Abstract

Given the large trade and current account deficits in some of the new EU member states the development of their external economic situation becomes a major criterion to assess their aptitude to enter the European Monetary Union. The empirical analysis with aggregated data indicates that in the eight central and east European EU member states FDI and trade are complementary. This result is confirmed by an FDI enhanced gravity model which makes use of sectoral data provided by the Bundesbank's FDI micro database. The net effect of FDI on the trade balance is ambiguous, but FDI in high-tech industries clearly stimulates exports more than imports. Technological spill-over and the conglomeration of human capital seem to be important factors for the export performance. Against this background the prospects for the Czech Republic, Hungary, Slovenia and the Slovak Republic are quite auspicious, whereas the external economic situation in the Baltic states reveals to be more difficult.

JEL classification: F14, F15, F21

Keywords: foreign direct investment, trade balance, gravity model

Non technical summary

The eight countries in central and eastern Europe that acceded European Union in May 2004 all have high trade and current account deficits. The broadening of these deficits was accompanied by a substantial increase of foreign trade. The stock of foreign direct investment (FDI) also has been growing at double digits rates in most years since the start of the transition process. This study analyses the link between these developments and examines the possible contribution of FDI to a consolidation of trade balance deficits in the long run.

In an initial step, estimations are made with macro data in order to identify the overall impact of foreign direct investment. On the aggregate level, clear effects of inward FDI on the trade balance could not be identified. Both exports and imports are stimulated by direct investment. However, a great deal of information is lost by aggregating the data. The Deutsche Bundesbank's micro database makes it possible to link data on FDI and trade separately for countries and sectors. Thus detailed information on the specific sectoral relationship can be made available.

An FDI enhanced gravity model indicates that there are important direct and indirect effects of FDI on trade. For the manufacturing sector as a whole the results point to a complementary relationship with both exports and imports. The net effect on the trade balance is again unclear. FDI in services, however, has a negative impact on the trade balance which might be due to the presence of distributing companies. Differencing according to the degree of technological intensity shows that in the high-tech industries the link between FDI and trade is particularly close. Exports are highly stimulated by the domestic activity of foreign firms and the influence of FDI in other high-tech branches even exceeds the direct effect. From this one can conclude that technological spill-over or the conglomeration of human capital are important mechanisms which link FDI to the trade balance. With regard to imports we rather observe a substitution of domestically produced for imported goods. FDI in sectors with a low intensity of technology has no appreciable impact on trade.

With respect to the external economic relations with Germany those countries that attract a significant amount of FDI in sectors with advanced technologies indeed tend to realise surpluses in the bilateral trade balance. Economies with low inward FDI levels and a high proportion of low-tech industries, however, exhibit the highest deficits. Against this background the prospects for an external economic consolidation in the Czech Republic, Hungary, Slovenia and the Slovak Republic are quite auspicious. These countries reveal a

relatively high share of FDI in the metal industry, machinery, information and communication technologies or the car industry. The Baltic States, however, where engagement of foreign investors in the mentioned branches is rather low, cannot expect an appreciable relaxation of their foreign trade positions from this side.

Nicht technische Zusammenfassung

Die acht Länder Mittel- und Osteuropas, die im Mai 2004 der Europäischen Union beigetreten sind, weisen hohe Handels- und Leistungsbilanzdefizite auf. Die Ausweitung dieser Defizite ging mit einer erheblichen Zunahme des Außenhandels einher. Auch die Bestände an ausländischen Direktinvestitionen (ADI) wiesen in den meisten Jahren seit Beginn des Transformationsprozesses zweistellige Wachstumsraten auf. Die vorliegende Studie untersucht den Zusammenhang zwischen diesen Entwicklungen und erkundet den möglichen Beitrag ausländischer Direktinvestitionen zu einer langfristigen Konsolidierung der Handelsbilanzdefizite.

In einem ersten Schritt werden Schätzungen mit Makrodaten durchgeführt, um den Einfluss von Direktinvestitionen auf den Außenhandel insgesamt zu erfassen. Auf dieser aggregierten Ebene lassen sich keine eindeutigen Effekte der Direktinvestitionen auf die Handelsbilanzen in den untersuchten Ländern identifizieren. Sowohl Exporte als auch Importe werden durch ausländische Direktinvestitionen gefördert. Ein großer Teil der Informationen geht allerdings durch die Aggregation der Daten verloren. Die Mikrodatenbank Direktinvestitionen der Deutschen Bundesbank macht es möglich, Daten zu Direktinvestitionen und Außenhandel gesondert nach Ländern und Sektoren zusammenzuführen und so detaillierte Informationen über den spezifischen Zusammenhang auf Sektorebene zu gewinnen.

Die Ergebnisse eines um ADI erweiterten Gravitationsansatzes deuten auf wesentliche direkte und indirekte Effekte von Direktinvestitionen auf den Außenhandel hin. Für das Verarbeitende Gewerbe insgesamt bestätigt sich eine komplementäre Beziehung von ADI zu Exporten und Importen. Der Nettoeffekt auf die Handelbilanz ist auch hier nicht eindeutig. Direktinvestitionen im Dienstleistungssektor gehen aber mit einem negativen Einfluss auf die Handelsbilanz einher, was auf die Präsenz von Vertriebsgesellschaften zurückzuführen sein könnte. Unterscheidet man nach dem Grad der Technologieintensität, zeigt sich für den Hochtechnologiebereich, dass der Zusammenhang zwischen Direktinvestitionen und Außenhandel besonders ausgeprägt ist. Exporte werden durch die Präsenz ausländischer Firmen erheblich gefördert, wobei der Einfluss von Direktinvestitionen in anderen high-tech Branchen sogar größer ist als die direkten Effekte. Daraus lässt sich schließen, dass technologische Übertragungseffekte oder die Ansammlung von Humankapital wichtige Mechanismen für das Zusammenspiel von Direktinvestitionen und Außenhandel darstellen. Auf der Importseite ist hingegen eher eine Substitution durch lokal produzierte Güter zu beobachten. Direktinvestitionen in Branchen

mit geringer Technologieintensität haben keinen nennenswerten Einfluss auf den Außenhandel.

Für die Wirtschaftsbeziehungen mit Deutschland zeigt sich in der Tat, dass jene Länder, die einen hohen Bestand deutscher Direktinvestitionen in high-tech Sektoren aufweisen, im bilateralen Warenverkehr tendenziell Überschüsse erzielen. Dagegen haben Länder mit einer schwach ausgeprägten Präsenz deutscher Direktinvestoren und einem hohen Anteil von Direktinvestitionen in Sektoren mit geringer Technologieintensität die höchsten Defizite zu verzeichnen. Vor diesem Hintergrund sind die Aussichten auf eine außenwirtschaftliche Konsolidierung für die Slowakische Republik, Slowenien, die Tschechische Republik und Ungarn recht vielversprechend. Diese Länder verzeichnen einen hohen Anteil an Direktinvestitionen in der Metallindustrie, dem Maschinenbau, der Informations- und Kommunikationstechnologie oder in der KFZ-Industrie. Die baltischen Staaten hingegen können bei äußerst geringen Engagements ausländischer Investoren in den genannten Branchen von dieser Seite keine nennenswerte Entlastung ihrer Handelsbilanzen erwarten.

