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Good or Bad? The Influence of FDI on Output Growth: An industry-level analysis

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Carmen Fillat Castejón and
Julia Wörz

Good or Bad? The Influence of FDI on Output Growth: An industry-level analysis

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Research was financed by Oesterreichische Nationalbank through Jubiläumsfonds Project No. 10214.

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Abstract

This paper attempts to reconcile the often inconclusive evidence on the impact of FDI on growth by taking into account the heterogeneity both among industries and among countries. Using a comparable database at the industry level for 35 countries of the OECD, Asia and Eastern Europe from 1987 to 2002, we test both the stage of development and the FDI industrial pattern for the economic impact of FDI on growth. In certain industries and for the catching-up countries, a significant and positive relationship emerges when FDI interacts with investment or export orientation.

***Keywords**: FDI, heterogeneity, manufacturing sector, panel data analysis*

***JEL classification**: C33, F14, F21, L60*

Carmen Fillat Castejón and Julia Wörz

Good or Bad? The Influence of FDI on Output Growth: An industry-level analysis

Introduction

While in theory, the nexus between FDI and growth (in terms of output and productivity) is in general positive, the empirical literature is far less conclusive. Some studies find positive effects from outward FDI for the investing country (Van Pottelsberghe and Lichtenberg, 2001; Nachum et al., 2000), but suggest a potential negative impact from inward FDI on the host country. This results from a possible decrease in indigenous innovative capacity or crowding out of domestic firms or domestic investment. Thus, in their view and in line with the standard literature on the determinants of FDI (i.e. Dunning's OLI paradigm, see Dunning, 1988) inward FDI is intended to take advantage of host country (locational) characteristics instead of disseminating new technologies originating in the sending country. Other studies report more positive findings: Nadiri (1993) finds positive and significant effects from US-sourced capital on productivity growth of manufacturing industries in France, Germany, Japan and the UK. Also Borensztein et al. (1998) find a positive influence of FDI flows from industrial countries on developing countries' growth. However, they also report a minimum threshold level of human capital for the productivity enhancing impact of FDI, emphasizing the role of absorptive capacity. Absorptive capacity or minimum threshold levels in a country's ability to profit from inward FDI is frequently mentioned in the literature (see also Blomström et al., 1994). Consequently the effect of FDI depends among other things to a large extent on the characteristics of the country that receives FDI. The resulting issue of cross-country heterogeneity, however, has so far largely been neglected in the literature, with few exceptions. Blonigen and Wang (2005) stress explicitly cross-country heterogeneity as the crucial factor which determines the effect of FDI on growth. Further, Nair-Reichert and Weinhold (2001) and Mayer-Foulkes and Nunnenkamp (2005) explicitly take up this aspect in their analysis. Our paper will follow their direction and introduce two forms of heterogeneity: differences among countries and differences among receiving industries.

We argue that, since host country heterogeneity plays a role, it is equally likely that the impact of FDI on the host economy differs greatly according to the receiving industry. FDI in constant returns to scale industries will have different effects than FDI in increasing returns to scale industries. Likewise, the effect of FDI may be related to the technology and human capital intensity of the industry and other factors. As a very intuitive example, heavy FDI in the extractive sector in Nigeria has not improved the country's growth performance (Akinlo, 2004). Consequently, the potential for positive spillovers does not solely depend on a country's overall absorptive capacity, but also on the industrial structure of the

economy. Thus, the impact of FDI differs depending on country-specific absorptive capacity or stage of development as well as on the sectoral and industrial structure and allocation of FDI. Since the two are in general related, this implies a relationship between the industrial pattern of inward FDI and its effect on the host country. The economy-wide effect of industry-specific FDI inflows will then further depend on the extent of intra-industry versus inter-industry spillovers.

In this paper we investigate the magnitude of all these factors for the role of FDI on the host country by focusing on individual manufacturing industries. Due to measurement issues, interdependencies between various types of spillovers and their complexity, it is difficult to distinguish between the different theoretically possible channels of technology transmission in empirical research. Therefore, we will focus on the overall effect of foreign-sourced capital on manufacturing output growth in addition to the effects of traditional factors (domestic capital and labour) and controlling for other factors. What is new in our analysis is the focus on the industry level of the economy. To our knowledge, there is very little empirical research on FDI at this level of disaggregation. Disaggregated data on FDI for a large and heterogeneous set of countries rarely exist in a comprehensive and comparable form – and when they exist, they are often plagued with two kinds of problems: First, the coverage of firms and flows which are recorded as FDI may differ among countries (problems are often caused by the exclusion of reinvested profits in some countries). Second, the classification into industrial activities may differ among countries as well.

The present paper proceeds as follows: Section 1 gives a brief review of the theoretical background of the FDI-growth nexus. Section 2 describes the data set. Section 3 introduces the estimating framework, the results are summarized in Section 4: we present results for the influence of FDI on both output and productivity growth. Section 5 concludes.

1 Theoretical background

Economic theory provides us with many reasons why foreign direct investment may result in enhanced growth performance of the receiving country. In the neo-classical growth literature, FDI is associated positively with output growth because it either increases the volume of investment and/or its productivity and thus puts the economy on a path of higher long-term growth. In an exogenous growth model, FDI has only a level effect in the steady state and no permanent impact on the growth rate, except during the transitional dynamics to the new steady state. The potential role for FDI is much greater in endogenous growth models. In a neoclassical production function, output is generated by using capital and labour in the production process. With this framework in mind, FDI can exert an influence on each argument in the production function. FDI increases capital, it may qualitatively

improve the factor labour (explained below) and by transferring new technologies, it also has the potential to raise total factor productivity. Further, as discussed in more recent theoretical growth models (e.g. by Grossman and Helpman, 1991) by raising the number of varieties for intermediate goods or capital equipments, FDI can also increase productivity (see Borensztein et al., 1998 for an empirical analysis of this channel).[1] Thus, in addition to the direct, capital-augmenting effect, FDI may also have additional indirect and thus permanent effects on the growth rate. Most importantly, FDI can permanently increase the growth rate through spillovers[2] and the transfer and diffusion of technologies, ideas, management processes, and the like.

The literature mentions basically four channels that allow for technological spillovers from FDI to the host economy (Kinoshita, 2001; Halpern and Muraközy, 2005): The classical indirect channel for the transmission of technology from FDI to the domestic economy functions via imitation. The effect of FDI depends crucially on factors such as the legal system, regulations, infrastructure and human capital endowments, as well as the complexity of the technology. Secondly, and often considered to be the most important channel, the training of local workers in foreign-owned firms generates positive spillovers through the acquisition of human capital. The empirical evidence concerning the labour market implications of foreign-owned firms is mixed. On the one hand, foreign firms spend on average more on training of workers than do local firms. On the other hand, foreign-owned firms may skim the market of well-trained workers and – at least in the short run – free-ride on previous training by domestic firms. The smaller the wage differential between foreign and domestic firms, the greater the scope for positive spillovers, since this would allow also domestic firms to attract well-trained workers from foreign firms. An important question relates also to the specificity of the knowledge acquired through training in foreign-owned firms. Based on meta-analysis, Görg and Strobl (2002) find evidence that the managerial skills of owners of domestic firms who were previously employed by multinationals were industry-specific but not firm-specific, which points towards a large potential for intra-industry spillovers. Thirdly, foreign presence increases competition in a market. The impact of FDI on the market structure depends on the size of the technology gap as well as on entry and exit behaviour in the market. Finally, there are vertical or backward spillovers. By purchasing intermediates from foreign suppliers or by selling output to foreign firms, local firms will be affected positively in terms of efficiency and quality of output. Thus, the increased variety of intermediate goods may induce a more effective international specialization in production and this, together with increasing returns to scale in production, will result in higher productivity growth.

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[1] The same effect can also be achieved through imports of such goods. In this sense, FDI represents an alternative means to increase the number of available varieties in addition to trade, even if there are qualitative differences between the two.

[2] Spillovers occur when multinationals are unable to capture all the productivity effects that follow in the host country's local firms as a result of the presence of the multinational (Caves, 1996).

A potential problem at the micro-level, where the spillovers arise, is the evidence for self-selection bias: while there is a general consensus that FDI increases the productivity of receiving firms, part of this effect is in fact due to FDI selecting better firms as targets for takeover (Bellak, 2004). At the more aggregate level, this translates into the imminent causality or endogeneity problem, faced by all empirical studies on the effects of FDI.

Another crucial role in this context is played by the absorptive capacity of the host country. The importance of absorptive capacity – often captured by differences in the stage of development between donor and host country – has been a central finding in many empirical studies on the FDI-growth link (Blonigen and Wang, 2005; Borensztein et al., 1998; De Mello, 1999). There are also theoretical justifications for the importance of a certain amount of absorptive capacity. For example, Markusen and Rutherford (2004) develop a three-period model where they show that the speed and degree of positive spillovers from FDI is positively related to the absorptive capacity of the host country. In an earlier paper and using a new economic geography model, Rodriguez-Clare (1996) relates the developmental impact of multinational firms to the type of the linkages which they create. Positive linkage effects are the stronger the more intensive the multinational is in the use of intermediate goods, the larger the costs of communication and trade between headquarters and local plants and the more similar home and host country are in terms of the variety of intermediate goods produced. This implies stronger linkages – and thus greater positive effects – if the developmental gap between donor and host country is smaller. Thus, for all of the channels outlined above, one may argue that positive spillovers will only occur in a suitable setting. If the host economy does not provide an adequate environment in terms of human capital, private and public infrastructure, legal environment and the like, many of the spillovers that may potentially arise from FDI cannot materialize. Public infrastructure such as educational institutions and publicly funded R&D collaborations can significantly support potential spillovers.

As a consequence, country-specific effects have a strong influence on the impact of FDI on growth. Hence, cross-country heterogeneity is one of the important aspects to be addressed in empirical research on the topic. In addition, different stages of economic development are characterized by specific industrial patterns. In line with the previous arguments, a high structural match between the donor and the host country would imply a proximity in stage of development and thus also a good precondition for the absorptive capacity of the receiving country to be high. In other words, the match between the industrial allocation of FDI and the host country's stage of development as characterized by its industrial structure determines the effectiveness of FDI. We argue in this paper that the 'optimal' pattern of FDI across industries varies with the stage of development. The effect of FDI in the same industry but in countries at different stages of development can be just as different as the effect of FDI in one country but in different industries. Thus, we will address both, cross-country and cross-industry heterogeneity in this paper.

