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The Role ff Imported Inputs and FDI on Economic Growth: Evidence from Emerging and Advanced Economies

El papel de inputs importados e IDE en el crecimiento economico: evidencia para economías emergentes y avanzadas

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Abstract

The role of imported inputs (capital and intermediate goods) and foreign direct investment [FDI] on economic growth as a mechanism of international technology transfer has been highlighted by different growth models. However, empirical evidence regarding the concurrent impact of both imported inputs and FDI on economic growth is still scarce. The main aim of the paper is to give empirical evidence about the effects of these variables as channels of international technology diffusion. In the same framework, this study captures the different responses in economic growth when considering two different groups of countries separately, emerging and advanced. Our findings reveal different responses in economic growth between advanced and emerging countries. Some important economic political recommendations can be derived from the empirical results.

Keywords: Imported Inputs; FDI; Economic Growth; Emerging and Advanced Economies; International Technology Transfer.

Resumen

El papel de los inputs importados (bienes intermedios y de capital) y la inversión extranjera directa (IDE) en el crecimiento económico como mecanismos de transferencia internacional de tecnología ha sido resaltado en diferentes modelos de crecimiento. Sin embargo, la evidencia empírica relativa al impacto conjunto de ambos, inputs importados e IDE sobre el crecimiento económico, es aún escasa. El principal objetivo de este artículo es proporcionar evidencia empírica sobre los efectos de estas variables como canales de difusión internacional de tecnología. En este contexto, el estudio capta las diferentes respuestas en el crecimiento económico cuando se consideran dos grupos diferentes de países separadamente, emergentes y avanzados. Nuestros resultados revelan diferentes respuestas en el crecimiento económico de países emergentes y avanzados. De los resultados empíricos pueden derivarse algunas importantes recomendaciones de política económica.

Palabras clave: Inputs importados; IDE; Crecimiento económico; Economías emergentes y avanzadas; Transferencia internacional de tecnología.

JEL Classification: F14, F20, F43, O1.

1. Introduction

In recent years, the relationship between trade, foreign direct investment (FDI) and economic growth in host countries has become a matter of increasing interest in economic literature (see, among others, Liu *et al.*, 2009; Alfaro, 2014; Thorbecke and Salike, 2016; Tampakoudis *et al.*, 2016). Endogenous growth models set up the relevance of these interactions and provide the theoretical framework in which imports and FDI may play a key role in economic growth as a means of international technology diffusion (Grossman and Helpman, 1991; Coe and Helpman, 1995; Keller, 2004).

Imported inputs (imports of capital and intermediate goods) may embody foreign technology, which can be implemented to produce domestic goods. Thus, it could be assumed that imported inputs could impact positively on economic growth (Eaton and Kortum, 2001; Miroudot *et al.* 2009; Woo, 2009) and also on productivity of firms bearing in mind the implications of Global Value Chains (García and Solís, 2014; Díaz and García, 2016). Furthermore, FDI is expected to be beneficial to the host country, not only through capital accumulation, but also boosting productivity through technology diffusion and spillover effects (Blomström and Kokko, 1998; Lin *et al.*, 2011; Fernández and Márquez, 2014; Zekarias, 2016).

Despite the theoretical foundations, there is little empirical evidence about the impact of imports and FDI on economic growth (Wang *et al.*, 2004; Liu *et al.*, 2009; Savvides and Zachariadis, 2005; Miroudot *et al.*, 2009; Woo, 2012; Rahman and Shabaz, 2013; Belloumi, 2014; Glas *et al.*, 2016). Furthermore, the results achieved are still inconclusive; they vary across countries and over time. Based on these studies, it would seem logical to expect different responses in economic performance in countries according to their characteristics, in particular due to their different stage of development. However, to our knowledge, only Wang *et al.*, (2004) have pooled together advanced and developing countries.

Thus, new empirical evidence on this issue is provided. The purpose of the present paper is to test the impact of imported inputs and FDI on the economic growth of a set of 53 advanced and emerging countries in a single framework. This study departs from the previous ones in several ways. Firstly, it is focused on the impact of both types of imported inputs (intermediate and capital goods) and FDI. This way, a better understanding of the contribution of technological transfer to economic growth may be

reached. Secondly, it is expected that an empirical analysis of this nature is subjected to econometric problems like endogeneity. We carefully tackle these difficulties by using an appropriate methodology. Thirdly, bearing in mind that the magnitude and the sign of these effects may vary across countries, this research aims to capture the different responses in economic growth of the countries categorized into advanced and emerging economies. To this end, we use the interaction term approach instead of a simple estimation of the model for different subsamples. The distinction between dissimilar groups of countries will allow us to avoid spurious results. But it will also simplify the task of providing reliable guidelines in the devising of effective recommendations for policymakers to promote economic growth. Based on a panel dataset over the period 1996-2010, our empirical results find different responses between emerging and advanced countries in economic growth. They suggest that imported intermediate goods may be more beneficial to emerging economies while imported capital goods and FDI may be important to both groups of countries.

