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Discussion Paper

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**FDI and domestic investment in Germany:
crowding in or out?**

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FDI and domestic investment in Germany: crowding in or out?

Abstract

This paper estimates the effects of outward FDI on domestic business investment in Germany at the industry level for a panel of 19 industry and 10 services sectors in Germany. We pay particular attention to the different motivations behind FDI, and distinguish between FDI to high versus low wage countries, to Europe versus the rest of the world, and FDI in services and industry sectors. We find that in industry FDI to low-wage countries crowds out domestic investment, whereas FDI to high wage countries outside Europe crowds in domestic investment. In services, FDI to Western Europe crowds in domestic investment.

Keywords: Econometrics, Domestic Capital Formation, Foreign Direct Investment, cost seeking, market seeking, Germany

1. INTRODUCTION

This paper analyses the effects of outward foreign direct investment (FDI) on domestic business investment in Germany. Germany is an interesting case as its exports and multinational investments have increased strongly in the last two decades; outward FDI has risen by six times since the beginning of the 1990s (Deutsche Bundesbank 2006). However, in the same period, the German economy experienced a period of slow growth and weak domestic investment. This stylised fact poses an interesting question: is there any link between the increase in outward FDI of multinational enterprises (MNEs) and the stagnation in domestic investment in Germany? Does FDI crowd out domestic investment? Germany is also interesting because German MNEs have activities in very different groups of countries: high wage as well as low wage host countries, which are also geographically diversified in terms of proximity to the headquarters. The integration of Central and Eastern European countries to the European economic sphere has added a particularly important dimension to the significant increase in FDI to low wage countries within an arms-length trading distance.

Theoretically, the effect of FDI on domestic investment is ambiguous, and is related to the motivation of FDI as well as to its effects on exports and other tasks in the home country (Hejazi and Pauly, 2003; Arndt et al, 2007; Hering et al, 2010). If FDI is cost-seeking, negative effects are more likely because of the replacement of domestic activities; however even then recent literature points to two potentially offsetting positive effects: scope effects due to a shift in specialization at home towards new higher skilled tasks like headquarter activities, and scale effects due to an increase in market share via cost saving (Hanson et al, 2003). If FDI is market seeking, the effect depends on whether it replaces exports or generates new tasks and exports.

While there is a rich literature on the effects of inward and outward FDI on growth, exports, productivity, employment and wages (see for example Blömmstrom and Kokko, 1994; Markusen and Venables, 1997; Aitken et al, 1997; Lipsey et al, 2000; Lipsey, 2001; Lipsey, 2002; Görg and

Greenaway, 2004), work on the effects of outward FDI on domestic investment is much more limited. Most of the early literature focused on the effects of outward FDI on aggregate domestic investment in the home country. In a seminal paper Feldstein (1994) finds a negative effect of outward FDI on domestic investment in OECD countries in the 1970s and 1980s. Desai et al (2005a) replicate Feldstein's estimations for a broader sample of countries (20 OECD countries for the 1980s and 26 OECD countries for the 1990s) and confirm that higher outward FDI causes lower domestic investment. However, Desai et al (2005a), based on estimations using aggregated plant level time series data for US multinationals, find that the effects are positive. The Deutsche Bundesbank (2006), using balance of payments data, argues that the rapid increase of inward and outward FDI in the last decade is not at the expense of domestic investment in Germany. Herzer and Schrooten (2007), again using aggregate data, find, on the contrary, negative effects in Germany, but positive effects in the US.

A second group of studies analyses the effects using firm level data. Desai et al (2005b), using plant level data, again find that FDI stimulates domestic investment as well as employment and exports of the parent firm in the US. Lin and Chuang (2007) analyse the impact of outward FDI on domestic investment for Taiwanese manufacturing firms using firm-level data and find that FDI to low wage countries, i.e. cost seeking FDI, has a crowding out-effect on domestic investment, whereas FDI to high wage countries, i.e. market seeking FDI, has an augmenting effect. Hering et al (2007) use firm level data for Japanese manufacturing and services firms and find that FDI in manufacturing and FDI to low wage countries crowds out, whereas FDI in services and FDI to high wage countries crowds in domestic economic activity.

Finally a third group of studies analyses effects at the industry level. FDI not only has a direct effect on the parent firm but also an indirect effect on other domestic firms due to possible spillovers. Markusen and Venables (1997) find both positive spillovers on the production of local firms because of backward linkages and negative spillovers because of increased product market competition. Lipsey (2004) points out that there may be a difference between firm and industry level studies, since

substitution between types of activities may take place not only between home and foreign operations of a firm, but also between parent firms and non-multinational firms in the same industry at home. It is possible to have a case where the parent company enjoys positive scope and scale effects, but the output in the sector overall is negatively affected through substitution of domestic supplier networks with the foreign affiliate supply. Hejazi and Pauly (2002; 2003) use Canadian industry-level data for a panel of 15 industry and services sectors for the period of 1984-1995, and find that outward FDI to the US has a positive effect on domestic investment, whereas FDI to the rest of the world has a negative effect, and the effect of FDI to Britain is insignificant. Brauerhjelm et al (2004) estimate the impact of outward FDI on domestic investment for a panel of manufacturing industries from 1982 to 2001 in Sweden, and find that the effect of FDI to the EU is positive, but in R&D intensive industries there is a substitution effect, and the positive effect is limited to industries with a low R&D intensity. FDI to the rest of the world has no significant effect. Arndt et al (2007) estimate the effects in Germany using a panel of 13 manufacturing and 9 services industries during 1991-2003, and find that outward FDI stock has a positive long run impact on domestic capital stock; however the elasticity is rather small; the positive effect results from FDI to high income countries, which is used as a proxy for market seeking FDI, and FDI to sectors different from that of the parent firm, which is used as a proxy for cost seeking FDI. They also estimate the short run effects of FDI on domestic investment (the long run relation in first differences), but find no significant effect. Thus no clear cut conclusion can be reached regarding the different effects of different types of FDI.

