



ASOCIACION ARGENTINA  
DE ECONOMIA POLITICA

ANALES | ASOCIACION ARGENTINA DE ECONOMIA POLITICA

# XLVIII Reunión Anual

Noviembre de 2013

ISSN 1852-0022

ISBN 978-987-28590-1-5

CAPITAL FLOWS TO DEVELOPING COUNTRIES  
AND TERMS-OF-TRADE SHOCKS

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XLVIII REUNION ANUAL. ASOCIACIÓN  
ARGENTINA DE ECONOMÍA POLÍTICA.  
Universidad Nacional de Rosario. 13-15 de  
Noviembre 2013.  
**Capital flows to developing countries  
and terms-of-trade shocks**

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August 31, 2013

**Abstract**

This paper studies the relationship between *FDI* inflows and terms-of-trade shocks. We examine the existing literature related to the “Lucas Paradox”, and analyze theoretically how a terms-of-trade shock would impact on less developed economies. We apply a fixed effects generalized least square regression framework to regress *FDI* inflows on terms-of-trade shock alongside other control variables. We find that for the group of “developing” economies the estimated coefficient of shocks to *TOT* are lower than that estimated for the group of “advanced” economies. Then, less developed economies do not take advantage of positive global cycles because they are investment-constrained economies.

**JEL Classification:** F32, F34, F41

**Keywords:** Capital Flows, Terms of Trade, Lucas Paradox.

**Resumen**

Este trabajo estudia la relación entre los flujos de entrada de inversión externa directa (“*FDI* inflows”) y los términos de intercambio. Se examina la literatura existente sobre la denominada “Paradoja de Lucas”, y se analiza teóricamente el impacto de los shocks en los términos de intercambio en las economías menos desarrolladas. Se aplica una regresión de mínimos cuadrados generalizados con efectos fijos, utilizando como variable dependiente a los “*FDI* inflows”; los términos de intercambio actúan como variable independiente. Entonces, los países en desarrollo no aprovecharían completamente los ciclos globales positivos, dado que se trata de economías con restricciones para invertir.

**Clasificación JEL:** F32, F34, F41

**Palabras Claves:** Flujo de Capitales, Términos de Intercambio, Paradoja de Lucas.

## 1 Introduction

This papers analyses the behavior of capital flows in less developed countries. The objective is twofold: **(a)** To distinguish between capital flows determinants in developing countries versus developed ones; **(b)** To analyze the role (if any) of the terms of trade in the determination of capital flow direction.

Our theoretical approach follows the seminal work of Lucas (1990) who according to neoclassical theory states that the differences in production per worker between rich and poor economies are due to differences in the level of capital per worker. However, if trade in capital good is free and competitive, the capital will be allocated only in the poorer economy (where capital per worker is lower) until the capital-labor ratio, and hence capital returns are equalized. Lucas finds that relative income per worker ratios (between U.S. and a given developing country) are large to expect to flow as expected by neoclassical theory. Then,

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he explores three possibilities to explain why capital does not flow to poorest countries. Firstly, Lucas corrects labor inputs estimation for differences in human capital. Secondly, he indicates that differences in the level of capital per worker are additionally caused by human-capital-stock's local spillovers. Finally, refers to failures in capital markets as determinants of capital misallocation in poorer countries. He points out that a "political risk" would appear as borrowing contracts arising from the flow of capital goods to poor economies can not be enforced. Policy recommendations should be focused on the investment in human capital to reduce income per worker differentials between poor and rich countries as well as on the reduction of the "political risk" in order to promote the capital to flow toward poor countries.

Alfaro *et al.* (2005) based on Lucas classification summarizes the theoretical explanations of the "Lucas paradox" in two groups. First, those that consider differences in fundamentals across countries (missing factor of production, government policies, institutional structure and total factor productivity) on the one hand; and those who emphasize the existence of imperfections in in capital markets. Obstfeld and Rogoff (1995) state that these imperfections arises because of either asymmetric information problems or due to sovereign risk. Additionally, asymmetric information problems can be *ex-ante* (adverse selection), *interim* (moral hazard) or *ex-post* (costly state verification).

Alfaro *et al.* (2005) indicate that the quality of the country's institutions affects the capital flows toward poor countries by assuming that institutions encourage investment decisions by ensuring property rights of entrepreneurs and preventing elites from blocking the adoption of new technologies. Under this view, the Solow's residual no only captures the differences in overall efficiency across countries but also the incentive that institutions offer to promote the foreign investment.

Gertler and Rogoff (1990) presents a model when an endogenous risk premium risk appears in less developed countries as a consequence of moral hazard in capital markets. They state that borrowing countries have to bear higher interest rates (the risk-free rate plus a risk premium) because of the existence of information asymmetries in credit markets: creditors are no sure that borrowed funds will be applied to finance capital formation in the poor economy (actually, borrowers could secretly lend abroad rather than invest in the projects). Given that investor are not able to verify what the borrower does with the funds they require higher interests rate to lend them. However, the higher the interest rate the lower the investment needs in the poor countries. Thus, it is concluded that the optimal capital stock is below the level associated with the first-best allocation (as a result, the ex post per-capita output mus lie below its first-best value). Moreover, they show that risk premium depend upon the size of the collateral (i.e. natural resources), which is supposed to be independent from the projects to which the borrowed funds would be applied.

