REyF Revista de Economía y Finanzas

www.reveyf.es

2023 – Vol. 1 – n.º 1 - Artículo 4

Does foreign investment improve or worsens productivity? a panel var analysis

Carlos Chavez

Universidad Nacional Mayor de San Marcos – Lima - Perú.

JEL CODES:
D24; F21; C23

KEYWORDS:
Productivity, Human capital, international investments.

Abstract: The paper studies the effects of Foreign Direct Investment (FDI) on productivity. I make two hypotheses, the first one is that foreign firms consider initial stock allocations of capital and human capital to decide what kind of investment to make. The second one is that if the foreign firms make investment, the productivity will increase in countries with higher stock allocations and human capital and will decrease for countries with lower stock allocations and human capital. The methodology I use is a Panel VAR whose estimator is System GMM. The results found show that there are positive impacts of Foreign Direct Investment (FDI) on productivity for countries with a high degree of financial development and high-income level while negative impacts on countries with a low degree of financial development and low-income level in most estimates.

CÓDIGOS JEL:
D24; F21; C23

PALABRAS CLAVE:
Productividad, Capital humano, Inversiones internacionales.

Resumen: El documento estudia los efectos de la Inversión Extranjera Directa (IED) en la productividad. Hago dos hipótesis, la primera es que las firmas extranjeras consideran las asignaciones iniciales de stock de capital y capital humano para decidir qué tipo de inversión realizar. La segunda es que si las empresas extranjeras invierten, la productividad aumentará en los países con mayor asignación de acciones y capital humano y disminuirá en los países con menor asignación de acciones y capital humano. La metodología que utilizo es un Panel VAR cuyo estimador es Sistema GMM. Los resultados encontrados muestran que existen impactos positivos de la Inversión Extranjera Directa (IED) en la productividad para países con alto grado de desarrollo financiero y nivel de ingresos altos mientras que impactos negativos en países con bajo grado de desarrollo financiero y nivel de bajos ingresos en la mayoría de las estimaciones.

E-mail: carlos.chavez2@unmsm.edu.pe

1. Introduction

Since the 1990's many countries have made a transition from domestic development policies, i.e., based on the development of the domestic industry to a free market economy, through the lowering of tariffs and elimination of regulations, Rodrik (1995), which has allowed the arrival of foreign investment from multinationals in developing countries. However, foreign direct investment (FDI) flows in high-income countries have increased substantially since the beginning of the 2000s and have been reduced since the great financial crisis of 2008–2009, while in middle and low-income countries, there has been an increase, but not a substantial increase in FDI. On the other hand, since the '80s, aggregate productivity has been decreasing, having its lowest point in the late '90s; however, since the beginning of 2000, aggregate productivity in high-income countries has been increasing until 2010, while in the same period, although there were increases in middle and low-income countries, this was not as substantial as in high-income countries. Since 2010, there has been a significant reduction in aggregate productivity in high-income countries, to a lesser extent also in low-income countries, while it has remained constant in middle-income countries.

The motivation for studying the relationship between FDI and Productivity is to answer whether FDI has differentiated impacts across groups of countries. To answer this question, I use a Panel VAR that allows dealing with the dynamic process characteristic of the FDI subject to the macroeconomic factors of each country, such as its degree of institutionalization and economic and conjunctural variations before the FDI shock. The results I find are that for low and middle-income countries, FDI has a negative impact on aggregated productivity while, for high-income countries, FDI has a positive effect on aggregated productivity, corroborating the hypothesis raised in this paper. Those findings are related to recent works such as Görg and Greenaway (2004), Karimi et al. (2013), Herzer et al. (2008), Abdullah and Chowdhury (2020), and Herzer (2012). However, the main difference between those papers is that I develop a possible explanation considering absorptive capacity and the decision of the Multinational Firms to make the FDI on the countries regarding the initial endowments on capital stock and human capital levels.

The main contribution I find that the effects of the foreign companies on the productivity depends on the previous level of initial endowments of the country to assimilate external knowledge, and multinational companies can choose what type of investment to make according to these initial endowments, thus avoiding learning costs. The main limitation of this paper is that by using the aggregate productivity of a country, I may need to overestimate the effects that FDI may have on this variable because the FDI a country receives may be concentrated in specific industries, ultimately having an aggregate impact. The second limitation is what Beugelsdijk et al. (2010) point out that FDI stocks may overestimate the actual activity of multinational companies in tax havens relative to non-tax havens and that FDI stocks not only include value-added investment.

This paper is as follows: The next section develops the literature related to the links between FDI and productivity; the third section presents the empirical strategy and the description of the database I used; the fourth section presents the results obtained, and the fifth section presents the conclusions and limitations of this paper.

2. Literature review

The literature on FDI and aggregate productivity is relatively small, and results tend to differ across studies. For example, Görg and Greenaway (2004) review 25 studies on productivity effects in manufacturing industries in different countries, finding that only six have positive effects for developed countries. There is an essential discussion about the spillover effect between these variables from the presence of a multinational company in domestic economies.

Narula (2002) points out that the spillover effect does not occur automatically; if an international decides to invest in another country, it does so taking into account a higher return than what it would obtain by investing in the country where its base is located, Görg and Greenaway (2004) point out that a multinational company will not give its technological source once it establishes its plant in another country, but until profits have already exceeded the opportunity cost required by the investment. The positive effect of FDI on productivity through a spillover will depend on the capacity and skills to assimilate such knowledge, which is found in Buckley et al. (2010). Bruhn and Calegario (2014) find that FDI negatively affects labor-intensive industries, and that FDI depends on the absorption capacity of enterprises.

On the other hand, there is literature that studies the risks of a firm becoming self-sufficient to create knowledge since it is likely to be unsuccessful, Glaister and Buckley (1999). Mayer-Foulkes and Nunnenkamp (2009) suggest that FDI only has positive impacts if initial levels of GDP per capita are already relatively high and according to Xu (2000), who studies the importance of initial human capital endowments for positive technology transfer. Abdullah and Chowdhury (2020) analyze the FDI and TFP for 77 low-income and middle- countries, finding no impact of the FDI on productivity. Li and Tanna (2019) find a weak relationship between FDI and productivity but then accounting by institutions and human capital; this relationship gets more robust.

The primary mechanism by which FDI can affect aggregate productivity is through knowledge diffusion and technology spillovers. Ozturk (2007) finds that FDI can facilitate the use of technology in local firms to promote exports and job creation. In the same line, Gorg and Greenway (2004) mention that FDI can allow local firms to learn from export strategies which also implies reaching new markets. Laborda et al. (2014), Fosfuri et al. (2001), and Javorcik (2004) find that productivity can be boosted through channels such as imitation, labor turnover, and backward and forward linkage with local firms.

Other studies may find neutral or negative effects because local firms lose market share and their sales fall, see Aitken and Harrison (1999). This implies that the arrival of FDI causes them to have a less efficient scale and experience higher production costs. Globerman (1979) mentions that

the effects of FDI will depend on the quality of labor in terms of education and worker experience. If the quality of labor is poor, technological transfers may be difficult to occur, see Wang & Blomstrom (1992). Kokko (1994) finds that this technology gap reduces the positive effect of the arrival of FDI. Aitken and Harrison (1999) find that in the case of Venezuela, the relationship between FDI and productivity is negative, related to other studies such as Djankov and Hoekman (2000) for the Czech Republic, Kathuria (2000) for India, Damijan et al. (2003) for transition economies, Hu and Jefferson (2002) for China. Girma et al. (2001) for UK.

When the relationship between FDI and Productivity is further explored in the field of International Trade Theory, it can also be related to innovation as a proxy of productivity. The seminal paper by Cohen and Levinthal (1990) points out the importance of path dependence, in which a part of all the previous knowledge that the firm has will allow the assimilation and exploitation of new technology, this part of the prior knowledge must be related to the latest technology to assimilate this new technology.

The initial level of development in absorption capacity can diminish the attraction that firms have to invest in that same area in the subsequent periods of the first absorption, that is, if the firm sees that the external knowledge is not assimilated by the site that receives this superficial knowledge, it will not invest further on new knowledge for that same area, the same happens when a multinational sees that a country takes a time and cost prologue until its investment has returns. Rocha (1999) finds that accumulating previous knowledge influences how the firm obtains external knowledge through different activities and specializations.

Jasimuddin et al. (2019) propose certain conditions for effective knowledge transfer. Liu (2019) analyzes the mechanisms by which multinational corporations can transfer knowledge in different parts of a process. Nelson and Winter (1982) suggest that there is a pattern of inertia, that is, the absorption capacity is cumulative, thanks to previous investments, at the time this new investment is made than at the time the initial investment was made, so there are no incentives for them to invest in countries where they do not have those initial endowments, at least in terms of human capital and stock of accumulated wealth, because the incentives could change through tax reductions and so on.

However, this fact does not take away from the fact that developing countries themselves can build their technologies and industrialization processes through strategic reforms, such as South Korea, see Adelman (1999) and Kim and Leipziger (1997) so that potentially in the long term they can be attractive to multinationals and become developed countries. The initial endowments, or previous knowledge, have an essential role in the innovative performance of the firm or country in an uncertain environment. A high initial level of human capital should be beneficial in acquiring new technologies.

If a country opens to international trade, this high rate of human capital will be necessary to sustain the process of technological development. There will be more significant economic growth thanks to this technological development. For these reasons, I do not see Google, Facebook, or Apple doing FDI with a high load of R&D in African, Middle Eastern, or South American countries, with a low level of human capital as opposed to the United States and European countries. Barros et al. (2020) make a literature review on the private sector and on technology transfer for attaining innovation, customer orientation, and acquiring technological abilities. Asongu et al. (2018) analyze the determinants of FDI in fast-growing economies.

This paper considers the relationship between technological catches and human capital formation, related to previous literature such as Evenson and Westphal (1995) and Pack (1992). These findings would validate the hypothesis that multinationals when making an FDI distinguish between countries and considering the initial endowments, make an FDI with a high R&D burden or a low R&D burden, and countries receiving the FDI with a high R&D burden their productivity increases. In contrast, for countries receiving a low R&D burden, their productivity may remain the same or, in the worst-case decrease.

Other studies as Görg and Greenaway (2004), Karimi et al. (2013), Herzer et al. (2008), Abdullah and Chowdhury (2020), and Herzer (2012) shows that the decision of the foreign firm to invest in a home country depends on the human capital and technology levels. Grimpe and Sofka (2009) find that if low-technology industries decide to invest in R&D and absorption capacity, this will be successful in innovation if combined with a pattern of pursuing market knowledge goals. Szkorupová (2015) and Mišun and Tomšík (2002) analyze the effects of crowding-out and crowding-in of FDI on domestic investment for Eastern and Central European countries finding that FDI can have an adverse impact on domestic investment. Crescenzi et al. (2015) find that a domestic firm with significant foreign investments from multinational companies has a more robust innovation performance than companies that do not receive foreign investment. However, the heterogeneity across domestic firms in terms of internationalization is the primary driver of this effect.

Mattoo et al. (2004) point out that technology transfer will depend on the entry mode chosen by the foreign investor. Romer (1993) points out that if companies decide to make an FDI by selecting to transfer the know-how to developing countries, the gap between rich and developing countries would be reduced. Boyd and Smith (1992) argue that the effect of capital investment will depend on how much distortion there is in local markets, which may even be harmful and lead to lower-than-expected economic growth. Alfaro et al. (2004) point out that the effects of FDI can be ambiguous on economic growth.

Alfaro et al. (2009) point out that there will only be positive effects if the local market is sufficiently developed. Lipsey and Sjoholm (2005) make, a compilation of firm-level studies finding that the impacts of FDI on productivity can be mixed and depend on several factors; Iamsiraroj and Ulubasoglu (2015) make a meta-analysis in which they find less than half of the studies find a positive effect of FDI on the economy. Belderbos et al. (2020) see the positive impact of FDI on the productivity of domestic firms and affiliates the Multinational Firms. Peres et al. (2018) analyze the relationship between FDI and institutional quality. Bermejo and Werner (2018) find no evidence that

the FDI affects the economic growth of Spain. Titus et al. (2020) sees mixed effects of the FDI on economic growth. Borensztein et al. (1998) propose to develop the assumption that productivity can only be transmitted when the country in which one decides to invest has a stock of human capital above a minimum threshold.

