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# FDI and the labor share in developing countries: A theory and some evidence\*

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**Abstract:** This paper addresses the impact of FDI on the labor share of income in developing countries.

We propose a theory that relies on the impacts of FDI on productive heterogeneity between firms in a frictional labor market. We argue that FDI have two opposite effects on the labor share: a negative force originated by market power and technological advance, and a positive force due to increased labor market competition between firms. Then, we test this theory on aggregate panel data through fixed effects and system-GMM estimations. We find a quantitatively meaningful U-shaped relationship between the labor share in the manufacturing sector and the ratio of FDI stock to GDP. However, most of the countries are stuck in the decreasing part of the curve, which we relate to multinationals' location choices.

**Keywords:** FDI; Matching frictions; Firm heterogeneity; Technological advance

**J.E.L classification:** E25; F16; F21

## 1 Introduction

This paper addresses the impact of FDI on the labor share of income in developing countries. We propose a theory that relates on the impacts of FDI on productive heterogeneity. We build on the idea that FDI have two opposite effects on the labor share: a negative force originated by market power and technological advance, and a positive force due to increased labor market competition between firms.

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Then, we test this theory on aggregate panel data through fixed effect and system-GMM estimations. We find a (statistically meaningful) U-shaped relationship between the labor share in manufacturing sector and the ratio of FDI stock to GDP. However, most of the countries are stuck in the decreasing part of the curve, which we relate to multinational's location choices.

Labor shares have plunged over the past two/three decades in poor countries. Harrison (2002) for instance estimates that developing countries have experienced a yearly 0.1 point decrease in labor share from 1970 to 1993 and 0.3 point from 1993 to 1996. Meanwhile, developing countries have become increasingly open to capital movements. Main-street people as well as world-famous economists suggest that these two phenomena are deeply related. To quote Sachs (1998):

"For example, both evidence and theoretical logic make it quite clear that union wage premia are driven down by the openness of the world financial system and that the ability of capital to move offshore really does pose limits on the wage-setting or wage-bargaining strategies of trade unions which are restrained in their wage demands by the higher elasticity of labor demand."

This borrows from Rodrik (1997) who explains that the current wave of globalization mainly increases the relative mobility of capital vis-à-vis labor. This has received some support from recent papers that examine how trade and capital account openness affect the labor share of income<sup>1</sup>. These papers mostly underline the side effects of globalization, casting doubt on the relevance of policies that advertise more trade and financial openness.

This paper makes four contributions. First, and most importantly, this provides a simple frictional model of the labor market tailored to think about the impacts of FDI and financial openness on the labor share of income in the host country. Second, we argue that FDI can have negative effects on the labor share of income, even though foreign firms pay higher wages than local firms and FDI benefit all the workers. Third, we suggest that there should be a reversal in the relationship between FDI and the labor share. At least, we claim that the labor share cost of FDI decreases with FDI level. Fourth, we examine the relevance of the theory on aggregate data.

In the theoretical part of the paper, we present a two-sector static model in which local and foreign firms coexist. Foreign firms are more productive than local firms<sup>2</sup>, but they face higher entry costs. Such entry costs for the foreign firms have two components. On the one hand, they parameterize the degree of financial openness. This component is related to the institutions that shape the attractiveness of the country for the foreign investors. On the other hand, they capture opportunity costs of entry. Foreign firms have alternative profit opportunities in the rest of the world.

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<sup>1</sup>Ortega and Rodriguez (2002) argue that trade openness deteriorates the labor share of income in developing countries. Diwan (2000, 2002) claims that exchange rate crises have a strong negative impact on the labor share. Harrison (2002), and Jayadev and Lee (2005) show that capital controls tend to increase the labor share.

<sup>2</sup>Foreign firms are more productive than local firms for several reasons. First, foreign firms are likely to benefit from advanced technologies. Second, theoretical models of FDI like Helpman et al (2004) predict that only the most productive firms become multinational companies. Third, foreign owners self-select into high-productivity sectors, and/or where they have a comparative advantage. Fourth, foreign-owned firms have easier access to capital. The particular reason why foreign firms are more productive does not matter.

Sectors are perfectly symmetric and they both feature matching frictions. Workers search in both sectors. If a worker receives a single offer, he is paid the monopsony wage. If he receives more than one offer, potential employers enter Bertrand competition and the worker goes where the wage offer is the highest. When a foreign firm and a local firm compete, the foreign firm wins the competition. The worker is then paid at the marginal productivity he would have reached if he had been employed by the local firm. When two foreign firms or two local firms compete, the worker obtains full marginal product.