This paper belongs to the third group of studies, working at an industry level. We estimate an investment equation for a panel of 19 industry and 10 services sectors in Germany for the period of 2002-2006. The classification we use is more disaggregated than in most previous studies. In order to be able to distinguish the different motives behind FDI, we disaggregate FDI according to the level of wages in the host country and the distance of the host country from Germany, and estimate separate coefficients for the effects of FDI in services and industry. The major contribution is to distinguish the motivation behind FDI along these three measures: industry versus services, wage level, and distance of the host country. FDI to low wage countries is more likely to be cost-seeking and have a negative

effect on domestic investment compared to FDI to high wage countries, which is more likely to be market seeking. FDI to high wage countries other than in Europe is more likely to have positive effects than FDI to Western Europe, since market creation effects are more likely to dominate export replacement effects in the former particularly in industry. Finally, the effect of FDI is more likely to be positive in services, since they are mostly non-tradable and FDI is more likely to be market seeking in these sectors. We find that FDI to both low-wage country groups crowds out domestic investment in industry, whereas FDI to high wage European countries in services and FDI to other high wage countries in industry crowds in domestic investment. However, a qualification is in place here. There may be market seeking FDI directed towards low wage countries as well as resource or cost seeking FDI directed towards high wage countries like the US in particular for skill intensive operations. Therefore distance as well as information about the sector at the destination are further important measures to reflect the motives of FDI.

The rest of the paper is organised as follows. The next section introduces our model; section three describes the data and stylised facts. Section four and five discuss the estimation methodology and results. Section six concludes.

2. MODEL

Our investment model is based on a behavioural equation, where investment decisions are based on sales prospects and profitability. We start with the following basic investment model:

$$I = f(Y, R) \qquad \text{Equation (1)}$$

where I stands for domestic business investment, Y for real value added and R for profits. Both Y and R are expected to have a positive impact on domestic investment. Y reflects the prospects for future sales; it is the typical accelerator term in behavioural investment functions. R is a proxy for expected profits as well as available internal funds of the firm for investment. An additional

determinant of investment could be the interest rate, but since we work with industry level data, we do not include aggregate macroeconomic variables.

We augment this basic behavioural function with the effects of outward FDI stock:

$$I = f(Y, R, FDI) \qquad \text{Equation (2)}$$

We use the stock of outward FDI as an explanatory variable in order to capture the long term cumulative effects of FDI. Given that investment projects require time for planning and implementation, investment is more likely to respond over the long run to FDI stock rather than volatile changes in FDI flows. Note that we control for the current scale of domestic activity, i.e. value added as it is common in the literature (Arndt et al, 2007; Hanson et al; 2003). Outward FDI will affect domestic investment through its effects on the domestic sales, i.e. value added as well as expectations about future sales and profitability; however most of the effects of outward FDI on investment will take time and will be through its effects on expectations. Thus our model, which controls for current value added, captures the effects of FDI on domestic investment via changes in expectations regarding the domestic production in the future rather than its simultaneous effect via changes in the current value added.

The effect of FDI is related to the motivation for FDI as well as to the question of whether it substitutes the exports and production of the home country or creates new, complementary tasks (Hejazi and Pauly, 2003; Arndt et al, 2007). If FDI is cost seeking, on the one hand it can replace future domestic production and thereby affect current domestic investment plans negatively. On the other hand, cost seeking FDI may trigger the production of higher value-added and more skill-intensive products and services (e.g. headquarter services such as R&D, design, marketing, finance) at the parent firm (scope effects), and/or a general increase in market share and output due to cost saving effects (scale effects), which may increase the production of the parent firm (Hanson et al., 2003). Thus, FDI may create a change in the composition of production via scope effects or an overall

increase in production in the future via longer term scale effects, both of which lead to additional domestic investment in the home country. Thus, overall it is an empirical issue whether the positive or negative effects of outward FDI dominate, and theoretically the sign of the effect is ambiguous. If FDI is market seeking, the crucial question is whether it replaces exports or whether it creates new tasks at home, and even complements exports. If production by the foreign affiliate is expected to replace the exports of the parent firm to foreign markets, then negative effects on domestic investment can arise due to an expected reduction in exports. However, in some cases FDI creates new markets, which were formerly out of reach of exports due to tariffs or transportation costs; then the effect of FDI on domestic investment will be either insignificant, or may even be positive, if scope effects prevail. It is also important to distinguish whether the sector of the foreign affiliate is a tradable or non-tradable sector. In services, which are more likely to be non-tradable, FDI usually creates new markets without replacing exports, and it may even generate exports by intermediates from the parent company to the foreign affiliate. In industry, the proximity of markets may be crucial in determining how much FDI replaces former exports, and thereby generate negative effects. Overall, the effect of FDI is more likely to be positive in services because of the sector's predominantly non-tradable nature and FDI's predominantly market-seeking motivation in this sector. However, the share of trade in services has been increasing recently due to innovations in IT; this may create some reduction in exports in services due to outward FDI.

In order to be able to distinguish the different effects on domestic investment associated with the different motives behind FDI, we use three methods: we disaggregate FDI according to the level of wages in the host country and the distance of the host country to Germany; thus we distinguish between four different host country groups, two high wage country groups in Western Europe vs. the rest of the world, and two low wage country groups in the "Emerging East" versus the rest of the world.¹ Additionally, we allow for different effects of FDI in services and industry. FDI to the low wage countries is more likely to be cost-seeking while FDI to high wage countries is more likely to be market seeking, and thereby FDI to low wage countries is more likely to have a negative effect on domestic investment. FDI to the rest of the world is also more likely to be market seeking; however it

is yet to be seen whether Emerging East and low wage countries in the rest of the world have fundamentally different effects. Particularly in the case of German FDI to Central and Eastern Europe securing and expanding the market share has been an important motive as well. Thus it is hard to generalize all of the FDI to the “Emerging East” as cost seeking FDI. FDI to the high wage countries in the rest of the world is more likely to have positive effects than FDI to Western Europe, since market creation effects are more likely to dominate export replacement effects in the former, particularly in industry. As a result our investment function takes the following form:

$$I = f(Y, R, FDI^{WE}, FDI^{EE}, FDI^{HWR}, FDI^{LWR}) \quad \text{Equation (3)}$$

where the superscripts *WE* stands for Western Europe, *EE* for Emerging East, *HWR* for other high wage countries in the rest of the world, and *LWR* for other low wage countries in the rest of the world. We extend this equation further by allowing different coefficients for services and industry as will be discussed in Section 4.