Blomstrom et al. (1994) find that FDI only has positive effects on economic growth when the country is sufficiently rich; this is in line with Alfaro et al. (2004), who find that FDI only promotes economic growth when there is a high degree of financial development and Okwu et al. (2020) see positive effects of the FDI on Economic Growth for 30 leading global economies. Herzer (2012) finds that export dependence may explain the differences between FDI effects across countries. Pradhan et al. (2019) find that financial development and FDI matter for the determination of long-term economic growth. These results are in line with the findings of Arvin et al. (2021). Pradhan et al. (2018) find a short-term and long-term causal relationship between FDI, financial development, and economic growth. Osei and Kim (2020) find that the FDI has a threshold that positively affects economic growth; this threshold is related to credit expansion.

In this paper I use a Panel VAR to estimate the FDI's effects on aggregate productivity, this methodology is proposed by Love and Zicchino (2006); the main reason to use this methodology instead of other techniques is that I rely on the orthogonalization of the impulse response of FDI to aggregate productivity that isolates other effects such as the economic situation of each country or global. This methodology is appropriate because it compares the response of productivity in countries with different types of income or financial development. The following section develops the method that I will use and the database.

3. Methodology and database

3.1. Empirical Strategy

The methodology that I will use is a Panel Vector Autoregressive, the model is presented in Equation (1):

$$Y_{i,t} = A.\sum_{P=1}^{2} Y_{t-P} + \gamma_t + \sigma_i + e_{i,t} \ , \quad (1)$$

where $Y_{i,t}$ is a $vector_{1xk}$ of endogenous variables, Y_{t-P} is the vector of endogenous lagged variables up to $t-P$. $\gamma_t \ and \ \sigma_i$ are the time and country fixed effects respectively. $e_{i,t}$ is the error term, also called idiosyncratic error, and A is the matrix of coefficients of the impacts of lagged values of endogenous variables. This form of measure the absorptive capacity is not new as an aggregated way, see Borensztein et al. (1998). Other studies, such as Liu (2019) suggest that to incorporate the spillover effects of the FDI in an economy, I have to add an interaction term between time train and the FDI, this is FDI * Time Trend, in this way it will allow us to control the productivity absorption capacity from the FDI, but the non-stationarity of the time-trend due to the fact that I are using a large period, 1980–2018, could generate biases in the estimates, for this reason I decide to control including the time-trend but without the interaction term.

In this estimation, I assume that the idiosyncratic error is presented as follows: $E\left[e_{I,t}\right] = 0, E\left[e'_{i,t}\, e_{i,t}\right] = \Sigma$ and $E\left[e'_{i,t}\, e_{i,s}\right] = 0$, for all $t > s$. This model uses as estimator the system GMM, proposed by Blundell and Bond (1995), which allows us to treat the endogeneity of the variables. I also add exogenous variables, so Equation (1) takes the following form:

$$Y_{i,t} = A \sum_{P=1}^{2} Y_{i,t-P} + B\, X_{i,t} + u_i + e_{i,t} \ , \quad (2)$$

where $X_{i,t}$ is the $vector_{1xj}$ of exogenous variables in the model. In this paper I developed three models to estimate the consistency of the results and also following the recent literature on this topic, see Li and Tanna (2019), Jasimuddin, et al. (2019) and Abdullah and Chowdhury (2020): The first model will have the following form:

$Y_{i,t} = \left[Productivity_{i,t}, FDI_{i,t}\right]_{1x2}$

and $X_{i,t} = \left[GDP_{i,t}, Pop_{i,t}\right]_{1x2}$.

For the vector $Y_{i,t}$, the variable $Productivity_{i,t}$ is the productivity of country i at time t. $FDI_{i,t}$ is the FDI received by country i for period t. For vector $X_{i,t}$, the variable $GDP_{i,t}$ is the gross domestic product of country i for period t. The variable $Pop_{i,t}$ is the population of country i for period t. The second model aggregates human capital and capital stock as endogenous variables. As I mentioned in the introduction and in the review of the literature, the type of FDI that a company makes on a given country will depend on its initial endowments, which are the levels of these variables.

Therefore, this model takes the following form:

$Y_{i,t} = \left[Productivity_{i,t}, FDI_{i,t}, Human\ Capital_{i,t}, Capita\ Stock_{i,t}\right]_{1x4}$

and $X_{i,t} = \left[GDP_{i,t}, Pop_{i,t}\right]_{1x2}$.

And the third model adds exogenous macroeconomic variables such as Inflation, Monetary Aggregates and Government Debt.

So this model takes the following form: $Y_{i,t} = \left[Productivity_{i,t}, FDI_{i,t}, Human\ Capital_{i,t}, Capital\ Stock_{i,t}\right]_{1x24}$

and $X_{i,t} = \left[GDP_{i,t}, Pop_{i,t}, Inflation_{i,t}, Monetary\ Aggregates_{i,t}, Debt_{i,t}\right]_{1x6}$

The main problem that arises with this estimation is that I have the presence of u_i, which are the unobserved time-invariant effects that can be correlated with the regressors due to the lags of our variables, which leads to a bias in the results' coefficients. On the one hand, using lagged variables as instruments allows us to control, in part, this variable, see Baltagi (2008) but I also choose to transform our variables. I can use two techniques to eliminate u_i, the first technique is called First Difference, which consists in taking the difference of the current period with respect to the past period, Δ is the operator that represents the transformation of this technique, that is, $\Delta Y_{i,t} = Y_{i,t} - Y_{i,t-1}$, using this transformation, Equation (2) is presented as follows:

$$\Delta Y_{i,t} = A \sum_{P=1}^{2} \Delta Y_{t-P} + B\, \Delta X_{i,t} + v_{,i,t} \ . \quad (3)$$

The second transformation I use is a technique called Forward Orthogonal Deviations (FOD), proposed by Arellano and Bover (1991). This procedure consists of subtracting the

average of all future observations from the variables. This technique has the following form:

$$Y_{i,t+1} = c_{i,t}(Y_{i,t} - \frac{1}{T_{i,t}}\sum_{s>t}^{N} Y_{i,s}) \ , \quad (4)$$

where the sum is taken from all the available observations, $T_{i,t}$, and $c_{i,t}$ is a scale factor that takes the following form $\sqrt{\frac{T_{i,t}}{T_{i,t}+1}}$. ∇ is the operator that means that the variable has been transformed with Forward Orthogonal Deviations (FOD). Then, Equation (2) takes the following form:

$$\nabla Y_{i,t} = A \sum_{P=1}^{2} \nabla Y_{t-P} + B \nabla X_{i,t} + v_{,i,t} \ . \quad (5)$$

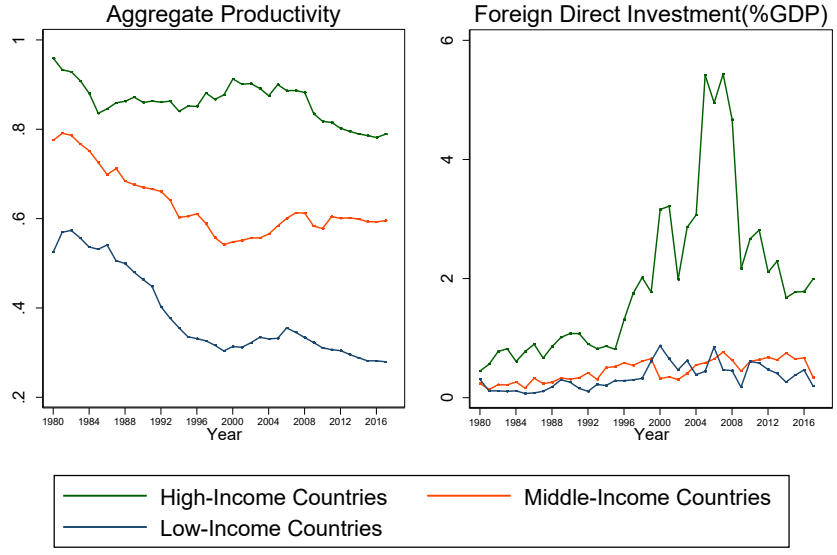
The main difference between these two is that the First Difference (FD) technique magnifies the gaps when there are zero observations, that is if I make the first difference of period t with period t-1. However, if there are no observations in period t-1, then the FD will be made with the next closest one, which is t-2, leaving a gap of one period in the estimate, while FOD, when using the average of all future observations, does not magnify the holes, see Roodman (2009). The second difference between these transformations is that Hayakawa (2009) finds that FOD tends to perform better when T is more significant, and its biases are smaller than FOD. The last difference between these transformations, following Phillips (2019), is that using FOD is convenient when using a System GMM estimator because of the smaller biases it presents in the estimates.

So, for those differences, I choose FOD transformation rather than FD transformation. When analyzing panel data for a VAR, restrictions need to be imposed. However, there is a probability that at the country level, these restrictions are violated, so introducing fixed effects allows one to control for individual heterogeneity. At the same time, these fixed effects may be correlated with the regressors due to the lags of the dependent variables. To avoid this, i use forward mean-differencing, which removes the forward mean and preserves the orthogonality between the transformed variables and the lagged regressors. This methodology differs from others studies as Abdullah & Chowdhury (2020) because it allows us to control for possible endogeneity in the regressions, as previously mentioned. Also, by adding country-fixed and time-fixed effects, I contain the macroeconomic uncertainties of each country and over time because it allows us to have a larger panel of data compared to the use of regressions such as the system GMM.

3.2. Database

The database I use comes from the union of Penn World Table V.9.1 and the World Bank Database. I have information available for 134 countries considering all the regions in the world for the period 1980–2018 because it is better balanced to construct the Panel Data. It is important to note that the panel data with annual frequency allow for controlling the effects of the economic cycle of each country, working in a pooled cross-section, see Kose et al. (2009). I make two classifications distinct the type of country; the first classification is by Income level, elaborated by World Bank; using this classification, I have for High-Income Countries, there are 39 countries; for Middle-Income Countries, there are 62 countries, and for Low-Income Countries, there are 29 countries.

Figure 1: Evolution of aggregate productivity and foreign direct investment



Source: Penn World Table V.9.1 and World Bank
Taking the average for Aggregate Productivity and Foreign Direct Investment by income group

Table 1 present the countries used in this paper by income classification.

Table 1: Countries by income classification (source: World Bank and author's calculations)

High-Income Countries	Middle-Income Countries	Low-Income Countries
Antigua and Barbuda, Australia, Austria, Bahrain, Barbados, Belgium, Canada, Croatia, Cyprus, Czech Republic, Denmark, Equatorial Guinea, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Kuwait, Luxembourg, Malta, Netherlands, New Zealand, Norway, Oman, Portugal, Saudi Arabia, Slovenia, Spain, Sweden, Switzerland, United Arab Emirates, United Kingdom, United States	Albania, Algeria, Angola, Argentina, Armenia, Azerbaijan, Belarus, Belize, Bhutan, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Cameroon, Chile, Colombia, Costa Rica, Djibouti, Dominica, Dominican Republic, Ecuador, El Salvador, Gabon, Georgia, Grenada, Guatemala, Honduras, India, Indonesia, Jamaica, Jordan, Kazakhstan, Latvia, Lesotho, Lithuania, Malaysia, Maldives, Mauritius, Mexico, Montenegro, Morocco, Namibia, Nicaragua, Nigeria, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Romania, Serbia, Seychelles, South Africa, Sri Lanka, Vincent and the Grenadines, Syrian Arab Republic, Thailand, Tunisia, Turkey, Ukraine, Uruguay	Central Bangladesh, Benin, Burkina Faso, Burundi, Cambodia, African Republic, Chad, Comoros, Ethiopia, Ghana, Guinea, Guinea-Bissau, Haiti, Kenya, Madagascar, Malawi, Mali, Mauritania, Mozambique, Myanmar, Niger, Rwanda, Senegal, Sierra Leone, Tajikistan, Togo, Uganda, Uzbekistan, Zambia

And the second classification is by financial development degree; I use the domestic credit as a percentage of the GDP as a proxy of the economic development degree. To get the classification from this, I split it using quantiles. For High Financial Development Countries, there are 31 countries; for Middle Financial Development Countries, there are 62 countries; and for Low Financial Development Countries, there are 32 countries. Table 2 present the countries by financial development degree.