There is a one-to-one decreasing relationship between the equilibrium proportion of foreign firms and their entry costs. In turn, the proportion of foreign firms governs the degree of productive heterogeneity between firms. Firms are very similar when foreign firms produce no output, and when they produce most of output. Owing to market frictions, the labor share decreases with firm heterogeneity. We show that there is a single value of the entry cost that foreign firms face above which a decrease in such a cost reduces the labor share, and below which this raises the labor share. Therefore, the relationship between foreign firms' cost of entry and the labor share is U-shaped. The magnitude of the relationship is governed by the technological gap between foreign and local firms.

In the empirical part of the paper, we estimate a linearized version of the model on aggregate panel data. The dataset covers a large panel of countries whose GDP per capita was 60% or lower than US GDP per capita in 1980. The dependent variable is the labor share in manufacturing sector, that is the ratio of total wage bill to GDP produced in that sector. The variable that captures the magnitude of foreign firms' activity is the stock of inward FDI in percentage of GDP. One minus the ratio of local GDP per capita to US GDP per capita is a proxy for the technological gap between local firms and foreign firms. We typically explain the labor share by means of FDI stock to GDP, FDI stock to GDP squared, proxy for technological gap, ratio of capital to output, unemployment rate, and time dummies. We first focus on fixed effects regressions, but we also discuss outliers, control for endogeneity and autocorrelation bias with system-GMM estimates, and control for alternative measures of globalization. Our estimations show a significant U-shaped relationship between the labor share and FDI stock to GDP. The other determinants of the labor share have the predicted sign: technological gap (-), unemployment rate (-), capital to output ratio (0/+).

The threshold above which the labor share starts increasing with FDI is very high, typically 150-180% of GDP. This means that FDI have decreased the labor share in most of the host countries of our dataset. This casts some doubt on the ability of openness policies to attract FDI above the threshold. One of the likely reasons suggested by our model is that opportunity costs matter a lot for foreign firms. The countries above the threshold are Hong-Kong, Ireland, Macao, and Singapore. Those countries experienced very high growth rates, and attracted enormous volumes of FDI. A thoughtful government may shape a high-quality institutional environment to please foreign investors; but the government cannot reduce alternative profit opportunities in other countries.

Overall, the quantitative impact of FDI is substantially large. Consider a country that is characterized by the mean value of FDI/Y and experiences an increase of one standard deviation in this ratio, *everything else equal*. Our estimates imply a fall in the labor share that varies between 3.5 to 7 points. This impact amounts between 7% to 22% of the mean labor share in our sample. FDI have substantially contributed to falling labor shares in these countries.

This paper relates to two strands of literature.

First, we contribute to the ongoing debate on the effects of FDI on the factor distribution of output in the host country. Most of the literature focuses on wage inequality (recent theoretical contributions include Liang and Mai, 2003, Marjit et al, 2004, and Das, 2005), and displays mixed evidence in favor of the thesis according to which FDI cause wage inequality, either at industry level<sup>3</sup> or country level<sup>4</sup>. By contrast, we focus on the labor share. A decrease in labor share originated by FDI inflows may indicate that the overall benefits accruing to globalization are captured by foreign investors, with unchanged standard of living for the population. This is especially true when the host country fails to design the fiscal tools to tax the benefits made by firms financed by foreign capital. FDI-induced falls in labor shares in developing countries also strengthen the protectionist view according to which developed economies should not trade with low-wage countries. These different effects are likely to give political support against FDI and the multinationals, both in developed and developing countries.

Second, this paper is related to the growing literature on globalization and labor market frictions. This literature mostly focuses on trade liberalization. A first strand of contributions incorporates matching frictions in two-sector models of international trade (see Davidson et al, 1999, Moore and Ranjan, 2005, Davidson and Matusz, 2006a, 2006b). Another strand of contributions uses models of international trade with firm heterogeneity (see Egger and Kreickemeier, 2006, Davis and Harrigan, 2007, Helpman and Itskhoki, 2007). Mitra and Ranjan (2007) analyze the impact of offshoring in the home economy, while Davidson et al (2006) discuss the outsourcing of high-skill jobs. Our paper complements these contributions in two ways. On the one hand, we are interested in the labor share rather than in unemployment and wage dispersion/inequality. On the other hand, we focus on the host economy rather than on the home country.

The rest of the paper is organized as follows. Section 2 introduces our model. Section 3 discusses extensions dealing with microeconomic implications, FDI learning, transfer pricing, technological transfers, and capital choice. Section 4 contains the empirical part of the paper. Section 5 concludes.

