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The Impact of Foreign Direct Investment on Economic Growth – An Empirical Analysis of Different Effects in Less and More Developed Countries

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Abstract:

This paper studies the effects of foreign direct investment (FDI) on national economic growth with the help of GMM panel regressions. Effects on productivity growth, capital and labor inputs as well as innovation activities are distinguished. Furthermore, less and more developed countries as well as the time periods 1974-1991 and 1992-2009 are studied separately. Effects of FDI on production capacities are found for more developed countries in the first time period, while effects on innovation activities are found for the medium developed countries in the latter time period. Effects in less developed countries are rather negative.

Keywords: growth, foreign direct investment, FDI, growth effects, panel GMM.

JEL Classifications: O11, O40, E10, C23, F23.

I. Introduction

The effects of foreign direct investment (FDI) on the economy in the host country are frequently studied and discussed in the literature (overviews can be found, e.g., in Mebratie & van Bergeijk 2013 and Iwasaki & Tokunaga 2014). The effects are manifold, occur on various levels and affect different aspects, including besides economic conditions also social and environmental conditions. This paper focuses on economic effects of foreign direct investment on the national level in the host country.

FDI is seen by countries, especially transition countries, as a way to boost the national economy and generate jobs and economic development (e.g., Carlin & Landesmann 1997, p. 102 and Jensen 2006, p. 881). Two kinds of empirical studies on the impact of foreign direct investment on the host country's economic exist: Studies on the firm level and studies on the national level. While the former studies usually examine the effects of FDI on firm productivity, and only sometimes on growth and employment (overviews are given, e.g., in Mebratie & Bedi 2013 and Mebratie & van Bergeijk 2013), most of the latter studies examine the effects of FDI on economic growth (an overview on some studies is given in Iwasaki & Tokunaga 2014).

This paper adds to this literature by adding two aspects to the existing studies. First, the impacts of FDI on various aspects of economic growth are studied separately. The existing empirical studies add FDI as an additional factor in a standard growth equation, which includes capital and labor inputs as well as some further variables. Thus, the impact of FDI on total factor productivity is studied. However, FDI does not only change productivity but might also influence the utilized capital and labor inputs in a country as well as further aspects. Therefore, this paper studies the impact of FDI on total factor productivity, capital and labor inputs and innovation activity. The only study also analyzing various such impacts of FDI that the author is aware of is the study by Alfaro et al. (2009). They analyze separately the effects of FDI on domestic investment, human capital and GDP. Furthermore, a number of recent papers exist that examine the impact of FDI on innovation output (e.g., Guloglu et al. 2012, AlAzzawi 2012 and Garica et al. 2013).

Second, it can be expected that the effects of FDI differs between countries, depending on their development level (e.g., Kottaridi & Stengos 2010). FDI in less developed countries is usually motivated by low labor costs and concern rather labor-intensive industries. FDI in more developed countries is more often motivated by tapping into knowledge sources and utilizing qualified labor. The aim of this paper is to check whether respective differences can be confirmed empirically. Therefore, less, medium and more developed countries as well as two time periods, 1974-1991 and 1992-2009, are examined separately.

Data on 112 countries is analyzed with the help of GMM panel regressions with instruments. The results show that FDI has a positive impact on innovation activity and total factor productivity mainly in medium developed countries in the second time period, while in less developed countries total factor productivity is negatively influenced. Capital and labor inputs are positively influenced in the more developed countries in the first time period.

The reminder of the paper proceeds as follows. The next chapter contains the theoretical background. The empirical approach and the used data is described in Chapter three. Chapter four contains the presentation and discussion of the results. Chapter five concludes.