3. DATA AND STYLISED FACTS

For German domestic investment, value added and profits we use data from the OECD-Stan database, which has sectoral data at a two digit level. For outward FDI we used data supplied by the Deutsche Bundesbank,² which provides researchers with industry level data based on two digit NACE classification for industry and services by aggregating the firm level data in the MIDI database from 1998–2005³. The sectoral classification of the aggregate FDI is based on the sector of the affiliate. Thus we test how FDI of a parent company in any sector in Germany, which is directed to a particular sector abroad (affiliate’s sector) affects domestic investment in that sector at home. Due to the limitations of the data supplied by the Deutsche Bundesbank, we cannot test the effects of FDI to a sector, which is different from the sector of the parent company, on domestic investment in the sector of the parent firm, i.e. cross-sector effects are ignored.

We exclude three sectors, which have a high share in domestic investment, but very small FDI (Real Estate and Business Services, Renting of Machinery and Equipment, and Other Community, Social and Personal Services), but we check for the robustness of our results with respect to the inclusion of these sectors. We have a total of 19 industry and 10 services sectors.⁴ Tables A.1 and A.2 in the Appendix show the variables, data sources, and list of sectors.

Figure 1a & b show the trend of domestic investment and outward FDI stock to the four country groups (both as a ratio to value added) in industry and services respectively.⁵ In particular in industry the decline in domestic investment along with the increase in FDI to emerging east is striking. FDI to the other low wage countries is also increasing, but the opposite trend with respect to domestic investment is less clear in this case. FDI to Western Europe has also increased, but not as strikingly as that towards the Emerging East, while FDI towards other high wage countries has overall declined. Particularly the latter development goes in line with the decline in domestic investment. The picture in services is much less clear. FDI towards all country groups has increased in the last two decades with the increase being strongest towards the high wage countries. Domestic investment in the meantime increased between 1998 and 2000, decreased in the early 2000s and recovered again in the later years.

4. ESTIMATION METHODOLOGY

At the estimation stage, we take the ratio of investment (I), outward FDI stock (FDI), and profits (R) to value added (Y), in order to decrease volatility and avoid heteroscedasticity. Real value added is introduced in logarithms. All explanatory variables enter into the estimations with one and two year lags. This is done for two reasons: First, to cope with time lags in the effects of FDI as well as demand and profitability on domestic investment decisions. We prefer to use both the first and second lags, due to the long time that may be required to plan and implement investment decisions. We cannot use a higher number of lags due to data limitations. Second, using lagged values mitigates potential problems due to reverse causality. A better way to cope with endogeneity issues would be to apply a GMM-approach. However, due to the low number of cross-sections (sectors) a reliable GMM-estimation is

precluded. A second best approach is to use lagged values of the right-hand side variables (see Wooldridge, 2002: 301).

We estimate a two-way fixed effects estimator. Our standard OLS estimations had severe autocorrelation problems; therefore we use the feasible GLS estimator that corrects for autocorrelation with panel data (Baltagi and Wu, 1999). As we still have autocorrelation problems when estimating with the FGLS estimator in levels, we estimate with FGLS in first differences, where our Durbin-Watson statistic no longer indicates a problem of autocorrelation.⁶ This is also helpful since the dependent variable, investment/value added (I/Y), as well as the explanatory variables, log(Y), FDI/Y, and profit share (R/Y) might have unit roots. Due to the shortness of our time series dimension, we also cannot use co-integration techniques (Baltagi, 2005: 237).

The different motivations for FDI in manufacturing versus services and the stylised facts suggest that industry and services may behave differently as far as the link between outward FDI and domestic investments is concerned. Therefore pooling would be problematic. However, we expect similar effects of value added and profits on domestic investment in industry and services sectors. Thus we include only dummy variables for industry and services interacted with the FDI variables, instead of a full interaction model. This approach also has the advantage that we do not lose too many degrees of freedom.

We first estimate a specification that does not distinguish between the countries of destination of FDI, but only distinguishes between industry and services.

$$\Delta \left(\frac{I}{Y} \right)_{it} = b_i + b_t + \sum_{j=1}^2 b_{1j} \Delta \log(Y_{it-j}) + \sum_{j=1}^2 b_{2j} \Delta \left(\frac{R_{it-j}}{Y_{it-j}} \right) + \sum_{j=1}^2 b_{3j} \Delta (d^{IND} * \frac{FDI_{it-j}}{Y_{it-j}}) + \sum_{j=1}^2 b_{4j} \Delta (d^{SRV} * \frac{FDI_{it-j}}{Y_{it-j}}) + \epsilon_{it} \text{ Equation (4)}$$

where (i) is the sector index (ranging from 1 to 29), (t) is the year index (ranging from 2002 to 2006⁷), $j=1,2$ is the lag operator, d^{IND} and d^{SRV} stand for the dummies for industry and services⁸. b_i are industry fixed effects. b_t are time fixed effects, which capture the effect of other time variant determinants of investment, which are common to all sectors (e.g. the interest rate; macroeconomic expectations). ε_{ij} is the error term. The estimated coefficients b_{3j} and b_{4j} can be directly interpreted as the marginal effect of a one unit increase in the FDI ratio on I/Y in the respective sector group.⁹