Table 2: Countries by financial development classification (source: World Bank and author's calculations)

High Financial Development	Middle Financial Development	Low Financial Development
Australia, Austria, Barbados, Cambodia, Chile, China, Cyprus, Denmark, Finland, France, Greece, Iceland, Japan, Kuwait, Luxembourg, Malaysia, Mauritius, Morocco, Netherlands, New Zealand, Panama, Portugal, South Africa, Spain, Sweden, Thailand, Tunisia, United Arab Emirates, United Kingdom, United States	Albania, Antigua and Barbuda, Armenia, Bangladesh, Belarus, Belgium, Belize, Bhutan, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Cabo Verde, Colombia, Costa Rica, Croatia, Czech Republic, Dominica, Dominican Republic, Ecuador, El Salvador, Estonia, Georgia, Germany, Grenada, Guatemala, Hungary, India, Indonesia, Ireland, Israel, Italy, Jordan, Jordan, Kazakhstan, Kenya, Latvia, Lithuania, Maldives, Malta, Mauritania, Mexico, Montenegro, Namibia, Nicaragua, Oman, Paraguay, Peru, Philippines, Poland, Romania, Russian Federation, Saudi Arabia, Senegal, Serbia, Seychelles, Slovenia, Vincent and the Grenadines, Togo, Turkey, Ukraine.	Algeria, Angola, Argentina, Azerbaijan, Benin, Burundi, Cameroon, Chad, Comoros, Djibouti, Equatorial Guinea, Gabon, Ghana, Guinea, Guinea-Bissau, Haiti, Lesotho, Madagascar, Mali, Mozambique, Myanmar, Niger, Nigeria, Pakistan, Rwanda, Sao Tome and Principe, Sierra Leone, Tajikistan, Uganda, Uruguay, Zambia

Concerning the changes by the group during the period, it is not a problem because considering the income classification, there are no changes over the period, and considering the financial development classification, only four countries change from low to middle and middle to high financial development. Table 3 present the basic statistics for the variables used in the paper.

Table 3: Basic statistics

Variables	Total			High-Income Countries			Middle-Income Countries			Low-Income Countries		
	Observations	Mean	Standard Deviation	Observations	Mean	Standard Deviation	Observations	Mean	Standard Deviation	Observations	Mean	Standard Deviation
Foreign Direct Investment	4652	2.52	12.17	1392	5.21	21.42	2116	1.49	3.24	1025	1.189	3.696
Total Factor Productivity	3404	0.676	0.26	1274	0.86	0.18	1588	0.63	0.22	480	0.38	0.18
Capital Stock	1180	2356345	6600589	380	3261810	4847652	530	1742135	3742020	250	176763.1	286501.8
Human Capital	1080	2.58	0.67	370	3.17	0.41	470	2.53	0.46	230	1.77	0.459
GDP	1180	570501	1543828	380	722433.7	1041300	530	466705.8	944370.4	250	49995.68	79336.92
Population	1,180	48.37758	171.5882	250	24.68974	31.9025	530	57.08505	174.6263	250	24.68974	31.9025
M1	978	59.79533	41.61868	209	88.43821	44.05992	510	58.72729	37.0538	239	30.92923	16.3794
Inflation	1,153	4.863793	5.252316	379	2.198857	2.510551	518	5.602088	5.227277	236	7.720771	6.57686
Public Debt	1,147	16.21024	5.267496	370	19.53043	4.136367	524	15.05851	4.872482	233	13.57337	5.319704

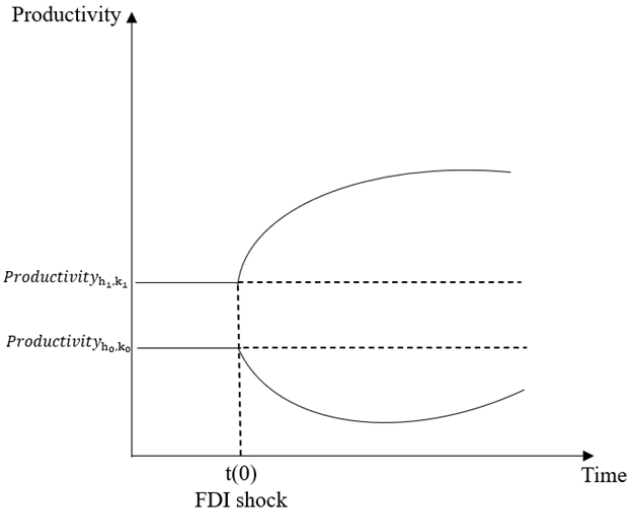
Note: The Table 1 shows basic summary statistics about the main variables included in the paper.

The FDI variable is extracted from the World Bank databank, which is in percentage to the GDP of each country and is the investment flows entering the economy, which is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital. In the case of high-income countries, the average FDI for high-income countries is four times more than the average FDI of middle- and low-income countries. And it is double the average FDI of our sample of countries. The aggregate productivity that I use in this paper is Total Factor Productivity (TFP) which is prepared by the Penn World Table and is the classic aggregate productivity measure when studying these fields; there is a difference between high-income and middle-income countries are 0.23. In contrast, that between high-income and low-income countries is more than double. The other two main variables in our paper are Capital Stock and Human Capital, extracted from the Penn World Table V9.1. The Capital Stock is measured as the investment for four assets: structures (including residential and non-residential), machinery (including computers, communication equipment, and other machinery), transport equipment, and other assets (including software, other intellectual property products, and cultivated assets).

The Human Capital variable is based on the average years of schooling from Barro and Lee (2013) and an assumed rate of return to education based on Mincer equation estimates around the world, see Psacharopoulos (1994). The Capital Stock in high-income countries is 18 times higher than the average in low-income countries and two times more for middle-income countries. Human capital in high-income countries is higher than in middle- and low-income countries, but the difference is more significant concerning the latter group.

Additional variables I add to the models to account for country-specific differences in the levels are GDP per capita, population, broad money, inflation, and public debt. This type of modeling that includes capital stock and human capital is well-documented in endogenous growth literature; see Lucas (1990) and Barro (2001). Theoretically, these differentiated impacts are reported in Figure 2, which shows an FDI shock based on the initial levels of capital endowments and human capital.

Figure 2: Theoretical shock considering different productivity levels.



Own elaboration

Where h_1 is the level of human capital of country 1, k_1 is the stock of accumulated capital of country 1 and $productivity_1$ is the level of productivity of country 1 subject to its level of human capital and stock of accumulated capital, while in its counterpart h_0 is the level of human capital of country 0, k_1 is the stock of accumulated capital of country 0, and $productivity_0$ is the level of productivity of country 0 subject to its level of human capital and stock of accumulated capital. From the figure it can be understood that $h_1 > h_0, k_1 > k_0$ and $productivity_1 > productivity_0$.

Once the FDI shock occurs, I can notice that the gap between the productivities of these two countries with different initial endowments increases; this is because the countries that have received an FDI shock with a high R&D burden have been the countries with higher initial endowments, and therefore productivity has increased while the countries with lower initial endowments, that have received an FDI shock but with low R&D burden, productivity has decreased or at best has continued as the dotted line, i.e., no change. Therefore, in this research, absorptive capacity is captured at the country level, considering all foreign investments made in each country and how these investments affect the aggregate productivity of a country.

Therefore, the results presented in the following section consider all the potential spillovers found at the level of individual firms in each country and are added, finding the net effect of all the investments made in that country in each period. Therefore, the following section presents the results.

4. Results

All the following tables present the dynamic relationship through a Panel VAR with System GMM estimator and consider two types of transformation to control possible correlation-serial and autocorrelation; those transformations are Forward Orthogonal Deviations (FOD) and First Difference (FD). Also, I include Hansen's J test to

check the validity of instruments and if these models meet the stability condition. Finally, each table presents the results by the two classifications; it is by income and financial development degree.

4.1. Results for all models

As mentioned in the previous section, I consider three models; the first model only considers the FDI, GDP per capita, and Population, as the independent variable. This model checks the linear relationship between FDI and Aggregate Productivity. The results of this model are presented in Table 4.

Table 4: Results considering the first model and TFP as Productivity Variable

Variables	All Countries		High Income		Middle Income		Low Income	
	FOD TFP	FD TFP	FOD TFP	FD TFP	FOD TFP	FD TFP	FOD TFP	FD TFP
$TFP_{i,t-1}$	1.18*** (9.88)	0.19*** (4.34)	1.06*** (16.21)	0.44*** (4.07)	1.20*** (32.13)	0.50*** (5.44)	1.15*** (17.65)	0.79*** (6.71)
$TFP_{i,t-2}$	-0.21*** (-5.93)	-0.03 (-0.9)	0.12 (1.84)	0.09 (1.41)	-0.32*** (-8.62)	-0.04 (-0.76)	-0.16* (-2.57)	-0.32*** (-3.96)
$FDI_{i,t-1}$	-0.03* (-2.29)	-0.01 (-0.56)	0.01 (0.69)	0.00 (0.07)	-0.39* (-2.51)	-1.53*** (-5.19)	-0.23* (-2.35)	-0.73*** (4.09)
$FDI_{i,t-2}$	-0.00 (-0.05)	-0.02 (-1.42)	-0.01 (-0.60)	0.01 (1.13)	0.40 (1.29)	0.24 (0.81)	-0.01 (-0.05)	0.79*** (4.1)
GDP_t	0.02 (1.52)	0.01 (0.08)	0.01 (0.49)	0.07 (0.75)	0.09*** (3.5)	0.33*** (3.69)	0.117 (1.93)	0.37** (3.15)
Pop_t	-0.05 (-1.12)	-0.41 (-1.09)	-0.05 (-0.76)	-0.67 (-1.59)	-0.27** (-3.18)	-1.18*** (-4.16)	0.17 (1.77)	-0.87*** (-3.91)
Instruments	34	34	34	34	50	34	42	34
Hansen's J *p*-value	0.011	0.160	0.234	0.349	0.466	0.197	0.679	0.19
Observations	3037	3037	1132	1132	1419	1419	430	430
Number of Panels	94	94	35	35	44	44	13	13
Stability Condition	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Variables	High Financial Development		Middle Financial Development		Low Financial Development	
	FOD TFP	FD TFP	FOD TFP	FD TFP	FOD TFP	FD TFP
$TFP_{i,t-1}$	1.15*** (26.31)	0.52*** (6.27)	1.14*** (20.98)	0.12* (1.98)	1.23*** (17.12)	0.62*** (3.92)
$TFP_{i,t-2}$	-0.21*** (-5.52)	-0.11* (-2.20)	-0.15** (-2.85)	0.07 (1.80)	-0.34*** (-4.68)	-0.26** (-2.68)
$FDI_{i,t-1}$	0.02* (2.54)	0.00 (0.30)	-0.08 (-1.47)	-0.07 (-1.58)	-1.34*** (-5.11)	-2.00*** (-6.30)
$FDI_{i,t-2}$	0.02* (-2.13)	0.02** (2.60)	0.22** (3.28)	-0.10* (-2.43)	0.20 (0.63)	-0.28 (-1.44)
$GDPi_{,t}$	0.01 (0.75)	0.27* (2.40)	0.022 (1.24)	0.126 (0.89)	0.0735 (1.29)	0.31* (2.07)
$Pop_{i,t}$	0.07 (1.04)	-1.51*** (-3.76)	-0.04 (-0.80)	-0.67 (-1.47)	-0.13 (-1.07)	-0.71* (-2.51)
Instruments	34	34	50	34	34	34
Hansen's J *p*-value	0.171	0.821	0.904	0.732	0.345	0.487
Observations	892	899	1340	1351	437	437
Number of Panels	51	50	76	76	36	35
Stability Condition	Yes	Yes	Yes	Yes	Yes	Yes

t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All variables in natural logarithm terms. The table shows the results of the regressions for FOD and FD of the first model that I consider TFP as productivity variable and include gdp

per capita and population. This table is divided by two classifications: First, income classification and second, financial development classification. To evaluate if the initials endowments affect the impacts of FDI on productivity I present the instruments used in the regressions, the *p*-value of the Hansen's J test for endogeneity, number of panels and stability condition.