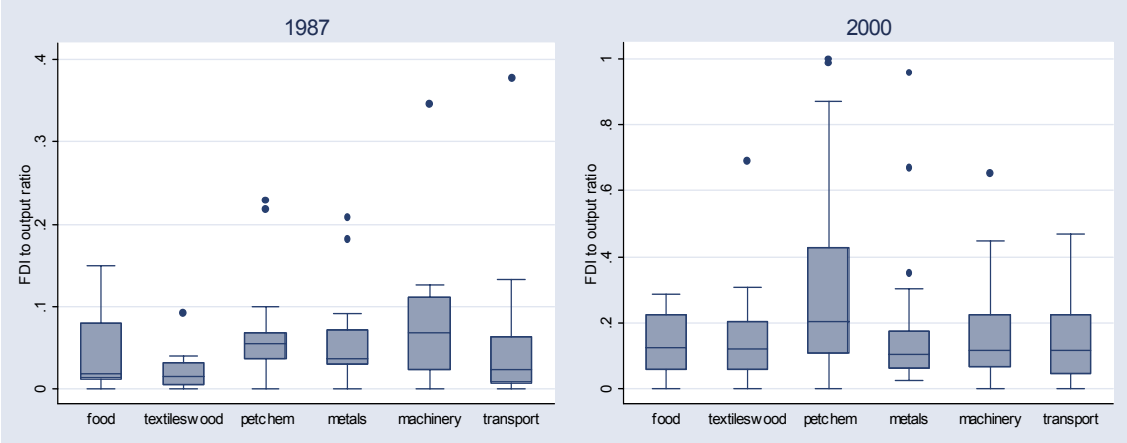
2 Industrial patterns of inward FDI

Due to the lack of comparable data at the industry level, empirical research on the link between FDI and development has largely remained at the macro level, since comparable FDI data across countries are best available at this level. More recently, firm-level datasets have been released and, as a consequence, the number of studies using micro data has grown rapidly. However, in contrast to the macro-level analysis, which often takes a global perspective and analyses large cross-country data sets (in the cross-section dimension as well as in the panel dimension), many firm-level studies are limited to one country or a homogenous group of countries (such as the EU) due to issues of data availability and comparability.

In order to obtain a clear picture of the link between FDI and growth of individual industries, we collected indicators such as output, employment, gross fixed capital formation and wages from several sources (UNIDO, UN COMTRADE, OECD, wiiw, ASEAN Secretariat, Timmer, 2003, MOEA; see Wörz, 2005, for a detailed description of the data set). In total, our data set contains more than 3000 observations for 28 to 35 countries, eight industries and 14 years (1987-2000). The data set is highly unbalanced, the number of countries varies over time, with data for 28 countries over the years 1987 to 1997 and data for 35 countries over the years 1998 to 2000. The ratio of inward FDI stock to output varies along all dimensions, across industries, years and countries. For the complete sample, the FDI to output ratio ranges from far less than 1% in the textile and wood industry in Japan to more than 100% in the industry group comprising fuels, rubber, plastics and chemicals in Indonesia. Also the variance is highest in the latter industry (see Figure 1).

Figure 1

FDI to output ratios, 1987 and 2000



Note: The median is given by the bar in the middle of the box, the upper and lower bound of the box signifies the 25- and 75-percentile. Observations which are outside the 75-percentile plus 1.5 times the innerquartile range, as well as observations below the 25-percentile minus 1.5 times the innerquartile range are classified as outliers and drawn as dots.

It is further striking to see not only the rise in the average FDI to output ratio, but also the rapid increase in variance over time. In some cases, the ratio of FDI to total industry output increased to 100%.[3] The general rise in FDI in relation to industry output clearly reflects the increasing internationalization of production. The additional sharp increase in variance across countries tells us that this internationalization did not happen at equal rates for all countries and industries. While Asian countries on average show higher shares of FDI in total industry output, they also exhibit much more variation across individual countries than OECD members. Entering the picture at a much later point in time, the Central and East European countries (CEECs) show again substantially higher FDI to output ratios, yet with considerably less variation across countries. Thus, this region experienced a uniformly high inflow of foreign capital into manufacturing. On average, CEECs display higher FDI to output ratios than do most other countries in the sample. Many of the former communist countries allowed and actively encouraged the inflow of foreign capital as a way to privatize the former state-owned companies. Due to a general lack of domestic capital and the disruption of state-owned companies, with many inefficient firms exiting the market, the share of foreign capital was particularly high in the transition countries.

Table 1 below gives the weighted averages of FDI to output ratios for different geographic regions towards the end of the observation period. We classified the countries into advanced OECD members (Australia, Austria, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Japan, the Netherlands, Norway, Sweden, Great Britain, USA), catching-up OECD members (Greece, Mexico, Portugal, Spain, Turkey), the four Asian Tigers (Taiwan, Hong Kong, Korea, Singapore), East Asia (Indonesia, Malaysia, Philippines, Thailand) and the CEECs (Croatia, Czech Republic, Hungary, Latvia, Poland, Slovak Republic, Slovenia). The table illustrates the two sources of heterogeneity, stemming from differences among countries as well as industries.

Table 1

FDI-output ratios, 1998-2000.

	adv. OECD	catch-up OECD	4 Tigers	East Asia	CEECs
Food	4.6	10.5	7.1	2.9	13.7
Textiles/Wood	7.4	7.7	4.6	11.8	12.2
Petroleum/Chemicals	15.7	16.3	16.1	30.4	15.4
Metals/Machinery	5.7	13.3	4.5	9.0	9.1
Transport	3.6	9.5	4.6	6.7	18.6
Electrical machinery	6.6	8.3	12.4	11.1	13.7

[3] In a few cases, not shown in the figure, the stock of inward FDI valued at the end of the year exceeds the industry's output of the same year, leading to a ratio above 100%. This may happen as a result of heavy foreign investment in a specific year. As a consequence of these investments, one would expect strong increases in output in the following years, for the theoretical reasons given above.

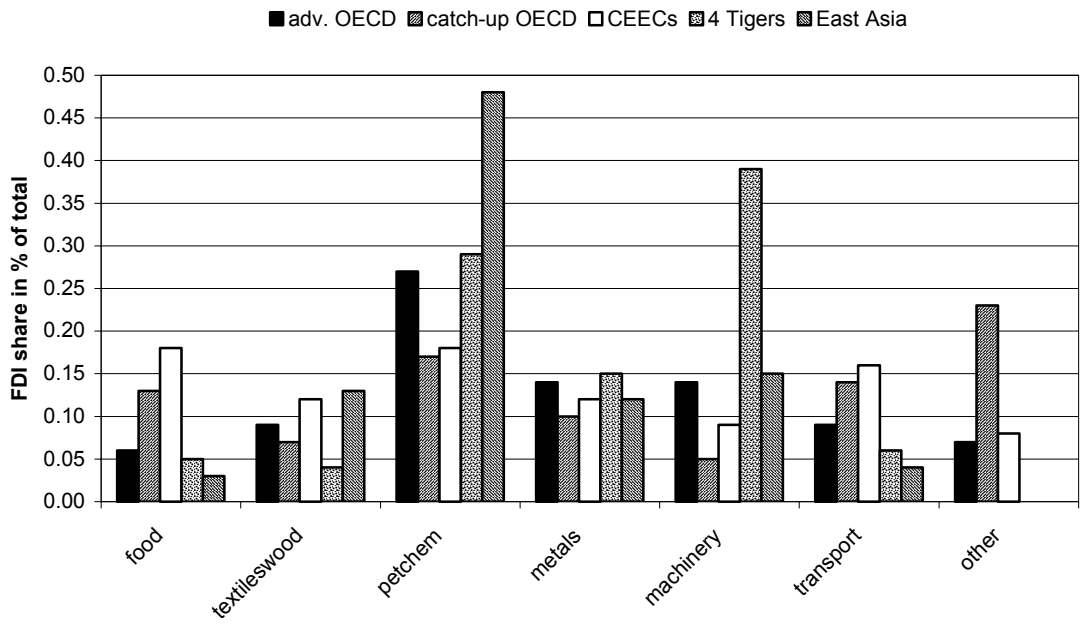
There are distinct differences among industries, with the highest ratio in general prevailing in the petroleum, chemical, rubber and plastics industry. The CEECs are the only region with the highest FDI to output ratio in a different industry: for them the transport industry turns out to be the most FDI-intensive one. Apart from the strong role of FDI in petroleum, chemicals, rubber and plastics, all regions differ with respect to the importance of FDI in individual industries. Thus, the data exhibit very large disparities across regions as well as across industries, supporting our argument of the two sources of heterogeneity in the relationship between FDI and output or productivity. Let us briefly identify these differences here.

Besides the high FDI to output ratio in the petroleum and chemical industry, the advanced OECD countries show relatively low FDI to output ratios of far less than 10% in all other industries. For the group of catching-up OECD countries, FDI is important in the metal and machinery industry, the ratio of more than 13% is nearly as high as in the petroleum and chemical industry (16%). The four Tigers are characterized by a high FDI ratio again in the petroleum and chemical industry (16%), as well as in the manufacture of electrical machinery (12%), where they also show strong international competitiveness. East Asia has an extremely high ratio of FDI in the petroleum and chemical industry (30%), and equally high ratios of 11-12% in textiles and wood as well as electrical machinery. Finally, the CEECs are characterized by higher FDI ratios than all other groups in all industries with the exception of petroleum/chemicals and metals/machinery. They receive relatively high inward FDI first of all in transport equipment (18%), followed by petroleum and chemicals (15%), and further in electrical machinery and food (about 14%).