## 2 The model

### 2.1 Environment

The model is static. There are two final goods entering preferences symmetrically. Each good is produced within an autonomous sector. There are a continuum of workers normalized to one and a continuum of firms. Workers are homogenous. Firms are not. Foreign firms differ from local firms. The labor market is characterized by frictions. Matching frictions will parameterize the ability of people to generate wage competition between potential employers.

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<sup>3</sup>Feenstra and Hanson (1997) on Mexico, Figini and Görg (1999) on Ireland and Taylor and Driffield (2005) on the UK find a positive effect of FDI on wage inequality, while Blonigen and Slaughter (2001) on the US do not find any significant effects.

<sup>4</sup>Tsai (1995) and Gopinath and Chen (2003) find that FDI has increased wage inequality only in a subset of developing countries, while Basu and Guariglia (2006) find a more general relationship. Figini and Görg (2006) argue that the positive effect of FDI on wage inequality decreases with development.

Each firm, foreign or local, is endowed with a single job slot. Foreign firms are more productive than local firms: the amount of output produced by a foreign and a local firm are respectively  $y_F$  and  $y_R$  with  $y_F > y_R$ . This reflects the technological advance of foreign firms (so that total factor productivity is higher), and/or their better access to the financial market (so that capital intensity is higher).

Before searching for a worker and starting to produce, a firm has to pay the entry cost  $c > 0$ . This is a shadow cost as in Blanchard and Giavazzi (2003). This assumption means that firms make pure profits. If  $c$  was an actual cost, these profits would be dissipated in entry costs. The entry cost is proportional to output and differs according to the nationality of the owners. Hence,  $c_F$  is the entry cost per unit of output of a foreign firm, and  $c_R$  stands for the entry cost of local firms. We assume that  $c_F > c_R$ .

The cost  $c_R$  represents the local difficulties to set up a firm. This cost measures the formal and informal difficulties to set up new businesses (product market regulations, knowledge of recruitment procedures and network of potential employees) and that lead to higher rents. The cost  $c_F$  has three components: general difficulties to open a new business  $c_R$ , imperfect financial openness  $c_O$ , and opportunity cost of entry  $\bar{\pi}$ . Formally,  $c_F = c_R + c_O + \bar{\pi}$ .

Imperfect financial openness is associated to the existence of capital controls and restrictions on international transactions for foreign investors. Foreign investors may also face higher administrative costs (because they have to learn local regulations), or information costs (they have to learn how to recruit their employees). Rising financial openness translates into a lower cost  $c_O \geq 0$ . Opportunity costs of entry result from multinationals' alternative location choices. These alternative locations offer alternative rewards.

Workers and vacancies meet at the sector level according to the matching technology  $M_i = M(u_i, n_i)$ . Here,  $u_i$  stands for the number of job-seekers in sector  $i$  and  $n_i$  stands for the number of vacancies in the same sector. The matching technology  $M$  is homogenous of degree one to ensure that the unemployment rate does not depend on the number of traders in the economy. It is also strictly increasing in both arguments, strictly concave, and bounded by  $\min\{u_i, n_i\}$ . Workers search jobs in both sectors. Hence,  $u_1 = u_2 = 1$ . Firms choose one sector before opening their vacancy. Given such assumptions,  $M(1, n_i) = m(n_i)$  is the probability for a given worker to receive an offer from sector  $i$ . It is increasing in  $n_i$ . Similarly,  $m(n_i)/n_i$  is the probability for a firm to meet a worker. It is decreasing in  $n_i$ .

Firms set wages. If a worker receives a unique offer, he is paid the monopsony wage. For simplicity, the market value of outside opportunities is normalized to zero, and so is the monopsony wage. If a worker receives two offers, one from each sector, firms enter Bertrand competition to attach labor services. Therefore, the model is static, but it features some of the properties of dynamic models with on-the-job search.

To conclude this subsection, note that we introduce two symmetric sectors associated with two matching markets as a trick to ensure that a worker either receives zero, or one, or two job offers (coming from the two sectors). This originates simple free-entry conditions, and this allows to highlight the roles played by firm heterogeneity and matching frictions on the labor share of income. Alternatively, we could have considered a single sector, while workers would have been endowed with two applications (see e.g. Albrecht et al, 2006). Assuming that workers cannot direct their applications towards foreign or local firms would give very similar results.