Barone and Descalzi (2012) test the hypothesis that indicates that terms-of-trade shocks raises the value of the collateral that the domestic economy posses to back their liabilities: as terms of trade increase the (endogenous) borrowing rate decreases and it encourages capital accumulation in developing economies. This assumption was testing by distinguishing four groups of countries according to the country income level (lower, medium, upper medium and high income). Results indicate that the risk premium is negatively associated with the terms of trade in all country groups, although the estimated coefficients seem to be greater for the group of countries with higher income levels. However, the growth variable (which also could be approximated to the collateral) is not significantly different from zero in the group of poorer countries. It would mean that in the less developing countries the growth trend would be leaded by the terms of trade cycle. In the rest of the countries this variables is significantly different from zero and has the expected negative sign.

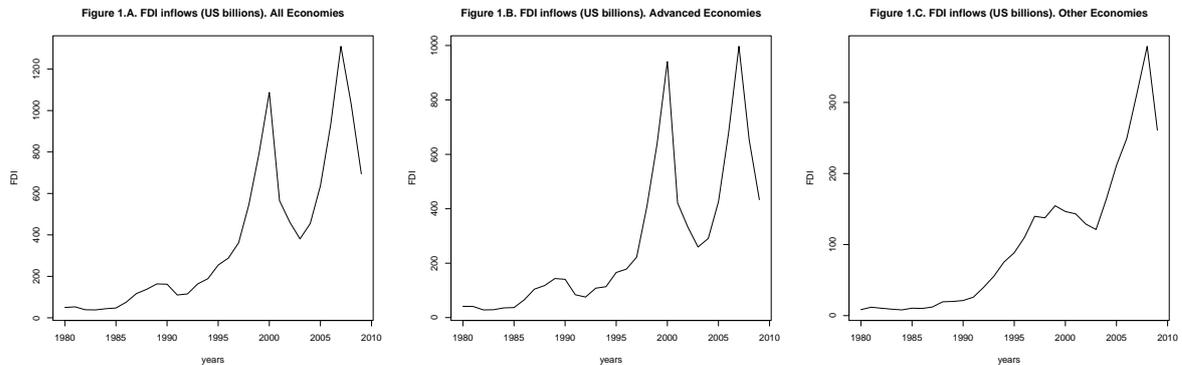


Figure 1 shows that the inflows of foreign direct investment erupted during nineties. They reached a peak in 1998. Then experienced a sudden decrease due to the global economic downturn observed in central economies. Data also show the recovery of *FDI* inflows since 2004 and the subsequent retreat triggered by the global financial crisis in 2007. What we want to emphasize here, is that the capital flows movement is mostly driven by advanced economies: during the lapse 1980-2009 the *FDI* inflows in advanced countries have been on average four times what it was in less development economies. *FDI* are not only increasing but rather more volatile, and what is more important for the purpose of this paper, they still remain being captured by more developed countries. So, it does not seem that external capital flows moves according to the existing differences in the income per capita between developed and developing countries.

Then, the following question arises: why *FDI* flows have not been redirected to less developing countries? The fact that most recent economic downturns have been generated in more developed economies would lead to think that less developed countries should have took advantage of this situation and *FDI* should have flow to to these countries. Even though there is same evidence that capital flows have increased in developing countries in last years (Bluedorn *et al.*, 2011) the whole picture taken by Lucas in 1990 (when international capital flows started to increase at a faster pace) still remain unchanged. In other words, why developing countries do not take advantage of the “opportunities” they face?

Our view is that when developing countries face an “opportunity” such as term-of-trade shock, the availability of borrowing funds increases (i.e. the borrowing rate decreases); however, developing countries not only remain reluctant to invest, but also they instantaneously tend to export capital abroad given the existing barriers to accumulate domestic capital (i.e. lack of institutional quality and corruption). Thus, an increase in the current income caused by, say, a term-of-trade shock would be reflected in a rise of national savings which also is equal to a current account surplus.<sup>1</sup>

In this paper we present an eclectic approach and assess the response of *FDI* inflows to terms-of-trade shocks. The contribution is to assess whether terms of trade foster growth in developing economies: does the terms-of-trade cycle promote long-term growth by encouraging foreign direct investment or what it simply does is raise savings and promote capital flight? Do terms-of-trade shocks really represent an opportunity for development economies? In the following section we analyze rough data related to *FDI* inflows and interpret them according to existing literature. Next, we describe the estimation strategy for testing the null hypothesis and present the results. Finally, we conclude.