Next, we disaggregate FDI with respect to the 4 destinations as FDI^{WE} , FDI^{EE} , FDI^{HWR} , FDI^{LWR} and estimate the following equation:

$$\begin{aligned} \Delta \left(\frac{I}{Y} \right)_{it} = & b_i + b_t + \sum_{j=1}^2 b_{1j} \Delta \log(Y_{it-j}) + \sum_{j=1}^2 b_{2j} \Delta \left(\frac{R_{it-j}}{Y_{it-j}} \right) + \sum_{j=1}^2 b_{3j} \Delta (d^{IND} * \frac{FDI_{it-j}^{WE}}{Y_{it-j}}) + \\ & \sum_{j=1}^2 b_{4j} \Delta (d^{SRV} * \frac{FDI_{it-j}^{WE}}{Y_{it-j}}) + \sum_{j=1}^2 b_{5j} \Delta (d^{IND} * \frac{FDI_{it-j}^{EE}}{Y_{it-j}}) + \sum_{j=1}^2 b_{6j} \Delta (d^{SRV} * \frac{FDI_{it-j}^{EE}}{Y_{it-j}}) + \\ & \sum_{j=1}^2 b_{7j} \Delta (d^{IND} * \frac{FDI_{it-j}^{HWR}}{Y_{it-j}}) + \sum_{j=1}^2 b_{8j} \Delta (d^{SRV} * \frac{FDI_{it-j}^{HWR}}{Y_{it-j}}) + \sum_{j=1}^2 b_{9j} \Delta (d^{IND} * \frac{FDI_{it-j}^{LWR}}{Y_{it-j}}) + \\ & \sum_{j=1}^2 b_{10j} \Delta (d^{SRV} * \frac{FDI_{it-j}^{LWR}}{Y_{it-j}}) + \varepsilon_{it} \end{aligned} \quad \text{Equation (5)}$$

5. ESTIMATION RESULTS

Table 1 shows the estimations results for Equation (4). In Column 1, the three sectors, which have a large share in domestic investment, but a very low stock of outward FDI (“Real Estate and Business Services”, “Renting of Machinery and Equipment” and “Other Community, Social and Personal Services”) are excluded. In column 2, we include all sectors for which data are available, and test the robustness of our results with respect to the inclusion of these three industries. The time effects are jointly statistically significant in all specifications.

Insert Table 1 here

Profitshare has the expected and statistically significant positive sign in the first lag; the second lag is not statistically significant. Value added however is not statistically significant.

Outward FDI in industry has statistically significant negative effects on domestic investment, and both the first and the second lagged effects are statistically significant. Summing up the effects in two years, a 1%-point increase of outward FDI stock as a ratio to value added in industry reduces domestic investment by 0.294%-points. These results suggest that the cost seeking character of FDI is dominating the effects. In services, however we find no statistically significant effect of FDI on domestic investment.

The results are robust when the 3 sectors with large domestic investment but small FDI are included, as can be seen in Column 2. Our results are also robust when we exclude “Mining and Quarrying”.¹⁰

Table 2 presents the estimation results for equation 5 allowing for four different country groups. In the specification in Column 1 the three sectors (“Real Estate and Business Services”, “Renting of Machinery and Equipment” and “Other Community, Social and Personal Services”) are again excluded. Both value added and profits now have the expected positive effect; value added is statistically significant in the second lag, profits in the first lag.

Insert Table 2 here

In services sectors we find a positive and statistically significant effect of FDI to Western European countries, but no statistically significant effect of FDI to all other country groups. Our results show a 1%-point increase of FDI to Western Europe increases domestic investment by 0.133%-points as a ratio to value added.

In industry sectors the disaggregated results show that the substitutionary relationship between FDI and domestic investment results from FDI to both low wage country groups, Emerging East and Low Wage Rest. A 1%-point increase in FDI to Emerging East reduces domestic investment by 0.782%-points as a ratio to value added, and a 1%-point increase in FDI to Low Wage Rest reduces domestic investment by 0.855%-points. FDI to High Wage Rest in industry sectors by contrary positively affects domestic investment. A 1%-point increase in FDI to High Wage Rest increases domestic investment by 0.154%-points. The positive effect of FDI to High Wage Rest is much smaller than the negative effect of FDI to both low wage country groups, which explains the negative coefficient of FDI in industry when country groups are not distinguished.

The results are robust to including the three sectors with large domestic investment and small FDI (see column 2 of table 4). FDI to High Wage Rest in industry and FDI to Western Europe in services are no longer statistically significant in this specification, although their coefficient remain positive.

The substitution effect of FDI on domestic investment can thus be explained by FDI stock in low wage countries in industry. This illustrates that the cost-seeking nature of FDI towards Emerging East and Low Wage Rest dominates the results. The positive effect of FDI in industry to high wage countries outside of Europe signals the positive effects of new market creation and expected scope and scale effects on investment. The insignificant effects of FDI in industry in high wage Europe can be explained by a possible decline in future expected exports to these countries, which may offset the positive scope or scale effects. The positive effect of FDI in high wage Europe in services sectors is consistent with the expectation that market seeking FDI in services crowds in investment via the creation of further headquarter services or new export complementarities. The lack of any significant effect of FDI in services to other country groups indicate that the complementary effects are not strong; but clearly a negative effect from export replacement is also not the case, since FDI in services is mostly market seeking and the sector is primarily non-tradable. Interestingly, cost advantages of Emerging Europe in tradable services like business services in finance and insurance has not led to a crowding out of investment in these sectors as of now. However recent developments

concerning the relocation of R&D or other high-skilled tradable IT services to Emerging Europe may change this finding in the future.