The paper is organized as follows. Section 2 briefly reviews the literature on the subject. Section 3 presents the pattern of both imported inputs and FDI by groups of countries. Section 4 illustrates the model. Section 5 shows the econometric methodology and empirical results. Concluding remarks and policy implications are summarized in Section 6.

2. Literature review

The theoretical foundations of the effects of imports and FDI on economic growth stem from neoclassical and endogenous growth models. Both models assert that technology is a key determinant on long run economic growth. However, while the neoclassical theory assumes technological progress to be exogenous (Solow, 1957), endogenous growth theory considers technology as a type of investment spillover emerging from different sources. If technology spillovers are international in scope, then imports and FDI may be considered as a means of technology transfer, knowledge and spillover effects (Romer, 1990; Grossman and Helpman, 1991). As a consequence, they may play a key role in the economic growth of the host country.

In regard to imports, they may benefit domestic producers, not only by using more advanced and sophisticated technology which would otherwise not be available in the local economy, but also through the access to new and cheaper inputs. Thus, imports may expand the country's production possibilities since they can be used to produce domestic goods. This way, imports of inputs enable local firms to introduce new varieties of products (Goldberg *et al.*, 2010), specialize and diversify (Rahman and Shahbaz, 2013) or encourage innovation in domestic producers (Lawrance and Weinstein, 2001).

Bearing in mind this issue, decomposition of imports by end-use is required since not all types of imports give rise to the same effects on economic growth. In this sense, it will be relevant to distinguish the effects of imports which incorporate technology (imports of capital goods and intermediate inputs) from other imports which do not (mainly consumer products). Furthermore, Jesko (1992) emphasizes the importance of disaggregating imports to avoid any possible estimation bias. However, at an empirical level, the majority of studies have been focused on general imports as a whole (Wang *et al.*, 2004; Liu *et al*, 2009; Rahman and Shabaz, 2013; Belloumi, 2014; Karahan and Çolak, 2016). Even so, some scholars highlight the importance of capital goods on economic growth (Xu and Wang, 2000). Other authors underline the relevance of intermediate goods' imports (Stone and Shepherd, 2011; Sharma, 2014). Some of them conclude that imported intermediate inputs increase the firm productivity (Halpern *et al*, 2015). In contrast, Iscan and Yildirim (2012) consider both types of imported inputs (capital and intermediate goods). In general terms, empirical evidence leads to a significant role for these imported inputs on the economic process. Thus, it is assumed that imports of intermediate and capital goods may generate a positive impact on economic growth. However we have to take into account that the benefit of imported inputs is differed along a number of factors such as import source country, trade status or industry R&D intensity among others (Feng *et al*, 2016).

On the other hand, it could be considered that FDI encourages long-run economic growth by promoting forward and backward linkages within the domestic economy (Ahmed *et al.*, 2011). In this sense, input-output relationships and inter-industry linkages may act as propagation channels generating externalities to domestic producers (Capello, 2009). Furthermore, some scholars emphasize the relevance of direct contact between foreign and local firms, since competition, demonstration effect, learning by watching and learning by doing may increase productivity (Blomström and Kokko, 1998). There is also evidence of indirect effect of FDI related to productivity spillovers, although these seem to be lower than direct effects caused by foreign participation in company management through ownership (Iwasaki and Tokunaga, 2016). As a consequence, FDI may generate a positive impact on economic growth. Nevertheless, in spite of this, several studies have found a negative impact (Wang *et al.*, 2004) or a no significant relationship (Laureti and Postiglione, 2005) of FDI on economic growth. In some cases, the effect of FDI on economic growth is positive but much smaller than one could expect (Gunby *et al*, 2017). These results could due to additional factors such as the existence of a dominating negative crowding out effect, which leads to a displacement of domestic firms by foreign firms (Sadik and Bolbol, 2003). However, an emerging empirical literature has emphasized that the impact of FDI on growth is conditioned by the characteristics of the host country (Hansen and Rand, 2006). These characteristics could be explained mainly by its absorptive capabiblity in

terms of human capital (Eaton and Kortum, 2001; Fernández and Márquez, 2012; Giménez *et al.* 2015), financial market development (Alfaro *et al.* 2004), outward-looking trade policy (Balasubramanyam *et al.*, 1996) and institutional quality (Woo, 2009). Also the position in the supply chain is essential for capturing FDI spillovers (Jude, 2016). In addition, an inappropriate pooling of developed with developing countries may lead to no significant effects of FDI on economic growth (Blonigen and Wang, 2005). Consequently, categorizing the type of host country according to their level of development becomes a great concern.