## 2 Theoretical background and evidence

In this section we examine the theoretical reasons that explain why capital does not flow from reach to poor countries. Following Alfaro *et al.* (2005) we consider that explanations can be divided into two main camps: fundamentals and financial markets distortions. For each case we make a brief literature review and also gather rough evidence to analyze whether *FDI* inflows data fit into the theoretical framework. In the next section these theoretical benchmarks will be utilized to analyze the impact of the terms of trade on *FDI* inflows.

### 2.1 Fundamentals

Current literature tend to explain that capital flows towards richest countries because they are who really offer investment opportunities. Poor countries does not show good fundamentals; actually, they are investment-constrained (Rodrik, 2007). Alfaro *et al.* (2005) explains that the main reason is the lack of institutional quality. The following equation is used to test the “Lucas Paradox”:

$$FDI_{it} = \alpha + GDP_{it} \times \beta \tag{1}$$

where  $F_{it}$  is the foreign direct investment inflow of country  $i$  at time  $t$  and  $GDP_{it}$  is the the gross domestic product (*GDP*) per capita. According to the neoclassical growth theory  $\beta$  is predicted to be negative: as capital per capita (and income per capita as well) reaches its long-run level the investment decreases and capital flows tends to decrease. Thus, domestic capital will flow towards a poorer country (i.e. with lower capital per capita).

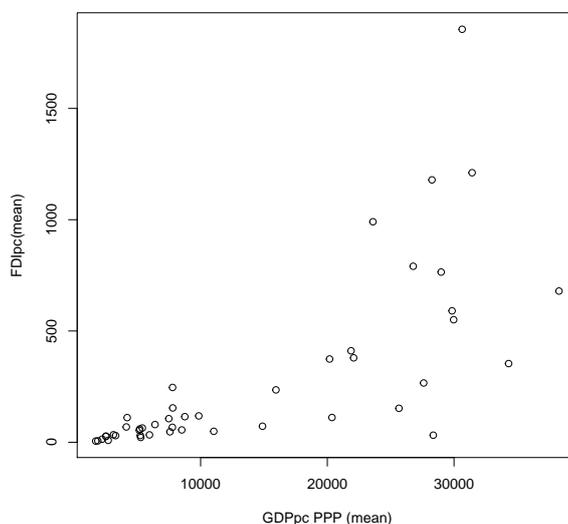
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<sup>1</sup>The proof of this is that the current account respond positively to a real shock in the moment of impact (Barone and Descalzi, 2010), then the current account balance tend to banish as soon as overvaluation process takes place.

The measure of capital flows to be utilized is far from been a clear matter. Kose *et al.* (2010) define that a country is either a capital-importer or capital-exporter depending on whether he has either current account deficit or surplus. They report that the average income, relative to the United States, of capital-exporting countries (i.e. abundant capital countries evidencing current account surplus) has fallen below that of capital-importing countries indicating that actually capital flows from poor to rich countries.<sup>2</sup> Prasad *et al.* (2007) examine the long-run relationship between current account balances and growth for a sample of nonindustrial countries, concluding that the correlation using averaged data over a long period for each country is positive (they relate average growth in *GDP* per capita and level of current account balances as percentage of *GDP* during 1970-2004). All these findings would reinforce the “Lucas Paradox”.

Figure 2 shows that there is a (unconditional) positive relationship between *FDI* per capita inflows and the *GDP* inflows. The plot reports the mean during 1980-2009 for each country in the sample.<sup>3</sup> This would indicate that the higher the income per capita the higher is the propensity to import capital in all countries. Thus “Lucas Paradox” is corroborated by our *FDI* inflows data.

Figure 2. FDI vs GDP (1980–2009)



How “Lucas paradox” could be explained? Lucas (1990) consider three possible answers. Firstly, he accounts for differences in labor quality or human capital per worker between United States and less developing countries, and rather than obtaining a measure of “capital per worker” he computes the “capital per *effective* worker”. Thus, the differences in the income per *effective* worker between United States and other (less developed) economies diminish, although the paradox remains still alive. Secondly, Lucas points out that usually there is a misspecification in the estimation of the aggregate production function. He assumes that human capital also produces externalities. Taking account human capital’s externalities the differences in income per capita across countries disappear. Alfaro *et al.* (2005) also points out that government tax policies differences across countries can lead to discrepancies in the effective return of capital. For example, they indicate that inflation could work as a tax that would lower the return of the capital. Additionally, they mention that these policies can limit capital flows. Finally, Alfaro *et al.* (2005) additionally stress the role of the institutional structure. They state that if the quality of institution is high the government is allowed to protect property rights, encouraging investment. On the other hand, poor institutions would promote uncertainty. Thus, the total productivity factor represents not only just productivity index but rather the incentive structure that protect property rights. In summary, as a consequence of having poor fundamentals only rich countries receive capitals inflows.