Next we calculate the economic significance of the effects of FDI on domestic investment in Table 3 by multiplying the estimated coefficients for FDI (based on specification 1 in Table 4, if the coefficient is statistically significant) with the actual changes in the FDI variables. E.g. the actual change in outward FDI stock as a ratio to value added in industry in Emerging Europe between 1998 and 2005 was 5.3%-points. This change multiplied by the coefficient of -0.782 gives a total actual effect of -4.2%-points (column 3 of table 3). Thus the actual change in FDI to Emerging East has led to a reduction in domestic investment by 4.2%-points as a ratio to value added. The increase in FDI in industry to other low wage countries explains a reduction of domestic investment by 2.733%-points. Finally the increase of FDI to other high wage countries caused an increase of domestic investment by 0.07%-points. Compared to the actual decline in domestic investment in industry between 1998 and 2006 of 0.022 (average of the sectors), this is a very strong effect. The increase in the profit share and growth has offset most of the negative effects. The actual increase of FDI to Western Europe in services sectors has contributed to an increase of domestic investment by 1.8 %-points.

Insert Table 3 here

Finally, we compare our results with previous literature on industry level effects of outward FDI. Arndt et al. (2007) also use aggregated firm-level MiDi data of the Deutsche Bundesbank for Germany, but have fewer sectors and a different time period. They find a positive effect of outward FDI in the long run based on a cointegration specification between domestic capital stock and outward FDI stock, but Arndt et al do not distinguish between services and industry. The positive effect in their study is in particular due to the positive effect of FDI to high income countries, which is consistent with our findings in both industry and services; however the authors do not report the effects of FDI to low income countries. Additionally, our results indicate that the effects differ crucially in services vs. industry as well as with respect to the destination of FDI; i.e. positive effects prevail in services,

whereas crowding out effects dominate in industry, particularly if the destination is a low wage country. Moreover, methodologically it is hard to compare the results, since our dependent variable is the investment share and we estimate the equation in first difference to overcome autocorrelation problems, whereas they estimate domestic capital stock using a co-integration specification. However, it is problematic to estimate a cointegration specification with only 12 observations in time and 21 sectors (Baltagi, 2005: 237). They also estimate a short-run relation by taking the first difference of the equation in stocks, and find no effect of outward FDI in the short run, which is again different from our findings without the distinction between different country groups. They do not report short run effects of FDI to high vs. low income country groups. Their short run estimations also have a possible econometric problem, since the first difference of both domestic capital stock and FDI stock are also likely to have a unit root.

Regarding industry level studies for other countries, our results are similar to those of both Hejazi and Pauly (2003) and Braunerhjelm et al (2004), who find that cost seeking FDI has a negative impact on domestic investment. Our results are also in line with those of Hering et al (2010), who, however, use a different econometric approach: instead of estimating investment equations, they compare the performance of a firm that started its production abroad in a given year and specific sector with the performance of similar firms that have not gone abroad in the same year and sector, using propensity score matching techniques. They find that FDI of Japanese firms between 1995 and 2003 in manufacturing and FDI to low wage countries had a negative effect on domestic economic activity, whereas FDI in services and FDI to high wage countries affected the domestic economy positively. They also argue that cost seeking FDI has negative effects and market seeking FDI has positive effects and conclude that it is crucial to distinguish between different motivations of FDI in order to analyse its impact.

6. CONCLUSION

This paper estimates the effects of outward FDI on domestic business investment in Germany at the industry level for a panel of 19 industry and 10 services sectors in Germany. We pay particular attention to the different motivations behind FDI, and use three measures for this purpose: we distinguish between FDI to high versus low wage countries, to Europe versus the rest of the world, and FDI in services and industry sectors.

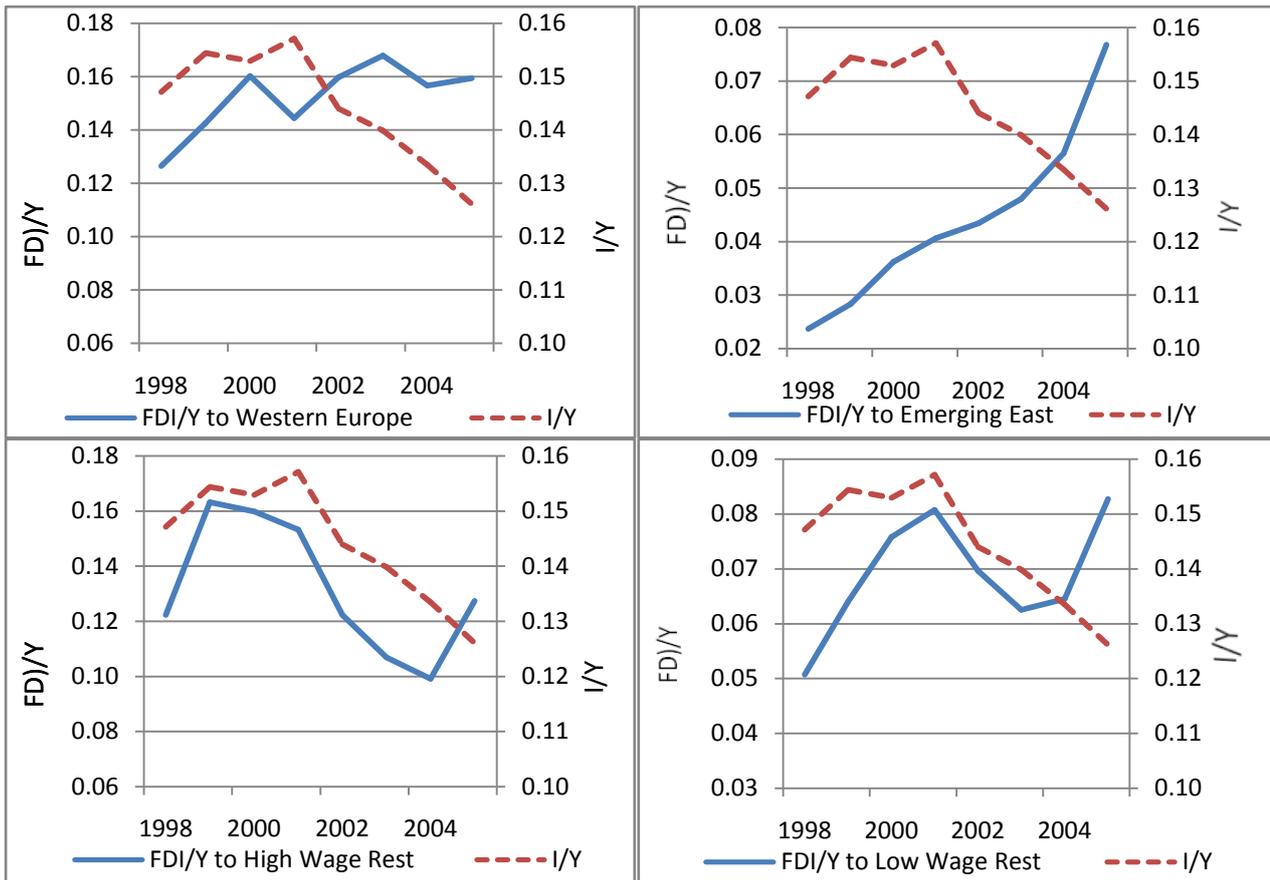
We find that German FDI to low-wage countries crowds out domestic investment in industry, whereas FDI to high-wage countries positively affects investment in industry and services. The negative effects of FDI to low wage countries indicate that FDI in this region has a primarily cost-seeking nature or in the case of market seeking FDI the negative export replacement effects dominate. However FDI in industry to high wage countries outside Europe crowds in domestic investment, which reflects the dominance of market seeking FDI with positive scope and scale effects. The effect of FDI in industry in high wage Europe is insignificant; apparently the export replacement effects are offsetting the positive scope or scale effects in this case. In services FDI to Western Europe crowds in domestic investment, which is consistent with the primarily market seeking nature of FDI in these sectors. In the case of other country groups the results indicate that the complimentary effects are not strong.