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Trade balances of the central and east European EU member states and the role of foreign direct investment*)

I Introduction

The present study is part of a research project on the current account developments of EU member states in central and eastern Europe (EU-8) and on the associated consequences for the enlargement of the euro area. The development of the current account is explicitly mentioned in Article 121 (1) EC as a criterion for sustainable convergence and has to be examined in the convergence reports of the ECB and the European Commission. Unsustainable current account positions imply possible repercussions to the real exchange rate or other key economic variables and are therefore of special interest. In an earlier study we have identified the macroeconomic determinants of current account deficits. A major result was that the current account deficits are being influenced mainly by factors that are connected with the economic stage of development, primarily buoyant investment.[1] Even if this result is basically positive for the future current account developments, essential risks remain and consist in possible back sets of the catching-up process and in the long-run effects of investment inflows.

This paper therefore focuses on the role which foreign direct investment plays for the external position of the eight new EU member states. Since the start of the transition process the central and east European EU countries have been attracting ever increasing amounts of FDI. In most years the annual growth rates have been in double digits. At the same time, trade with the EU has been intensified immensely. The purpose of this study is to ascertain whether there is a link between these developments and to examine the prospects of future trade balance developments that can be expected as a consequence of foreign direct investment in the long run.

The interplay between FDI and trade greatly depends on the motives behind the investment of multinational enterprises (MNEs). Corporate behaviour results in trade and investment

*) We are indebted to Jörg Breitung for his advice in econometric questions. For helpful comments we also want to thank Ulrich Grosch, Heinz Herrmann, the participants of the research meeting of the Deutsche Bundesbank, the participants of the Bundesbank Workshop in Potsdam, the participants of the Wilton Park Conference in Warsaw as well as the participants of an ECB Seminar on this issue. Of course, all remaining errors are ours.

1 See Herrmann/Jochem (2005).

flows that can be examined by means of gravity models.[2] The main purpose of the analysis is to verify to what extent foreign direct investment is complementary or substitutive to exports and imports and whether it affects the trade balance positively or negatively. A negative relationship between inward foreign direct investment and the trade balance is mainly to be expected if the subsidiaries primarily serve as marketing companies. By contrast, positive effects are likely to predominate if foreign direct investment increases the output of export goods and import substitutes. Outward direct investment by domestic enterprises may also have positive or negative effects on the trade balance.

In an initial step, panel estimations for the eight countries are made at the aggregate level in order to identify the total impact of foreign direct investment. However, a great deal of information is lost by aggregating the data. The Deutsche Bundesbank's micro database makes it possible to link bilateral data on FDI and trade separately for countries and sectors.[3] Sectors are an appropriate level of aggregation, since they form relatively homogenous groups of firms without being too sensitive to outliers. Furthermore, not only direct but also indirect effects can be taken into account. These arise when direct investment affects the competitiveness or growth of other sectors through externalities, technological spill-over effects or changes in the relative factor endowment.

In *section II* an account is given of developments in foreign direct investment and trade flows in the eight central and east European economies between 1994 and 2003. *Section III* provides an overview of the relevant literature. In *section IV* empirical analyses are undertaken both at the macroeconomic level and by means of sectoral data. *Section V* shows implications for the trade balances of the central and east European member states. *Section VI* summarises and draws conclusions concerning EMU enlargement.

II Developments of FDI and trade in the EU member states of central and eastern Europe

This section provides a brief overview of the current account and trade balance situation in the eight central and east European EU member states and shortly describes the developments in direct investment and foreign trade. *Figure 1* shows that the current account deficits in four EU member countries of Central and Eastern Europe exceeded 8%

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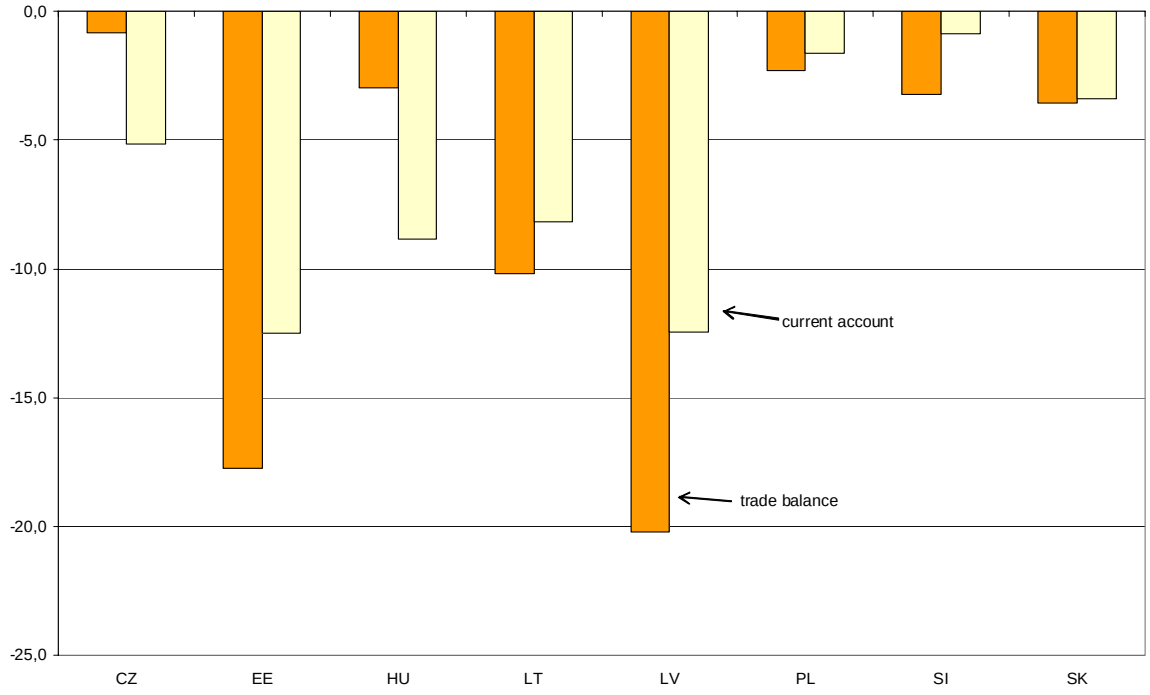
[2] For the theoretical basis of gravity models see Anderson (1979) and Deardorff (1984). These approaches have their roots back in the 1960s and are based on Tinbergen (1962) and Linnemann (1966) among others.

[3] Effects on the relationships with third countries are not captured by this paper. Such investigations are still not possible with the data available.

of GDP in 2004. In Estonia and Latvia they even amounted to around 12% of GDP. In most countries deficits in the trade balances were higher than in the current account, since current transfers, especially EU payments, more than compensated for the negative income balance. Only in the Czech Republic and Hungary net income payments exceeded current transfers and attributed substantially to the current account deficit.

Figure 1. Current account and trade balance (2004, % of GDP)



Source: Eurostat, NewCronos; IMF, International Financial Statistics.