Kose *et al.* (2010) also indicates that this empirical findings suggest that the positive relationship

<sup>2</sup>Each observation is the average GDP per capita (weighted by the country’s share of the total current surplus or deficit) of countries in the World Economic Outlook (WEO) database with current account surpluses or deficits in the indicated year, expressed as a percentage of GDP per capita in the country with the highest GDP per capita that year. GDP per capita is adjusted for purchasing power parity. Raw data from the WEO database. The period of analysis is 1970-2005.

<sup>3</sup>Alfaro *et al.* (2005) run a regression of the average capital inflows (during 1970-2000) on the income per capita for the year 1970

between low reliance in external capital and growth is explained by national savings. Actually, what they report is that countries with high investment ratios and lower reliance on foreign capital (with lower current account deficits) tend to grow faster. However, how it could be explained - at the very beginning of growth process - that domestic savings would be enough to finance either growing consumption needs as well as huge investment requirements?<sup>4</sup> The answer that Prasad *et al.* (2007) suggest is that fast growing economies present an stereotype which is distinct to that of the traditional business-cycle theory: it is not necessary to rely on external saving to grow faster. In the initial stages of development, restrictions to access to international credit markets would exist. High domestic interest rates (mixed with high risk aversion) would postpone consumption and would encourage domestic investment and exports. So when you are rich, you have more collateral and borrowing rates decreases; thus, in this model you have access to external borrowing when you no longer need it!!!

All in all, it expected that in less developing economies the effects terms-of-trade (*TOT*) shock would be dampened by internal barriers to invest. As entrepreneurs remain reluctant to invest, the (positive) terms of trade shock increases current income and also consumption (if the perturbation is permanent). The investment would not respond. Thus, the response of a shock to *TOT* is predicted to be lower in less developed economies than that of in advanced ones. In the next subsection we analyze the relationship between imperfections in capital markets and the effect of a shock to *TOT*.

## 2.2 Failures in financial markets

Lucas (1990) also mentions that capital markets imperfections prevent capital from flowing to less developed countries. He remarks the difficulties that countries may face to enforce their borrowing contracts; then, the “political risk” appears. The borrowing rate would be higher if a risk premium had to be considered. Thus, investment would be lower. Gertler and Rogoff (1990) introduce a model with moral hazard in capital markets, where an endogenous risk premium arises because the investor can not see what the borrower does with the funds he borrows from abroad. A collateral is needed to back the debt. The problem is that if the country is poor that collateral will not be enough to back the liabilities. Thus, the borrower has to pay a higher rate due the existence of uncollateralized component of borrowing. So, the model predicts that as country wealth increases, the risk premium decreases because the collateral is greater. Then, the richest countries are those who are able to borrow higher amounts of money to fund its projects. Then the higher the income per capita (which is a proxy of wealth) the lower is the borrowing rate that the country has to bear (in this situation the credit markets offer money when the country no longer need it as in Agenor and Aizenman (2004)). Gertler and Rogoff (1990) show an increasing relationship between debt and income per capita for a sample of developing countries.

Figure 3 shows a negative relationship between (the log of) risk premium and income per capita. The variables are averaged during 1980-2009 for each country. In the figure we plot variables for “advanced” economies” and for “developing” economies as well.<sup>5</sup> What the data show is that apparently that Glick-Rogoff’s conclusions hold: the higher the income per capita (which is considered as a proxy of country wealth) the lower the borrowing rate.

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<sup>4</sup>Glick and Rogoff (1995) show that permanent country-specific shock cause (at the moment of the impact) small open economies to run current account deficits. Then distinction between permanent and transitory shocks becomes paramount. Theoretically, the current account response to a permanent country-specific shock at the moment of the impact is negative, while in the long run it tends to zero. However, the stylized facts indicate that in the short run (i.e. when a positive terms-of-trade shocks hits the economy) the current account respond positively while in the long run it tend to show a deficit and a subsequent adjustment. (Agenor and Aizenman, 2004) sketch a model where the current account responds asymmetrically to (permanent) terms-of-trade shocks under the assumption that credit markets are constrained; thus a positive shock would cause an improvement in the current account because the country is prone to increase its savings in “good times” to draw upon in “bad times” (thus, growth and current account surpluses would be correlated given that developing countries face credit restrictions in borrowing markets). Rodrik (2007) points out that rather than been saving-constrained, developing economies are investment-constrained. This explanation would imply that the access to credit markets would not encourage investment opportunities. Actually, our approach is somewhat different, although it would be acknowledged that in developing countries the investment is constrained by fundamentals, the existence of borrowing constraints encourage domestic savings as well as capital flight when the economy is benefited by a positive shock to *TOT*, because the economy wants to be protected of a potential economic downturn in the future (when she additionally will suffer borrowing constraints).

<sup>5</sup>In this paper we distinguish between “advanced” and “other economies”; additionally, within the later group we split the sample into two country sets: “developing” economies” and “other development economies”. Figure 3 we consider “advanced economies” and within the group of “other economies” we only include the “developing economies”.