II. Theoretical background

Based on the usual growth theory (Romer 1990) foreign direct investment can be included in growth models as additional varieties of capital goods (see, e.g., Wang 2009). This implies that foreign direct investment (*FDI*) enters the standard growth equation, which explains growth in economic output (*Y*) by changes in capital (*C*), human capital (*H*) and labor (*L*) (cf. Wang 2009):

$$\Delta \ln\left(\frac{Y_{it}}{P_{it}}\right) = \delta \cdot \ln\left(\frac{Y_{it}}{P_{it}}\right) + \sigma \cdot \frac{\mathrm{FDI}_{it}}{Y_{it}} + \alpha \cdot \Delta \ln\left(\frac{C_{it}}{P_{it}}\right) + \gamma \cdot \Delta \ln(H_{it}) + \beta \cdot \Delta \ln\left(\frac{L_{it}}{P_{it}}\right) \quad (1)$$

with P_{it} denoting the number of inhabitants and Δ standing for the difference between the value at time *t+1* and the value at time *t*. Similar equations to Equation (1) are frequently used in the literature. As a consequence, the results for the FDI term are usually interpreted as representing the effects of FDI on total factor productivity (e.g., Bitzer & Görg 2009).

However, this usual perspective ignores the fact that FDI can increase total factor productivity and factor accumulation (see Alfaro et al. 2009, p. 113). While the above approach captures the impact of FDI on total factor productivity, it is not able to detect impacts on capital inputs, labor inputs and human capital because these factors are themselves part of the equation. Therefore, additional equations and regression are necessary to examine the effects of FDI on the various factors (as done in Alfaro et al. 2009).

First, FDI itself provides capital for production in the host country. Furthermore, it might trigger additional domestic investment (Alfaro et al. 2009). As a consequence, capital input in production should increase if the effect is not counterbalanced by crowding out effects (e.g., Misun & Tomsik 2002 and Kosova 2010). This would imply that the growth in capital inputs depends among other things on the relative FDI inflows:

$$\frac{\Delta \frac{C_{it}}{P_{it}}}{\frac{C_{it}}{P_{it}}} = \nu_C \cdot \frac{\mathrm{FDI}_{it}}{Y_{it}} + \eta_C. \quad (2)$$

Second, if FDI increases the production capacities through the provision of addition capital, one can expect that also new jobs are generated. The generation of employment by foreign direct investment is frequently studying in the literature on the firm level (e.g., Girma 2005, Gong, Görg, & Maioli 2007, Lehto & Böckerman 2008 and Bandick & Görg 2010). The results are quite mixed. However, if FDI has a positive effect on employment growth in the host country this effect can be written as

$$\frac{\Delta \frac{L_{it}}{P_{it}}}{\frac{L_{it}}{P_{it}}} = \nu_L \cdot \frac{\mathrm{FDI}_{it}}{Y_{it}} + \eta_L. \quad (3)$$

Third, foreign direct investment may increase human capital in the host country (Alfaro et al. 2009). However, it is difficult, if not impossible, to measure this effect on the national level because the usual measures of human capital are based on education within the country. Furthermore, using this data would reduce the set of countries for analysis significantly. Therefore, studying this effect is left over for further studies.

Finally, FDI implies the spillover of technological knowledge to the host country. This effect is most

discussed in the literature and seen as the main contribution of FDI to the development of the host country in form of productivity growth (see above). Hence, this effect is reflected in Equation (1). However, using Equation (1) implies that all kinds of effects that lead to an increase in total factor productivity are measured jointly.

The usual assumption behind the effect on total factor productivity is that investing actors provide with their investment knowledge that is used in production in the destination country and increases productivity within this production. An interesting question is whether the transfer of knowledge goes beyond the individual production site and triggers also an increase in technological capabilities in the host country. This would imply that the innovation capability increases. FDI would have an impact on innovation output in the host country in this case. Innovation output is usually modeled by a Cobb-Douglas knowledge production function in the literature (Griliches 1979). The following equation is used here:

$$\Delta \ln\left(\frac{I_{it}}{P_{it}}\right) = \mu_I \cdot \ln\left(\frac{I_{it-1}}{P_{it-1}}\right) + \mu_H \cdot \Delta \ln(H_{it}) + \mu_K \cdot \frac{FDI_{it}}{Y_{it}}. \quad (4)$$

Other studies have examined the impact of FDI on innovation output in similar ways (e.g., Guloglu et al. 2012, AlAzzawi 2012 and Garica et al. 2013).