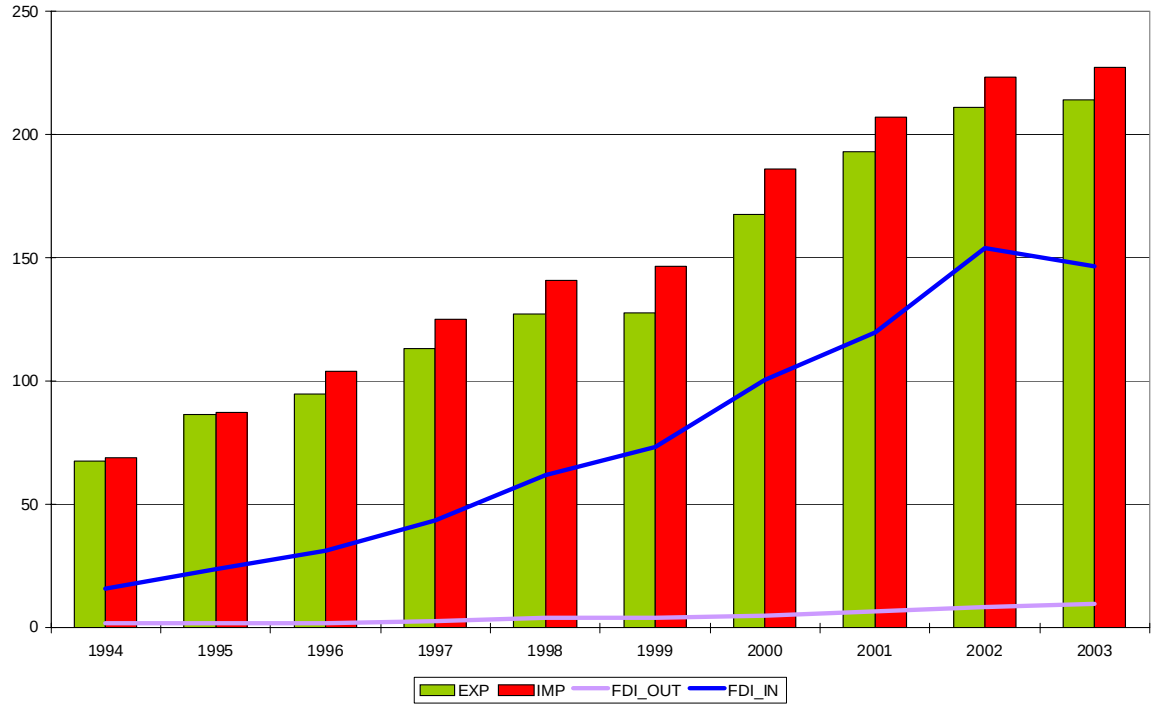
In the following we focus on trade effects of FDI, since this link clearly dominates the relationship between FDI and the current account.[4] *Figure 2* shows the flows of imports and exports as well as the stock of inward FDI (FDI_IN) and outward FDI (FDI_OUT) for the central and east European economies.

When seen in the aggregate, trade flows are much more important than the stock of foreign direct investment. This is particularly true at the beginning of the period under review when exports and imports accounted for about four times the aggregated direct investment stocks. Owing to the – at times – fairly differing developments, however, the ratios change over the years. While the annual growth rates of foreign direct investment are mostly in

[4] The presumable impact on future income payments is ignored in this study, since this would go beyond the scope of the paper.

double digits,[5] foreign trade rose continuously but did not gain considerable momentum until 1999. Consequently, in 2003 direct investment stocks were already accounting for about 60% of exports and imports. High rates of growth can also be seen in the case of direct investment by the central and east European EU member states abroad even if the level is low. At the current end it still accounts for less than 5% of exports and imports.

Figure 2. Exports, Imports and FDI stocks of EU-8 (EUR billion)



Sources: UN, World Investment Report; IMF, International Financial Statistics.

III Review of the literature

Over a lengthy period of time the theory of direct investment developed independently of international trade theory and ignored the influence of multinationals on the structures of foreign trade and the trade balance. However, these approaches could hardly explain empirical findings such as the growing importance of horizontal direct investment between

[5] The decrease in 2003 was solely due to changes in the valuation and resulted from depreciations of the national currencies vis-à-vis the euro. At constant prices and exchange rates this year showed an increase, too. The sharp rise in foreign direct investment is in part due to liberalisation measures which have probably eased the inflows of capital – as well as the outflows – during the period under review. Another reason is the important role played by privatisation and the associated M&A activities, especially in the initial phase of the transformation process. Greenfield investment became more important later.

economies with comparable levels of income in times of dwindling trade barriers. The reorientation of trade theory at the beginning of the 1980s – to encompass product diversification, increasing returns to scale and imperfect markets – made it finally possible to combine trade theory and theory of multinationals.

Drawing on empirical findings, Markusen (1984) developed stylised facts about multinationals and linked these consistently - under the heading "Knowledge Capital Model" - to the specific characteristics of firms and countries.[6] He comes to the conclusion that multinationals foster the international division of labour and that foreign direct investment – unlike portfolio investment – has to be seen as a complement to trade in goods.[7] While Markusen concentrated on horizontal direct investment, Helpman (1984) and Grossman/Helpman (1991) investigated the impact of vertical direct investment, which involves the fragmentation of the production process in dependence of varying factor endowments. Differing factor costs determine the choice of the most favourable place to locate production. As in the models developed by Markusen, a complementary relationship can also be expected here.

The simultaneous inclusion of vertical and horizontal direct investment is analytically complex and occurs for the first time in the studies undertaken by Markusen (2002) and Markusen *et al* (1996). One of the results of these types of model is that, depending on country-specific characteristics, direct investment and trade can be mutually replaceable or complementary. For example, FDI lowers the volume of trade if trade barriers and the similarity of standards are substantial. By contrast, an increase in trade volumes can be expected, if the obstacles to trade are low and the country characteristics are rather different.

The question whether FDI is substitutive or complementary to trade can eventually only be answered by empirical studies. However, the empirical literature on direct investment and

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6 *1. Fragmentation/transportation:* multinational enterprises make intensively use of human capital. Knowledge-based services can be provided at various locations at little cost. Human capital can therefore be concentrated in areas away from the actual place of production. *2. Skilled labour intensity:* in contrast to the production of finished products, the values arising from human capital depend on the availability of well qualified manpower. *3. Jointness:* values created on the basis of specialised know-how serve as inputs in multiple production processes and represent a kind of public good in the firm. In connection with this there are "multi-plant economies of scale", ie the input factor is used at various locations without its marginal productivity being reduced as a result. By contrast, increasing returns to scale at the enterprise level would argue in favour of concentration and for a decision in favour of exports. See, in particular, Markusen (1995).

7 This contradicts the results of the Heckscher-Ohlin model, which assumes substitutive relationship between trade in goods and trade in factors of production. Markusen (1984) makes it clear, however, that his result is due to the specific assumptions made in the model. He supposes that the trade in factors of production is a prerequisite for achieving gains from trade and increasing the volumes of traded goods.

foreign trade is just as complex as the theoretical models. For the new EU member states in central and eastern Europe Hoekman/Djankov (1997) come to the conclusion that - with the exception of Poland - no significant correlation exists between direct investment and the structure of the export markets. By contrast, Zemplinerova (1997) finds out that in the Czech Republic firms with foreign participation are more export oriented than domestic firms. As Brenton/Di Mauro/Lücke (1999) illustrate for various country groups in central and eastern Europe, however, more is also imported at the same time. According to Holland/Pomerantz (2003) the impact of direct investment on the trade balance of the new EU members (with the exception of Cyprus and Malta) is more or less neutral because imports and exports increase at the same rate. Lankes/Venables (1997) argue on the basis of surveys that the main goal of foreign direct investment in central and eastern Europe is to serve the domestic markets more adequately.