In general terms, both imported inputs and FDI could enhance economic growth. However, at the empirical level, most existing studies deal with each of these channels separately. They have been applied to a great heterogeneity of countries, mainly developing economies, using different periods of time and methodologies. Nevertheless, as we mentioned above, empirical investigations on their simultaneous impact on income growth under a single framework are scarce.

Dealing with general imports, Wang *et al.* (2004) study the effects of openness (total imports and exports) and FDI on economic growth in different country groups (high, middle and low income). They suggest by using Fixed-Effect (FE) panel regression that FDI is more beneficial to high-income countries, while trade is more important for low-income countries. Liu *et al.* (2009) suggest that exports, imports and FDI are integral elements of the economic growth for nine Asian economies in a VECM framework. Rahman and Shabaz (2013) analyze the impacts of imports and FDI on economic growth of Pakistan by applying the structural break autoregressive distributed lag (ADRL) bounds testing approach. They reach positive and significant effects. Belloumi (2014) examines the relationship between FDI, trade openness (exports and imports) and economic growth in Tunisia by applying the bounds testing (ARDL) approach to cointegration. The results found are no significant.

In other studies focused on disaggregated imports, Savvides and Zachariadis (2005) examine the role of capital goods' imports and FDI on Total Productivity of Factor and value-added growth in the manufacturing sector of 32 developing countries. They show a small but significant positive impact of both capital goods' imports and FDI on economic growth by using OLS panel data estimation. Woo (2012) confirms these results in the cases of China and India by using FE panel regression and the Generalized Method of Moments (GMM) panel estimator. And also Glas *et al.* (2016) found the same outcomes in the case of BRICs[1]. Miroudot *et al.* (2009) examine the effect of imported intermediate inputs and inward FDI stock on output growth for 10 OECD economies at the sector level. The OLS estimation with robust standard errors and the GMM estimation show positive and significant effects.

[1] BRICs (Brazil, Russian Federations, India and China).

In summary, this paper complements the literature conducting an empirical investigation of the role of imported inputs and FDI on economic growth in emerging and advanced economies. Its main contribution is that it focuses on FDI and a disaggregation of imports of inputs in intermediate and capital goods in the same framework and by distinguishing between a representative sample of emerging and advanced countries.

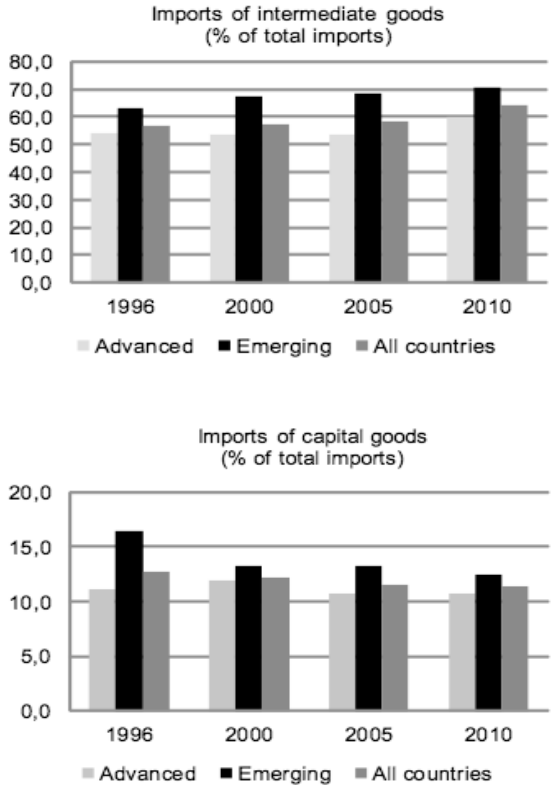
3. Patterns of imported inputs and fdi by groups of countries

This section analyzes stylized trends of both imports of inputs and FDI flows in 53 countries grouping by different development stages in the period 1996-2010. From the sample, and in line with the 2012 World Economic Outlook Report of IMF, 21 members of the OCDE are considered as advanced economies, while 32 non-OECD economies as emerging (see Annex 1).