From this first model, Table 4 shows that considering the all-countries columns, I find negative effects of the FDI on the TFP but only significant when considering FOD transformation. For the High-Income columns, I see positive but insignificant impacts for both transformations, and for middle and low-income, I find negative and significant effects of the FDI on TFP. Also, GDP per capita positively affects middle- and low-income countries.

Considering the High Financial Development columns, I find positive effects of the FDI on the TFP but only significant for FOD transformation; I find negative effects but not significant for Middle Financial Development countries, and strong negative effects for Low Financial Development Countries. GDP per capita positively impacts countries with high and low financial development but not countries with medium financial development. The Population has negative effects on these two types of countries as well. From Table 4, there are negative linear dynamic effects of FDI on aggregate productivity. Now, to check the relationships between FDI and aggregate productivity through the initial endowments of the capital stock and human capital, I include these variables in the model, and they are presented in Table 5.

Table 5: Results considering the second model and TFP as productivity variable

Variables	All Countries		High Income		Middle Income		Low Income	
	FOD TFP	FD TFP	FOD TFP	FD TFP	FOD TFP	FD TFP	FOD TFP	FD TFP
$\mathbf{TFP_{i,t-1}}$	1.16*** (25.60)	0.24*** (5.24)	1.21*** (13.70)	0.32*** (5.95)	1.34*** (24.06)	0.41*** (7.00)	1.03*** (43.13)	0.10 (1.91)
$\mathbf{TFP_{i,t-2}}$	-0.28*** (-8.44)	-0.07* (-2.29)	-0.44*** (-5.85)	0.03 (0.82)	-0.40*** (-8.16)	-0.12** (-3.28)	-0.46*** (-20.68)	-0.01 (-0.14)
$\mathbf{FDI_{i,t-1}}$	-0.20*** (3.43)	-0.13*** (-5.34)	0.04* (2.50)	0.01* (-2.01)	1.46** (3.22)	0.98*** (6.40)	-0.08* (-2.23)	-0.53*** (-3.69)
$\mathbf{FDI_{i,t-2}}$	0.59*** (10.22)	0.03 (1.71)	-0.14*** (-8.01)	-0.01* -2.27)	-1.01*** (-5.09)	-0.64*** (-3.75)	-0.35*** (-8.82)	-0.83*** (-3.79)
$\mathbf{Capital\ Stock_{i,t-1}}$	0.44** (2.98)	1.18*** (5.35)	0.26 (0.86)	0.12 (0.37)	0.80*** (5.53)	0.16 (0.68)	0.99*** (8.55)	1.86** (3.14)
$\mathbf{Capital\ Stock_{i,t-2}}$	0.35* (2.40)	-1.49*** (-7.14)	-0.39 (-1.36)	-1.22*** (-4.16)	0.74*** (5.26)	0.54* (2.49)	-1.04*** (-9.11)	-2.39*** (-4.19)
$\mathbf{Human\ Capital_{i,t-1}}$	1.24 (1.95)	1.60 (1.43)	2.31* (2.04)	4.43*** (3.58)	0.92 (1.66)	0.99 (1.31)	1.66* (2.25)	4.36 (1.61)
$\mathbf{Human\ Capital_{i,t-2}}$	-1.31* (-2.25)	-2.27* (-2.08)	-2.08* (-2.02)	-3.09** (-2.63)	-0.86 (-1.67)	-1.56* (-2.07)	-4.36*** (-6.14)	-7.15* (-2.57)
$\mathbf{GDP_{i,t}}$	0.10*** (5.71)	0.50*** (8.86)	0.08** (3.00)	0.52*** (8.99)	0.07*** (3.94)	0.59*** (11.75)	0.21*** (10.42)	1.19*** (8.56)
$\mathbf{Pop_{i,t}}$	-0.01 (-0.18)	-0.62*** (-3.64)	-0.11 (-1.69)	-0.82* (2.51)	-0.06 (-1.30)	-0.61** (-2.86)	-0.38*** (-8.20)	-0.66* (-2.25)
Instruments	66	66	38	66	38	66	98	26
Hansen's J *p*-value	0.14	0.41	0.22	0.133	0.568	0.12	0.373	0.5
Observations	3037	3037	1132	1132	1419	1419	430	430
Number of Panels	94	94	35	35	44	44	13	13
Stability Condition	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Variables	High Financial Development		Middle Financial Development		Low Financial Development	
	FOD TFP	FD TFP	FOD TFP	FD TFP	FOD TFP	FD TFP
$\mathbf{TFP_{i,t-1}}$	1.22*** (22.36)	0.32*** (6.99)	1.30*** (23.46)	0.45*** (8.32)	0.93*** (12.18)	0.34*** (20.3)
$\mathbf{TFP_{i,t-2}}$	-0.34*** (-7.98)	-0.09** (-2.61)	-0.30*** (-6.74)	-0.26*** (-6.23)	-0.28*** (-4.68)	-0.32*** (-26.02)
$\mathbf{FDI_{i,t-1}}$	0.00 (0.20)	0.04*** (4.88)	1.20*** (4.42)	0.52*** (10.77)	-0.897 (1.81)	-1.69*** (-53.34)
$\mathbf{FDI_{i,t-2}}$	-0.09*** (-10.08)	0.01 (0.78)	-0.75*** (-5.09)	-0.91*** (-14.47)	-0.51** (-2.76)	-0.05* (-2.06)
$\mathbf{Capital\ Stock_{i,t-1}}$	0.46** (2.90)	1.96*** (5.58)	-1.07*** (-4.13)	-0.92*** (-3.87)	-0.73* (-2.31)	-0.15* (-2.07)
$\mathbf{Capital\ Stock_{i,t-2}}$	0.42** (2.71)	-2.31*** (-6.63)	0.95*** (3.87)	-1.11*** (-5.16)	0.60 (1.91)	-0.61*** (-7.72)
$\mathbf{Human\ Capital_{i,t-1}}$	0.153 (0.26)	2.72*** (3.36)	3.66*** (4.08)	1.572 (1.20)	6.88** (2.99)	4.57*** (15.04)
$\mathbf{Human\ Capital_{i,t-2}}$	0.20 (0.36)	2.11** (2.72)	-3.45*** (-4.16)	-2.15 (-1.63)	-7.31*** (-3.50)	-7.15*** (-23.00)
$\mathbf{GDP_{i,t}}$	0.04 (1.80)	0.37*** (6.68)	0.05** (2.82)	0.45*** (8.29)	0.36*** (5.32)	0.77*** (43.11)
$\mathbf{Pop_{i,t}}$	-0.03 (-0.47)	-0.08 (-0.26)	-0.06 (1.46)	-0.77*** (-3.93)	-0.31** (-3.14)	-0.05 (0.47)
Instruments	66	66	66	82	34	82
Hansen's J *p*-value	0.449	0.584	0.518	0.527	0.854	0.595
Observations	892	892	1340	1351	437	437
Number of Panels	51	51	76	76	36	35
Stability Condition	Yes	Yes	Yes	Yes	Yes	Yes

t statistics in parentheses. * p < 0.05, ** p < 0.01, *** p < 0.001. All variables in natural logarithm terms. The table shows the results of the regressions for FOD and FD of the second model that I consider TFP as productivity variable and include capital stock, human capital, gdp per capita and population. This table is divided by two classifications: Frist, income classification and second, financial development classification. To evaluate if the initials endowments affect the impacts of FDI on productivity I present the instruments used in the regressions, the p-value of the Hansen's J test for endogeneity, number of panels and stability condition.

Once I add the capital stock and human capital in the second model, I can see from Table 5 that there is a strong significance in the effects of FDI on productivity; considering the columns of all countries, I find negative effects and Significant for both FDI transformations on productivity, I also find positive effects of FDI on productivity for high-income countries, and negative and significant effects for low- and middle-income countries. Capital stock has positive effects for all classifications and all countries, while human capital only has positive effects for high-income countries. GDP Per capita positively affects all income groups, including all countries; the Population has negative effects for all countries and all income groups.

Considering the classification by degree of financial development, there are positive effects of FDI on productivity for countries with high and medium financial development, while negative for countries with low financial development. Likewise, capital stock has positive effects for countries with high financial development while negative for countries with medium and low financial development; human capital has a positive and significant impact on all degrees of financial development and GDP per capita. Once I control the dynamics of the FDI through human capital and capital stock, I add the additional macroeconomic variables presented in the third model; the results of these estimates are shown in Table 6.