Figura.3. Risk Premium and GDPpcppp (1980–2009)

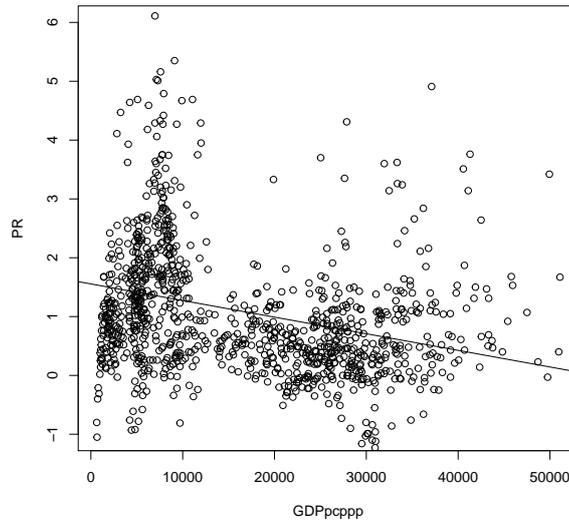


Figure 3 shows that, apart from showing good fundamentals, rich countries have access to more funds because they have a collateral to back their debts. This reduces its borrowing rate and increases investment. Thus rich countries take advantage of their fundamentals (they are not investment-constrained) as well as of their collateral, which causes the interest rate to decrease. In this theoretical setting, a positive (permanent) terms-of-trade shock would cause the risky premium to decrease. Barone and Descalzi (2012) concluded that find the risk premium is negatively correlated with the terms of trade, and that the estimated coefficients seem to be greater for the group of countries with higher income levels.

Figure.4.A. Shocks to Risk Premium vs Shocks to Terms of Trade. AE

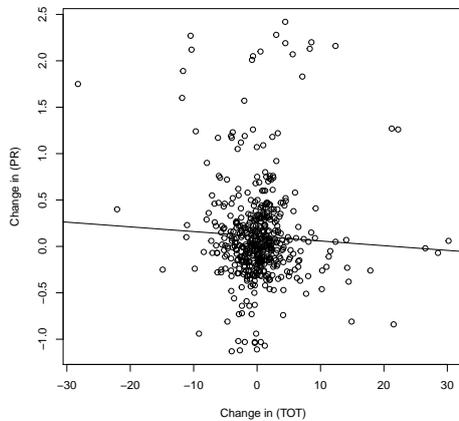
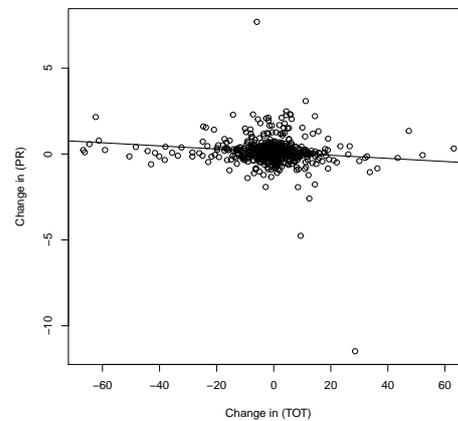


Figure.4.B. Shocks to Risk Premium vs Shocks to Terms of Trade. DE.



Are the shocks to  $TOT$  related to the changes in the collateral in developing economies? Barone and Descalzi (2010) found some evidence about the influence of  $TOT$  on the growth trend in developing countries: they concluded that in some economies  $GDP$  and  $TOT$  were cointegrated for a sample of Latin American countries. Figure 4.A and 4.B show the relationship between the terms-of-trade shocks and shock to risk premium in “developed” countries and in “developing” ones (that is, the variables are plotted in differences). The (unconditional) relationship in each group is positive. A rise in the terms of trade would improve the collateral in developing economies by reducing the rate they must pay for their debt.

What it is assumed in this paper is that terms-of-trade shocks would reduce the borrowing rate in developing countries. A positive shock would alleviate the restriction in borrowing markets to which they are subject to. However, the effect of the drop in the borrowing rate on capital inflows is far from being clear. Given that the developing countries are assumed to be investment-constrained (they are “endowment” economies), the abundance of borrowing funds could not ensure that capital would flow to them. We tackle this topic in the following section.

### 3 Hypothesis and results

In this section we examine the relationship between *FDI* inflows and terms of trade tacking account the theoretical results reviewed in the last section. Our hypothesis is that shocks to *TOT* increase the current income; it will also reduce the borrowing rate. However, the response of the investment and *FDI* inflows will be lower than that of more developed countries (that is, developing countries are investment-constrained and the behave as “endowment” economies.) Additionally, following Agenor and Aizenman (2004) we assume that consumption do no rise as it should because individuals show a larger degree of risk aversion to adverse shocks to income in the future: then when a positive shock occurs they increase their saving to utilize in bad times. If the domestic investment opportunities are scarce, the increase in domestic savings will cause capital to flow abroad. Given that fundamentals are weak, the increase in domestic savings is reflected in a positive current account balance ( $\Delta S \cong \Delta CC$  because the country is investment constrained). Thus, the traditional Harberger-Laursen-Metzeler effects follows. This is the topic we tackle in this paper.