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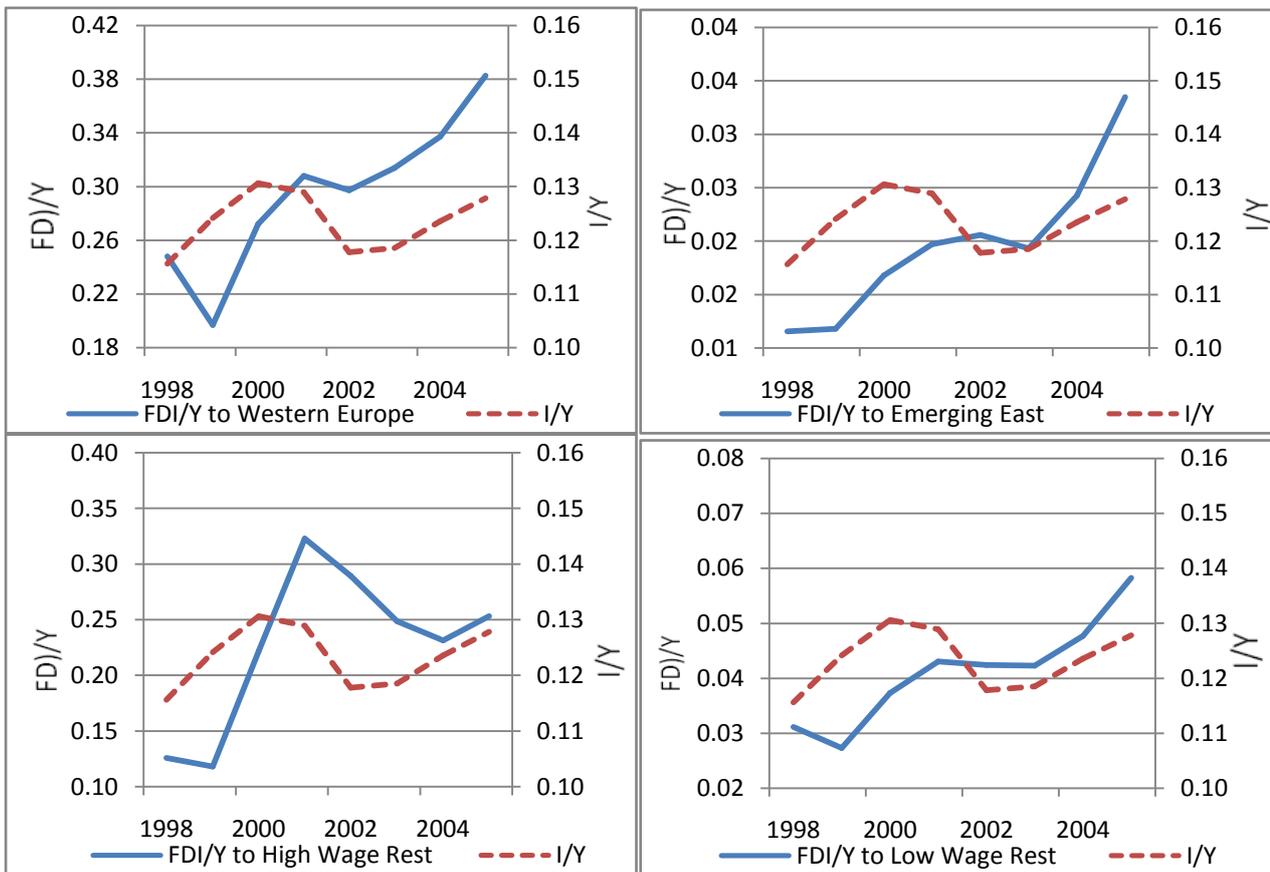
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Figure 1a: FDI and domestic investment in industry*



* Excluding “wearing apparel, dressing and dyeing of fur (18)”

Figure 1b. FDI in Services and Domestic Investment in Services*



*Excluding “electricity, gas and water supply”, Real Estate and Business Services, Renting of Machinery and Equipment, and Other Community, Social and Personal Services.