Focusing on direct investment of German firms Marin/Lorentowicz/Raubold (2003) analyse 1500 FDI projects in Eastern Europe and find a high share of intra firm exports to the parent company in those sectors in which Eastern Europe is commonly seen to have a comparative advantage and where the relocation of production makes particular sense.[8] A recent survey of Becker/Jäckle/Mündler (2005) based on FDI and employment data supports the assumption that German FDI in Central and Eastern Europe is predominantly of a vertical nature. This is also confirmed by a survey undertaken by the German Chamber of Industry and Commerce [DIHK] (2005) according to which German direct investment as a whole is primarily influenced by sales motives whereas in the central and east European EU member states efficiency seeking is the most often cited motive for FDI.

The paper at hand is different from the cited studies in that regressions on the aggregate level that are designed to capture the overall impact of FDI on trade are complemented by sectoral estimates that are able to identify direct and indirect effects in the bilateral relationships between the home and the host country. One might expect that in sectors, where competitiveness is mainly determined by production costs, FDI usually entails the relocation of specific production stages and primarily affects trade within the same sector. In those branches, on the other hand, where the quality and the variety of products play an essential role, the motives for FDI may be more complex and intra-sectoral spill-over effects can also be important. Consequently - and in analogy to country-specific effects cited by Markusen *et al* (1996) - sector-specific effects can also entail complementary or substitutive relationships between FDI and trade which are diluted by aggregating the data on the macro level. The analysis of these linkages is possible by matching the FDI micro

[8] According to the authors these are SITC 6 and 7 (manufacturing classified chiefly by material as well as machinery and transport).

database of the Deutsche Bundesbank with the external trade database of the German federal statistical office. In contrast to studies based on surveys we can do this for the entirety of officially registered activities. Furthermore, we concentrate on the relatively homogenous panel of the eight new EU member states in Central and Eastern Europe. Doing so we enlarge our database in opposite to individual country studies without mixing countries with very different economic backgrounds. Admittedly however, the trade-off between the number and the homogeneity of data cannot be totally solved.

IV FDI and trade of the central and east European EU member states

4.1. Estimations at the aggregate level

The empirical study on the impact of FDI on trade is based on a panel of the eight central and east European EU member states. The period under review is from 1994 to 2004. In order to eliminate valuation effects and to reduce the problem of simultaneity the estimates are done with constant values.[9] In an initial step, the analyses are carried out at the macroeconomic level. The regression equation to be estimated for the exports and for the imports is:

(1) $$EXP_{i,t} = \alpha_{0,i} + \alpha_1 GDP_{i,t} + \alpha_2 GDP_{OECD,t} + \alpha_3 RER_{i,t} + \alpha_4 FDI\_IN_{i,t-1} + \alpha_5 FDI\_OUT_{i,t-1} + \varepsilon_{i,t}$$

(2) $$IMP_{i,t} = \beta_{0,i} + \beta_1 GDP_{i,t} + \beta_2 GDP_{OECD,t} + \beta_3 RER_{i,t} + \beta_4 FDI\_IN_{i,t-1} + \beta_5 FDI\_OUT_{i,t-1} + \eta_{i,t}$$

where *EXP* and *IMP* are the central and east European economies' real exports and imports respectively. *GDP* is the real gross domestic product of the transition country and represents the size of the national economy. The gross value added in the OECD countries (GDP_{OECD}) serves as a proxy for the size of the external markets. The other variables are *RER* as the real effective exchange rate[10], *FDI_IN* as the stock of inward FDI and *FDI_OUT* as the stock of outward FDI.[11] All variables are logarithms. For α_1, α_2, β_1, β_2

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9 FDI denominated in US-dollar is deflated with the US GDP deflator. For exports and imports national unit values of exports and imports or – if these are not available - the national GDP deflators are used. FDI data stem from UN, World Investment Report. Other data are from the Eurostat NewCronos database and the IMF International Financial Statistics database. See the annex for further information. The estimations were carried out using Eviews 5.1.

10 The indirect quotation of the exchange rate is used, ie a rise in the variable means an appreciation.

11 We use lagged FDI values that indicate the capital stock at the end of the previous year. This makes it possible to isolate long-term production effects of FDI on the trade balance from one-time transactions that occur in the context of the investment activity. From an economic point of view it might also be reasonable to increase the lag even further in order to account for the time span that lies between the initial investment

and β_3 a plus sign is expected and for α_3 a minus sign. The signs for α_4, α_5, β_4 and β_5 are uncertain *a priori* and have to be established empirically.

Unit root tests indicate that the individual time series are non stationary.[12] We therefore run a two-steps Engle-Granger procedure and tested the residuals of a fixed effects OLS regression for stationarity.[13] Existing empirical and theoretical studies suggest that the explanatory variables are not strictly exogenous.[14] To take account of a possible endogeneity, a dynamic OLS (DOLS) procedure was chosen. A fixed effect estimator with fixed country as well as time effects was used both for the export and import equation. The heteroscedasticity error structure was corrected by a robust White estimator.[15]

In *Table 1* the results for the export and import equations are shown. The GDP has a plus sign and is significant at the 1% level in both estimations. World output is captured by the time fixed effects.[16] Somewhat surprisingly, a real effective appreciation not only entails higher imports, but is also positively correlated with exports. This might be due to the fact, that the real exchange rate tends to appreciate during the catching-up process without affecting price competitiveness.[17]

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and the start of production. This argument, however, mainly holds for greenfield investment, but not necessarily for mergers and acquisitions. The econometric results also give support to a one-year lag.

12 The panel unit root tests of Levin/Lin/Chu (2002), Breitung (2000), Im/Pesaran/Shin (2003) and Maddala/Wu (1999) were used, but do not obtain uniform results owing to the short observation period.

13 See Engle/Granger (1987). The stationarity of the residuals was tested using the panel cointegration tests of Pedroni (1995) and Kao (1997). According to the test of Pedroni both the export and the import equation are clearly cointegrated. The test of Kao verifies cointegration only for the export equation, but is not able to reject the null of no cointegration for the import equation. In a second step, an error correction estimation was carried out. The error correction term is significantly negative. To that extent, the time series move towards the long-term equilibrium. See Kremers *et al* (1992).

14 For trade effects on direct investment see, for example, the empirical studies by Kreinin *et al* (2000) and Petri/Plummer (1996**)**. In the present paper such relationships are eliminated through the use of lagged direct investment stocks. But the endogeneity problem cannot entirely be ruled out for GDP and the real exchange rate. For example, Frankel/Rose (2000) assume that foreign trade will have a significant effect on income. Endogeneity is also treated in detail by Maxwell *et al* (1995). He found no uniform results from his sample of 46 developing countries. However, he does identify variables which influence the direction of the existing causality. He shows, for example, that a large amount of debt reduces the likelihood that the financial account affects the current account. Conversely, a high growth rate and a high ratio of private-sector credit to GDP increases the likelihood that the current account determines the financial account. The more developed the foreign exchange markets, the more likely it is that direct investment is exogenous.

15 See Saikkonen (1991) and Stock/Watson (1993). A lead and a lag of the difference as well as the differences themselves were used as explanatory variables for GDP and RER. In view of the restricted number of observations, the insignificant fixed effects were excluded from the estimation.