III. Data and method

This paper follows the literature in using data from the Penn World Table (PWT8.0) and World Development Indicators (World Bank). In addition, patent data as a measure for innovation activity is derived from the Patstat database (European Patent Office). In total data on 112 countries for the years from 1974 to 2009 is utilized, excluding oil exporting countries as usual in the literature (e.g., Bond et al. 2010).

Existing studies repeatedly show that the relevant factors for growth differ between countries (e.g., Bond et al. 2010, Lee et al. 2011, Jaffe et al. 2013) and between time periods (Lu 2012). Therefore, the available panel data is split into two time period, 1974-1991 and 1992-2009, and into three country groups. Quite a number of countries in the sample (especially from Eastern Europe) are founded in the years 1991 or 1992, so that the second time period includes their development while the first time period is restricted to all countries that existed already before 1991. The assignment of countries to the country groups bases on the average GDP per capital in the observed time period. Countries with an average below 3,000 US$ build the less developed group, countries with an average between 3,000 and 10,000 US$ fall into the middle group, and countries with an average GDP per capital above 10,000 US$ are assigned to the more developed group.

Each combination of country group and time period is analyzed separately, so that six different data sets are analyzed. The used variables are as follows.

The Penn World Table provides data that is frequently used in the literature to study economic growth. It contains data on the output-side real GDP at current PPPs (*Y*), the capital stock at current PPPs (*C*), the numbers of persons engaged in each country, which is used as a proxy for the labor input here (*L*), an index that approximates the human capital per person on the basis of years of schooling and returns

to education (*H*), and the population in each country (*P*).

Patent data is used as a proxy for innovation output (for a discussion of this proxy see, e.g., Smith 2005). The Patstat database, provided by the European Patent Office, is the most comprehensive database on patents. All patents in this database (October 2013 release) are assigned to countries according to the country codes of the inventors and applicants (fractional counting is applied). Two variables are generated: $I^{(i)}_{it}$ represents patent counts with a country assignment based on the addresses of inventors and $I^{(a)}_{it}$ represents patent counts with a country assignment based on the addresses of applicants.

The World Development Indicators provide data on foreign direct investments (*FDI*). Net inflows of foreign direct investments in relation to GDP are used here.

In recent years it has become common in the empirical economic growth literature to use panel GMM regressions (e.g., Hasan & Tucci 2010, Güloglu & Tekin 2012, Vu et al. 2012, Neto & Veiga 2013 and Museru et al. 2014). This approach allows to test for causality with the help of instrument variables.

In order to test the impact of FDI on economic growth, capital and labor inputs and innovation activities, Equations (1), (2), (3) and (4) are estimated using panel GMM regression. Lagged variables are used as instruments as usual in the literature (e.g., Hasan & Tucci 2010, Güloglu & Tekin 2012, Neto & Veiga 2013 and Museru et al. 2014). Time and country fixed effects are included in the estimations. In the case of patent invention activities the analysis is not possible for the less developed countries in the first time period due to the lack of a sufficiently large data set (all cases with no patent invention activity are excluded).

IV. Results

GMM regressions for four different dependent variables and six different subsets of observations are conducted. FDI functions as independent variable in all estimations and the results for FDI are of main interest here. Table 1 presents all regression results. The results show clear evidence for a negative dependence of growth on the already reached development level and a positive dependence of economic growth on increases in capital inputs. Some evidence is found for a positive dependence of economic growth on increases in labor inputs. The results only weakly support the influence of human capital on economic growth in the case of less developed countries in the first time period. Impacts of human capital on innovation activities are not found.