Table 6: Results considering the third model

Variables	All Countries		High Income		Middle Income		Low Income	
	FOD TFP	FD TFP	FOD TFP	FD TFP	FOD TFP	FD TFP	FOD TFP	FD TFP
$TFP_{i,t-1}$	0.98*** (16.86)	0.37*** (4.58)	0.75*** (3.99)	-0.03 (-0.29)	1.34*** (16.96)	-0.04 (-0.58)	1.19*** (60.76)	0.11*** (4.69)
$TFP_{i,t-2}$	-0.17*** (-3.79)	0.07 (1.88)	0.14 (0.93)	0.24 (1.55)	-0.49*** (-6.25)	0.12* (2.43)	-0.12*** (-6.70)	0.12*** (6.66)
$FDI_{i,t-1}$	0.61*** (4.74)	0.34*** (5.74)	0.06** (2.63)	0.07* (2.07)	-0.97*** (-5.81)	-0.67** (-3.25)	-0.57*** (-17.50)	-0.73*** (-26.46)
$FDI_{i,t-2}$	-0.38*** (-4.71)	-0.08 (-1.65)	-0.02 (-0.22)	0.00 (0.05)	0.07 (0.60)	0.68** (3.04)	0.92*** (20.68)	0.39*** (11.42)
$Capital\ Stock_{i,t-1}$	0.83** (2.67)	1.71*** (5.33)	1.61 (0.92)	0.76 (0.78)	0.41 (1.04)	0.19 (0.52)	0.05 (0.85)	2.51*** (23.75)
$Capital\ Stock_{i,t-2}$	0.87** (2.85)	1.38*** (4.48)	-1.69 (-0.99)	0.50 (0.53)	-0.44 (-1.16)	-0.43 (-1.24)	0.19** (3.26)	-2.77*** (-28.74)
$Human\ Capital_{i,t-1}$	0.87 (0.95)	2.59 (1.75)	8.10 (1.33)	9.70 (1.85)	-3.36*** (-4.38)	-0.22 (-0.21)	-4.94*** (-7.00)	14.36*** (10.71)
$Human\ Capital_{i,t-2}$	0.67 (0.78)	-2.92* (-1.99)	-7.50 (-1.37)	-8.29 (-1.62)	3.29*** (4.73)	0.86 (0.79)	4.19*** (5.89)	-15.14*** (-11.39)
$GDP_{i,t}$	0.11*** (4.91)	0.33*** (5.60)	0.00 (0.05)	0.12 (0.60)	0.07* (2.27)	0.94*** (7.33)	0.27*** (13.11)	0.20*** (4.56)
$Pop_{i,t}$	-0.24*** (-4.80)	-0.10 (-0.43)	-0.06 (-0.34)	-1.26 (-1.45)	-0.21*** (-4.08)	-0.98* (-2.31)	-0.23*** (-4.21)	-0.26 (-1.35)
$Money_{i,t}$	0.02 (1.10)	0.22*** (3.37)	0.07 (0.95)	0.42* (2.32)	0.02 (1.03)	0.56*** (5.16)	0.05*** (4.78)	0.23*** (14.13)
$Inflation_{i,t}$	-0.01 (-0.52)	-0.14 (-1.79)	-0.24* (-2.37)	-1.42 (-1.94)	-0.03 (-1.09)	-0.53*** (-4.24)	-0.15*** (-11.49)	-0.02 (-0.47)
$Debt_{i,t}$	-0.01 (-0.85)	-0.09** (-3.17)	0.04 (1.03)	-0.13* (-2.21)	-0.00 (0.17)	-0.10 (1.51)	-0.01 (-1.72)	-0.03* (-2.56)
Instruments	69	69	17	29	69	29	69	53
Hansen's J *p*-value	0.330	0.448	0.395	0.625	0.255	0.549	0.247	0.886
Observations	1628	1628	492	492	868	868	230	230
Number of Panels	76	76	19	19	42	42	13	13
Stability Condition	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Variables	High Financial Development		Middle Financial Development		Low Financial Development	
	FOD TFP	FD TFP	FOD TFP	FD TFP	FOD TFP	FD TFP
$TFP_{i,t-1}$	0.48* (2.09)	0.03 (0.44)	0.95*** (11.48)	0.60*** (18.61)	0.99*** (61.29)	0.37*** (6.35)
$TFP_{i,t-2}$	-0.16 (-1.57)	0.17* (1.99)	-0.01 (-0.09)	-0.01 (-0.25)	-0.27*** (-20.28)	-0.21*** (-5.59)
$FDI_{i,t-1}$	0.08 (0.65)	0.52*** (6.92)	-0.03 (-0.44)	-0.50*** (-10.13)	-2.39*** (-58.16)	-1.04*** (-8.95)
$FDI_{i,t-2}$	0.01 (0.13)	0.03 (0.41)	0.00 (0.06)	0.37*** (4.90)	1.99*** (49.21)	1.24*** (12.53)
$Capital\ Stock_{i,t-1}$	1.02 (1.24)	3.72*** (3.80)	-0.37 (-1.01)	-0.90*** (-4.06)	-0.23*** (-3.36)	-1.19*** (-5.21)
$Capital\ Stock_{i,t-2}$	-1.09 (-1.38)	-3.79*** (-4.07)	0.30 (0.84)	0.64** (3.10)	0.13 (1.82)	1.00*** (4.23)
$Human\ Capital_{i,t-1}$	-8.98** (-2.58)	-11.00 (-1.12)	-0.68 (0.82)	-6.35*** (-5.38)	2.86*** (8.79)	2.74*** (4.33)
$Human\ Capital_{i,t-2}$	7.92* (2.47)	9.46 (1.00)	-0.74 (-0.94)	6.29*** (5.21)	-3.15*** (-10.29)	-2.65*** (-4.52)
$GDP_{i,t}$	0.41** (3.04)	0.16 (1.67)	0.09*** (3.38)	0.07 (1.03)	0.20*** (21.28)	0.66*** (11.18)
$Pop_{i,t}$	-0.73* (-2.24)	1.26* (2.49)	-0.01 (-0.12)	0.22 (0.93)	-0.35*** (-25.53)	-0.60* (-2.50)
$Money_{i,t}$	-0.13** (-2.61)	-0.13 (-1.48)	-0.01 (-0.41)	0.19*** (4.04)	0.22*** (27.73)	0.34*** (11.83)
$Inflation_{i,t}$	0.36*** (4.60)	-0.94*** (-3.50)	-0.05 (-1.33)	-0.01 (-0.21)	-0.17*** (-17.80)	-0.48*** (-9.60)
$Debt_{i,t}$	-0.07* (-2.25)	0.16*** (3.31)	-0.03** (-2.93)	-0.06* (-2.05)	-0.01** (-2.86)	-0.07*** (-3.55)
Instruments	17	41	17	41	69	41
Hansen's J *p*-value	0.3	0.51	0.307	0.036	0.398	0.469
Observations	494	499	842	842	284	284
Number of Panels	30	30	60	60	27	26
Stability Condition	Yes	Yes	Yes	Yes	Yes	Yes

t statistics in parentheses, t statistics in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, All variables in natural logarithm terms. The table shows the results of the regressions for FOD and FD of the third model including GDP, Population, Money, Inflation and Debt This table is divided by two classifications: First, income classification and second, financial development classification. To evaluate if the initials endowments affect the impacts of FDI on productivity I present the instruments used in the regressions, the *p*-value of the Hansen's J test for endogeneity, number of panels and stability condition.

The third model allows us to control the aggregate effects of the FDI on productivity through human capital and capital stock and the macroeconomic conditions that countries are in, measured through GDP per capita, inflation, money supply, and public debt.

The results in Table 6 show that the FDI has a positive and significant impact for all countries, however negative and significant for low- and middle-income countries while positive and significant for high-income countries. Capital Stock positively impacts all countries, while human capital negatively impacts low- and middle-income countries. GDP Per capita has positive impacts for all countries and all income groups, while Population has significant negative impacts only for low- and middle-income countries. The money supply has positive and significant effects on all income groups, and inflation has negative and significant effects on all income groups, as does the public debt.

5. Conclusions and limitations

The world has undergone a period of divergence of FDI and productivity; I can observe that a large portion of FDI has gone to high-income countries as aggregate productivity has increased, while a minor part to middle- and low-income countries and their productivity has remained relatively stagnant. In this paper, I analyze whether this divergence of FDI flows has been allowed to influence the variations in aggregate productivity across countries.

The theory I develop in this research is that the type of FDI that has flowed to low and middle-income countries has not significantly affected aggregate productivity in these countries due to the pre-established conditions in these countries, i.e., These low-income countries tend to have less human capital and infrastructure translated into capital stock, which means that the multinationals that arrive do not need to set up a technology industry that ends up impacting the country's productivity through spillovers, but rather their investments are related to mechanizing industrial processes. On the other hand, the opposite can be observed in countries with high human capital and infrastructure, such as the United States, where they invest in sizeable technological development centers because they have the human capital and infrastructure to develop technology, which allows them to increase their aggregate productivity.

To estimate the effects of the FDI on aggregate productivity, the hypothesis that the endogenous growth literature follows is proposed, which is that the impact of the FDI will depend on the initial endowments of a country. One of the contributions of this paper is that I consider an approach to international trade that amounts to absorption capacity, which is usually used at the company level, but at the country level, that is, the decisions made by all foreign firms. When investing in each country for a given period, they will be made based on the initial levels of the capital stock and human capital. The aggregate of investments will depend on how much that country can absorb according to its capacity. If a country has high levels of capital stock and human capital, as high-income countries tend to, these countries will have positive impacts in aggregate terms of all foreign investments made. In contrast, if a country has Low levels of capital stock and low levels of human capital, as low-income countries tend to, these countries will have fewer positive impacts than high-income countries or even negative impacts.

The results I find from the estimates made with a Panel VAR is that the FDI directly affects aggregate productivity, measured through the TFP. Considering the entire sample of countries, I find positive effects of the FDI on these variables; that is, at the global level, the FDI has tended to increase aggregate productivity; however, when I analyze these effects through two types of classification, such as classification by income and degree of financial development. The FDI positively impacts the aggregate productivity of high-income countries and countries of high financial grade, while negative for countries of medium and low income and medium and low financial development.

These results are even more robust when I add the channels of human capital, capital stock, and other macroeconomic variables. Therefore, these results allow us to validate the hypothesis raised in this paper. Those findings are important for policymakers because they could distinguish and permit what kind of FDI enters the hosted country considering its initial endowments. Those findings are related to recent works, but the main difference with those papers is that I develop possible explanations considering absorptive capacity and the decision of the Multinational Firm to make the FDI on the countries regarding the initial endowments.

The policy implications of this paper are that to attract quality foreign investment that promotes aggregate productivity in emerging (low and middle-income) countries; governments need to implement public policies that encourage infrastructure and human capital development so that foreign firms do not have a high opportunity cost when deciding what type of investment to make. The more human capital and infrastructure development a country has, the more likely it is that FDI will be of the technological kind and positively affect productivity.

Finally, this paper suffers from two main limitations. The first one is that using aggregate productivity might be overestimating the FDI's effects because the FDI that a country receives may be concentrated for specific industries. The second limitation implies that the FDI overestimates the activity that the multinational companies are currently doing in tax haven countries relative to non-tax haven countries.

Acknowledgements

The author would like to thank the anonymous referees and the associate editor for the comments that have significantly improved the paper.

References

Abdullah, M., & Chowdhury, M. (2020). Foreign direct investment and total factor productivity: Any nexus? Margin: The Journal of Applied Economic Research, 14(2), 164–190. https://doi.org/10.1177/0973801020904473

Adelman, I. (1999). Lessons from South Korea. Zagreb International Review of Economics & Business, 2(2): 57--71.

Aitken, B. J., & Harrison, A. E. (1999). Do domestic firms benefit from direct foreign investment? Evidence from Venezuela. American Economic Review, 89(3), 605–618.

Alfaro, L., Chanda, A., Kalemli-Ozcan, S., & Sayek, S. (2004). FDI and economic growth: The role of local financial markets. Journal of International Economics, 64(1), 89–112. https://doi.org/10.1016/S0022-1996(03)00081-3.

Alfaro, L., Kalemli-Ozcan, S., & Sayek, S. (2009). FDI, productivity and financial development. World Economy, 32(1), 111–135. https://doi.org/10.1111/j.1467-9701.2009.01159.x

Arellano, M., & Bover, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Review of Economic Studies, 58(2), 227-297. https://doi.org/10.2307/2297968

Arvin, M. B., Pradhan, R. P., & Nair, M. (2021). Uncovering interlinks among ICT connectivity and penetration, trade openness, foreign direct investment, and economic growth: The case of the G-20 countries. Telematics and Informatics, 60, 101567. https://doi.org/10.1016/j.tele.2021.101567

Asongu, S., Akpan, U. S., & Isihak, S. R. (2018). Determinants of foreign direct investment in fast-growing economies: Evidence from the BRICS and MINT countries. Financial Innovation, 4(1). https://doi.org/10.1186/s40854-018-0114-0

Baltagi, B. (2008). Econometric analysis of panel data. Wiley, Chichester.

Barro, R. J. (2001). Human Capital and Growth. American Economic Review, 91(2), 12–17. doi:10.1257/aer.91.2.12

Barro, R. J., & Lee, J. W. (2013). A new data set of educational attainment in the world, 1950–2010. Journal of Development Economics, 104, 184–198. doi:10.1016/j.jdeveco.2012.10.001

Barros, M. V., Ferreira, M. B., do Prado, G. F., Piekarski, C. M., & Picinin, C. T. (2020). The interaction between knowledge management and technology transfer: A current literature review between 2013 and 2018. The Journal of Technology Transfer, 45(5), 1585–1606. https://doi.org/10.1007/s10961-020-09782-w

Belderbos, R., Van Roy, V., & Sleuwaegen, L. (2020). Does trade participation limit domestic firms' productivity gains from inward foreign direct investment? Eurasian Business Review, 11(1), 83–109. https://doi.org/10.1007/s40821-020-00175-5

Bermejo Carbonell, J., & Werner, R. A. (2018). Does foreign direct investment generate economic growth? A new empirical approach applied to Spain. Economic Geography, 94(4), 425–456. https://doi.org/10.1080/00130095.2017.1393312

Beugelsdijk, S., Hennart, J. F., Slangen, A., & Smeets, R. (2010). Why and how FDI stocks are a biased measure of MNE affiliate activity. Journal of International Business Studies, 41, 1444–1459. https://doi.org/10.1057/jibs.2010.29

Blomstrom, M., Lipsey, R., & Zejan, M. (1994). What explains developing country growth? In Ed. W.illiam Baumol, R.ichard Nelson, &and E.dward Wofl (Eds.), Convergence and productivity: Gross-national studies and historical evidence. Oxford: Oxford University Press.