16 World output only changes in time, but not for the individual countries. Including it explicitly in the estimation together with fixed time effects would yield singular matrices.

17 This phenomenon is closely linked to the so called Balassa-Samuelson effect. For a discussion of real appreciation in the new EU member states see for example Fischer (2002).

Table 1. DOLS estimates for exports and imports on the aggregate level

	Exports	**Imports**
GDP	0.654*** *(7.58)*	0.663*** *(14.29)*
RER	1.663** *(2.23)*	2.44*** *(2.82)*
FDI_IN(-1)	0,165* *(1.74)*	0,197*** *(4.73)*
FDI_OUT(-1)	0,053** *(2.20)*	0,038 *(1.43)*

*** (**) [*] means significance at the 1% (5%) [10%] level; t-values in parentheses.

The positive parameter of the direct investment stocks in the export equation indicates that increased amounts of intermediate and finished products are returned from the subsidiary to the parent company or the subsidiaries serve as an export platform for other markets.[18] Indirect effects of inward investment on other sectors can also play a role. Such spill-over effects can arise, for example, in the course of technology transfers and improve the competitiveness of the economy as a whole.[19]

The stocks of direct investment at home also stimulate imports. This could be a sign that fairly large volumes of the parent company's intermediate products flow into the subsidiary's output or that the foreign firms draw on established business relationships with foreign partner firms for intermediate products. Another explanation could be that the aim of the direct investment of the parent company is to acquire better access to the markets of the host country.

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18 For the significance of direct investment as an export platform see also Ekholm *et al* (2003). According to Hanson *et al* (2001), the importance of an economy as an export platform is promoted when trade restrictions are low and the domestic market is rather small.

19 Markusen (1997) sees the main advantage of direct investment in the fact that a country is provided with the necessary inputs to produce more efficiently. According to Ethier/Markusen (1996), direct investment makes the transfer of know-how easier. This is essential for dynamic comparative advantages and for the long-term improvement of competitiveness. Borenstein et al (1998) are among those who point out the empirical relationships between direct investment and growth. They show that direct investment increases the marginal productivity of capital, fosters technical progress and thereby stimulates the growth of an economy. Balasubramanyam et al (1999) also speak of direct investment as an engine of economic growth. However, Aitken/Harrison (1999) come to the conclusion that with respect to Venezuela the aggregate effect of foreign direct investment for the economy as a whole will probably tend to be low because, although the productivity of the foreign enterprises increases, that of domestic firms is impaired. The 6th Structural Issue Report of the ECB (2005) highlights the stimulating effects of high-tech FDI for the catching-up process of Ireland.

The direct investment stocks of the central and east European EU member states abroad have a positive effect on exports, although their importance is much less pronounced than in the case of inward FDI. Imports, on the other hand, are not significantly influenced.

According to the estimations carried out, no clear effects of inward FDI on the trade balance can be identified. Both exports and imports are stimulated by direct investment. This is in accordance with the results of Holland/Pomerantz (2003) for Poland, Hungary, the Czech Republic and Slovenia, who cannot find a net effect of FDI on the trade balance, either.

Fontagné/Paijot (2000) point out that the results at the aggregate level may represent a purely statistical phenomenon. Altzinger (1998) also deals with the loss of information arising from macroeconomic estimations. To that extent, it seems appropriate to add estimations at the sectoral level where differing linkages between FDI and trade can be captured. This is especially important for the evaluation of future structural adjustments between sectors during the catching-up process. On the other hand, sectoral data are less sensitive to outliers than firm level data. Furthermore, direct and indirect effects can be taken into account separately at the sectoral level. Besides, Lipsey/Weiss (1984) assume that sectoral estimations reduce the simultaneity problem.[20]

4.2. Estimations at the sectoral level

Estimates on the sectoral level are only possible for the bilateral economic relationships between the eight countries under consideration and Germany. Sectoral data of overall FDI are either incomplete or not detailed enough to conduct an econometric study. Since German firms have played a pioneering role in establishing affiliates in central and eastern Europe, the economic relations of the eight EU member states with Germany might nevertheless give an idea of future external economic patterns with other partners, too.

In this section we focus on trade in manufactured goods for two reasons: First, the manufacturing sector is the most important playing field for German firms in central and eastern Europe. Second, trade in commodities and services both feature some particularities which make it difficult to compare them with each other and with manufactured goods. Trade in commodities is usually determined by the availability of

[20] In addition to the endogeneity problem, there is also a simultaneity problem, ie a kind of spurious regression which arises from the fact that the two variables are influenced by other variables such as the state of development of the host country. See Tadesse/Ryan (2004), Frankel *et al* (1995) and Poon/Thompson (1998). By contrast, Min (2003) cannot identify a simultaneity problem.

natural resources. International transactions in services, on the other hand, often are difficult to be interpreted in terms of exports or imports.[21] In the following we differentiate between eight manufacturing industries.[22]

Figure 3 shows foreign trade with Germany and inward FDI from Germany for the eight central and east European member states in the eight industries.[23] By far the highest investment level can be identified in the construction of vehicles and transport equipment as well as in the chemical industry including the manufacturing of rubber synthetics and mineral products. In these sectors German firms were engaged with about 5 billion and 4 billion euro, respectively, in 2003. A considerable amount of FDI can also be observed in the information and communication technology (ICT) sector amounting to just under 2 billion euro. In all the other sectors German FDI barely exceeded 1 billion euro during the observation period. The development of FDI is quite steady in all the sectors which is in line with the observation of total FDI on the macroeconomic level (*Figure 1*).

Looking at trade flows, construction of vehicles and transport equipment together with ICT goods is again the most important sector, closely followed by machinery. Interestingly, in all these sectors the initial trade deficit vis-à-vis Germany has diminished over time. In ICT and the car industry the eight central and east European countries have even become net exporters. The growth of exports usually took off in the second half of the observation period, whereas the dynamic of imports does not show uniform patterns in the individual sectors. In the chemical industry, the trade deficit has continuously widened as a result of muted export growth and a steady increase of imports. In other sectors, namely textiles and clothing or manufactured wood and paper, the countries under consideration have realised trade surpluses vis-à-vis Germany during the whole observation period.

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21 Reported income of insurances, eg, is equivalent to the balance of insurance contributions received and payments for insured losses. Consequently, the values in the statistics are much lower than the underlying transactions and can even be negative. Furthermore, their volatility is widely determined by exogenous incidents and not by economic fundamentals.

22 The match between the SITC systematic for foreign trade and the NACE, Rev. 1.1 classification of the European Union, which is relevant for FDI data, is described in the annex. Trade data are from the German Federal Statistical Office, FDI data from the micro database of the Deutsche Bundesbank. Other data used in the estimations stem from Eurostat. For further details see the annex.

23 Outward FDI of the new member states in Germany is not included, since it is negligible.

Figure 3. Foreign trade and FDI by industries (EUR billion)

Sources: Deutsche Bundesbank, German Federal Statistical Office.