Import data is derived from the OECD STAN Bilateral Trade Database by Industry and End-Use Category (BTDIxE). This Database groups imported goods according to their main end use into intermediate goods, household consumption, capital goods, mixed end-use and miscellaneous. Following this categorization, a new dimension to the traditional United Nations' Broad Economic Categories (BEC) classification is added, which generally classifies goods as intermediate, consumption or capital. According to Zhu *et al.* (2011) we follow the BTDIxE end-use classification because BEC categories could be ambiguous. Import data is also gathered and divided into 45 sectors defined in terms of International Standard Industrial Classification Revision 3 (ISIC Rev.3). Their values are measured in constant 2000 US dollars (deflated by GDP deflator).

Figure 1 shows the relevance of imported intermediate and capital goods in total imports and Figure 2 displays their importance in Gross Domestic Product (GDP). A few stylized facts emerge from data regarding trade in imported goods. Firstly, import flows are mainly made up of inputs rather than final consumption goods. Considering overall countries averages for the entire period, trade in imported inputs accounts for about 71% of total imports (while intermediate goods represent 58% of total imports, capital goods are 13% of total) (see Figure 1). Thus, the composition of imports emphasizes the key role of internationalization of world production. This import structure also may suggest that the benefits of imports on economic growth mainly derive from intermediate and capital good imports.

Figure 1. Importance of imported inputs in total imports, 1996-2010 (%)



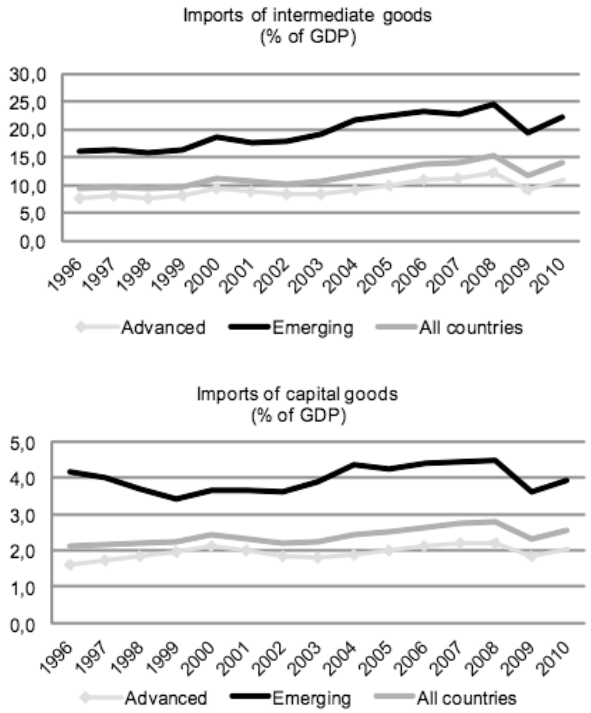
Source: Authors' elaboration from OECD.

Secondly, despite the rapid internationalization of supply chains observed during the last two decades (that is, the outsourcing and fragmentation of world production), it should be highlighted that the relative share of the different categories of goods in total imports has remained almost stable in all countries. In other words, the growth rates of these categories have been very similar over the period 1996-2010. They have been following the same pace as aggregate imports.

Thirdly, in general terms, both groups of economies are well adjusted to the commented pattern. That is, the shares of the different categories of imported goods in total imports have remained largely unchanged. In spite of this fact, imported inputs (intermediate as well as capital goods) have increased their percentage on GDP (see Figure 2). In addition, there are two important diffe-

rences between advanced and emerging economies. One is a higher rate of growth of import flows in emerging countries, being also accompanied by a higher pace in the different categories. Thus, the average annual growth rate of total imports between 1996 and 2010 was 10.5% in emerging versus 6.5% in advanced economies. The second difference is that, in relative terms, emerging countries account for a larger share of intermediate inputs and capital goods in total imports as well as in GDP. This finding suggests that these economies are more dependent on foreign technology than advanced countries.

Figure 2. importance of imported inputs in gdp, 1996-2010 (%)

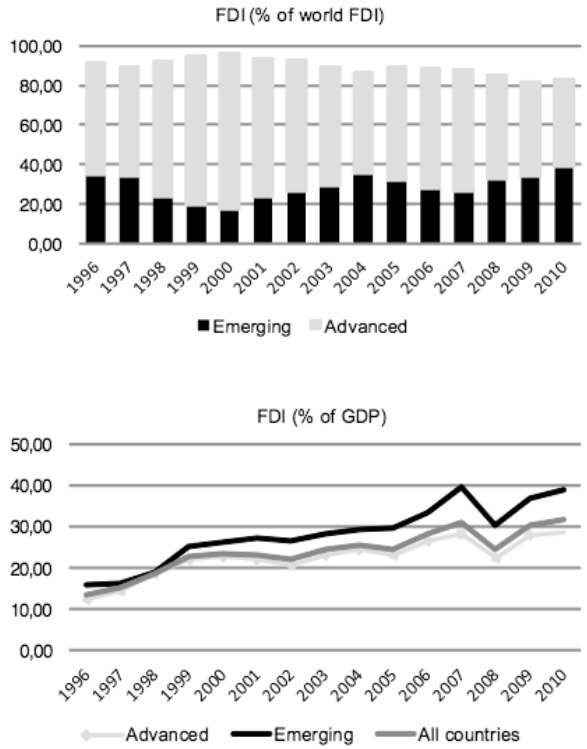


Source: Authors' elaboration from OECD and WDI.