## 2.2 Labor market equilibrium

The model only admits symmetric equilibria. This has two implications. First, in equilibrium, prices of the two goods are the same, and we normalize the common price to one. Second, the proportion of foreign firms in the total number of firms is also the same in each sector. As a result, we can drop indices  $i$  specific to sectors.

We first consider wage determination. The probability that a worker receives a single job offer is  $2m(n)(1 - m(n))$ . Then, the wage is nil and the firm gets the whole output. The probability of receiving two offers is  $m(n)^2$ . Then, the wage depends on the productivity of the two firms. Let  $\rho$  be the proportion of foreign firms. With probability  $(1 - \rho)^2$ , the two offers emanate from local firms and the worker receives output  $y_R$ . With probability  $\rho(1 - \rho)$ , one of the offers comes from a foreign firm, and the other comes from a local firm. Then, the worker is hired by the foreign firm and his wage is  $y_R$ . The firm gets the difference  $y_F - y_R$ . Finally, with probability  $\rho^2$ , the two offers come from foreign firms. Then, the worker gets the marginal product  $y_F$ .

Expected profits for the two types of firms are:

$$\pi_F = -c_F y_F + \frac{m(n)}{n} [(1 - m(n)) y_F + m(n)(1 - \rho)(y_F - y_R)] \quad (1)$$

$$\pi_R = -c_R y_R + \frac{m(n)}{n} [1 - m(n)] y_R \quad (2)$$

Firms enter the two sectors until profits cover the shadow costs. In equilibrium,  $\pi_R = \pi_F = 0$ .

$$c_F = \frac{m(n)}{n} \left[ 1 - m(n) + m(n)(1 - \rho) \frac{y_F - y_R}{y_F} \right] \quad (3)$$

$$c_R = \frac{m(n)}{n} [1 - m(n)] \quad (4)$$

These two equations simultaneously define  $\rho$ , the proportion of foreign firm in each sector, and  $n$ , the total number of firms in each sector. The system can be solved recursively. The free-entry condition (4) for the local firms determines the total number of firms  $n$ . Then, the free-entry condition (3) determines the proportion of foreign firms  $\rho$ . It is easy to check that  $c_F > c_R$  together with  $y_F > y_R$  imply that there exists a unique equilibrium with a non-trivial proportion of foreign firms.

The reason why the total number of firms only depends on the effective entry cost faced by local firms is the following. If  $c_F$  decreases, profits for foreign firms become positive. New foreign firms enter as result. Since  $c_R$  remains constant, profit expectations for local firms become negative as they find more difficult to recruit a worker. The number of local firms goes down until the total number of firms goes back to its initial value.

Foreign firms' entry cost is  $c_F = c_R + c_O + \bar{\pi}$ . Therefore, rising financial openness as well as falling outside profit opportunities do not modify the total number of firms, but increase the proportion of foreign firms – applying the implicit function theorem to equations (3) and (4) shows that  $dn/dc_F = 0$  and  $d\rho/dc_F < 0$ . An increase in productivity gap  $(y_F - y_R)/y_R$  has similar effects to an increase in financial openness. This increases the proportion of foreign firms, but does not impact the total number of firms.

### 2.3 Labor share

The total wage bill paid by foreign firms is

$$W_F = m(n)^2 \rho [\rho y_F + 2(1 - \rho)y_R] \quad (5)$$

The wage bill corresponds to workers who receive two offers. This happens with probability  $m(n)^2$ . With probability  $\rho^2$  the two offers are from foreign firms and the worker receives the totality of output  $y_R$ . With probability  $2\rho(1 - \rho)$ , one of the two offers is from a local firm, and the worker gets  $y_R$ .

The total wage bill paid by local firms is

$$W_R = m(n)^2 (1 - \rho)^2 y_R \quad (6)$$

Wages correspond to workers who receive two offers from local firms.

Total output in foreign firms is

$$Y_F = m(n) \rho [2 - m(n) \rho] y_F \quad (7)$$

The probability that a worker does not receive a job offer from a foreign firm is  $(1 - m(n) \rho)^2$ . Therefore, the probability that a worker receives an offer from such firms is  $1 - (1 - m(n) \rho)^2$ . However, the worker may receive two offers from such firms with probability  $m(n)^2 \rho^2$ . But, only one of the firms hires him. Hence, we subtract  $m(n)^2 \rho^2$ . The result follows.