In summary, our approach is described as follows: firstly, developing economies are investment-constrained by fundamentals because of the reluctance of entrepreneurs to invest, given the wrong policies applied by governments. The access to capital markets does not guarantee they to growth (Rodrik-assumption); secondly, given that developing countries suffer binding constraints in credit markets, they have a high degree of risk aversion to adverse shocks to income in the future (Agenor-Aizenman assumption); thirdly, risk premium depends upon collateral (Gertler-Rogoff assumption); fourthly, collateral depends on *TOT*.

As a consequence, if an exogenous shock (i.e. terms-of-trade shock) affects selectively the economy, the capital will flow abroad. The borrowing rate probably will decrease although the investment will still remain discouraged by negative fundamentals. Additionally, consumption will not rise because economy wants to be prevented from negative shocks in the future. As a consequence, domestic savings (caused mainly by the increase in the current income) will rise too. Finally, the less developed economy will became a capital-exporter nation, and a shock to *TOT* entails an “opportunity” to flight capital. In the section we gather some statistical evidence on the issue.

We consider the following regression equation:

$$F = \alpha + \beta_1 \times TOT + \beta_2 \times INFL + \beta_3 \times AC + \beta_4 \times RD + \beta_5 \times M2GDP \quad (2)$$

where *F* represent the foreign direct investment inflow in in per capita terms, *TOT* are the (log of) terms-of-trade shocks, *INFL*, is the annual inflation rate, *AC* is a measure of trade openness, *RD* is the dependency rate, while *M2GDP* is the *M2*-to-*GDP* ratio. We utilize a sample with 45 countries during 1980-2009. We run this regression equation according to two alternative countries classifications: first, we split the sample into into two country groups: that is, utilizing the International Monetary Fund criteria we distinguish between the group of “advanced economies” (AE) and the “other economies” (OE); secondly, we split the sample into three groups: the advanced economies (*AE*), the “developing economies” (*DE*) and the “other developing” (*ODE*) economies . In the latter classification we distinguish between those economies who have more chances of reaching the status of “advanced” economy (i.e. the *DE* countries) and those countries who are far away form that situation (i.e. the *ODE* countries). See statistical appendix for further details.

Our stated assumption implies that  $\beta_1$  is expected to be lower in developing countries than the value estimated for advanced economies. The sign of the remaining control variables is expected to be as follows. The estimated coefficient of inflation should be negative (as an increasing inflation rate is thought to rise risk premium and thus to discourage investment and capital inflows). The response of the *FDI* inflows to  $AC(\beta_3)$  is expected to be positive (trade and financial openness should be correlated). It is expected that the coefficient of the rate of dependency will be positive, given that *RD* is liked to reduce the domestic savings: in particular, the higher the *RD* the lowest the domestic savings (given a borrowing rate, the domestic saving in considered a substitute of capital flows).

Following Wooldridge (2001) We apply fixed effects feasible generalized least squares (FEFGLS). The results are showed in Table 1. It can be seen that for the group of advanced economies the coefficient of *TOT* is positive and significantly different from zero at 1% level of significance; it would reinforce our hypothesis that *AE* economies a terms-of-trade shock increases the collateral and also tends to lower the risk premium, encouraging investment and capital inflows. The sign of coefficients of *INFL* and *AC* have the expected sign and are statistically different from zero. However, the coefficient of *RD* is positive

(statistically different from zero), while  $\beta_5$  insignificantly different from zero at usual confidence levels. The regression results for the group of economies that are not advanced (the *OE* group) shows that the coefficient of (the log of) *TOT* is still positive, although its value is lower than that of *AE* economies, as expected. The coefficients of the inflation rate are negative while that of *M2GDP* is positive at 1% level of significance, as expected. However, the estimates of the coefficients of *AC* and *RD* are significant different from zero at 1% level but their sign are not the expected ones.

The two last columns reports the results obtained after splitting the group of “other economies” into two subgroups: the set of “developing” countries (*DE*) - the countries that are suppose to have more chances of reaching the developed ones; and the set of “other developing economies” (*ODE*) who are suppose to be more distant from the first group. For the subgroup of *DE* the coefficient of (the log of) *TOT* is negative and significantly different from zero at 1% level of significance. Then, the regression results do not reject our null hypothesis that indicates that developing countries are investment-constrained economies, and that the decrease in the borrowing rate due to a rise in the value of the collateral (caused by an increase in the terms of trade) would not be enough to encourage capital inflows. In other words, Lucas’ explanations of the paradox (human capital, externalities) indicate that there are still binding restrictions that prevent capital to flow towards less development countries even though restrictions associated to capital market imperfection are alleviated (i.e. a terms-of-trade shock rises the collateral and cause risk premium to diminish). With respect to the remaining variables, the signs of the estimated coefficients are those we expected except for that of *RD*, which is negative and statistically different from zero.