Focusing on the FDI inflows, Figure 3 illustrates the participation of the two groups of economies considered in total world inward FDI between 1996 and 2010, but also the importance of FDI in total GDP. FDI data is obtained from the UNCTAD FDI dataset, and it is expressed in constant 2000 US dollars

(deflated by GDP deflator). During this period, on average, FDI inflows in the whole sample countries represented about 90% of total FDI (remained roughly constant). Furthermore, the two groups of countries have improved their share of FDI in total GDP. However, different behavior is observed between advanced and emerging economies. Despite advanced countries being larger hosts of FDI inflows, their share of global FDI plummeted from 79% in 2000 to about 46% in 2010. In addition, FDI represents a smaller percentage of their GDP than in emerging countries. By contrast, emerging countries have attracted rapidly increasing FDI inflows, amounting to 40% of total FDI worldwide in 2010[2]. These emerging countries have been more resistant to economic crises.

Figure 3. Importance of fdi, 1996-2010



Source: Authors' elaboration from UNCTAD and WDI.

[2] Behind these results it is found that some of the world's largest hosts of FDI inflows in recent years such as China, Hong Kong, Singapore and India (belonging to the emerging group) have included policy actions in order to improve their economies' attractiveness for FDI (Liu *et al.* 2009).

From these stylized trends it is concluded that the most dynamic economies in terms of economic growth, i.e. emerging countries, have been also the most dynamic in terms of both imported inputs and FDI. These results may suggest that the levels of long-term growth in these economies could be linked with the dynamism of imported inputs and FDI.

4. The model

To model the transmission channels from trade and FDI activity as well as human capital input to economic growth, a common point of departure in the empirical literature is to start from a Cobb-Douglas production function.

A panel data set is used here. Therefore, the augmented production function can be specified as follows:

$$Y_{jt} = A_{jt} f(L_{jt}, K_{jt}, H_{jt}, FDI_{jt}, MI_{jt}, MK_{jt}) \quad (1)$$

where Y_{jt} denotes the output measure of country *j* at time *t*. The cross sectional dimension is specified *as j= 1, 2....53* and the time dimension is *t= 1996,...,2010. K, L* and *H* are capital stock, labour force and human capital respectively; *FDI* is the inward FDI stock and *MI* and MK are the imported intermediate and capital goods. The term *A* is driven by two effects (Wang *et al.*, 2004): one term, α_j, which represents country-specific effects and are time invariant, and a second common disturbance term, ε_{jt}, which varies across countries and time.

In this framework, after the log-transformation, the final specification is given in Equation 2.

$$LGDP_{jt} = \alpha_j + \beta_1 LL_{jt} + \beta_2 LK_{jt} + \beta_3 LH_{jt} + \beta_4 LFDI_{jt} + \beta_5 LMI_{jt} + \beta_6 LMK_{jt} + \varepsilon_{jt} \quad (2)$$

Next, given a country *j* at time *t,* the variables considered in expression (2) are explained.

- The dependent variable, GDP, is the gross domestic product at market prices (constant 2000 US$).
- *L* expresses the percentage of employment of ages 15+ over to population. A positive sign is expected.
- *K* is used as a proxy of physical capital stock. It is calculate by the use of the perpetual inventory method following the same procedure suggested by Wang *et al.* (2004)[3]. It is assumed a positive sign.
- *H* is considered as a proxy of the level of human capital. It is measured by the percentage of the population enrolled in secondary education.

[3] The capital stock series derive from Gross Fixed Capital Formation (constant 2000 US$). The GDP deflator is used to deflate investments. It is assumed that the average depreciation rate of capital stock is 7.5%.

According to Savvides and Zachariadis (2005) this level of education may be considered the most appropriate for the implementation and transfer of international technologies in emerging countries. A positive sign is expected.