Another way of looking at the difference in the industrial allocation of inward FDI across countries is presented in Figure 2. Here, the allocation of FDI across industries is plotted for each region in 2000. There are considerable differences in FDI structure among the five geographic regions. In the most advanced OECD members, the FDI share is highest in petroleum, chemicals, rubber and plastics (27%), followed by metals and mechanical products (14%) and electrical machinery (again 14%). Overall, FDI seems to be roughly balanced across all industries. The group of catching-up OECD members has the highest share of FDI in other manufacturing (23%), again a large share in petroleum, chemicals, rubber and plastic (17%), and further substantial FDI in the transport industry (14%). The CEECs show a similar, but slightly more balanced picture: 18% of all inward FDI stocks are found in petroleum, chemicals, rubber and plastics and in food, 16% in transport. In contrast to these three country groups, the two groups of Asian countries are characterized by considerably more concentration in FDI stocks. In the four Tiger countries, nearly 40% of all FDI are in the electrical machinery industry, and close to 30% in petroleum, chemicals, rubber and plastics. Finally, the East Asian countries have a share of as much as 48% in petroleum, chemicals, rubber and plastics, 15% in electrical machinery and 13% in textiles and wood.

Figure 2

Allocation of FDI across industries in 2000



Let us further report a few observations that cannot be seen from the above figures.[4] Structural developments have also been diverse among these regions, with more structural change in both groups of OECD countries as opposed to more stable FDI patterns in East Asian countries (including the four Tigers). Very little can be said about developments in FDI structures for the CEECs, given the extremely short period over which industrial FDI data are available for these countries. There is further a low correlation between FDI patterns and output patterns in both groups of OECD countries and in East Asia. The four Asian Tiger economies and the CEECs, by contrast, show closely matching FDI and output structures. In the case of the four Tiger countries, where the observation period extends over 20 years, the sequencing of industry patterns suggests that high FDI shares in electrical machinery have resulted in subsequently high output shares in the industry. For the CEECs, the time period is too short for any conclusions. However, FDI seems to play a more important role in these two regions and less so in others.

One can see that the data on FDI exhibit a substantial degree of heterogeneity across countries and industries. The question whether and how these differences relate to differences in international competitiveness or domestic development cannot be answered without a rigorous econometric analysis. This will be done in the following sections.

[4] See Wörz (2005) for a detailed description of the data.

3 Analytical framework

In this paper we look for empirical evidence of spillovers from FDI to the host country, controlling for cross-country and cross-industry heterogeneity. We chose to investigate the effects of FDI at the industrial level, thus we are unable to distinguish between own and inter-firm effects as well as between different forms of spillovers. We rather look for all types of effects without distinguishing between them by analysing the specific industries in which they matter most. We decided to work at the industry level, first because we believe that there is a substantial degree of heterogeneity among industries which is influential in the relationship between FDI and output or productivity growth. Second, industrial policy is an important economic policy tool available to governments in order to foster economic development. Historical evidence has shown that industrial policies were highly relevant in causing the East Asian growth miracle over the past decades. Thus, industry level analysis is necessary to identify the differences among the individual industries.

In deriving our empirical specification we follow Nair-Reichert and Weinhold (2001), who explore the relationship between FDI and economic growth at the macroeconomic level, putting special emphasis on causality and on cross-country heterogeneity in the sample. We take up the second issue and adapt their specification for our estimation to include industry-specific FDI.

The output level in the current year depends among other things on the investment share in the previous year (with the capital output ratio free to change over time):

$$Y_{it} = f\left(\frac{I_{it-1}}{Y_{it-1}}\right) \tag{1}$$

In order to find a causal relationship, the question could be, to what extent will changes in the share of investment in one period lead to changes in growth in a subsequent period:

$$\Delta Y_{it} = Y_{it} - Y_{it-1} = f\left(\Delta \frac{I_{it-1}}{Y_{it-1}}\right) \tag{2}$$

We also look at productivity effects of investment (in particular foreign direct investment) by replacing changes in output with changes in productivity on the right-hand side. Splitting the investment share into FDI and domestic investment, and taking into account that in an

international context the openness of the economy may have an important influence on growth, the model looks like this:[5]

$$\Delta Y_{it} = f\left(\Delta\frac{FDI_{it-1}}{Y_{it-1}}, \Delta\frac{INV_{it-1}}{Y_{it-1}}, \Delta\frac{EX_{it-1}}{Y_{it-1}}\right) \tag{3}$$

Writing the model in growth rates, the results become less dependent on the initial levels in every country in a cross-section context. Furthermore, growth rates are more likely to be stationary, while levels may not be, especially in the case of less developed countries (Weinhold, 1996). Intuitively speaking, the model allows to answer the following question: If FDI shares in certain countries and industries grow faster compared to other countries and industries, will output also grow faster? This is essentially a dynamic question, however, it can also be answered within a static model. The static model is a first approach and it avoids the usual problems with dynamic models, that is, important biases in efficiency when the sample is very heterogeneous, as is the case here.

The econometric model to be estimated in this paper, with a sample of countries *c*, industries *i* and years *t*, is the following:

$$GY_{ict} = \alpha + \beta_{1i} * GFDI_{ict-1} + \beta_{2i} * GINV_{ict-1} + \beta_{3i} * GEX_{ict-1} + \mu_{ic} + \varepsilon_{ict} \tag{4}$$

where μ_{ic} is the individual specific error component and ε_{ict} is the basic error component.

Since we have a panel of country/industry combinations over time, we are dealing in fact with three dimensions, which can be estimated with a one way error component random effects model. To emphasize this point, we do not simply treat every country/industry combination as one individual 'economy', but we assume industry characteristics to remain constant across countries and over time, and additionally include country-specific effects that are independent of the respective industry and time period. Thus, we include industry- and country-specific effects in our estimation. Also, we have a common error term which is capturing the correlation between industry-specific disturbances, i.e. representing identical non-systematic influences over countries, industries and time. We see this as a first step to control for both types of heterogeneity while allowing for interactions between industries.

Using a panel data model, we are testing for the effect of industry-specific FDI growth on output growth, while controlling for time-invariant country-specific characteristics and for the

[5] In this paper, we look at effects of FDI on output and productivity growth only. Of course, the two variables – FDI on the one hand and output/productivity on the other – are highly endogenous and as a consequence, there is no clear direction of causality. In another paper (Stehrer and Wörz, 2006), we take up the issue of endogeneity explicitly. Here we are mainly concerned with the effects of FDI on growth, which also allows to draw policy conclusions. Of course, the interdependence between the two variables has to be kept in mind when interpreting the results.

growth of other control variables (capital and exports). We use the growth rate of the FDI-output ratio as our explanatory variable of main interest in the regressions. This choice was motivated by the fact that industries with very small initial FDI levels (particularly so in the less developed countries in the sample) often exhibited extremely high FDI growth rates (due to the level effect). By normalizing FDI by output levels we avoid a possible bias in the results stemming from these level effects.[6] A few more econometric remarks are in order here: First, we stress the impact of heterogeneity in the FDI-growth nexus in our specific sample. For this reason, we base our conclusions on heteroskedastic-consistent standard errors (HC-type 1). Second, for every specification, we decided on fixed versus random effects based on the results of the Hausman test between the two models. Since the test was mostly in favour of random effects, we always report these results. We also think that the unbalanced nature of our panel calls for a treatment of the country-specific effects as being drawn randomly from a common population, which is coherent with the random effects model.

Further, we use one lag in the RHS variables, which are predetermined and non-exogenous, to avoid a simultaneity bias between output growth and the explanatory variables.[7] This bias could alternatively be reduced by instrumenting the predetermined variables or by using a dynamic panel estimation method in a long time series panel. Given the short time dimension in our case, the effect of a weak instrument cannot be assessed (Kiviet, 1995).[8] There might also be a problem of simultaneity bias because FDI could be determined together with domestic investment and with openness. In an alternative specification, we consider this relationship in an explicit way, with the interaction of FDI with each of the two in turn: the domestic investment share growth and the host country openness. The effect of foreign capital may depend on the amount of investment as such in the sense that a certain amount of investment in an industry is necessary for absorbing the external effects of FDI. Also, this interaction reflects the need of structural matching between foreign and domestic investment. Moreover, FDI is often related to the export orientation of a county or industry, and it can act as a complement or a substitute for the exchange of goods. These two possibilities arise primarily from differences in the motives for FDI. On the one hand, resource- or labour-seeking inward FDI is often associated with a complementary relationship to outward trade and can result in footloose production units,

6 We also normalized FDI by employment, however, we believe that this gives a different flavour to the analysis. FDI to employment ratios are higher for less labour-intensive industries, yielding potentially higher growth rates in the labour-intensive industries. This induces a bias towards labour-intensive industries. The results were indeed quite different, indicating no importance of FDI in less labour-intensive and therefore more high-tech industries.

7 In this setting an endogeneity bias is possible only if the relationship is driven by forward-looking expectations, which are excluded here, particularly because growth rates are extremely difficult to predict for LDCs.

8 The validity of several sets of instruments has been tested – such as the lagged endogenous variable, initial values of right-hand side variables and employment levels – and the GMM estimation was considered, but in all cases the instruments are rejected. These weak instruments together with the short time series could add more and unknown biases in the estimation. Moreover, it is highly unlikely to have a big endogeneity bias because forward-looking expectations are excluded in this specification.

which move globally in order to utilize the necessary resources. Thus, the potential for spillovers with a positive influence on long-run development in a specific location is limited. On the other hand, market-seeking and strategic FDI, substituting for arm's length trade, pursues very different objectives and as a consequence positive effects on the industry's development in the host country may result from linkages with upstream producers as well as downstream consumers.

Finally, in the last two specifications, we turn towards the role of the stage of development and absorptive capacity of the host country. The impact of these two on the FDI-growth relationship is tested first by the interaction of FDI with the host country's per capita income level, measured at purchasing power parities. The role of threshold effects in human capital – often referred to in the literature (see, among others, Borensztein et al., 1998) – is captured here by interacting the FDI ratio with secondary school enrolment. We therefore also test whether our coefficient on FDI is affected by human capital, and we expect this factor to play an important role in specific industries but not in all alike.

In a further step, the heterogeneity problem stemming from differing stages of development can be palliated by splitting the sample into different subsamples of countries: advanced and catching-up economies.