Blundell, R., & Bond, S. (1995). Initial conditions and moment restrictions in dynamic panel data models. Working Paper Series. doi:10.1920/wp.ifs.1995.9517

Borensztein, E., De Gregorio, J., & Lee, J.-W. (1998). How does foreign direct investment affect economic growth? Journal of International Economics, 45(1), 115–135. https://doi.org/10.1016/S0022-1996(97)00033-0

Boyd, J. & Smith, B. (1992). Intermediation and the equilibrium allocation of investment capital: Implications for economic development. Journal of Monetary Economics, 30: 409–4-32. https://doi.org/10.1016/0304-3932(92)90004-L

Bruhn, N. C. P., & Calegario, C. L. L. (2014). Productivity spillovers from foreign direct investment in the Brazilian processing industry. BAR -- Brazilian Administration Review, 11(1), 22–46. https://doi.org/10.1590/S1807-76922014000100003

Buckley, P. J., Wang, C., & Clegg, J. (2010). The impact of foreign ownership, local ownership and industry characteristics on spillover benefits from foreign direct investment in China. In Foreign direct investment, China and the world economy, (pp. 305–326). Palgrave Macmillan. https://doi.org/10.1057/9780230248328_14

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation., Administrative Science Quarterly, 35, 128--152. https://doi.org/10.2307/2393553

Crescenzi, R., Gagliardi, L., & Iammarino, S. (2015). Foreign multinationals and domestic innovation: Intra-industry effects and firm heterogeneity. Research Policy, 44(3), 596–609. https://doi.org/10.1016/j.respol.2014.12.009

Damijan, J. P., Knell, M., Majcen, B., & Rojec, M. (2003). The role of FDI, R&D accumulation and trade in transferring technology to transition countries: Evidence from firm panel data for eight transition countries. Economic Systems, 27(2), 189–204.

Djankov, S., & Hoekman, B. (2000). Foreign investment and productivity growth in Czech enterprises. The World Bank Economic Review, 14(1), 49–64.

Evenson, R. E., & Westphal, L. E. (1995). Technological change and technology strategy., In: J. Behrman &and T. N. Srinivasan, (Eds.), Handbook of development economics, (Vol. 3). (Elsevier, Amsterdam). https://doi.org/10.1016/S1573-4471(05)80009-9

Fosfuri, A., Motta, M., & Rønde, T. (2001). Foreign direct investment and spillovers through workers' mobility. Journal of International Economics, 53(1), 205–222.

Girma, S., Greenaway, D., & Wakelin, K. (2001). Who benefits from foreign direct investment in the UK? Scottish Journal of Political Economy, 48(2), 119–133.

Glaister, K. W., & Buckley, P. J. (1999). Performance relationships in UK international alliances. Management International Review, 39(, 2), 123–147.

Globerman, S. (1979). Foreign direct investment and spillover efficiency benefits in Canadian manufacturing industries. The Canadian Journal of Economics, 12(1), 42–56.

Görg, H., & Greenaway, D. (2004). Much ado about nothing? Do domestic firms really benefit from foreign direct investment? The World Bank Research Observer, 19(2), 171–197. https://doi.org/10.1093/wbro/lkh019

Grimpe, C., & Sofka, W. (2009). Search patterns and absorptive capacity: Low- and high-technology sectors in European countries. Research Policy, 38(3), 495–506. https://doi.org/10.1016/j.respol.2008.10.006

Hayakawa, K. (2009). First difference or forward orthogonal deviations: Which transformation should be used in dynamic panel data models? A simulation study. Economics Bulletin, 29(3), 2008--2017.

Herzer, D. (2012). How Does Foreign Direct Investment Really Affect Developing Countries' Growth?. Review of International Economics 20(2): 396-414.

Herzer, D. (2012). How does foreign direct investment really affect developing countries' growth? Review of International Economics, 20(2), 396–414. https://doi.org/10.1111/j.1467-9396.2012.01029.x

Herzer, D., Klasen, S., & Nowak-Lehmann, F. D. (2008). In search of FDI-led growth in developing countries: The way forward. Economic Modelling, 25(5), 793–810. https://doi.org/10.1016/j.econmod.2007.11.005

Hu, A. G., & Jefferson, G. H. (2002). FDI impact and spillover: Evidence from China's electronic and textile industries. World Economy, 25(8), 1063–1076.

Iamsiraroj, S., & Ulubaşoğlu, M. A. (2015). Foreign direct investment and economic growth: A real relationship or wishful thinking? Economic Modelling, 51, 200–213. https://doi.org/10.1016/j.econmod.2015.08.009

Jasimuddin, S. M., Li, J., & Perdikis, N. (2019). An empirical study of the role of knowledge characteristics and tools on knowledge transfer in China-based multinationals. Journal of Global Information Management, 27(1), 165–195. https://doi.org/10.4018/JGIM.2019010109

Javorick, B. (2004) Does foreign direct investment increase the productivity of domestic frms? In search of spillovers through backward linkages. Am Econ Rev l.94:605–627

Karimi, M. S., Yusop, Z., Hook, L. S., & Chin, L. (2013). Effect of human capital on foreign direct investment inflows. Journal of Economic Research, 18(1), 79–179. https://doi.org/10.17256/jer.2013.18.1.004

Kathuria, V. (2000). Productivity spillovers from technology transfer to Indian manufacturing firms. Journal of International Development, 12(3), 343–369.

Kim, K., & Leipziger, D. (1997). Korea: A case of government-led development. In D. Leipziger (Ed.), Lessons from East Asia. Ann Arbor: University of Michigan Press. https://doi.org/10.3998/mpub.14389

Kokko, A. (1994). Technology, market characteristics, and spillovers. Journal of Development Economics, 43(2), 279–293.

Kose, M., Prasad, E. S., & Terrones, M. E. (2009). Does openness to international financial flows raise productivity growth? Journal of International Money and Finance, 28(4), 554–580. doi:10.1016/j.jimonfin.2009.01.005

Laborda Castillo, L., Sotelsek Salem, D., & Moreno, J. D. J. (2014). Foreign direct investment and productivity spillovers: Firm-level evidence from Chilean industrial sector. Latin American Business Review, 15(2), 93–122.

Li, C., & Tanna, S. (2019). The impact of foreign direct investment on productivity: New evidence for developing countries. Economic Modelling, 80, 453–466. doi:10.1016/j.econmod.2018.11.028

Lipsey, R., & Sjöholm, F. (2005). Host country impacts of inward FDI: Why such different answers?. In Moran, T., Graham, E. Blomstrom, M. (Eds.), Does foreign direct investment promote development (, 2005, chapter 2). Institute for International Economics.

Liu, Y. (2019). Promoting cross-border knowledge transfer for new product development in MNCs: a process view. The Journal of Technology Transfer, 44, 802–821. https://doi.org/10.1007/s10961-017-9612-x

Love, I., & Zicchino, L. (2006). Financial development and dynamic investment behavior: Evidence from panel VAR. The Quarterly Review of Economics and Finance, 46(2), 190–210. doi:10.1016/j.qref.2005.11.007

Lucas, R., (1990)., Why doesn't capital flow from rich to poor countries?, American Economic Review, 80, 92--96.

Mattoo, A., Olarreaga, M., & Saggi, K. (2004). Mode of foreign entry, technology transfer, and FDI policy. Journal of Development Economics, 75(1): 95– 111. https://doi.org/10.1016/j.jdeveco.2003.08.002

Mayer-Foulkes, D., & Nunnenkamp, P. (2009). Do multinational enterprises contribute to convergence or divergence? A disaggregated analysis of US FDI. Review of Development Economics, 13(2): 304–318. https://doi.org/10.1111/j.1467-9361.2009.00510.x

Mišun, J., & Tomšík, V. (2002). Foreign direct investment in Central Europe -- does it crowd in domestic investment? Prague Economic Papers, 11(1), 57–66. https://doi.org/10.18267/j.pep.188

Narula, R. (2002). Innovation systems and inertia in R&D location: Norwegian firms and the role of systemic lock-in. Research Policy, 31(5), 795-816. https://doi.org/10.1016/S0048-7333(01)00148-2

Nelson, R. R., & and Winter, S. G. (1982). An evolutionary theory of economic change. Harvard University Press., Cambridge, MA

Okwu, A. T., Oseni, I. O., & Obiakor, R. T. (2020). Does foreign direct investment enhance economic growth? Evidence from 30 leading global economies. Global Journal of Emerging Market Economies, 12(2), 217–230. https://doi.org/10.1177/0974910120919042

Osei, M. J., & Kim, J. (2020). Foreign direct investment and economic growth: Is more financial development better? Economic Modelling, 93, 154–161. https://doi.org/10.1016/j.econmod.2020.07.009

Ozturk, I. (2007). Foreign direct investment-growth nexus: A review of the recent literature. International Journal of Applied Econometrics and Quantitative Studies, 4(2), 79-98.

Pack, H., (1992)., Technology gaps between industrial and developing countries: Are there dividends for late comers? The World Bank Economic Review, Volume 6(, Issue suppl_ 1), December 1992, Pages 283–302., https://doi.org/10.1093/wber/6.suppl_1.283

Peres, M., Ameer, W., & Xu, H. (2018). The impact of institutional quality on foreign direct investment inflows: Evidence for developed and developing countries. Economic Research-Ekonomska Istraživanja, 31(1), 626-644. https://doi.org/10.1080/1331677X.2018.1438906

Phillips, R. F. (2019). Quantifying the advantages of forward orthogonal deviations for long time series. Computational Economics, 55(2), 653–672. https://doi.org/10.1007/s10614-019-09907-w

Pradhan, R. P., Arvin, M. B., Hall, J. H., & Bennett, S. E. (2018). Mobile telephony, economic growth, financial development, foreign direct investment, and imports of ICT goods: the case of the G-20 countries. Economia e Politica Industriale, 45(2), 279–310. https://doi.org/10.1007/s40812-017-0084-7

Pradhan, R., Arvin, M. B., Bahmani, S., & Hall, J. H. (2019). Attaining economic growth through financial development and foreign direct investment. Journal of Economic Studies, 46(6), 1201–1223. https://doi.org/10.1108/JES-04-2018-0136

Psacharopoulos, G. (1994). Returns to investment in education: A global update. World Development, 22(9), 1325–1343. doi:10.1016/0305-750x(94)90007-8

Rocha, F. (1999). Inter-firm technological cooperation: Effects of absorptive capacity, firm-size and specialization. Economics of Innovation and New Technology, 8(3), 253-271., https://doi.org/10.1080/10438599900000011

Rodrik, D., (1995)., Trade and industrial policy reform, Ch. 45 in J. Behrman &and T. N. Srinivasan, (Eds.), Handbook of development economics, (Vol. 3, pp. 2925–2982). (Elsevier, Amsterdam). https://doi.org/10.1016/S1573-4471(95)30022-8

Romer, P., (1993). Idea gaps and object gaps in economic development. Journal of Monetary Economics, 32, 543-573. https://doi.org/10.1016/0304-3932(93)90029-F

Roodman, D. (2009). How to do Xtabond2: An introduction to difference and system GMM in stata. The Stata Journal: Promoting Communications on Statistics and Stata, 9(1), 86–136. https://doi.org/10.1177/1536867X0900900106

Szkorupová, Z. (2015). Relationship between foreign direct investment and domestic investment in selected countries of Central and Eastern Europe. Procedia Economics and Finance, 23, 1017–1022. https://doi.org/10.1016/S2212-5671(15)00350-0

Titus, A., Olasunkanmi, I., & Tochukwu, R. (2020). Does foreign investment enhance economic growth? Evidence from 30 Leading Global Economies. Global Journal of Emerging Market Economies, 12(2), :217–230. https://doi.org/10.1177/0974910120919042

Wang, J. Y., & Blomström, M. (1992). Foreign investment and technology transfer: A simple model. European Economic Review, 36(1), 137–155

Xu, B. (2000). Multinational enterprises, technology diffusion, and host country productivity growth. Journal of Development Economics, 62(2): 477–493. https://doi.org/10.1016/S0304-3878(00)00093-6