- *FDI* is the percentage of Inward FDI stock (constant 2000 US$, deflated by GDP deflator) over the recipient country's GDP[4]. Following the theories of endogenous growth a positive sign may be expected. Even so, this impact may be influenced by a set of conditions in the host economy as well as the type of foreign investments.
- *MI* represents the percentage of imports of intermediate goods over GDP (constant 2000 US$, deflated by GDP deflator). This variable is divided by GDP instead of total imports because this way one can have clues about the importance of these type of imports for the economy (an economy with very little imports, but a high share of intermediate inputs is different from an economy with a high level of imports in to GDP, and a high level of intermediate inputs). A positive sign may be expected.
- *MK* expresses the percentage of import of capital goods over GDP (constant 2000 US$, deflated by GDP deflator). We also considered this type of imports divided by the GDP as the same reason than imported intermediate inputs. A positive sign may be expected.
- α_j represents country-specific effects.
- ε_{jt} denotes the error term.

In order to capture the different responses of country grouping, the interaction term approach instead of a simple estimation of the model for different subsamples is used. This implies to augment the regression approach in equation (2) with an interaction effect that multiplies each regressor in the model by a binary dummy variable D_j (it will be equal to one when the country belongs to the group of advanced economies and equal to zero in the case of emerging countries)[5]:

$$LGDP_{jt} = \alpha_j + \beta_1 LL_{jt} + \beta_2 LK_{jt} + \beta_3 LH_{jt} + \beta_4 LFDI_{jt} + \beta_5 LMI_{jt} + \beta_6 LMK_{jt} + \beta_7 D_j LL_{jt} + \beta_8 D_j LK_{jt} + \beta_9 D_j LH_{jt} + \beta_{10} D_j LFDI_{jt} + \beta_{11} D_j LMI_{jt} + \beta_{12} D_j LMK_{jt} + \varepsilon_{jt} \quad (3)$$

This new specification allows us to avoid the issue of erroneously building of separate models for the subgroups of sample chosen. It enables us to measure the difference in the effects of imported inputs and FDI on economic growth introduced by groups of advanced and emerging economies. Based on the existing literature, one can assume that these effects will be different, depending on the host country's absorptive capability as well as the level of development

[4] Different measures of FDI may be considered (see among others Woo, 2009). Given our interest in analyzing the impact of foreign technology transfer, we focus on the FDI inflows from abroad to a country.

[5] In line with Mitze and Özyurt (2014) the reason for including a binary dummy variable is to assume that all countries chosen in the sample may have not an identical aggregate production function.

of countries (Blonigen and Wang, 2005; Hansen and Rand, 2006; Rahman and Shahbaz, 2013)[6].

5. Econometric methodology and empirical results

This empirical work is based on a balanced panel of 53 countries over the period 1996-2010. These countries are classified as advanced and emerging economies. The data-set comes from different data sources. As outlined in section 3, import data was derived from the OECD STAN Bilateral Trade Database by Industry and End-Use Category (BTDIxE); FDI inflows were obtained from the UNCTAD FDI dataset. Finally, the remainder of data used in this analysis is gathered from the World Development Indicators (World Bank 2012).

Table 1. Description of basis statistics, 1996-2010

Variables	All economies (53 countries)		Advanced economies (21 countries)		Emerging economies (32 countries)	
	Mean	sd.	Mean	sd.	Mean	sd.
GDP(constant 2000 US$, billions)	614	1560	1210	2320	225	369
L(percentage of population)	54.92	7.62	56.63	6.22	53.80	8.22
H(perc popul.enrol. in Second.Educ)	95.19	18.89	110.72	15.17	85.01	13.37
K (constant 2000 US$, billions)	1280	3130	2490	4610	488	866
FDI (percentage of GDP)	40.14	53.29	38.61	31.63	41.15	63.63
MI (percentage of GDP))	23.26	18.79	15.28	8.17	28.50	21.96
MK (percentage of GDP)	4.77	3.18	3.36	1.28	5.70	3.68

Source: authors' elaboration from WDI, UNCTAD and OECD

Table 1 reports a descriptive analysis of the variables from equation (2). From this table, advanced economies appear as a more homogeneous group than emerging countries. This is not surprising, since the emerging economies include Asian, Latin American and Eastern countries (with deep differences among each other). Particularly, the emerging economies display higher percentage of imported inputs and FDI over GDP. From the exploratory analysis, our starting hypothesis would be that both imported inputs and FDI may play a more important role on the economic growth in emerging countries than in advanced economies, since the former are more dependent on these sources of foreign technology.

Thus, this section aims to investigate empirically the hypothesis that the imported inputs and FDI are key determinants of economic growth. In addition, it is

[6] A bigger absorptive capability in advanced economies than emerging is expected since they have better conditions in terms of institutions, macroeconomics policies, governance and human capital.

tested the existence of different responses in the economic performance derived from the consideration of two groups of countries, advanced and emerging.