4 Empirical results: the impact of FDI on output and productivity growth

Table 2 reports the summary of results from estimating the above-discussed empirical model, including various interaction terms. The results for the basic model in column 1 show that a significant positive effect from FDI is seen in the food, textile and wood industries, and also in the category called PETCHEM (petroleum, chemicals, plastics and rubber industry). The impact of FDI in the food, textile and wood industries is surprising because these are lower-tech, resource-intensive industries. International marketing and brand names might explain the case of food. However, a strong effect is expected for PETCHEM, mainly because of the pharmaceutical's high-tech component, but as well due to the capital-intensive refining of petroleum. A significant result also emerges for the transport industry, but here only the complementarity with domestic investment and export potential seems to be relevant.

When we interact FDI with investment (Table 2, column 2), the same industries plus transport equipment show the important effect of FDI on growth in combination with a sufficient level of investment in the host country. The purely exogenous effect from FDI alone is mostly negative. This may indicate that FDI leads to increased output growth *only* in the presence of high overall investment shares; in other words, FDI and domestic investments are complementary. This is particularly true for food, where no type of investment has a positive effect on growth by itself. Domestic investment plays a positive

role in textiles, wood and transport. The interaction with openness is significant again for the same industries; but also for metals and mechanical machinery, where investments are only important in combination with export orientation (Table 2, column 3).

Table 2

Summary of results for output growth, GLS estimation

	(1)	(2)	(3)	(4)	(5)
GFDI	Food + Textiles/Wood + PETCHEM +	Food - Textiles/Wood - ETCHEM - Transport - Other +	Textiles/Wood - PETCHEM + Transport -	Food + Textiles/Wood + PETCHEM + el. Machinery +	Food + Textiles/Wood + PETCHEM +
GINV	Textiles/Wood + PETCHEM + Transport +	Food - Textiles/Wood + Transport +	PETCHEM + Metals/Mach. - Other -	Textiles/Wood + Transport +	Textiles/Wood + Metals/Mach. -
GEX	Food + Textiles/Wood + PETCHEM + Transport +	Food + Transport +	PETCHEM +	Food + Transport +	Food + Textiles/Wood + PETCHEM+ Transport +
GFDI*INV	-	Food + Textiles/Wood + PETCHEM + Transport + Other -	-	-	-
GFDI*OPEN	-	-	Food + Textiles/Wood + PETCHEM + Metals + Transport +	-	-
GFDI*PCGDP	-	-	-	Food - Textiles/Wood - PETCHEM - El.machinery -	-
GFDI*SCHOOLING	-	-	-	-	Food - Textiles/Wood - PETCHEM -
adj. R-squared	94.58	97.86	97.41	97.30	96.55

Notes: Dependent variable is output growth; only significant effects are reported, the sign of the effect is indicated by + and - signs; number of observations in all specifications = 1,152.

Thus, we conclude that FDI usually *needs additional factors* in order to exert a significant effect on growth, i.e. a sufficient level of domestic investment or export orientation. This result is in line with the observation of Carkovic and Levine (2005), who find in the macroeconomic context that the exogenous component of FDI does not exert a robust, independent influence on growth. Only for the category PETCHEM does FDI have an individual and complementary positive impact, as expected. It would be highly desirable to

have detailed information on each individual industry contained in this group, since petroleum extraction is not only very capital-intensive, but also very closely tied to endowments and international technology and distribution networks of big oil multinationals and thus not relevant for every country in the sample. Chemicals, on the other hand, cover a very wide spectrum of economic activities ranging from low-skill, resource-intensive production to high-skill, technology-intensive activities (such as pharmaceuticals). However, for the present sample that covers a wide range of countries, any further disaggregation was not possible.

Some differences are expected depending on the development level and on human capital endowment (Table 2, columns 4 and 5 respectively). Interactions of FDI with initial per capita income (at purchasing power parities) and schooling (secondary school enrolment of the population over 25 in 1985) show a significant negative impact on output growth rates for the same industries, and also for electrical machinery. In particular for the latter industry we expected to find a significant influence of FDI, given the extent of international fragmentation in production in this industry. This result shows that FDI has a stronger positive impact on growth for host countries with lower initial per capita income in these industries. This implies a greater role for FDI in less developed countries. Moreover, we may also find evidence for different industrial patterns in the relationship between FDI and output growth depending on the development level in this heterogeneous sample.

Given the importance attached to the stage of development as a determinant of the absorptive capacity, and to deal with this heterogeneity we stratified our sample in Table 3 into two broad groups which can roughly be associated with differing stages of development. The first group comprises the advanced OECD member states, while all other countries are classified as catching-up countries and subsumed under the second group (see Appendix Table A1 for a list of countries and their grouping). These two groups of countries are relatively homogenous in terms of schooling and initial and current GDP. The summary of results in Table 3 strongly supports our decision to treat these two groups of advanced and catching-up countries separately.

In line with earlier literature, FDI mainly exerts a statistically significant effect in the subsample of catching-up countries. For the subsample of advanced OECD countries, the positive association between FDI and output growth can be confirmed for PETCHEM only; no effects from FDI (marginally and in interaction with investment) are observed, and FDI in metals and mechanical machinery is important only for exporting. In the subsample of catching-up countries, nearly all industries show up with a positive and significant coefficient on the FDI ratio as before. However, this finding is modified when interaction terms are introduced. As for the whole sample, FDI in the food industry needs a sufficient level of investment to have a positive effect on output growth while the marginal effect of

Table 3

Summary of results for output growth by stage of development

		(1)	(2)	(3)
Advanced OECD	**GFDI**	PETCHEM +	no effects	no effects
	GINV	no effects	no effects	no effects
	GEX	no effects	no effects	no effects
	GFDI*INV	-	no effects	-
	GFDI*OPEN	-	-	Metals/Mach. +
Catching-up economies	**GFDI**	Food + Textiles/Wood + PETCHEM + Metals/Mach. + el. Machinery + Transport +	Food - Textiles/Wood - PETCHEM - el. Machinery + Transport + Other +	Food - Textiles/Wood - PETCHEM -
	GINV	Textiles/Wood + PETCHEM + Metals/Mach. -	Food -Textiles/Wood + Transport - Other -	Metals/Mach. - Other -
	GEX	Food + Textiles/Wood + PETCHEM + Transport +	Food + Transport +	PETCHEM -
	GFDI*INV	-	Food + Textiles/Wood + PETCHEM + Transport – Other -	-
	GFDI*OPEN	-	-	Food + Textiles/Wood + PETCHEM + Metals/Mach. + Transport +
adj. R-squared		97.00	97.80	98.68

Notes: Dependent variable is output growth; only significant effects are reported, the sign of the effect is indicated by + and - signs; number of observations in all specifications = 1,152.

both types of investment are negative. In textiles and wood the effectiveness of FDI is also enhanced through domestic investment, however, FDI by itself has a positive effect on growth as well. Qualitative differences in the results between the whole sample and the catching-up countries are observed for transport, metals and mechanical machinery, and for electrical machinery. FDI in the transport industry is important by itself, but mainly in interaction with exports. This is an appealing result, given the importance of international fragmentation in the production of transport equipment. The results also show a substitutive interaction with investment, which may reflect a crowding-out effect on domestic investment. The positive effect of FDI and the negative sign of the interaction with investment is also visible for the metals and mechanical machinery industry. According to our results, FDI in electrical machinery does not need any additional factor for the

subsample of catching-up countries: the interaction is significant and FDI by itself has a positive and significant effect on growth. To sum up, FDI has a very important role on growth in catching-up countries, with a complementary or substitutive relationship with domestic investment depending on the industry; further, export orientation plays a positive role, for all industries but for metals and both types of machinery.

Our results point towards a strong role for the stage of development in the relationship between FDI and growth, which has also been emphasized in previous research (Borensztein et al., 1998; Nair-Reichert and Weinhold, 2001; Blonigen and Wang, 2005). Our focus on individual industries here allows us to identify certain industries where inward FDI in combination with high investment or outward-oriented production offers the greatest potential for output growth given a certain stage of development.

So far we have looked at output growth as our dependent variable. This has given us an indication of the effects of FDI in individual industries. However, the correlation between FDI growth and output growth may be spurious if fast growing and hence more dynamic industries simply attract more FDI than do stagnant industries. Therefore we now turn to the relationship between the growth of labour productivity and FDI growth. The problems of reverse causation and endogeneity are not removed by using productivity growth as our dependent variable. Thus we are in general reluctant to talk about causation; however, indirect effects and thus spillovers are better captured when looking at productivity growth rather than output growth. Using productivity growth as our dependent variable will allow us to assess the improvements in efficiency concomitant with increases in FDI in a certain industry/country pair.

Table 4 shows the results with productivity growth as the dependent variable, and Table 5 reports the results for the advanced versus catching-up subsamples.

We find almost identical correlations with productivity growth by industry for the whole sample, indicating that in general growth in FDI, domestic investment and export shares improve labour productivity, and this effect is translated into output growth. In addition, FDI in metals and mechanical machinery yields a slight improvement in productivity (Table 4, column 1), but then this does not translate into higher output growth. When we stratify the sample into advanced and catching-up countries (Table 5), the results are almost identical to the ones for the output growth rate, with the catching-up countries dominating the pattern for the whole sample. There are only some exceptions: In PETCHEM the marginal effect of domestic investment is not significant. FDI growth in advanced countries improves the productivity of the food industry when accompanied by a high export orientation. For the remaining industries, the effects on productivity growth are identical to those for output growth, with an important role for FDI for the development of catching-up countries.

Table 4

Summary of results for productivity growth

	(1)	(2)	(3)	(4)	(5)
GFDI	Food + Textile/Wood + PETCHEM + Metals/Mach. +	Food - Textile/Wood - PETCHEM - Transport -	Food - Textile/Wood - Transport -	Food + Textile/Wood + PETCHEM + Metals/Mach + el. Machinery +	Food + Textiles/Wood+ PETCHEM +
GINV	Textile/Wood + PETCHEM + Metals/Mach. -	Food - Textiles/Wood + Transport +	PETCHEM + Metals/Mach. -	Textiles/Wood+ Metals/Mach. - Transport +	Textiles/Wood+ Metals/Mach. -
GEX	Food + Textiles/Wood + PETCHEM + Transport +	Food + Transport +	PETCHEM +	Food + Transport +	Food + Textiles/Wood+ PETCHEM + Transport +
GFDI*INV	-	Food + Textiles/Wood + PETCHEM + Transport + Other -	-	-	-
GFDI*OPEN	-	-	Food + Textiles/Wood + PETCHEM + Transport +	-	-
GFDI*PCGDP	-	-	-	Food - Textiles/Wood- PETCHEM - el. Machinery -	-
GFDI*SCHOOLING	-	-	-	-	Food - Textiles/Wood- PETCHEM -
adj. R-squared	96.01	98.30	98.45	98.01	97.36

Notes:: Dependent variable is output growth; only significant effects are reported, the sign of the effect is indicated by + and - signs; number of observations in all specifications = 1,148.