Whereas all the time series in *Figure 3* exhibit a positive trend it is not obvious whether there exists a direct link between FDI stocks and trade flows. In order to investigate the relationship in more detail we run panel regressions for the time from 1994 to 2004 with the eight manufacturing sectors listed above and the eight central and east European EU member countries. We employ an FDI enhanced gravity model with industrial production at constant prices (IND) of the individual countries and Germany.[24] Relative unit labour costs in the manufacturing sector (ULC) are used as a measure of price competitiveness.[25]

$$(3) \quad EXP_{i,MF,t} = \gamma_{0,i,k} + \gamma_1 IND_{i,t} + \gamma_2 IND_{D,t} + \gamma_3 ULC_{i,t} + \gamma_4 FDI\_IN_{i,MF,t-1} + \gamma_5 FDI\_IN_{i,PS,t-1} + \gamma_6 FDI\_IN_{i,SV,t-1} + u_{i,k,t}$$

$$(4) \quad IMP_{i,MF,t} = \delta_{0,i,k} + \delta_1 IND_{i,t} + \delta_2 IND_{D,t} + \delta_3 ULC_{i,t} + \delta_4 FDI\_IN_{i,MF,t-1} + \delta_5 FDI\_IN_{i,PS,t-1} + \delta_6 FDI\_IN_{i,SV,t-1} + v_{i,k,t}$$

where MF indicates the manufacturing sector, PS the primary sector and SV stands for services. Whereas γ_4 and δ_4 capture the *direct* effects of inward FDI (FDI_IN) on trade within the manufacturing sector, γ_5, γ_6, δ_5 and δ_6 indicate the role of spill-over from FDI in other sectors.[26] Unit root tests suggest again a non stationarity of the data. Likewise the estimations on the macro level we therefore run the two-step Engle-Granger procedure and use the DOLS fixed effect estimator.[27]

In a first step we analyse separately the effects on trade in manufactured goods stemming from FDI in the manufacturing sector (FDI_MF), in the primary sector (FDI_PS) and in services (FDI_SV). Whereas a close relationship within the manufacturing sector might indicate a fragmentation of production, spill-over effects from the primary sector can result from complementary trade of equipment. Finally, the impact of FDI in services possibly reflects more general consequences of a deeper economic integration.

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24 The distance to Germany is captured by the fixed effects. Explicitly incorporating it into the regressions yields singular matrices.

25 Relative unit labour costs are defined as the ratio of nominal unit labour costs in country i to the respective value in Germany. Since national unit labour costs are calculated in national currency, they are deflated with the nominal exchange rate against the euro (DM until 1998).

26 Outward FDI of the new member states in Germany is again ignored. The other variables are the same as in equations (1) and (2).

27 Unit root tests for the individual variables are again of lower reliability because of the short time span. For the DOLS estimates we use cross section weights in order to take account of heteroscedasticity and draw on panel corrected standard errors to consider contemporaneous correlation. AR-terms correct for serial correlation.

Table 2. DOLS estimates for manufactured exports and imports with spill-over from the primary and the services sector

	EXP_MF	**IMP_MF**
IND	0.413 *(1.183)*	0.508** *(2.30)*
IND_GER	1.017** *(1.978)*	1.749*** *(3.02)*
ULC	-0.415*** *(-3.023)*	1.481*** *(5.41)*
FDI_MF(-1)	0.057* *(1.85)*	0.062* *(1.73)*
FDI_PS(-1)	0.028** *(2.53)*	0.024*** *(2.61)*
FDI_SV(-1)	-0.008 *(-0.27)*	0.028* *(1.66)*

*** (**) [*] means significance on the 1%- (5%-) [10%-] level; t-values in parentheses.

Table 2 presents the results for the sectoral export (EXP_MF) and import (IMP_MF) equations.[28] They are consistent with the outcomes on the aggregate level (*Table 1*). Generally, there is a positive link between trade and industrial production at home or abroad. With the exception of the impact of industrial production in a given acceded country on its exports the estimated parameters are significant. Higher relative unit labour costs negatively affect exports and lead to higher imports. FDI in manufacturing stimulates both exports and imports of manufactured goods. Cross-sectoral impacts from FDI in the primary sector are also significant. Direct investment in services, however, is found to influence only imports, but not exports. This result might point to the role of marketing companies or the influence of German banks which make accessible foreign funds and hence facilitate imports. In their descriptive survey of German FDI and employment in foreign affiliates Becker/Jäckle/Mündler (2005) also find evidence of growing importance of market oriented FDI in central and eastern Europe.

[28] The residuals of fixed effects OLS estimations are stationary according to the tests of Pedroni (1995) and Kao (1997). The error correction term in the error correction model is significant and also points to the existence of a co-integration relationship.

All in all, the net effects of FDI on the trade balance are still unclear. FDI in the primary and the manufacturing sectors seems to stimulate trade as a whole. FDI in the services sector tends to passivate the trade balance.

In a next step we now want to analyse in more detail the link between trade and FDI within the manufacturing sector which is the most important playing field of German FDI in Central and Eastern Europe. We therefore differentiate between direct effects that occur within the same industry and cross-sectoral repercussions that reflect interdependencies between the individual branches. Since industrial production and unit labour costs are not available on the sectoral level for the whole sample we furthermore use aggregated data for manufacturing (without construction) and concentrate the sectoral analysis on the impact of FDI on trade:

(5) $$EXP_{i,k,t} = \gamma_{0,i,k} + \gamma_1 IND_{i,t} + \gamma_2 IND_{D,t} + \gamma_3 ULC_{i,t} + \gamma_4 FDI\_IN_{i,k,t-1} + \gamma_5 FDI\_IN_{i,MF-k,t-1} + u_{i,k,t}$$

(6) $$IMP_{i,k,t} = \delta_{0,i,k} + \delta_1 IND_{i,t} + \delta_2 IND_{D,t} + \delta_3 ULC_{i,t} + \delta_4 FDI\_IN_{i,k,t-1} + \delta_5 FDI\_IN_{i,MF-k,t-1} + v_{i,k,t}$$

with k indicating the individual industry of the manufacturing sector.

Table 3. DOLS estimates for manufactured exports and imports on the sectoral level

	EXP_SEC	**IMP_SEC**
IND	0.526** *(2.31)*	0.405** *(2.38)*
IND_GER	0.919* *(1.77)*	2.108*** *(3.49)*
ULC	-0.367** *(-2.27)*	1.599*** *7.31*
FDI_SEC(-1)	0.030** *(2.28)*	0.033*** *(3.15)*
FDI_MF(-1)	0.079** *(2.44)*	0.134*** *(6.81)*

*** (**) [*] means significance on the 1%- (5%-) [10%-] level; t-values in parentheses.

Table 3 shows that FDI has sensible positive effects on exports in the same industry (FDI_SEC). This outcome might again reflect a fragmentation of production which is

motivated by cost reduction. However, positive spill-over from FDI in other manufacturing sectors (FDI_MF) seems to be even more important.[29] The impact of FDI on imports is also positive within and across industries. These cross-section effects point to the existence of substantial economic links between individual industries.

In a last step we therefore try to get some additional insight into the nature of spill-over within the manufacturing sector. In the literature technology transfers of foreign affiliates to domestic firms are often cited to be a driving force in the catching-up process of reforming countries. If this phenomenon also plays a role in the new EU member states it should be possible to identify differences between individual industries in dependence of their technology intensity. In order to get an acceptable compromise between the number of observations and the homogeneity of the cross-sections we define a high-tech and a low-tech sector, each comprising four industries.