Table 2 presents the results of estimating equations (2) and (3) in a panel framework. Columns (2) and (3) show the results for advanced and emerging country groups respectively. Column (4) reports the outcomes achieved by running a single regression, with the interactions approach, such as Equation (3). The interactions terms would indicate whether the two groups differ or not.

Table 2. Estimation results of GDP national growth equation

Variables	Advanced economies (2)	Emerging economies (3)	All countries (4)
β0	9.5301	6.4374	7.6628
LL	0.5117 (9.23) ***	0.0873 (1.015)	0.0873 (1.13)
LK	0.5515 (34.86) ***	0.610 (17.33) ***	0.6101 (25.34) ***
LH	-0.0271 (-1.17)	0.4487 (4.85) ***	0.4487 (7.30)***
LFDI	0.0166 (2.30)**	0.0409 (2.63) ***	0.0409 (3.60)***
LMI	0.0297 (1.84)*	0.1173 (3.81) ***	0.1173 (4.67)***
LMK	0.0259 (1.62)	0.0405 (1.40)	0.0450 (2.41)**
D*LL			0.4244 (2.47) **
D*LK			-0.0585 (-1.17)
D*LH			-0.4759 (-5.35)***
D*LFDI			-0.0243 (-1.05)
D*LMI			-0.0876 (-1.71)*
D*LMK			-0.0190 (-0.39)
R2	0.98	0.99	0.98
Time periods (after adjustments) Cross-section included Total Pool Observation	14 21 294	14 32 448	14 53 742

Notes: 1) Pooled IV Two-Stage Least Squares estimation with fixed effects by country
2) t-statistics are in parentheses
3) Significance levels are represented as (*) 10%, (**) 5% and (***) 1%

Therefore, different variants of the models were estimated following the standard approach in the panel data methodology (Baltagi,1995). The Hausman (HS) test was applied to check the random effects assumption versus fixed effects. The significant Hausman statistics indicate the Fixed Effects (FE) models are better than the Random Effect (RE) models for the three cases. Thus, we used panel data model and incorporated fixed effects by country in order to control for unobservable country-specific omitted variables in the three estimations shown in Table 2. Additionally, the potential endogeneity of the FDI variable was dealt with an instrumental variable approach. The three models were re-estimated considering the corrections on endogeneity and heterogeneity proposed by Arellano and Bond (1991) and Blundell and Bond (1998). Thus, the lagged value of Inward FDI stock was used as instrument. Therefore, the impact of FDI on economic performance is considered in the form of one lag period (see, among others, Savvides and Zachariadis, 2005; Lin *et al.*, 2011).[7]

In general terms, it can be seen that the signs of coefficients on almost all explanatory variables are consistent with the expectations. When it is run separate regressions for each group of countries (see columns (2) and (3) in Table 2), the results for employment and physical capital are in line with those obtained in the literature (Wang *et al.*, 2004, among others). It is noteworthy the lack of significance of the coefficient of human capital for advanced countries, being positive and significant in emerging economies. According to Wang *et al.*, (2004), this result could be explained by the crude indicator used as a proxy of human capital (in our case, the percentage of population enrolled in secondary education).

Focusing on the variables of interest for our research, the estimation results suggest that imported intermediate inputs and FDI have significant and positive impacts on economic process in both groups of economies. On the contrary, imports of capital goods do not display a significant growth effect. These findings denote the relevance of imported intermediate goods and FDI as key channels of technology diffusion, as it is suggested by the endogenous growth theory.

The literature on this issue has dealt with a great heterogeneity of countries, mainly developing economies with mixed results. In our case, the outcomes obtained from the separate regressions (columns (2) and (3) in Table 2) do not supply evidence about the existence of relevant differences between advanced and emerging economies with respect to the growth effects of these variables. However, taking into account that the impact on growth may depend on the absorptive capacity and level of development of host countries, it would be of interest to check the possible existence of differences according to the characteristics of countries.

In this context, the simultaneous consideration of both groups of countries within the same regression allow us, not only to provide more efficiency to the

[7] Actually, the inward of FDI capital needs time to transfer international knowledge to local firms.

estimation, but also to test the existence of statistical differences between the estimations for the two groups (see column 4 in Table 2). From this regression, and focusing on our variables of interest, the significance of the coefficient β_5 from Equation (3) indicates that imported intermediate goods may be a key determinant of the economic progress.

Besides, the empirical results suggest significant differences between advanced and emerging economies regarding the growth effects of intermediate goods (the estimation of β_{11}. is significant). Effectively, *ceteris paribus*, if the imports of intermediate inputs of an emerging country increase 1%, its real national gross domestic product would increase 0.1173%, being higher than the equivalent elasticity in advanced countries (0.0297%)**.** This finding could imply that external shocks related to imports of intermediate inputs may have different impact on both groups of economies, being emerging countries more sensitive. These results are consistent with Raddaz's finding (2007), which indicates that external shocks have an important impact on GDP per capita of low income countries. Also Stone and Shepherd (2011)and Sharma (2014) found stronger link between imported intermediate goods and growth in developing countries.