Table 5

Summary for productivity growth by stage of development

		(1)	(2)	(3)
Advanced OECD	**GFDIadv**	no effect	no effect	No effect
	GINV	No effect	No effect	Other +
	GEX	no effect	no effect	No effect
	FDI*INV	-	Metals +	-
	FDI*OPEN	-	-	Food +
Catching-up economies	**GFDI**	Food + Textile/Wood + PETCHEM + Metals/Mach. + el. Machinery + Transport +	Food - Textile/Wood - PETCHEM - Metals/Mach. + el. Machinery + Transport + Other +	Food - Textile/Wood - PETCHEM -
	GINV	Textile/Wood + Metals/Mach. -	Food - Textiles/Wood +	Metals/Mach. - Other -
	GEX	Food + Textile/Wood + PETCHEM +	Food - PETCHEM + Transport +	No effect
	FDI*INV	-	Food + Textile/Wood + el. Machinery - Transport - Other -	-
	FDI*OPEN	-	-	Food + Textile/Wood + PETCHEM + Transport +
adj. R-squared		97.48	98.33	98.89

Notes: : Dependent variable is output growth; only significant effects are reported, the sign of the effect is indicated by + and - signs; number of observations in all specifications = 1,148.

5 Conclusions

We may conclude from our empirical analysis that the impact of FDI on economic development (in terms of output growth as well as in terms of efficiency and thus productivity gains) differs among countries at different stages of development, with a greater role for FDI in lagging economies. Further, the results differ across individual industries. For a country's long-term prospects it is thus crucial which types of industries receive foreign capital – and not so much the aggregate amount of FDI flowing into a country. This has important implications for the design of industrial and trade policies as well as for policies restricting or allowing capital mobility across borders. The decisions when, how, and which industries to open to the international capital market are important and should be guided by the long-run implications of FDI in the individual industries.

Secondly, it is not only the industrial allocation in connection with the timing of FDI over the development process that matters; there are also important interactions between FDI and domestic investment as well as between FDI and export orientation. FDI often turns out to be an important contributor to growth in combination with investment or exports. This is particularly true for the group of catching-up countries, where the interaction between openness and FDI is often positive while the direct effect of FDI is negative in most industries. Therefore, we conclude that FDI can be an important contribution to the host country's economic development, provided that the conditions and/or the economic environment is conducive to bringing out the positive impact of FDI. Further, the relationship between FDI and economic development implies a great deal of heterogeneity, thus the impact of FDI may differ substantially across countries and industries.

Finally, we should stress here again that the causality between FDI and growth remains unclear. In our setup, the issue of causality is addressed by using lagged values of FDI and all other explanatory variables in the regressions. Given limitations in the data (most importantly, the short time series dimension and the highly unbalanced sample) we were not able to do a rigorous causality test in this case. In a related paper (Stehrer and Wörz, 2006), we looked at the issue of causality for the subsample of OECD countries only. The results point towards a strong endogeneity between the two variables. Thus, further research should address this issue in more detail.

References

Akinlo, E. (2004), 'Foreign Direct Investment and Growth in Nigeria: An Empirical Investigation', *Journal of Policy Modeling* 26 (5), 627-639.

Bellak, C. (2004), 'How Domestic and Foreign Firms Differ and Why Does it Matter?', *Journal of Economic Surveys* 18 (4), 483-514.

Blomström, M., R.E. Lipsey and M. Zejan (1994), 'What Explains Developing Country Growth?', *NBER Working Papers* 4132.

Blonigen, B.A. and M. Wang (2005), 'Inappropriate Pooling of Wealthy and Poor Countries in Empirical FDI Studies', Chapter 9 in: T. Moran, E. Graham and M. Blomström (eds.), *Does Foreign Direct Investment Promote Development?,* Institute for International Economics, Washington D.C.

Borensztein, E., J.D. Gregorio and J.W. Lee (1998), 'How does foreign direct investment affect economic growth?', *Journal of International Economics* 45 (1), 115-135.

Carkovic, M. and R. Levine (2005), 'Does Foreign Direct Investment Accelerate Economic Growth?', Chapter 8 in: T. Moran, E. Graham and M. Blomström (eds.), *Does Foreign Direct Investment Promote Development?,* Institute for International Economics, Washington D.C.

Caves, R. (1996), *Multinational Enterprise and Economic Analysis*, New York, Cambridge University Press.

Dunning, J.H. (1988), 'The Eclectic Paradigm of International Production: a Restatement and Some Possible Extensions', *Journal of International Business Studies* 19 (1), 1-31.

Görg, H. and E. Strobl (2004), 'Outsourcing, foreign ownership, exporting and productivity: An empirical investigation with plant level data', Paper presented at the 6th Annual Meeting of The European Trade Study Group 2004, Nottingham.

Grossman, G. and E. Helpman (1991), *Trade, Innovation, and Growth in the Global Economy*; MIT Press, Cambridge, Mass.

Halpern L. and B. Muraközy (2005), 'Does Distance Matter in Spillover?', *CEPR Discussion Paper* No. 4857.

Hunya, G. and M. Schwarzhappel (2005), *wiiw Database on Foreign Direct Investment in Central, East and Southeast Europe: Opportunities for Acquisition and Outsourcing*, The Vienna Institute for International Economic Studies, May.

Kinoshita, Y. (2001), 'R&D and Technology Spillovers Through FDI: Innovative and Absorptive Capacity', *CEPR Discussion Paper* No. 2775.

Kiviet, J. (1995), 'On bias, inconsistency, and efficiency of various estimators in dynamic panel data models', *Journal of Econometrics* 68, 53-78.

Markusen J. and T. Rutherford (2004), 'Learning on the Quick and Cheap: Gains from Trade Through Imported Expertise', *CEPR Discussion Paper* No. 4504.

de Mello, L.R. (1999), 'Foreign direct investment-led growth: evidence from time series and panel data', *Oxford Economic Papers* 51, 131-151.

MOEA (1993), *Statistics on Overseas Chinese and Foreign Investment*, Taiwanese Investment Commission, 31 December.

Nachum, L., J.H. Dunning and G.G. Jones (2000), 'UK FDI and the Comparative Advantage of the UK', *The World Economy* 23 (5), 701-720.

Nadiri, M.I. (1993), 'Innovations and Technological Spillovers', *NBER Working Paper* No. 4423.

Nair-Reichert, U. and D. Weinhold (2001), 'Causality tests for cross-country panels: a new look at FDI and economic growth in developing countries', *Oxford Bulletin of Economics and Statistics*, 63 (2), 153-171.

Rodriguez-Clare, A. (1996), 'Multinationals, Linkages, and Economic Development', *The American Economic Review* 86 (4), 852-873.

Timmer, M.P. (2003), 'Technological development and rates of return to investment in a catching-up economy: the case of South Korea', *Structural Change and Economic Dynamics*, 14 (4), 405-425.

UNIDO (2003), Industrial Statistics Database.

UNCTAD (2000), *World Investment Directory Volume VII – Asia and the Pacific*.

Van Pottelsberghe De La Potterie, B. and F. Lichtenberg (2001), 'Does Foreign Direct Investment Transfer Technology Across Borders?', *The Review of Economics and Statistics* Vol. 83 (3), 490-497.

Wörz, J. (2005), 'Industry Patterns in Output, FDI and Trade: A regional comparison of CEECs with OECD and East Asia', *wiiw Statistical Reports*, No. 2, The Vienna Institute for International Economic Studies.

Appendix

Table A1

List of countries and groupings

Group	UNIDO code	*ISO code*	Country
advanced OECD	36	aus	Australia
	40	aut	Austria
	208	dnk	Denmark
	246	fin	Finland
	250	fra	France
	276	deu	Germany
	352	isl	Iceland
	380	ita	Italy
	372	irl	Ireland
	528	nld	The Netherlands
	578	nor	Norway
	752	swe	Sweden
	826	gbr	Great Britain
	840	usa	USA
catching-up economies	191	hrv	Croatia
	203	cze	Czech Republic
	300	grc	Greece
	348	hun	Hungary
	344	hkg	Hong Kong
	360	idn	Indonesia
	428	ltv	Latvia
	410	kor	Korea
	484	mex	Mexico
	458	mys	Malaysia
	608	phl	Philippines
	616	pol	Poland
	620	prt	Portugal
	702	sgp	Singapore
	703	svk	Slovak Republic
	705	svn	Slovenia
	724	esp	Spain
	158	twa	Taiwan
	764	tha	Thailand
	792	tur	Turkey