Table 4. DOLS estimates for exports and imports in the high-tech industries

	EXP_SEC	**IMP_SEC**
IND	-0.627 *(-0.46)*	1.078*** *(2.753)*
IND_GER	0.966 *(1.33)*	1.734*** *(3.394)*
ULC	0.816 *(0.74)*	-0.644** *(-2.25)*
FDI_SEC(-1)	0.063** *(2.17)*	0,028* *(1.72)*
FDI_HIGH(-1)	0.109** *(2.44)*	-0.093*** *(-3.06)*
FDI_LOW(-1)	0.062* *(1.94)*	0.033 *(1.07)*

*** (**) [*] means significance on the 1%- (5%-) [10%-] level; t-values in parentheses.

Albeit the classification of the chemical industry is not straightforward, in this study we add it to the low-tech sector which also includes the production of food, beverages and tobacco, the textile and leather industry and the manufacturing of paper or wood. On the

[29] These findings are in line with the results of Blattner (2004) for South-East Asia, but are in contrast to the studies of Damijan et al (2001), Görg/Greenaway (2001) or Konings (1999).

other hand, the metal industry, machinery, the information and communication technology and the construction of vehicles and transport equipment are defined as high-tech manufacturing.

In *Table 4* the macro variables only have a significant effect on high-tech imports, but no impact on exports can be verified. This is probably due to the limited correlation between the aggregates and the underlying variables which represent the developments in the various branches. With regard to FDI, where idiosyncratic data for the individual industries are used, significant trade effects can be detected from FDI in the same industry (FDI_SEC) and from FDI in other high-tech industries (FDI_HIGH).[30] FDI in the high-tech sector as a whole (FDI_SEC+FDI_HIGH) clearly has a positive impact on the trade balance in high-tech goods. This net effect is primarily due to a positive spill-over on exports and negative cross-effects for imports. With regard to exports technology transfers might play a role. A similar mechanism is the conglomeration of human capital induced by pioneering firms. Conglomeration effects might also be responsible for import substitution in the high-tech sector, when intermediate goods which were previously imported are now produced in the same country. FDI in the low-tech sector also stimulates exports, but has no significant effect on imports.

The close link between FDI and trade that could be established for the manufacturing sector as a whole and the high-tech industries in particular, cannot be affirmed for the low-tech sector *(see Table 5)*. Only a positive direct effect of FDI on imports in the same industry and a negative indirect impact of FDI in the high-tech sector on imports in the low-tech sector is confirmed.

30 Due to the reduced number of observations we use dummies for countries and for sectors instead of fixed effects for each cross section. As before we use cross sections weights and cross-section SUR panel corrected standard errors to take into account heteroscedasticity as well as contemporaneous correlation. AR-terms correct for serial correlation.

Table 5. DOLS estimates for exports and imports in the low-tech industries

	EXP_SEC	**IMP_SEC**
IND	-0.149 *(-0.36)*	1.637*** *(4.53)*
IND_GER	0.681 *(1.53)*	1.532** *(5.36)*
ULC	0.140 *(0.61)*	0.264 *(1.69)*
FDI_SEC(-1)	0.010 *(0.51)*	0.020* *(1.68)*
FDI_LOW(-1)	-0.010 *(-0.61)*	0.011 *(1.28)*
FDI_HIGH(-1)	0.025 *(0.824)*	-0.070*** *(-2.82)*

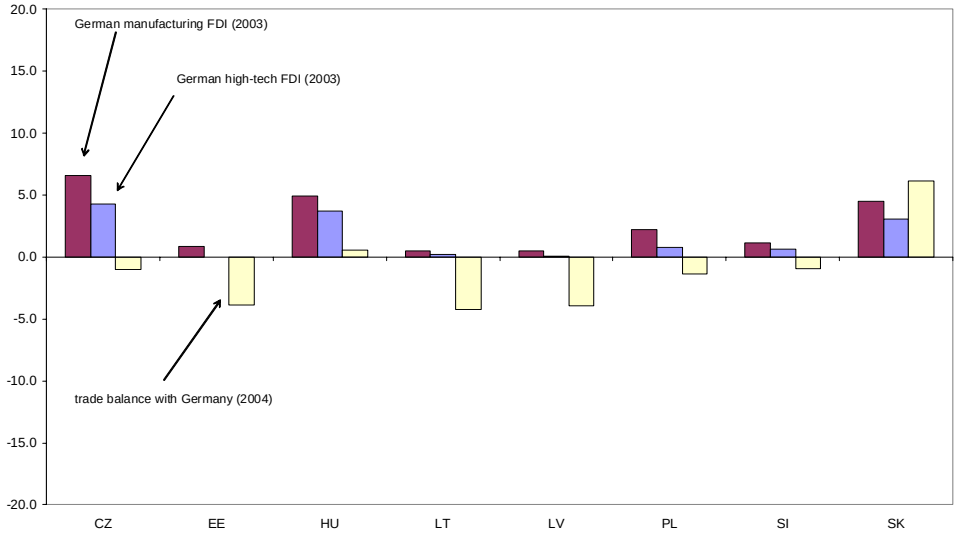
*** (**) [*] means significance on the 1%- (5%-) [10%-] level; t-values in parentheses.

Summarising, the sectoral analysis indicates that there are important direct and indirect effects of FDI on trade. For the manufacturing sector the results point to a complementary relationship with both exports and imports. The net effect on the trade balance is unclear. The same is true for FDI in the primary sector which stimulates trade as a whole. FDI in services, on the other hand, only has a significant impact on imports, whereas no effect on exports can be detected. The negative impact on the trade balance might be due to the presence of distributing companies. Differencing according to the degree of technological intensity shows that in the high-tech industries the link between FDI and trade is very close. Exports are highly stimulated by the domestic activity of foreign firms and the influence of FDI in other high-tech branches exceeds the direct effect. From this one can conclude that technological spill-over or the conglomeration of human capital are important mechanisms which link FDI to the trade balance. With regard to imports we rather observe a substitution of domestically produced for imported goods in the high-tech sector. FDI in sectors with a low intensity of technology has no appreciable impact on trade.

V Implications for the trade balances of the central and east European EU member states

The empirical analysis has shown that FDI can play an important role for the sustainability and a future reversal of current trade balance deficits in the central and east European EU member states. This is especially true for countries, who attract FDI in technologically advanced sectors such as the metal industry, machinery, information and communication technologies or the automobile industry. *Figures 4* and *5* show the link between inward manufacturing FDI, high-tech FDI and the trade balance for the eight central and east European countries vis-à-vis Germany and the world.