On the other hand, the significance of the variables FDI and imported capital goods (see column 4 in Table 2) also denotes the relevance of these two means of technology transfer on the economic growth. Moreover, the results obtained do not reveal statistical differences between advanced and emerging economies. Consequently, it could be assumed that benefits from technology diffusion through imported capital goods and FDI may be important for all economies, regardless of the level of development of the countries.

6. Concluding remarks

Economic theory suggested that imported inputs (intermediate and capital goods) and FDI may contribute to economic growth through international technology diffusion. Nevertheless, rather less attention has been paid to the empirical analysis of the simultaneous influence of these variables on growth. The main goal of this paper is to examine the joint impact of these different channels on economic growth in a sample of 53 advanced and emerging countries. The second purpose is to test the existence of different responses on economic growth according to the specific characteristics of the countries.

From the descriptive analysis it is concluded that emerging economies display higher percentages of imported inputs and FDI over GDP than advanced. This exploratory result suggests that economic growth in emerging economies could be more dependent of foreign technology. The reason is the scarce of domestic technology in emerging countries mainly due to low levels of capital, lack of skills and poor quality of institutions (Sharma, 2014).

The estimation results show that imported inputs and FDI have significant and positive effect on economic growth in both groups of countries. Therefore,

they may be considered as important channels of international technology diffusion. However, the main contribution of our research comes from the empirical evidence about the different influences of imported intermediate goods between emerging and advanced countries. This outcome confirms the stronger relevance of this type of inputs on growth in emerging economies. Our findings may also validate the argument of Goldberg *et al.* (2011) and Jones (2011) in the sense that intermediate goods leads to a multiplier effect that may contribute to amplify the impact on economic performance. These effects are supposed to be more sizable depending on the share of intermediate goods in gross outputs. In this sense, is very important to note that the reliance of this type of imports is higher in emerging countries than in advanced economies.

The results presented in this paper have important implications and recommendations for policy makers.

In general terms, actions aimed at improving access to imported inputs for domestic firms and attracting FDI are a good approach to promote economic growth in both advanced and emerging countries. However, since our main finding is that the impact of imported intermediate inputs on growth becomes stronger on emerging countries, the recommendations related to this type of imports are of special interest in these economies.

Firstly, policy makers should facilitate imports of intermediate inputs through policies such as the removal of entry barriers or lower tariffs which reduce trade costs. In fact, Amiti and Konings (2005) find that the productivity gains arise from reducing inputs tariffs. In this context, the creation of a good local transportation networks in emerging economies would facilitate trade avoiding distortions in production sector derived from transport deficiencies (Jones, 2011).

Secondly, there is a wide range of complementary policies which can help make the dynamic gains from trade even stronger (Stone and Sheperd, 2011). Thus, it could be recommended measures in competition policy and better access to factor markets (labour and capital).

Thirdly, and turning to FDI, the creation of adequate conditions to reap the benefits of the properly interplay between foreign and domestic investment will be necessary for all countries. Following Herzer *et al.* (2014) and Alfaro (2014), that success is, to some extent, determined by the stable macroeconomic environment (better schooling and qualification of the worker, financial development, institutional quality, level of inflation), as well as some characteristic at the micro level (fiscal incentives). In addition, it will be also necessary to promote the relationships between the private and public sector to improve the business climate (Sharma, 2014).

This study is the first step in analyzing the different responses between emerging and advanced economies on economic performance. It opens the door to possible avenues for future research. For example, disaggregated data according to the sectors of investment, the type of FDI or the origin country of technology, could shed more light on this issue.

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ANNEX 1. ECONOMIC GROUPS

Advanced economies	Emerging economies
Australia	Albania
Austria	Argentina
Belgium	Brazil
Canada	Bulgaria
Denmark	Chile
Finland	China
France	Croatia
Germany	Czech Republic
Greece	Estonia
Ireland	Hong Kong SAR, China
Italy	Hungary
Japan	India
Netherlands	Indonesia
New Zealand	Israel
Norway	Korea, Rep.
Portugal	Latvia
Spain	Lithuania
Sweden	Macedonia, FYR
Switzerland	Malaysia
United Kingdom	Mexico
United States	Moldova
	Philippines
	Poland
	Romania
	Russian Federation
	Saudi Arabia
	Singapore
	Slovak Republic
	Slovenia
	South Africa
	Thailand
	Turkey

Source: International Monetary Fund (2012).