Table A2

Regression results for the output growth equation

Variable	Industry	(1)		(2)		(3)		(4)		(5)	
		Coeff.	*t-stat*	Coeff.	*t-stat*	Coeff.	*t-stat*	Coeff.	*t-stat*	Coeff.	*t-stat*
GFDI	Food	1.2667	*17.34*	-0.6871	*-8.34*	-0.1063	*-1.47*	2.5519	*33.37*	2.3983	*27.42*
GFDI	Textiles/Wood	0.5299	*8.92*	-0.4419	*-7.79*	-0.3146	*-5.22*	1.4703	*20.15*	1.4487	*16.47*
GFDI	PETCHEM	0.4556	*8.15*	-0.6067	*-12.33*	0.1204	*1.78*	2.3988	*24.98*	2.2341	*20.90*
GFDI	Metals/Mechanicals	0.1328	*1.22*	0.0591	*0.75*	-0.1261	*-1.02*	0.1991	*1.17*	0.1785	*1.05*
GFDI	Electr. Machinery	0.0017	*0.17*	0.0223	*0.78*	-0.0085	*-0.58*	0.2028	*2.20*	-0.0055	*-0.06*
GFDI	Transport	5.26E-09	*0.10*	-0.1556	*-8.63*	-0.0404	*-16.24*	2.93E-09	*0.08*	5.39E-09	*0.13*
GFDI	Other	1.33E-04	*0.05*	0.1769	*3.09*	0.0107	*0.27*	0.0372	*0.44*	0.1223	*1.01*
GFDI	N.A.	-9.26E-07	*-0.01*	-0.0012	*-0.27*	0.0001	*0.10*	-0.0001	*-0.06*	-3.01E-05	*-0.05*
GINV	Food	0.0100	*1.14*	-0.0725	*-12.18*	0.0048	*0.80*	0.0069	*1.14*	0.0106	*1.58*
GINV	Textiles/Wood	1.2812	*9.49*	0.7453	*8.85*	0.1219	*1.09*	0.5445	*5.12*	0.7388	*6.44*
GINV	PETCHEM	0.2439	*4.31*	-0.0394	*-1.13*	0.2402	*6.18*	0.0637	*1.59*	0.1066	*2.40*
GINV	Metals/Mechanicals	-0.0724	*-1.58*	-0.0174	*-0.25*	-0.0551	*-1.76*	-0.0593	*-1.63*	-0.0588	*-1.51*
GINV	Electr. Machinery	-0.0153	*-0.18*	0.0038	*0.06*	-0.0053	*-0.09*	-0.0166	*-0.28*	0.0011	*0.02*
GINV	Transport	0.0700	*2.60*	0.1179	*6.98*	0.0103	*0.55*	0.0717	*3.84*	0.0706	*3.40*
GINV	Other	-0.0569	*-1.31*	-0.0414	*-1.55*	-0.0580	*-1.88*	-0.0498	*-1.63*	-0.0592	*-1.72*
GINV	N.A.	0.0001	*0.16*	0.0002	*0.36*	0.0002	*0.32*	0.0001	*0.22*	0.0001	*0.19*
GEX	Food	1.1462	*14.62*	0.1596	*2.72*	-0.0018	*-0.03*	0.2440	*3.60*	0.5878	*8.52*
GEX	Textiles/Wood	0.5898	*5.01*	-0.0049	*-0.06*	0.0357	*0.42*	0.0537	*0.61*	0.2278	*2.38*
GEX	PETCHEM	0.4915	*5.84*	-0.0442	*-0.83*	0.1662	*2.07*	-0.0241	*-0.38*	0.2691	*4.07*
GEX	Metals/Mechanicals	0.0654	*0.59*	0.0471	*0.72*	-0.0206	*-0.24*	0.0486	*0.63*	0.0473	*0.54*
GEX	Electr. Machinery	0.0536	*0.49*	0.0064	*0.10*	0.0002	*0.00*	-0.0138	*-0.17*	0.0435	*0.51*
GEX	Transport	0.2048	*4.72*	0.1045	*3.82*	-0.0063	*-0.20*	0.2086	*6.94*	0.2085	*6.22*
GEX	Other	0.0845	*0.59*	0.0554	*0.65*	0.0449	*0.46*	0.0668	*0.67*	0.0697	*0.63*
GEX	N.A.	0.0079	*0.21*	0.0005	*0.02*	0.0022	*0.08*	0.0040	*0.15*	0.0049	*0.17*
GFDI*INV	Food			18.0735	*27.75*						
GFDI*INV	Textiles/Wood			7.7632	*21.31*						
GFDI*INV	PETCHEM			13.3458	*28.32*						
GFDI*INV	Metals/Mechanicals			-0.5279	*-0.69*						
GFDI*INV	Electr. Machinery			-0.4556	*-0.79*						
GFDI*INV	Transport			3.1337	*8.63*						
GFDI*INV	Other			-2.9368	*-3.09*						
GFDI*INV	N.A.			0.0232	*0.27*						
GFDI*EX	Food					0.4065	26.115				
GFDI*EX	Textiles/Wood					0.7098	18.638				
GFDI*EX	PETCHEM					0.6975	5.5698				
GFDI*EX	Metals/Mechanicals					0.3673	1.8707				
GFDI*EX	Electr. Machinery					0.0157	0.6854				
GFDI*EX	Transport					0.1275	16.243				
GFDI*EX	Other					-0.0212	-0.2761				
GFDI*EX	N.A.					-0.0001	-0.0787				
GFDI*GDPpc	Food							-1.34E-04	*-22.35*		
GFDI*GDPpc	Textiles/Wood							-6.65E-05	*-15.75*		
GFDI*GDPpc	PETCHEM							-9.11E-05	*-22.29*		
GFDI*GDPpc	Metals/Mechanicals							-5.56E-06	*-0.56*		
GFDI*GDPpc	Electr. Machinery							-1.04E-05	*-2.19*		
GFDI*GDPpc	Transport							-1.37E-11	*-0.25*		
GFDI*GDPpc	Other							-3.14E-06	*-0.44*		
GFDI*GDPpc	N.A.							2.87E-09	*0.07*		
GFDI*SCHOOL										-1.05E-01	*-16.80*
GFDI*SCHOOL										-6.87E-02	*-12.23*
GFDI*SCHOOL										-9.30E-02	*-18.27*
GFDI*SCHOOL										-2.31E-03	*-0.25*
GFDI*SCHOOL										6.53E-04	*0.08*
GFDI*SCHOOL										-3.22E-08	*-0.36*
GFDI*SCHOOL										-4.78E-03	*-1.01*
GFDI*SCHOOL										1.81E-06	*0.06*
CONST		0.0640	*1.44*	0.1483	4.2517	0.1243	*3.83*	0.0768	*2.72*	0.0692	*2.25*
adjusted R-squared		94.58		97.86		97.41		97.30		96.55	
Std. Error of Reg.		0.6212		0.3925		0.4301		0.4382		0.4950	
Hausmann (p-value)		0.1089	*(1.000)*	0.2197	*(1.000)*	1.2492	*(0.996)*	0.7516	*(1.000)*	0.2531	*(1.000)*
Observations		1152		1152		1152		1152		1152	

Table A3

Results for the output growth equation by stage of development

	Variable	Industry	(1)		(2)		(3)	
			Coeff.	*t-stat*	Coeff.	*t-stat*	Coeff.	*t-stat*
OECD	GFDI	Food	0.0292	*0.27*	0.2086	*0.64*	0.0300	*0.33*
	GFDI	Textiles/Wood	-0.0054	*-0.09*	0.25E-02	*0.01*	-0.0061	*-0.08*
	GFDI	PETCHEM	0.0783	*1.68*	0.1687	*0.70*	0.0758	*1.48*
	GFDI	Metals/Mechanicals	0.0488	*0.40*	-0.7697	*-0.26*	-0.1530	*-1.12*
	GFDI	Electr. Machinery	-0.0006	*-0.08*	0.0300	*0.38*	0.0034	*0.16*
	GFDI	Transport	0.44E-08	*0.11*	0.41E-08	*0.14*	0.39E-08	*0.15*
	GFDI	Other	0.0094	*0.07*	-0.0208	*-0.11*	-0.0051	*-0.04*
	GFDI	N.A.	0.68E-05	*0.07*	0.26E-03	*0.06*	0.0001	*0.18*
	GINV	Food	-0.0104	*-0.04*	0.55E-02	*0.03*	-0.0143	*-0.08*
	GINV	Textiles/Wood	0.0433	*0.22*	0.0443	*0.30*	0.0447	*0.35*
	GINV	PETCHEM	-0.0867	*-0.42*	-0.0064	*-0.38*	-0.0872	*-0.65*
	GINV	Metals/Mechanicals	-0.0874	*-0.50*	-0.1011	*-0.76*	-0.0475	*-0.41*
	GINV	Electr. Machinery	-0.0819	*-0.33*	-0.0918	*-0.49*	-0.0867	*-0.53*
	GINV	Transport	0.0054	*0.05*	0.50E-02	*0.07*	0.0048	*0.07*
	GINV	Other	0.0233	*0.17*	0.0189	*0.19*	0.0216	*0.24*
	GINV	N.A.	0.0666	*0.89*	0.0666	*1.20*	0.0667	*1.38*
	GEX	Food	0.0284	*0.25*	0.0259	*0.30*	0.0263	*0.34*
	GEX	Textiles/Wood	-0.0103	*-0.09*	-0.0145	*-0.16*	-0.0148	*-0.19*
	GEX	PETCHEM	-0.0120	*-0.17*	-0.76E-02	*-0.13*	-0.0147	*-0.22*
	GEX	Metals/Mechanicals	0.0638	*0.64*	0.0691	*0.91*	0.0050	*0.07*
	GEX	Electr. Machinery	-0.0062	*-0.06*	-0.0167	*-0.22*	-0.0128	*-0.20*
	GEX	Transport	0.0049	*0.13*	0.41E-02	*0.15*	0.0040	*0.17*
	GEX	Other	0.0203	*0.15*	0.0190	*0.19*	0.0183	*0.20*
	GEX	N.A.	-0.0129	*-0.40*	-0.0143	*-0.60*	-0.0146	*-0.70*
	GFDI*INV	Food			-4.6805	*-0.59*		
	GFDI*INV	Textiles/Wood			-0.2010	*-0.06*		
	GFDI*INV	PETCHEM			-1.8216	*-0.39*		
	GFDI*INV	Metals/Mechanicals			3.1533	*0.42*		
	GFDI*INV	Electr. Machinery			-0.6448	*-0.39*		
	GFDI*INV	Transport			-0.91E-05	*-0.42*		
	GFDI*INV	Other			0.6770	*0.18*		
	GFDI*INV	N.A.			-0.48E-02	*-0.06*		
	GFDI*EX	Food					-0.0376	*-0.13*
	GFDI*EX	Textiles/Wood					-0.0114	*-0.06*
	GFDI*EX	PETCHEM					0.0003	*0.00*
	GFDI*EX	Metals/Mechanicals					0.3238	*1.77*
	GFDI*EX	Electr. Machinery					-0.0076	*-0.20*
	GFDI*EX	Transport					-0.11E-05	*-0.39*
	GFDI*EX	Other					0.0387	*0.15*
	GFDI*EX	N.A.					-0.0002	*-0.16*