Figure 4. Inward FDI and trade balances vis-à-vis Germany (% of GDP)



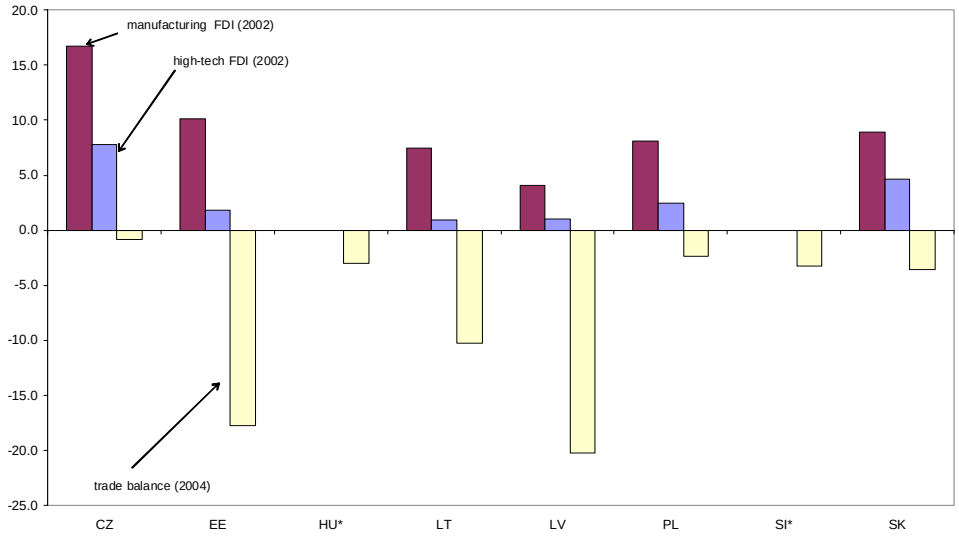
Source: Eurostat, Deutsche Bundesbank.

For the external relations with Germany *Figure 4* backs the econometric results that those countries that attract a significant amount of FDI in sectors with advanced technologies tend to realise surpluses or only moderate deficits in the bilateral trade balance. Economies with low inward FDI levels and a high proportion of low-tech industries, on the other hand, exhibit the highest deficits. Turning to *Figure 5* it becomes evident that the overall share of high-tech industries in manufacturing FDI is below the respective values of FDI coming from Germany. This might explain, to some extent, why all the eight countries under consideration run overall trade balance deficits.

Given the level and structure of FDI and based on the experience in the bilateral external relationships of the individual countries with Germany one could argue the current trade

deficits of the Czech Republic, Hungary, Poland, Slovenia and the Slovak Republic are less worrisome and will diminish over time, whereas the situation in the Baltic States is much less favourable.

Figure 5. Inward FDI and trade balances worldwide (% of GDP)



* Sectoral FDI data for Hungary and Slovenia are not available.
Source: Eurostat.

VI Conclusion

Given the large trade and current account deficits in some of the new EU member states the sustainability and the likely development of their external economic situation becomes a major criterion to assess their aptitude to enter the European Monetary Union. To a certain extent trade and current account deficits are normal or even desirable for reforming countries, since the catching-up process can be significantly enhanced by the inflow of foreign capital and technologies. In this context FDI plays a crucial role.

Economic literature describes a multitude of links between FDI and trade making it difficult to predict the likely development of trade patterns with respect to FDI inflows. The empirical analysis with aggregated and sectoral data indicates that in the eight central and east European EU member states FDI and trade are positively correlated. So far, our outcomes are in line with previous findings in the literature, even if results for overall FDI are less clear than studies that focus on German FDI.

Additionally, the sectoral analysis has shown that indirect effects are at least as important as direct effects. Especially in the high-tech sector technological spill-over and the conglomeration of human capital seem to be important factors for the export performance. The important differences that are revealed between sectors and industries are of high relevance for the assessment of the sustainability of existing trade deficits and for economic policy.

Against this background the prospects for the Czech Republic, Hungary, Slovenia and the Slovak Republic are quite auspicious. These countries reveal a relatively high share of FDI in the metal industry, machinery, information and communication technologies or the car industry. Hungary and the Slovak Republic already now display surpluses in their trade with Germany. Since the economic integration of the central and east European EU countries with other EU member states often lag somewhat behind their relationship with Germany one might expect a general relaxation of their foreign trade positions. The Baltic States, however, where the engagement of foreign investors in these branches is rather low, cannot expect a significant improvement of their foreign trade positions from this side.

Another aspect, which was not explicitly addressed in this paper, are possible third country effects of FDI which arise when a country becomes an export platform of foreign firms. This "Irish" strategy would further strengthen the important role of FDI in the catching-up process and potentially help to overcome problems of excessive trade deficits. An empirical analysis of this phenomenon for central and eastern Europe requires a more detailed and complete database than is available at time and remains a topic of future research.

Annex

A1 Data sources

Variable	Source	Unit/calculation	Observations
Aggregated exports and imports of goods and services	Eurostat	Euro, converted into US-$	Czech Republic (2004), Slovak Republic (2001, 2004)
	IMF, International Financial Statistics	US-$	All remaining observations
Sectoral exports to and imports from Germany	German Federal Statistical Office, external trade statistics	DM (until 1998)/Euro	All observations
GDP	IMF, International Financial Statistics	Constant prices at levels of 1995	Poland, Czech Republic (1994)
	Eurostat, NewCronos	Constant prices at levels of 1995	All remaining observations
Industrial production	IMF, International Financial Statistics	Constant prices at levels of 1995	Poland, Czech Republic (1994)
	Eurostat, NewCronos	Constant prices at levels of 1995	All remaining observations
Aggregated FDI	United Nations, World Investment Report	US-$	All observations
Sectoral FDI from Germany	Deutsche Bundesbank, micro database FDI	DM (until 1998)/Euro	All observations
GDP deflators for US-$ denominated GDP and FDI	IMF, International Financial Statistics	Index	All observations
GDP deflators for euro denominated GDP and FDI	Eurostat, NewCronos	Index	All observations
Unit values of exports and imports		Replaced by GDP deflator	Czech Republic, Latvia, Lithuania, Poland (1994)
	Eurostat, NewCronos	Index	All remaining observations
Unit values of exports to and imports from Germany, denominated in euro	Eurostat, NewCronos	Index	All observations
Nominal exchange rate	IMF, International Financial Statistics	Exchange rates of national currencies vis-à-vis DM (until 1998) / euro	All observations
Real effective exchange rate (CPI, against 25 countries)	Eurostat, NewCronos	Index	All observations
Labour costs, industry without construction	Eurostat, NewCronos	Monthly labour costs per employee; national currency	All observations
Employment, industry without construction	Eurostat, NewCronos	millions	All observations

A2 Manufacturing Sectors and Classifications[31]

Sector	NACE, Rev. 1	SITC-Rev. 3	Description
EUT	15, 16	01, 02, 06, 08, 09, 11, 12, 41, 42, 43	food products, beverages and tobacco
TBL	17, 18, 19	26, 61, 65, 83, 84, 85	textiles, textile products, leather and footwear
HPS	20, 21, 22, 36, 37	25, 63, 64, 80, 81, 82, 89, 90-99	wood, furniture, paper, paper products, other manufacturing
CHM	24, 25, 26	51, 52, 53, 54, 55, 56, 57, 58, 59, 62, 66	chemical products, rubber, plastics, fuel products, mineral products
MET	27, 28	67, 68, 69	metal products except machinery and equipment
MAS	29	60, 70, 71, 72, 73, 74	machinery and equipment n.e.c.
ICT	30, 31, 32, 33	75, 76, 77, 87, 88	office, accounting and computing machinery; electrical machinery; radio, television and communication equipment; medical, precision and optical instruments
FZB	34, 35	78, 79	vehicles and transport equipment

31 A perfect match between the product classification for goods (SITC, Rev. 3) and the activity classification for FDI (NACE, Rev. 1) is not possible. Nevertheless, we think that the remaining fuzziness is of minor importance.

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