Table 1:

Panel GMM regression results (p-values in brackets)

Variable	*1974-1991* $\Phi(Y_t/P_t)<3.000$	*1992-2009* $\Phi(Y_t/P_t)<3.000$	*1974-1991* $3.000<\Phi(Y_t/P_t)<10.000$	*1992-2009* $3.000<\Phi(Y_t/P_t)<10.000$	*1974-1991* $\Phi(Y_t/P_t)>10.000$	*1992-2009* $\Phi(Y_t/P_t)>10.000$
Number of countries	34	35	31	35	34	42

	Output growth (Equation (3))					
$log(Y_{it-1}/P_{it})$	**-.362*** (.000)**	**-.108** (.006)**	**-.151** (.002)**	**-.183** (.005)**	**-.163* (.014)**	-.0156 (.837)
$\Delta log(C_{it}/P_{it})$	.163 (.457)	**.630*** (.000)**	**.855*** (.0000)**	**.337** (.010)**	**.898*** (.000)**	**.357*** (.000)**
$\Delta log(L_{it}/P_{it})$	-.086 (.366)	.145 (.190)	**.301* (.041)**	.091 (.394)	**.582*** (.000)**	.276 (.181)
$\Delta log(H_{it})$	***3.48 (.095)***	.461 (.762)	-1.34 (.128)	.0774 (.932)	-1.10 (.368)	-.480 (.613)
FDI_{it}/P_{it}	**-.00692*** (.000)**	**-.00162*** (.000)**	.00300(.483)	.00056 (.795)	-.0107 (.248)	***.00076 (.051)***
Number of observations	354	547	395	555	437	629
	Capital input growth (Equation (4))					
FDI_{it}/P_{it}	-.000040 (.894)	.000086 (.324)	.00111 (.261)	.00015 (.852)	**.00363* (.034)**	-.00032 (.163)
Number of observations	384	547	406	555	437	629
	Labor input growth (Equation (5))					
FDI_{it}/P_{it}	-.000065 (.596)	-.000106 (.340)	***.00175 (.051)***	-.00028 (.723)	**.00736* (.010)**	.00013 (.537)
Number of observations	354	547	395	555	437	629
	Innovations - Patent inventors (Equation (6))					
$\Delta log(H_{it})$	-	22.2 (.764)	15.3 (.462)	-3.79 (.758)	-6.26 (.411)	-4.19 (.374)
FDI_{it}/P_{it}	-	.0321 (.140)	-.0095(.806)	**.0838* (.025)**	.0293 (.490)	***.0024 (.084)***
Number of observations	-	268	241	453	375	593
	Innovations - Patent applicants (Equation (6))					
$\Delta log(H_{it})$	116 (.213)	-59.3 (.541)	38.9 (.113)	10.7 (.393)	8.63 (.491)	-.881 (.861)
FDI_{it}/P_{it}	-.0068 (.495)	.00217 (.514)	.0256 (.330)	**.0865** (.009)**	.174 (.125)	-.0018 (.400)

Number of observations	98	294	269	480	391	597

Concerning the impact of FDI, the results provide a heterogeneous and detailed picture. In the case of the less developed countries the results are the same for both time periods: FDI has a clear negative impact on economic growth, while no significant impacts are found for the other dependent variables. As stated above, the impact in the growth equation can be interpreted as the impact on total factor productivity. Hence, foreign direct investment decreases productivity in less developed countries. An explanation might be a decrease in the productivity of domestic firms caused by FDI as it is found by Aitken and Harrison (1999).

Another possible explanation is based on the fact that countries are only able to benefit from FDI in form of productivity growth if other characteristics are sufficiently developed. Various results suggest that whether FDI have a positive impact in the host country depends on this country's characteristics, such as its absorption capacities and human capital (Borensztein et al. 1998), the level of economic freedom (Azman-Saini et al. 2010a), financial development (Ang 2009), the level of financial market development (Alfaro et al. 2004 and Azman-Saini et al. 2010b) and the initial total factor productivity (Neto & Veiga 2013). Furthermore, the impact of FDI on economic growth clearly depends on how developed the host country is (Bitzer & Kerekes 2008 and Kottaridi & Stengos 2010). This argument seems to fit also the insignificant results for the impact of FDI on innovation output: Lacking sufficient development in other aspects, less developed countries might not be able to benefit from knowledge spillovers from FDI in the form of higher innovation capabilities.

A further explanation might be that FDI reinforces the orientation of less developed countries towards less productive and less innovative economic activities. The lack of effects of FDI on capital and labor inputs in less developed countries can be explained by crowd-out effects as stated in the literature (e.g., Misun & Tomsik 2002 and Kosova 2010).