Table 1: Estimation results, Dependent variable: $\Delta I/Y$

	total without 70+71+90	total industry + services
$\Delta \log(Y)_{(t-1)}$	-0.013 (0.775)	-0.006 (0.903)
$\Delta \log(Y)_{(t-2)}$	0.022 (0.545)	0.018 (0.634)
$\Delta FDI/Y_{(t-1)}^{SRV}$	-0.019 (0.289)	-0.022 (0.251)
$\Delta FDI/Y_{(t-2)}^{SRV}$	-0.002 (0.898)	-0.001 (0.937)
$\Delta FDI/Y_{(t-1)}^{IND}$	-0.192*** (0.001)	-0.207*** (0.001)
$\Delta FDI/Y_{(t-2)}^{IND}$	-0.102* (0.084)	-0.110* (0.073)
$\Delta R/Y_{(t-1)}$	0.174** (0.017)	0.152** (0.047)
$\Delta R/Y_{(t-2)}$	0.048 (0.491)	0.040 (0.587)
c	-0.018*** (0.003)	-0.017*** (0.007)
rho	-0.153	-0.095
Adjusted R2	0.070	0.034
Durbin Watson	2.256	2.167
Time Dummies	yes	yes
pftest Time Dummies	0.008	0.003
nr of obs	135	147
nr of groups	29	32
note: *** p<0.01, ** p<0.05, * p<0.1		
p-values in parantheses		

Note: Our panel is unbalanced, since there are missing values for several sectors due to data confidentiality problems.

Table 2: FDI and domestic investment: four country groups

	total without 70+71+90	total industry + services
$\Delta \log(Y)_{(t-1)}$	-0.051 (0.200)	-0.045 (0.311)
$\Delta \log(Y)_{(t-2)}$	0.057* (0.068)	0.051 (0.142)
$\Delta FDI^{WE} / Y^{SRV} (t-1)$	-0.110 (0.327)	-0.126 (0.315)
$\Delta FDI^{WE} / Y^{SRV} (t-2)$	0.133* (0.075)	0.100 (0.242)
$\Delta FDI^{EE} / Y^{SRV} (t-1)$	-0.368 (0.635)	-0.876 (0.311)
$\Delta FDI^{fdi^{EE}} / Y^{SRV} (t-2)$	-1.015 (0.408)	-0.549 (0.687)
$\Delta FDI^{HWR} / Y^{SRV} (t-1)$	-0.015 (0.551)	-0.021 (0.443)
$\Delta FDI^{HWR} / Y^{SRV} (t-2)$	-0.017 (0.435)	-0.023 (0.350)
$\Delta FDI^{LWR} / Y^{SRV} (t-1)$	0.249 (0.600)	0.326 (0.533)
$\Delta FDI^{LWR} / Y^{SRV} (t-2)$	-0.229 (0.672)	0.097 (0.874)
$\Delta FDI^{WE} / Y^{IND} (t-1)$	-0.145 (0.115)	-0.156 (0.135)
$\Delta FDI^{WE} / Y^{IND} (t-2)$	-0.072 (0.290)	-0.084 (0.276)
$\Delta FDI^{EE} / Y^{IND} (t-1)$	-0.048 (0.694)	-0.093 (0.495)
$\Delta FDI^{EE} / Y^{IND} (t-2)$	-0.782* (0.073)	-0.852* (0.089)
$\Delta FDI^{HWR} / Y^{IND} (t-1)$	0.154* (0.091)	0.115 (0.264)
$\Delta FDI^{HWR} / Y^{IND} (t-2)$	0.058 (0.542)	0.048 (0.657)
$\Delta FDI^{LWR} / Y^{IND} (t-1)$	-0.855*** (0.000)	-0.839*** (0.000)
$\Delta FDI^{LWR} / Y^{IND} (t-2)$	0.037 (0.782)	0.052 (0.731)
$\Delta R / Y_{(t-1)}$	0.161** (0.011)	0.141** (0.050)
$\Delta R / Y_{(t-2)}$	0.025 (0.678)	0.025 (0.717)
c	-0.011* (0.073)	-0.011 (0.112)
rho	-0.045	-0.004
Adjusted R2	0.308	0.193
dw	2.057	2.006
time dummies	yes	yes
pftest_td	0.005	0.001
nr of obs	135	147
nr of groups	29	32

note: *** p<0.01, ** p<0.05, * p<0.1, p-values in paranthesis

Table 3: The economic impact of FDI and domestic investment (based on specification 1 in Table 2, in %-points)

	FDI variables	Estimated coefficients (0 if not statistically significant)	Actual change in FDI (2005 - 1998), in %-points	Economic effect (coefficients * change), in %-points
industry	FDI/Y^{WE}	0.000	3.283	0.000
	FDI/Y^{EE}	-0.782	5.313	-4.155
	FDI/Y^{HWR}	0.154	0.508	0.078
	FDI/Y^{LWR}	-0.855	3.197	-2.733
services	FDI/Y^{WE}	0.133	13.464	1.791
	FDI/Y^{EE}	0.000	2.193	0.000
	FDI/Y^{HWR}	0.000	12.735	0.000
	FDI/Y^{LWR}	0.000	2.714	0.000