The sign of  $\beta_1$  the regression equation related to *ODE*, although positive (is significantly different from zero at 1% level), still remains below that of estimated for the sample of developed countries. However, the signs of the estimated coefficients for the control variables are far from been the expected, except for the sign of *M2GDP* which is positive and significantly different from zero.

Table 1: **Determinants of Foreign Direct Investment (FDI)**

<i>Independent variable</i>	<i>Dependent variable is the FDI per capita</i>			
	FEFGLS ALL	FEFGLS AE	FEFGLS DE	FEFGLS ODE
<i>TOT</i>	0.6594 (0.0000)	12.0574 (0.0000)	-0.1197 (0.0000)	0.5472 (0.0000)
<i>INFL</i>	0.0042 (0.0367)	-24.1991 (0.0000)	-0.0178 (0.0000)	0.0036 (0.0015)
<i>AC</i>	3.8598 (0.0000)	41.6175 (0.0000)	0.7585 (0.0000)	-1.0738 (0.0000)
<i>RD</i>	1.1581 (0.2821)	-20.6450 (0.0000)	-3.0963 (0.0000)	-2.6862 (0.0000)
<i>M2GDP</i>	4.0400 (0.0000)	-0.5735 (0.2143)	0.4723 (0.0000)	4.2394 (0.0000)
<i>Observation</i>	1350	510	540	300
<i>AdjustedR – squared</i>	0.176	0.203	0.432	0.368

Note: p-value between parentheses. The dependent variable is the Foreign Direct Investment per capita. The list of explanatory variables includes the terms of trade (*TOT*), the rate of inflation (*INFL*), the trade openness (*AC*), the dependency ratio (*RD*) and the quasi money to gross domestic product ratio (*M2GDP*).

## 4 Concluding remarks

This paper is aimed to study differences in the determinants of capital inflows in developing countries versus developed ones. Our main propose is to evaluate the response of foreign direct investment (*FDI*) inflows to terms-of-trade shocks in developing countries and compare the obtained results with that of

more developed countries. Thus, our main interest is based on addressing the impact of global real cycles on developing economies. We expect the response of *FDI* inflows to terms-of-shocks to be lower in less developed countries.

Our assumption is associated to Lucas (1990), who according to neoclassical theory stated that the differences in production per worker between rich and poor economies are due to differences in the level of capital per worker. What we specifically point out here is that poor countries does not show good fundamentals and they are investment-constrained economies (Rodrik, 2007). Alfaro *et al.* (2005) explains that capital does not flow from rich to poor countries because of the lack of institutional quality (thus, bad fundamentals are tied to a deficient level of institutional quality).

Additionally, poor countries have not access to credit markets because they do not have enough collateral (i.e. the country wealth is less than her capital requirements) to back their liabilities (Gertler and Rogoff, 1990). This increases their borrowing rate. On the other hand, rich countries not only take advantage of their fundamentals (given that they are not investment-constrained) but also of their collateral, which cause their borrowing rate to decrease (and as a consequence the investment rises).

Finally, under these assumptions we expect that an increase of terms-of-trade shocks should not cause *FDI* inflows to increase in developing countries. Even though the positive shock would increase the country wealth (i.e. the collateral) - which causes the borrowing rate to decrease as it was shown by Barone and Descalzi (2012) - the economy is investment-constrained and the investment will not rise (furthermore, as Agenor and Aizenman (2004) shows, a (positive) terms-of trade shock would improve the current account balance rather than a deficit).

The empirical evidence suggests that a (positive) terms-of-trade shock will probably ease the borrowing constraints. However, there are still remaining distortions that discourage investment and cause capital to flow abroad even though interest rate decreases.

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## 5 Statistical Appendix

Annual data for years 1980-2009 for economic aggregates were obtained from World Development Indicators (WDI), International Financial Statistics (IFS), Penn World Table version 7, UNCTAD and The Worldwide Governance Indicators, 2011 Update.

*AC*: Trade openness is calculated as the sum of exports and imports ratio to GDP. Serie code NE.EXP.GNFS.ZS serie name Exports of goods and services (% of GDP) and serie code NE.IMP.GNFS.ZS y serie name Imports of goods and services (% of GDP), WDI

*FDI*: is the foreign direct investment per capita, UNCTADstat. The *FDIpc* is calculated using serie name Population serie code SP.POP.TOTL, WDI.

*GDPpcppp*: Gross Domestic Product per capita Purchase Power Parity. Peen World Table version 7.

*INFL*: is the inflation rate serie code NY.GDP.DEFL.KD.ZG, serie name INFLATION, GDP DEFLACTOR (% annual).

*M2GDP*: is the M2 to GDP ratio. M2 serie code FM.LBL.MQMY.CN serie name Money and quasi money (current LCU), WDI and Central Bank. GDP serie code NY.GDP.MKTP.CN serie name GDP (current LCU).

