.455)	(5.438)
Debt equity ratio	10.2	50.2	23.1
	(132.7)	(620.1)	(341.5)
ln(Employment)	6.06	6.06	4.75
	(1.909)	(1.428)	(1.833)
standard deviations in parentheses.			

Table A2: Bias reduction through matching (group specific means)

Group	Switchers	Control group	National firms
ln(Profits)	6.08	5.89	1.79
	(3.915)	(4.194)	(3.079)
ln(Output)	11.34	11.42	4.32
	(2.365)	(2.279)	(5.257)
Age	21.0	32.2	17.3
	(20.99)	(34.42)	(21.79)
Productivity (OP)	3.03	3.03	2.6
	(1.583)	(1.320)	(1.637)
ln(Physical capital	10.11	10.14	3.72
	(2.455)	(2.567)	(5.438)
Debt equity ratio	50.2	21.8	23.1
	(620.1)	(189.3)	(341.5)
ln(Employment)	6.06	6.05	4.75
	(1.428)	(1.690)	(1.833)
standard deviations in parentheses.			

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