Appendix

A.1. Variables

Name	Description	Data Source
I	Gross Fixed Capital Formation, Volumes (GFCK)	OECD-Stan
Y	Value Added, Volumes (VALK)	OECD-Stan
VALU	Value Added, Current Prices	OECD-Stan
GOPS	Gross Operating Surplus and Mixed Incomes, Current prices	OECD-Stan
FDI^{WE}	Outward FDI stock to Western Europe	MIDI
FDI^{EE}	Outward FDI stock to Emerging East	MIDI
FDI^{HWR}	Outward FDI stock to High Wage Rest	MIDI
FDI^{LWR}	Outward FDI stock to Low Wage Rest	MIDI
FDI/Y^{WE}	= $FDI^{WE}/VALU$ (FDI stock/nominal value added)	own calculations
FDI/Y^{EE}	= $FDI^{EE}/VALU$ (FDI stock/nominal value added)	own calculations
FDI/Y^{HWR}	= $FDI^{HWR}/VALU$ (FDI stock/nominal value added)	own calculations
FDI/Y^{LWR}	= $FDI^{LWR}/VALU$ (FDI stock/nominal value added)	own calculations
R/Y	= $GOPS/VALU$ (Nominal gross operating surplus/nominal value added)	own calculations
I/Y	= $GFCK/VALK$ (Real Gross Fixed Capital Formation/real value added)	own calculations

A.2. Industries

Industry

Number	Sector*
11	Mining and Quarrying
15	Manufacture of food products and beverages
17	Manufacture of textiles
20	Manufacture of wood and wood products (except furniture)
21	Manufacture of pulp, paper and paper products
22	Publishing, printing and reproduction of reported media
23	Manufacture of coke, refined petroleum products and nuclear fuel
24	Manufacture of chemicals and chemical products including pharmaceutical products
25	Manufacture of rubber and plastic products
26	Manufacture of glass and glass products and other non-metallic mineral products
27	Manufacture of basic metals
28	Manufacture of fabricated metal products service activities
29	Manufacture of machinery and equipment n.e.c.
31	Manufacture of electrical machinery and apparatus n.e.c.
32	Manufacture of radio, television and communication equipment and apparatus
33	Manufacture of medical, precision and optical instruments
34	Manufacture of motor vehicles, trailers and semi-trailers
35	Manufacture of other transport equipment
36	Manufacture of furniture; of jewellery and related articles; of musical instruments; of sports goods; of games and toys; other manufacturing n.e.c.

* The data for “wearing apparel, dressing and dyeing of fur (18)” are not available at the level of our detailed destination country classification due to confidentiality reasons because of the limited number of firms engaged in outward FDI in each country group in this industry.

Services

Number	Sector*
45	Construction
50	Sale, maintenance and repair of motor vehicles and motorcycles - retail sale of automotive fuel
51	Wholesale, trade and commission excl. motor vehicles
52	Retail trade excl. motor vehicles - repair of household goods
63	Transport and storage
64	Post and telecommunications
65-67	Financial intermediation, except insurance and pension funding; Insurance and pension funding, except compulsory social security; Activities auxiliary to financial intermediation
70	Real Estate Activities
71	Renting of Machinery and Equipment
72	Computer related activities
73	Research and Development
74	Other Business activities
90	Other Community, Social and Personal Services

*The data for “Electricity, Gas and Water Supply (40)” are not available due to confidentiality reasons. Furthermore, in the sectors for Financial Intermediation and Insurance and Pension Funding, there are very high year-to-year changes of value added (above 50%), which indicates changes in classification of several firms in different years. Therefore we used one digit level data for the aggregate sector Financial Intermediation, Insurance and Pension Funding.

Endnotes

¹ 1. Western Europe (Belgium, Denmark, France, Ireland, Italy, Luxembourg, Netherlands, Austria, Portugal, Sweden, Finland, Spain, United Kingdom, Greece, Norway, Switzerland, Iceland), 2. Emerging East (Poland, Romania, Bulgaria, Slovakia, Czech Republic, Hungary, Turkey, Estonia, Latvia, Lithuania, Albania, Macedonia, Bosnia-Herzegovina, Serbia, Croatia, Slovenia, Ukraine, Moldova, Belarus, Russia), 3. High Wage Rest (USA, Canada, Australia, New Zealand, Japan), 4. Low Wage Rest (Africa, America excluding USA and Canada, Asia excluding Japan, Australia and Oceania excluding Australia & New Zealand)

³ Bundesbank kindly provided the aggregate data by sectors for the period of 1998–2005.

⁴ Data for the sectors of “wearing apparel, dressing and dyeing of fur (18)” and “electricity, gas and water supply (40)” are not available at the level of our detailed destination country classification due to confidentiality reasons because of the limited number of firms engaged in outward FDI in each country group in these sectors. Furthermore, in the sectors for Financial Intermediation and Insurance and Pension Funding, there are very high year-to-year changes of value added (above 50%), which might be due to changes in classification of several firms in different years. Therefore we used one digit level data for the aggregate sector “financial intermediation, insurance, pension funding, and auxiliary activities” (65-67).

⁵ The figures correspond to the sectors for which the econometric estimations are done.

⁶ The estimator has three steps: In a first step a fixed-effects estimation with the autocorrelation parameter, ρ , is estimated. The autocorrelation parameter is obtained by a Prais-Winsten estimation, which has the advantage over Cochrane-Orchutt, that the first observation does not become lost (Wooldridge 2006: 426). Then the data is transformed in order to remove the AR(1) component based on a method by Baltagi and Wu (1999). In the third step a fixed effects estimator on the transformed data is run. We lose one more observation in this stage of the estimation procedure. Nevertheless this estimator is very efficient with short time series and comparably larger number of cross-sections compared to other estimation procedures that reduce autocorrelation.

⁷ Although FDI data is only available until 2005, since the data for investment and value added are available until 2007, our estimation period can be extended until 2006 given the lag structure.

⁸ d^{IND} has an entry 1 if a sector belongs to industry and zero otherwise. d^{SRV} has an entry 1 if a sector belongs to services and zero otherwise.

⁹ Since Y is used on the right hand side both in first difference and in the denominator of FDI/Y , the effect of a change in Y ceteris paribus, i.e. for a given FDI, has to be calculated by summing up the coefficient of Y as well as the indirect effect through the decline in FDI/Y for a given FDI.

¹⁰ The results are available upon request.