*PR*: Risk Premium is calculated as the difference between representative interest rate and international interest rate. the rate of interest of United State (code 11160CS.ZF .IFS) as the international free-risk rate

*RD*: is the dependency ratio, serie code SP.POP.DPND serie name AGE DEPENDENCY RATIO (per cent of working-age population) WDI.

*TOT*: is the terms of trade, serie code TT.PRI.MRCH.XD.WD serie name NET BARTER TERMS OF TRADE INDEX (2000=100), WDI. For India data were obtained from the UNCTAD.

The representative interest rate for each country included in the panel data analysed the relationship between different definitions of interest rates available for the study period in each country. The following table shows the correlation coefficients between definitions alternative interest rates, this correlation between different rates is high. The lending rate is preferred in cases where it was available, since it reflects the opportunity cost of domestic investors.

Table 2: Correlation Coefficients

<i>Country</i>	(1)	(2)	(3)	(4)	(5)	(6)
Argentina(1994 2009)		0.9429				
Australia (1980 2009)				0.9821	0.9076	0.9173
Bolivia(1996 2009)	0.8964	0.7898		0.9265		
Brazil(1997 2009)	0.7236	0.7481		0.9784		
Canada(1980 2009)	0.9313	0.9984		0.9268	0.9357	
Chile(1993 2009)		0.8149				
Colombia(1986 2009)		0.9760				
Denmark(1980 2002)		0.8866	0.8271			
Ecuador(1980 2007)		0.8167				
Egypt(1980 2009)		0.9068				
Germany(1980 2009)					0.8943	

Table 2 – *Continued*

<i>Country</i>	(1)	(2)	(3)	(4)	(5)	(6)
Iceland(1987 2009)	0.8393	0.7990		0.9174	0.8626	
India(1980 2009)		0.8626				
Ireland(1980 2009)					0.9292	
Israel(1982 2009)		0.8760				
Italy(1980 2009)					0.9637	
Japan(1980 2009)	0.9862	0.9649		0.9784		0.8155
Jordan(1990 2009)		0.4434				
Korea, Rep.(1980 2009)	0.8257	0.7957		0.8576		
Malaysia(1987 2009)				0.7760		
Mexico(1993 2009)				0.9971		
New Zealand (1987 2009)	0.9310	0.8685		0.9645		
Norway(1980 2006)	0.8883	0.9764		0.9764		
Pakistan(1980 2009)	0.7283					
Peru(1986 2009)		0.4076				
Philippines(1985 2009)	0.8804	0.8730		0.8730		
South Africa(1980 2009)	0.8780	0.8704		0.9629		
Spain(1980 2009)					0.9338	
Sweden(1980 2003)	0.9266	0.9590		0.9417		
Thailand(1980 2009)	0.9476	0.9387		0.9472		
Turkey(1987 2009)	0.7672					
United Kingdom(1980 2009)				0.9982	0.9123	0.9174
United States(1980 2009)	0.9410	0.9277		0.9907		
Uruguay(1981 2009)		0.9340				
Venezuela, Rep. (1984 2009)		0.9088				

Source: IFS. (1) Correlation between Discount and Money Market Rate. (2) Correlation between Discount and Lending Rate. (3) Correlation between Discount and Bond Yield. (4) Correlation between Money and Lending Rate. (5) Correlation between Money and Bond Yield. (6) Correlation between Lending and Bond Yield.

The representative interest rate selected for each country was: **a)** Discount Rate (IFS) for Colombia, Ecuador, Jordan, Peru, Turkey and Venezuela. **b)** Lending Rate IFS or WDI for Australia, Bolivia, Botswana, Canada, Chile, China, Egypt, Gabon, Guatemala, Iceland, India, Israel, Korea Republic, Morocco, New Zealand, Norway, Philippines, South Africa, Thailand, United States and Uruguay. **c)** Money Market Rate (IFS) for Argentina, Brazil, Indonesia, Malaysia, Mexico, Pakistan, Sweden and Tunisia. **d)** Government Bond Yield IFS for Japan, Denmark, Germany, Ireland, Italy, Netherlands, Portugal, Spain and United Kingdom. **e)** Treasury Bill Rate, IFS for Greece.

In addition, the correlation between risk premium and the  $EMBI+$  for the period and the countries which data were available is studied. The results shows a high correlation between the risk premium calculated as the difference between the rate of interest and international interest rate of each country and the annual average  $EMBI+$ .

Table 3: Correlation between  $EMBI+$  and lending rate minus international rate (2002-2008)

<i>Country</i>	<i>Correlation Coefficient</i>
Argentina	0.6859
Brazil	0.6450
Colombia	0.9140
Mexico	0.9248
Morocco	0.8812
Peru	0.5339
Philippines	-0.7942
South Africa	0.6858
Venezuela, RB	0.6108

Figure A shows that the value of risk premium faced by developing economies are higher and more volatile than for the advanced economies. Figure B notice the increased volatility in the terms of trade in developing countries and the others developing, the range of values for the terms of trade is two times higher in developing countries than advanced economies.