(Table A3 continued)

Table A3 (continued)

	Variable	Industry	(1)		(2)		(3)	
			Coeff.	***t-stat***	**Coeff.**	***t-stat***	**Coeff.**	***t-stat***
non-OECD	GFDI	Food	1.3727	*18.94*	-0.6284	*-5.75*	-0.1695	*-2.38*
	GFDI	Textiles/Wood	0.7616	*9.99*	-0.6176	*-6.12*	-0.6990	*-7.57*
	GFDI	PETCHEM	1.6715	*15.67*	-0.5818	*-3.83*	-0.9883	*-5.87*
	GFDI	Metals/Mechanicals	0.2613	*2.45*	0.1084	*1.22*	-0.1015	*-0.85*
	GFDI	Electr. Machinery	0.2113	*3.02*	0.1675	*2.27*	0.0803	*1.28*
	GFDI	Transport	0.4871	*7.89*	0.6083	*8.99*	-0.0484	*-0.89*
	GFDI	Other	0.29E-04	*0.02*	0.1844	*3.33*	-0.0180	*-0.63*
	GFDI	N.A.	0.0231	*1.22*	-0.0466	*-0.74*	-0.1131	*-2.59*
	GINV	Food	0.0087	*1.36*	-0.0686	*-11.32*	0.0040	*0.97*
	GINV	Textiles/Wood	1.1399	*8.90*	1.0814	*11.34*	0.0887	*0.86*
	GINV	PETCHEM	0.0800	*1.85*	-0.0302	*-0.92*	0.0312	*1.09*
	GINV	Metals/Mechanicals	-0.0693	*-1.84*	0.65E-0.2	*0.09*	-0.0445	*-1.81*
	GINV	Electr. Machinery	-0.0240	*-0.37*	0.0292	*0.49*	0.0025	*0.06*
	GINV	Transport	0.0047	*0.22*	-0.0456	*-2.05*	0.0055	*0.40*
	GINV	Other	-0.0499	*-1.51*	-0.0429	*-1.69*	-0.0608	*-2.73*
	GINV	N.A.	-0.0002	*-0.30*	0.37E-02	*0.98*	0.0001	*0.17*
	GEX	Food	1.0581	*13.60*	0.2553	*3.62*	-0.0211	*-0.33*
	GEX	Textiles/Wood	0.6427	*4.51*	0.0330	*0.29*	0.0371	*0.38*
	GEX	PETCHEM	0.5229	*3.64*	0.31E-0.2	*0.03*	-0.2499	*-2.37*
	GEX	Metals/Mechanicals	0.0565	*0.38*	0.0409	*0.36*	-0.0935	*-0.85*
	GEX	Electr. Machinery	-0.0392	*-0.25*	-0.0157	*-0.13*	-0.0417	*-0.41*
	GEX	Transport	0.2094	*2.39*	0.3670	*4.63*	0.0786	*1.36*
	GEX	Other	0.1899	*1.17*	0.1231	*1.03*	0.0668	*0.62*
	GEX	N.A.	0.2860	*1.68*	0.0887	*0.68*	0.0683	*0.58*
	GFDI*INV	Food			17.1647	*20.69*		
	GFDI*INV	Textiles/Wood			8.0469	*15.84*		
	GFDI*INV	PETCHEM			-1.8216	*-0.39*		
	GFDI*INV	Metals/Mechanicals			3.1533	*0.42*		
	GFDI*INV	Electr. Machinery			-0.6448	*-0.39*		
	GFDI*INV	Transport			-0.91E-05	*-0.42*		
	GFDI*INV	Other			0.6770	*0.18*		
	GFDI*INV	N.A.			-0.48E-02	*-0.06*		
	GFDI*EX	Food					0.4209	*28.34*
	GFDI*EX	Textiles/Wood					0.8799	*18.27*
	GFDI*EX	PETCHEM					4.0905	*16.79*
	GFDI*EX	Metals/Mechanicals					0.4828	*2.08*
	GFDI*EX	Electr. Machinery					0.0044	*0.20*
	GFDI*EX	Transport					0.1234	*13.95*
	GFDI*EX	Other					0.0351	*0.63*
	GFDI*EX	N.A.					0.3458	*3.13*
	CONST		0.0286	*0.80*	0.1320	4.07	0.1156	*4.40*
	adjusted R-squared		97.00		98.20		98.68	
	Std. Error of Reg.		0.4611		0.3596		0.3072	
	Hausmann (p-value)		1.4412	*(1.000)*	1.0852	*(1.000)*	0.8698	*(1.000)*
	Observations		1152		1152		1152	

Table A4

Results for the productivity growth equation

Variable	Industry	(1)		(2)		(3)		(4)		(5)	
		Coeff.	*t-stat*	Coeff.	*t-stat*	Coeff.	*t-stat*	Coeff.	*t-stat*	Coeff.	*t-stat*
GFDI	Food	1.2328	*19.94*	-0.6839	*-9.49*	-0.1237	*-2.27*	2.4806	*38.00*	2.3140	*30.49*
GFDI	Textiles/Wood	0.5584	*11.10*	-0.4561	*-9.20*	-0.3282	*-7.23*	1.5320	*24.61*	1.5005	*19.67*
GFDI	PETCHEM	0.2167	*4.58*	-0.3389	*-7.88*	0.0272	*0.53*	1.2286	*14.99*	1.1504	*12.40*
GFDI	Metals/Mechanicals	0.1518	*1.65*	0.0924	*1.35*	-0.0406	*-0.44*	0.2638	*1.81*	0.2156	*1.46*
GFDI	Electr. Machinery	0.0023	*0.27*	0.0385	*1.55*	-0.0037	*-0.33*	0.1615	*2.05*	0.0105	*0.14*
GFDI	Transport	0.37E-08	*0.08*	-0.0599	*-3.80*	-0.0183	*-9.77*	0.16E-08	*0.05*	0.33E-08	*0.09*
GFDI	Other	-0.0004	*-0.17*	0.1079	*2.15*	-0.0004	*-0.01*	0.0440	*0.61*	0.1258	*1.19*
GFDI	N.A.	0.20E-05	*0.02*	-0.0015	*-0.39*	0.38E-05	*-0.01*	-0.10E-02	*0.00*	-0.19E-04	*-0.03*
GINV	Food	0.0079	*1.07*	-0.0725	*-13.94*	0.0030	*0.66*	0.0053	*1.02*	0.0089	*1.53*
GINV	Textiles/Wood	1.3455	*11.77*	0.7654	*10.39*	0.1300	*1.54*	0.5616	*6.19*	0.7645	*7.68*
GINV	PETCHEM	0.1201	*2.51*	-0.0234	*-0.76*	0.1230	*4.20*	0.0278	*0.81*	0.0495	*1.28*
GINV	Metals/Mechanicals	-0.0646	*-1.67*	0.0056	*0.09*	-0.0474	*-2.01*	-0.0652	*-2.10*	-0.0633	*-1.87*
GINV	Electr. Machinery	-0.0361	*-0.51*	-0.0043	*-0.08*	-0.0252	*-0.58*	-0.0383	*-0.76*	-0.0279	*-0.49*
GINV	Transport	0.0270	*1.18*	0.0462	*3.13*	0.0018	*0.13*	0.0288	*1.81*	0.0272	*1.51*
GINV	Other	-0.0249	*-0.67*	-0.0220	*-0.94*	-0.0279	*-1.20*	-0.0228	*-0.87*	-0.0326	*-1.09*
GINV	N.A.	-0.25E-05	*0.00*	0.0002	*0.32*	0.0001	*0.15*	0.28E-04	*0.07*	0.25E-04	*0.05*
GEX	Food	1.1565	*17.43*	0.1894	*3.69*	0.0235	*0.45*	0.2786	*4.82*	0.6209	*10.37*
GEX	Textiles/Wood	0.6091	*6.11*	-0.0132	*-0.20*	0.0276	*0.43*	0.0529	*0.70*	0.2377	*2.86*
GEX	PETCHEM	0.2964	*4.16*	0.0122	*0.26*	0.1151	*1.91*	0.0203	*0.38*	0.1732	*3.02*
GEX	Metals/Mechanicals	0.0701	*0.75*	0.0544	*0.96*	0.0090	*0.14*	0.0592	*0.91*	0.0609	*0.80*
GEX	Electr. Machinery	0.0403	*0.43*	-0.0005	*-0.01*	-0.0107	*-0.19*	-0.0204	*-0.30*	0.0264	*0.36*
GEX	Transport	0.0960	*2.62*	0.0460	*1.93*	-0.0061	*-0.25*	0.0952	*3.71*	0.0933	*3.21*
GEX	Other	0.0658	*0.54*	0.0311	*0.42*	0.0252	*0.34*	0.0474	*0.56*	0.0526	*0.55*
GEX	N.A.	0.0594	*1.83*	0.0515	*2.59*	0.0536	*2.71*	0.0555	*2.45*	0.0569	*2.21*
GFDI*INV	Food			17.7083	*31.07*						
GFDI*INV	Textiles/Wood			8.1180	*25.49*						
GFDI*INV	PETCHEM			6.7676	*16.43*						
GFDI*INV	Metals/Mechanicals			-0.7962	*-1.19*						
GFDI*INV	Electr. Machinery			-0.7812	*-1.55*						
GFDI*INV	Transport			1.2068	*3.80*						
GFDI*INV	Other			-1.7990	*-2.16*						
GFDI*INV	N.A.			0.0291	*0.39*						
GFDI*EX	Food					0.4014	*34.21*				
GFDI*EX	Textiles/Wood					0.7448	*25.97*				
GFDI*EX	PETCHEM					0.3692	*3.92*				
GFDI*EX	Metals/Mechanicals					0.2249	*1.52*				
GFDI*EX	Electr. Machinery					0.0082	*0.48*				
GFDI*EX	Transport					0.0578	*9.77*				
GFDI*EX	Other					-0.0003	*-0.01*				
GFDI*EX	N.A.					0.0001	*0.05*				
GFDI*GDPpc	Food							-1.31E-04	*-25.47*		
GFDI*GDPpc	Textiles/Wood							-6.91E-05	*-19.16*		
GFDI*GDPpc	PETCHEM							-4.78E-05	*-13.70*		
GFDI*GDPpc	Metals/Mechanicals							-9.12E-06	*-1.07*		
GFDI*GDPpc	Electr. Machinery							-8.22E-06	*-2.03*		
GFDI*GDPpc	Transport							-9.69E-12	*-0.20*		
GFDI*GDPpc	Other							-3.76E-06	*-0.62*		
GFDI*GDPpc	N.A.							5.24E-10	*0.01*		
GFDI*SCHOOL										-1.00E-01	*-18.55*
GFDI*SCHOOL										-7.07E-02	*-14.50*
GFDI*SCHOOL										-4.90E-02	*-11.09*
GFDI*SCHOOL										-4.00E-03	*-0.49*
GFDI*SCHOOL										-7.15E-04	*-0.11*
GFDI*SCHOOL										-2.19E-08	*-0.24*
GFDI*SCHOOL										-4.94E-03	*-1.19*
GFDI*SCHOOL										1.36E-06	*0.05*
CONST		0.0742	*2.06*	0.1639	*5.40*	0.1442	*5.70*	0.0961	*3.77*	0.0914	*2.87*
adjusted R-squared		96.01		98.30		98.45		98.01		97.36	
Std. Error of Reg.		0.5227		0.3438		0.3266		0.3691		0.4245	
Hausmann (p-value)		0.1363	*(1.000)*	0.2944	*(1.000)*	0.3606	*(1.000)*	0.6501	*(1.000)*	0.44706	*(1.000)*
Observations		1148		1148		1148		1148		1148	