Appendix

Table 7: Results considering the first model and GCI as productivity level

Variables	All Countries		High Income		Middle Income		Low Income	
	FOD GCI	FD GCI	FOD GCI	FD GCI	FOD GCI	FD GCI	FOD GCI	FD GCI
$GCI_{i,t-1}$	0.251 (1.65)	-0.01 (-0.08)	0.31 (1.41)	0.22*** (3.44)	0.63*** (5.87)	0.13 (1.92)	0.51* (2.52)	-0.05 (-0.41)
$GCI_{i,t-2}$	-0.11* (-1.99)	-0.19*** (-4.74)	-0.28** (-2.76)	-0.29*** (-5.27)	-0.06 (-0.80)	-0.16** (-2.62)	-0.05 (-0.46)	-0.27*** (-3.62)
$FDI_{i,t-1}$	-0.0145 (1.05)	-0.01*** (-3.96)	0.04** (2.73)	0.01** (2.82)	-0.29 (-1.70)	-0.73*** (-4.55)	-1.03*** (-3.82)	-0.57*** (-4.83)
$FDI_{i,t-2}$	-0.02* (-2.22)	-0.01*** (-3.56)	0.03*** (3.6)	0.00 (0.68)	-0.06 (0.42)	-0.46*** (-3.79)	-0.09 (0.56)	-0.23* (-2.01)
GDP_t	0.08 (1.62)	0.10** (2.81)	0.08* (2.33)	0.04 (0.97)	0.10*** (3.54)	0.17*** (3.45)	0.16 (1.75)	0.28** (2.81)
Pop_t	0.05 (0.3)	0.12 (1.01)	0.09 (0.84)	0.19 (1.56)	-0.18 (-1.61)	-0.24 (-1.10)	-0.32 (-1.51)	-0.33 (-1.29)
Instruments	18	18	18	18	18	18	18	18
Hanse's J p-value	0.593	0.580	0.303	0.17	0.155	0.524	0.181	0.181
Observations	751	749	266	266	335	334	139	138
Number of Panels	116	116	38	38	52	52	24	24
Stability Condition	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Variables	High Financial Development		Middle Financial Development		Low Financial Development	
	FOD GCI	FD GCI	FOD GCI	FD GCI	FOD GCI	FD GCI
$GCI_{i,t-1}$	0.53*** (3.63)	0.16* (2.49)	0.04 (0.24)	-0.06 (-1.08)	0.68*** (3.79)	0.05 (0.43)
$GCI_{i,t-2}$	-0.17 (-1.90)	-0.20*** (-3.47)	-0.20 (-1.69)	-0.07 (-1.28)	-0.02 (-0.20)	-0.26*** (-3.70)
$FDI_{i,t-1}$	0.03*** (3.94)	0.00 (1.00)	-0.03 (-1.09)	-0.02 (-0.84)	-0.62** (-2.73)	-0.27*** (-3.34)
$FDI_{i,t-2}$	0.02** (3.24)	0.00 (0.81)	0.07** (2.61)	0.08*** (4.25)	0.15 (1.36)	-0.05 (-0.46)
GDP_t	0.08 (1.61)	0.17*** (4.34)	0.14*** (4.16)	0.20*** (4.93)	0.12 (1.85)	0.27** (2.69)
Pop_t	-0.09 (-0.39)	-0.15 (-1.00)	-0.04 (-0.35)	-0.09 (-0.54)	-0.24* (-2.06)	-0.42* (-2.17)
Instruments	18	18	34	34	18	18
Hansen's J *p*-value	0.13	0.21	0.264	0.307	0.477	0.707
Observations	199	198	379	380	155	154
Number of Panels	35	34	69	69	31	31
Stability Condition	Yes	Yes	Yes	Yes	Yes	Yes

t statistics in parentheses, * p < 0.05, ** p < 0.01, *** p < 0.001, All variables in natural logarithm terms, the table shows the results of the regressions for FOD and FD of the first model that I consider GCI as productivity variable and include gdp per capita and population. This table is divided by two classifications: First, income classification and second, financial development classification. To evaluate if the initials endowments affect the impacts of FDI on productivity I present the instruments used in the regressions, the p-value of the Hansen's J test for endogeneity, number of panels and stability condition.

Table 8: Results considering the second model and GCI as productivity level

Variables	All Countries		High Income		Middle Income		Low Income	
	FOD GCI	FD GCI	FOD GCI	FD GCI	FOD GCI	FD GCI	FOD GCI	FD GCI
$GCI_{i,t-1}$	0.02	-0.21**	-0.19	-0.20*	0.46*	0.15*	-0.21	-0.02
	(0.17)	(-2.99)	(-0.72)	(-2.12)	(2.38)	(2.29)	(-1.56)	(-0.21)
$GCI_{i,t-2}$	-0.01	-0.24***	-0.27*	-0.36***	-0.10	-0.20***	-0.28***	-0.26***
	(-0.16)	(-5.23)	(-2.18)	(-5.34)	(-0.92)	(-3.61)	(-3.55)	(-6.31)
$FDI_{i,t-1}$	0.13***	0.01	0.05**	0.01***	-0.53	-1.45***	-0.13**	-0.16*
	(4.92)	(0.28)	(3.19)	(3.58)	(1.71)	(-6.02)	(-2.62)	(-2.18)
$FDI_{i,t-2}$	0.03*	-0.02***	0.05***	0.02***	0.79**	0.33*	0.17	0.73***
	(2.42)	(-3.36)	(4.89)	(7.25)	(2.97)	(2.20)	(1.87)	(4.03)
$Capital\ Stock_{i,t-1}$	0.09	0.07	1.51***	1.25***	-0.02	-0.10	-0.73**	-0.31***
	(0.25)	(0.70)	(5.41)	(6.36)	(-0.05)	(-0.66)	(-2.95)	(-4.14)
$Capital\ Stock_{i,t-2}$	0.00	0.14	-1.29***	-0.52*	0.05	0.16	0.50*	0.09
	(0.01)	(-1.20)	(-3.65)	(-2.47)	(0.14)	(1.35)	(2.11)	(1.29)
$Human\ Capital_{i,t-1}$	0.40	1.53	-21.38***	-13.02**	-0.68	-3.26***	-1.09	-2.06**
	(0.13)	(1.68)	(-4.52)	(-3.04)	(-0.30)	(-3.63)	(-0.66)	(-2.64)
$Human\ Capital_{i,t-2}$	0.10	-0.77	20.98***	11.69**	-0.79	-2.34**	0.89	2.28**
	(0.03)	(-0.87)	(4.36)	(2.67)	(-0.36)	(-2.75)	(0.56)	(3.17)
$GDP_{i,t}$	0.19***	0.21***	0.12***	0.20***	0.13**	0.11**	0.69***	0.60***
	(6.09)	(4.7)	(3.71)	(6.41)	(2.92)	(2.59)	(8.52)	(13.72)
$Pop_{i,t}$	-0.30	-0.43*	-0.04	-0.98***	-0.42	-0.63*	-0.52**	-0.66***
	(-1.29)	(-1.98)	(-0.15)	(-4.02)	(-1.57)	(-2.30)	(-3.24)	(-3.60)
Instruments	26	26	26	50	14	50	14	26
Hansen's J p-value	0.875	0.615	0.514	0.758	0.894	0.341	0.746	0.519
Observations	708	708	259	259	311	310	131	130
Number of Panels	106	106	37	37	46	46	22	22
Stability Condition	Yes	Yes	Yes	Not	Yes	Yes	Yes	Yes

Variables	High Financial Development		Middle Financial Development		Low Financial Development	
	FOD GCI	FD GCI	FOD GCI	FD GCI	FOD GCI	FD GCI
$GCI_{i,t-1}$	-0.13	-0.45***	-0.05	-0.36***	-0.10	-0.05
	(-0.55)	(-6.06)	(-0.24)	(-4.57)	(-0.54)	(-0.47)
$GCI_{i,t-2}$	-0.03	-0.27***	-0.21*	-0.10	-0.19**	-0.54***
	(-0.18)	(-5.06)	(-2.40)	(-1.61)	(-2.80)	(-5.70)
$FDI_{i,t-1}$	0.06**	0.00	-0.03	-0.07*	-0.38	-0.31***
	(2.70)	(1.37)	(-0.89)	(-2.47)	(-1.65)	(-3.76)
$FDI_{i,t-2}$	0.01	0.00*	0.00	0.08***	0.06	-0.25***
	(1.38)	(2.46)	(0.03)	(3.69)	(0.68)	(-4.30)
$Capital\ Stock_{i,t-1}$	0.56	1.25***	0.95***	0.58***	-1.16*	-0.42*
	(1.76)	(6.75)	(3.32)	(3.84)	(-2.21)	(-2.24)
$Capital\ Stock_{i,t-2}$	-0.69*	-1.24***	-0.82**	-0.53***	0.95	0.66***
	(-2.20)	(-6.94)	(-2.95)	(-3.36)	(1.86)	(3.55)
$Human\ Capital_{i,t-1}$	21.25***	16.43***	-2.73	-4.29*	-0.13	-1.15
	(4.93)	(3.82)	(-0.95)	(-2.33)	(-0.07)	(-0.79)
$Human\ Capital_{i,t-2}$	-20.24***	-16.09***	2.35	-4.10*	0.09	1.94
	(-4.91)	(-3.64)	(0.85)	(-2.29)	(0.05)	(1.33)
$GDP_{i,t}$	0.12	0.00	0.19***	0.23***	0.29***	0.45***
	(1.53)	(0.04)	(4.23)	(5.22)	(3.43)	(5.44)
$Pop_{i,t}$	-0.61**	-0.37	-0.24	-0.45	0.10	-1.36***
	(-2.83)	(1.86)	(-1.23)	(-1.95)	(0.53)	(-4.81)

Instruments	50	50	50	26	50	50
Hansen's J *p*-value	0.604	0.438	0.995	0.563	0.951	0.974
Observations	195	194	353	353	142	142
Number of Panels	34	34	62	62	28	28
Stability Condition	Yes	Not	Yes	Yes	Yes	Yes

t statistics in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, All variables in natural logarithm terms. The table shows the results of the regressions for FOD and FD of the second model that I consider GCI as productivity variable and include capital stock, human capital, gdp per capita and population. This table is divided by two classifications: Frist, income classification and second, financial development classification. To evaluate if the initials endowments affect the impacts of FDI on productivity I present the instruments used in the regressions, the p-value of the Hansen's J test for endogeneity, number of panels and stability condition.

Appendix 2

The annex 1 show the impulse-response graphs.

Figure 3: Impulse-Response Function considering all models for all the sample and TFP as Productivity variable

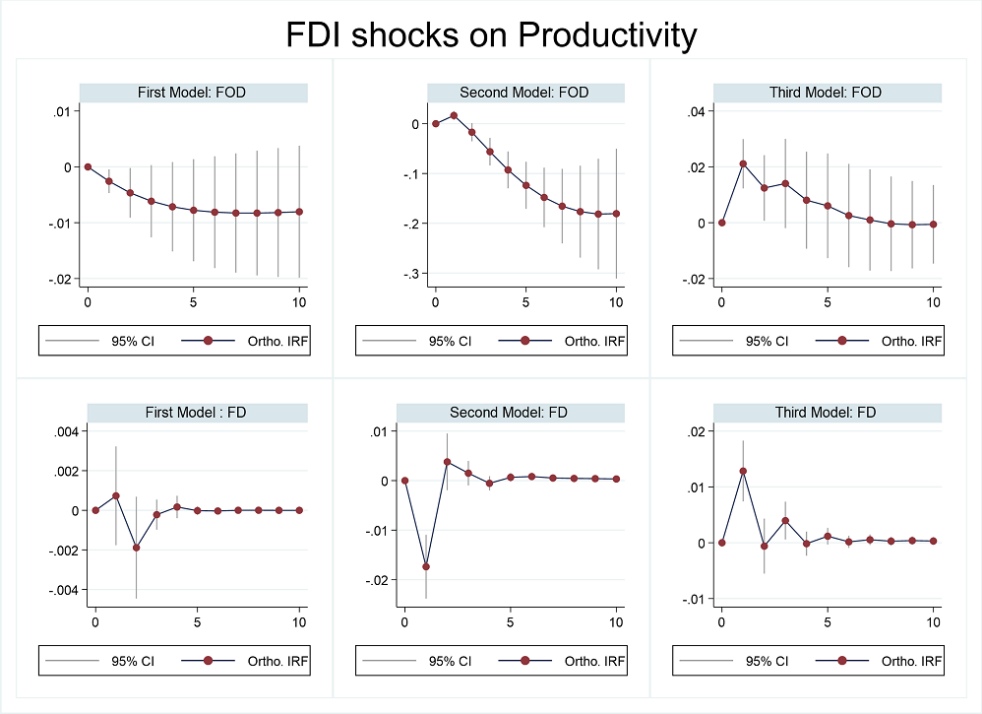


Figure 4: Impulse-Response Function considering all models for High Income Countries and TFP as Productivity variable