For the medium and more developed countries the results differ strongly between the two time periods. East European countries that are founded in 1991 and 1992 might be responsible for this result. However, the middle group increases only from 31 to 35 countries and the group of more developed countries increases from 34 to 42 countries. Hence, especially in the middle group, it seems unlikely that four additional countries change the results completely. The two time periods seem to be indeed different.

In the first time period FDI seems to have no direct impact on economic growth, so that total factor productivity seems not to increase as a consequence of FDI. Furthermore, no evidence for an increased innovation activity due to FDI is found. Instead, clear evidence is found for a positive impact of FDI on capital and labor inputs, especially in the case of the more developed countries. In the case of medium developed countries the effect is only weakly significant for labor inputs. A possible interpretation is that in the time period from 1974 to 1991 foreign direct investments in medium and more developed countries had been on average in line with the technological advancement of the host country. Therefore, these investments did not change productivity and innovation capabilities, but increased the total production capacities, utilizing more capital and labor inputs. The latter implies that crowd-out effects are low or additional crowd-in effects are present (see, e.g., Borensztein et al. 1998, Kim & Seo

2003 and Al-Sadig 2013). The missing of such capacity increasing effects of FDI in other countries might be explained by crowd-out effects. That would me that only the more developed countries are able to benefit from FDI in the form of capacity increases, while in other countries these investments replace other investments.

This changes completely in the second time period. From 1992 to 2009 no significant impacts of FDI on capital and labor inputs are found for medium or more developed countries. Instead, in the more developed countries FDI has a weakly significant positive impact on total factor productivity (in form of a direct impact on economic growth) and on inventive activity. Clearly significant results are obtained for medium developed countries, which benefit from FDI in form of higher patent invention and application activities. Hence, clear evidence is obtained for a positive effect of FDI on technological advancement and especially innovation capability in especially medium, but also more developed countries in recent years. Since the medium developed countries benefit more clearly, it seems as if these countries have been well able to benefit technologically from investments from more developed countries in recent years. This seems to have helped them to improve their innovation capabilities. In the literature the findings for the relationship between FDI and innovation output are mixed. Guloglu et al. (2012) find a positive relationship in the G7 countries, AlAzzawi (2012) finds a positive relationship, especially for firms that are technological followers, and Garcia et al. (2013) find a negative relationship for Spanish firms. The results here are in line with the findings by AlAzzawi (2012) if we see the medium developed countries as technological followers.

The change between the two time periods might by related to the strong increases in R&D offshoring in recent years (Moncada-Paterno-Castello 2011 and Castellani & Pieri 2013). This might have increased technological spillovers in the context of foreign direct investment, so that effects of these spillovers have become statistically significant in the second time period. Countries seem to benefit technologically from FDI from more developed countries if they have a sufficient absorptive capacity for such receiving spillovers.

V. Conclusions

This paper studies the contributions of foreign direct investment (FDI) to economic growth on the basis of data on 112 countries. The countries are assigned according to their GDP into three groups and two time periods are studied separately. The results differ fundamentally between the less developed countries and the other country groups and between the time periods.

In less developed countries the only significant impact of FDI is a decrease in total factor productivity. Previous studies have found quite heterogeneous results for the effect of FDI on economic growth in developing countries (Liu & Agbola 2014). This paper adds to the evidence on rather negative effects.

In medium and more developed countries the situation is very different. In the time period from 1974 to 1991 positive effects of FDI on the production capacity in the host countries are found, indicating that FDI simply creates additional economic activity that is not completely counterbalanced by crowd-out effects in this time period. From 1992 to 2009 the benefits in the host countries are rather of technological nature. Especially the medium developed countries seem to benefit from FDI through knowledge spillovers that increase in their innovation capabilities. While differences between more and

less developed countries are discussed in the existing literature, changes in time are an interesting issue, which should be analyzed in further detail in the future.

As a policy conclusion from the above findings we might draw the lesson that especially medium developed countries benefit from FDI. Further industry-specific analyzes (such as Cipollina et al. 2012) might help to understand, in which industries FDI activities are most beneficial for the host countries.

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