Table A5

Results for the productivity growth equation by stage of development

	Variable	Industry	(1)		(2)		(3)	
			Coeff.	*t-stat*	Coeff.	*t-stat*	Coeff.	*t-stat*
OECD	GFDI	Food	0.0281	*0.29*	-0.1012	*-0.34*	-0.0874	*-1.04*
	GFDI	Textiles/Wood	0.0031	*0.06*	0.0404	*0.23*	0.0114	*0.16*
	GFDI	PETCHEM	0.0087	*0.21*	-0.2397	*-1.09*	0.0046	*0.10*
	GFDI	Metals/Mechanicals	0.0665	*0.60*	-0.3858	*-1.41*	-0.0806	*-0.65*
	GFDI	Electr. Machinery	0.0004	*0.06*	0.0381	*0.53*	0.0087	*0.44*
	GFDI	Transport	0.17E-08	*0.05*	0.15E-08	*0.06*	0.13E-08	*0.05*
	GFDI	Other	0.0142	*0.11*	-0.0162	*-0.10*	-0.0014	*-0.01*
	GFDI	N.A.	0.14E-04	*0.16*	0.11E-03	*0.03*	0.24E-04	*0.07*
	GINV	Food	0.0104	*0.04*	-0.27E-02	*-0.01*	0.0354	*0.20*
	GINV	Textiles/Wood	0.0670	*0.37*	0.0693	*0.52*	0.0700	*0.60*
	GINV	PETCHEM	-0.0469	*-0.25*	-0.1176	*-0.77*	-0.0494	*-0.40*
	GINV	Metals/Mechanicals	-0.0371	*-0.23*	-0.0860	*-0.71*	-0.0094	*-0.09*
	GINV	Electr. Machinery	-0.0594	*-0.26*	-0.0737	*-0.43*	-0.0707	*-0.47*
	GINV	Transport	-0.0036	*-0.04*	-0.37E-02	*-0.06*	-0.0040	*-0.07*
	GINV	Other	0.1511	*1.15*	0.1473	*1.49*	0.1504	*1.75*
	GINV	N.A.	-0.0165	*-0.24*	-0.0174	*-0.35*	-0.0168	*-0.38*
	GEX	Food	0.0662	*0.63*	0.0626	*0.80*	0.0350	*0.50*
	GEX	Textiles/Wood	-0.0093	*-0.09*	-0.0156	*-0.19*	-0.0155	*-0.21*
	GEX	PETCHEM	0.0246	*0.37*	0.51E-02	*0.10*	0.0204	*0.33*
	GEX	Metals/Mechanicals	0.0566	*0.62*	0.0801	*1.15*	0.0144	*0.22*
	GEX	Electr. Machinery	-0.0070	*-0.08*	-0.0175	*-0.26*	-0.0157	*-0.27*
	GEX	Transport	0.0069	*0.20*	0.64E-02	*0.25*	0.0062	*0.28*
	GEX	Other	-0.0127	*-0.10*	-0.0136	*-0.15*	-0.0143	*-0.17*
	GEX	N.A.	0.0530	*1.83*	0.0523	*2.41*	0.0515	*2.71*
	GFDI*INV	Food			3.1934	*0.44*		
	GFDI*INV	Textiles/Wood			-0.7196	*-0.23*		
	GFDI*INV	PETCHEM			4.9026	*1.14*		
	GFDI*INV	Metals/Mechanicals			11.8746	*1.72*		
	GFDI*INV	Electr. Machinery			-0.7945	*-0.52*		
	GFDI*INV	Transport			-0.86E-05	*-0.46*		
	GFDI*INV	Other			0.6757	*0.20*		
	GFDI*INV	N.A.			-0.18E-02	*-0.24*		
	GFDI*EX	Food					0.5327	*2.00*
	GFDI*EX	Textiles/Wood					-0.0403	*-0.22*
	GFDI*EX	PETCHEM					0.0039	*0.04*
	GFDI*EX	Metals/Mechanicals					0.2320	*1.39*
	GFDI*EX	Electr. Machinery					-0.0154	*-0.44*
	GFDI*EX	Transport					-0.98E-06	*-0.46*
	GFDI*EX	Other					0.0416	*0.17*
	GFDI*EX	N.A.					-0.25E-04	*-0.02*

(Table A5 continued)

Table A5 (continued)

	Variable	Industry	(1)		(2)		(3)	
			Coeff.	*t-stat*	Coeff.	*t-stat*	Coeff.	*t-stat*
non-OECD	GFDI	Food	1.3224	*20.06*	-0.6533	*-6.54*	-0.1982	*-3.05*
	GFDI	Textiles/Wood	0.7860	*11.33*	-0.6699	*-7.27*	-0.7608	*-9.02*
	GFDI	PETCHEM	0.8707	*8.97*	-0.2895	*-2.08*	-0.5619	*-3.66*
	GFDI	Metals/Mechanicals	0.2362	*2.44*	0.1331	*1.51*	-0.0010	*-0.01*
	GFDI	Electr. Machinery	0.1640	*2.58*	0.1524	*2.26*	0.0528	*0.92*
	GFDI	Transport	0.2561	*4.56*	0.2985	*4.83*	-0.0023	*-0.05*
	GFDI	Other	-0.0005	*-0.29*	0.1111	*2.19*	-0.0184	*-0.71*
	GFDI	N.A.	0.0352	*2.04*	-0.0435	*-0.75*	-0.1560	*-3.92*
	GINV	Food	0.0071	*1.22*	-0.0696	*-12.56*	0.0024	*0.63*
	GINV	Textiles/Wood	1.1933	*10.25*	1.1128	*12.77*	0.0685	*0.73*
	GINV	PETCHEM	0.0336	*0.85*	-0.0177	*-0.59*	0.0135	*0.52*
	GINV	Metals/Mechanicals	-0.0656	*-1.91*	0.0358	*0.53*	-0.0411	*-1.82*
	GINV	Electr. Machinery	-0.0449	*-0.76*	0.0175	*0.32*	-0.0191	*-0.49*
	GINV	Transport	-0.0027	*-0.14*	-0.0258	*-1.27*	0.0010	*0.08*
	GINV	Other	-0.0271	*-0.90*	-0.0296	*-1.27*	-0.0356	*-1.75*
	GINV	N.A.	-0.0002	*-0.49*	0.43E-02	*1.21*	-0.31E-05	*-0.01*
	GEX	Food	1.0820	*15.29*	0.0626	*0.80*	0.0005	*0.01*
	GEX	Textiles/Wood	0.6676	*5.15*	-0.0156	*-0.19*	0.0166	*0.18*
	GEX	PETCHEM	0.2960	*2.26*	0.51E-02	*0.10*	-0.1026	*-1.07*
	GEX	Metals/Mechanicals	0.0721	*0.54*	0.0801	*1.15*	-0.0213	*-0.21*
	GEX	Electr. Machinery	-0.0511	*-0.36*	-0.0175	*-0.26*	-0.0514	*-0.56*
	GEX	Transport	0.0564	*0.71*	0.64E-02	*0.25*	-0.0028	*-0.05*
	GEX	Other	0.1646	*1.11*	-0.0136	*-0.15*	0.0633	*0.64*
	GEX	N.A.	0.3413	*2.20*	0.0523	*2.41*	0.0971	*0.91*
	GFDI*INV	Food			17.0036	*22.43*		
	GFDI*INV	Textiles/Wood			8.5869	*18.50*		
	GFDI*INV	PETCHEM			6.4541	*8.85*		
	GFDI*INV	Metals/Mechanicals			-1.1695	*-1.49*		
	GFDI*INV	Electr. Machinery			-1.2326	*-2.04*		
	GFDI*INV	Transport			-1.1377	*-2.08*		
	GFDI*INV	Other			-1.8564	*-2.21*		
	GFDI*INV	N.A.			0.8570	*1.24*		
	GFDI*EX	Food					0.4178	*30.83*
	GFDI*EX	Textiles/Wood					0.9379	*21.33*
	GFDI*EX	PETCHEM					2.1612	*9.72*
	GFDI*EX	Metals/Mechanicals					0.2437	*1.15*
	GFDI*EX	Electr. Machinery					0.0023	*0.11*
	GFDI*EX	Transport					0.0560	*6.94*
	GFDI*EX	Other					0.0348	*0.68*
	GFDI*EX	N.A.					0.4916	*4.87*
	CONST		0.0632	*2.09*	0.1558	5.29	0.1405	*6.34*
	adjusted R-squared		97.48		98.43		98.88	
	Std. Error of Reg.		0.4146		0.3295		0.2772	
	Hausmann (p-value)		0.2680	*(1.000)*	0.8548	*(1.000)*	4.4423	*(0.992)*
	Observations		1148		1148		1148	

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