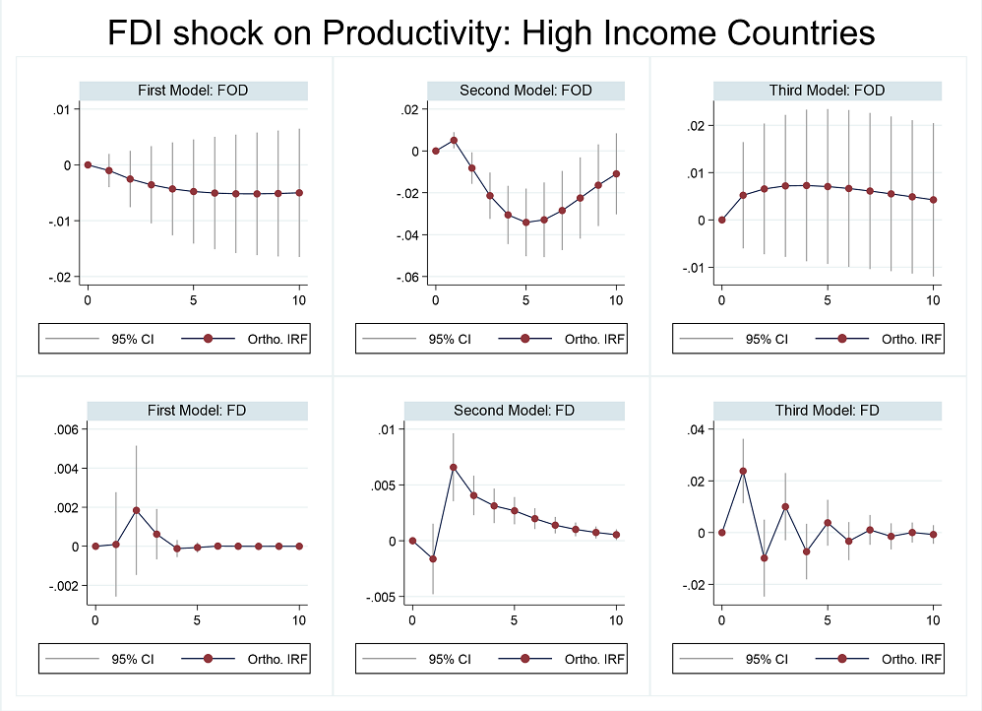


Figure 5: Impulse-Response Function considering all models for High Financial Development Countries and TFP as Productivity variable

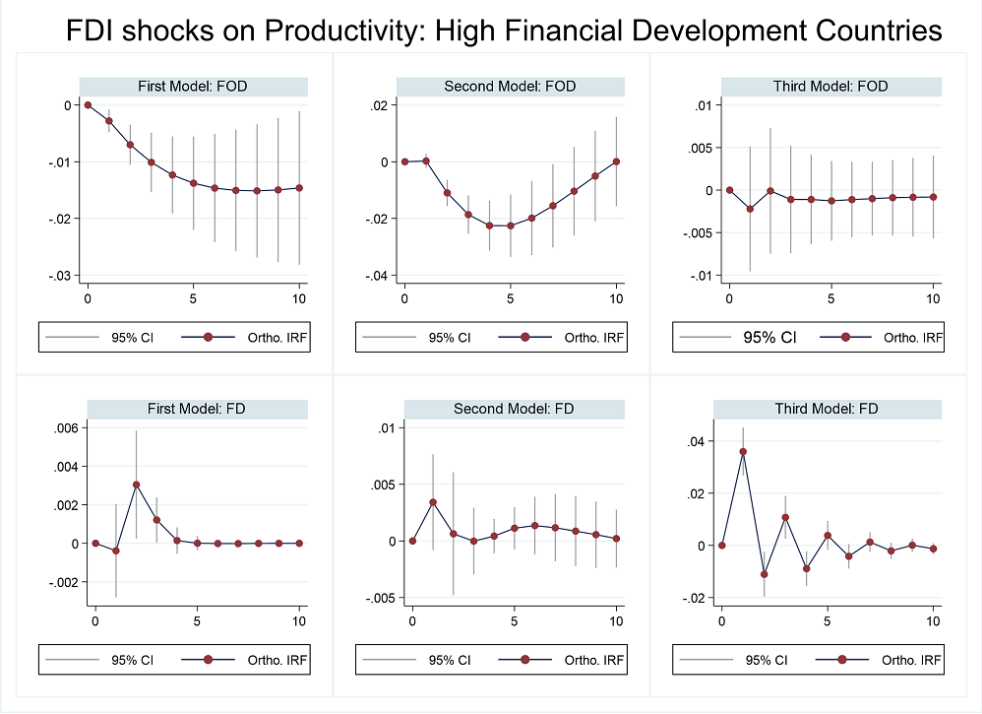


Figure 6: Impulse-Response Function considering all models, Middle Income Countries and TFP as Productivity variable

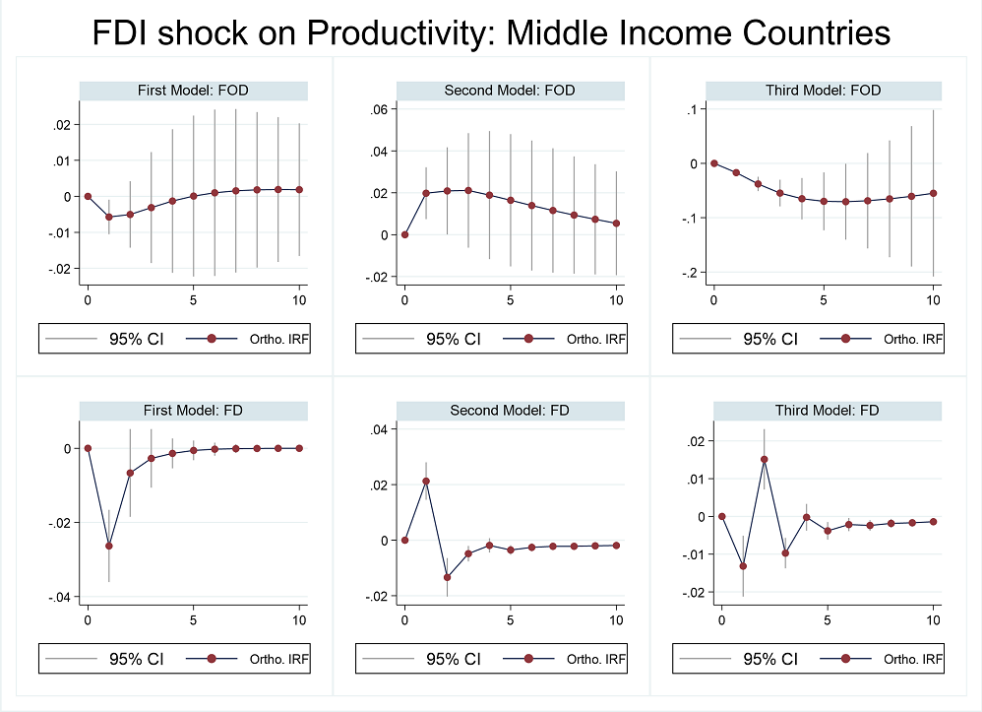


Figure 7: Impulse-Response Function considering all models for Middle Financial Development Countries and TFP as Productivity variable

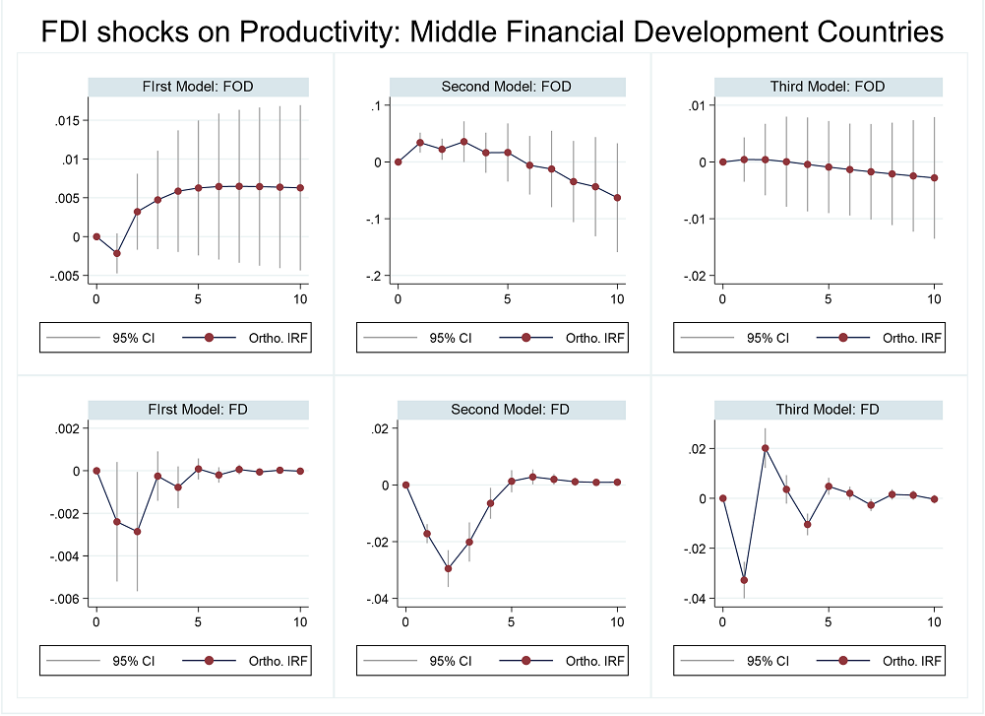


Figure 8: Impulse-Response Function considering all models, Low Income Countries and TFP as Productivity variable

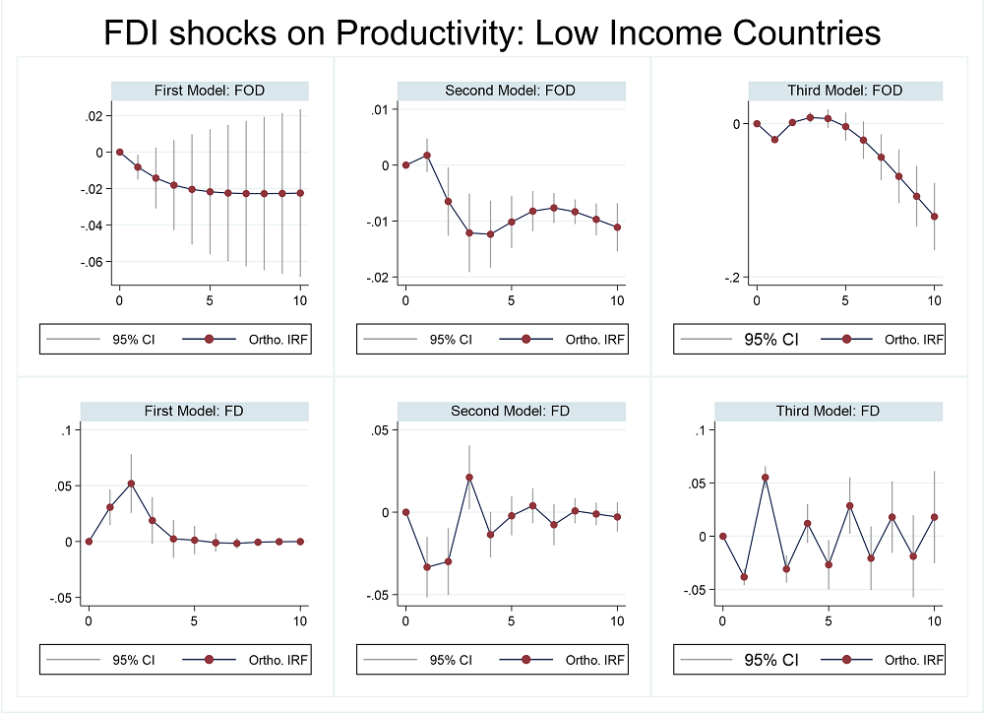


Figure 9: Impulse-Response Function considering all models Low Financial Development Countries and TFP as Productivity variable