Similarly, total output in local firms is

$$Y_R = m(n) (1 - \rho) [2 - m(n) (1 + \rho)] y_R \quad (8)$$

Total wage bill is  $W = W_F + W_R$ , while total output is  $Y = Y_F + Y_R$ . After simple algebra, we obtain

$$LS = \frac{W}{Y} = \frac{m(n) [\rho^2 y_F + (1 - \rho^2) y_R]}{\rho [2 - m(n) \rho] y_F + (1 - \rho) [2 - m(n) (1 + \rho)] y_R} \quad (9)$$

### 2.4 Impact of foreign firms on the labor share

In this sub-section, we analyse how the labor share responds to changes in foreign firms' entry cost. First, entry costs only affect the labor share through effective changes in the proportion of foreign firms. Second, there is a U-shaped relationship between the labor share and the proportion of foreign firms. Finally, multinationals' opportunity costs of entry limit the effectiveness of openness policies, and may forbid the possibility to reach the increasing part of the curve.

The gap in entry costs paid by foreign and local firms is  $c_F - c_R = c_O + \bar{\pi}$ . This gap depends on the degree of financial openness, which determines  $c_O$ , and alternative profit opportunities, which determine  $\bar{\pi}$ . According to the free-entry conditions (3) and (4), changes in either one or both of these cost components only lead to changes in the proportion  $\rho$  of foreign firms in the total number of firms.

Therefore, to capture the impact of a decrease in foreign firms' entry cost, we only need to differentiate LS given by equation (9) with respect to  $\rho$ . We obtain:

$$\frac{dLS}{d\rho} \stackrel{sign}{=} -dY/d\rho \times LS + dW/d\rho \quad (10)$$

$$\stackrel{sign}{=} \underbrace{-(1 - \rho m(n)) (y_F - y_R) LS}_{\text{technological gap effect}} + \underbrace{\rho m(n) (y_F - y_R)}_{\text{wage competition effect}}$$



Two opposite forces are involved:

·The *technological gap effect* tends to decrease the labor share. An increase in the proportion of foreign firms raises output, as they benefit from better productivity. At given wage, this reduces the labor share. This effect depends on the ability of foreign firms to extract a rent on labor thanks to their better technology.

·The *wage competition effect* tends to increase the labor share. An increase in the proportion of foreign firms raises wage competition between them, which increases wages. At given output, this tends to raise the labor share.

The impact of foreign firms' entry cost on the labor share results from the interplay between these two forces. After simple algebra, we get:

$$\frac{dLS}{d\rho} \stackrel{sign}{=} \rho^2 y_F - (1 - \rho)^2 y_R \quad (11)$$

Hence,  $dLS/d\rho$  is non-monotonic in  $\rho$ . It decreases at first, reaches a minimum, and finally increases. The technological rent effect initially dominates, while it is dominated at larger proportion of foreign firms. The threshold proportion of foreign firms  $\rho^*$  below (above) which increased financial openness deteriorates (raises) the labor share results from  $dLS/d\rho = 0$ . We find

$$\rho^* = \frac{(y_R y_F)^{1/2} - y_R}{y_F - y_R} \quad (12)$$

The pattern of the labor share with respect to the proportion of foreign firms reflects the pattern of productive heterogeneity among firms. The labor share is the same when there are no foreign investors ( $c_F$  sufficiently large, which implies that  $\rho = 0$ ), and when output is only produced by foreign firms ( $c_R = c_F$ , which implies that  $\rho = 1$ ). For these two extreme cases:

$$LS = \frac{m(n)}{2 - m(n)} \quad (13)$$

Figure 1 depicts the U-shaped relationship between the proportion of foreign firms and the labor share.

Increasing financial openness or reducing outside profits means moving along the curve from the left to the right. These variables only affect the labor share to the extent they alter the proportion of foreign firms. Financial openness has no impact per se. This prediction differs from Rodrik-type models in which the labor share decreases with institutional openness (see Harrison, 2002, for instance).

It is important to disentangle costs induced by imperfect financial openness  $c_O$  from opportunity costs  $\bar{\pi}$ . Governments can alter the degree of financial openness; however, they cannot reduce profit opportunities in alternative countries. The proportion of foreign firms easily responds to financial openness policies at early stages of financial openness. It is, therefore, easy to go along the decreasing part of the curve. However, opportunity costs of entry limit the ability of openness policies to reach the increasing part of the curve. In Figure 1,  $\bar{\rho}$  is the proportion of foreign firms implied by the entry cost  $c_F = c_R + \bar{\pi}$ . This constraint may be so tight that  $\bar{\rho}$  is actually lower than  $\rho^*$ .

In our empirical analysis, we will show that most of the developing countries are actually stuck on the decreasing part of the locus. In line with the current discussion, we will argue that this is implied by multinationals' alternative profit locations.

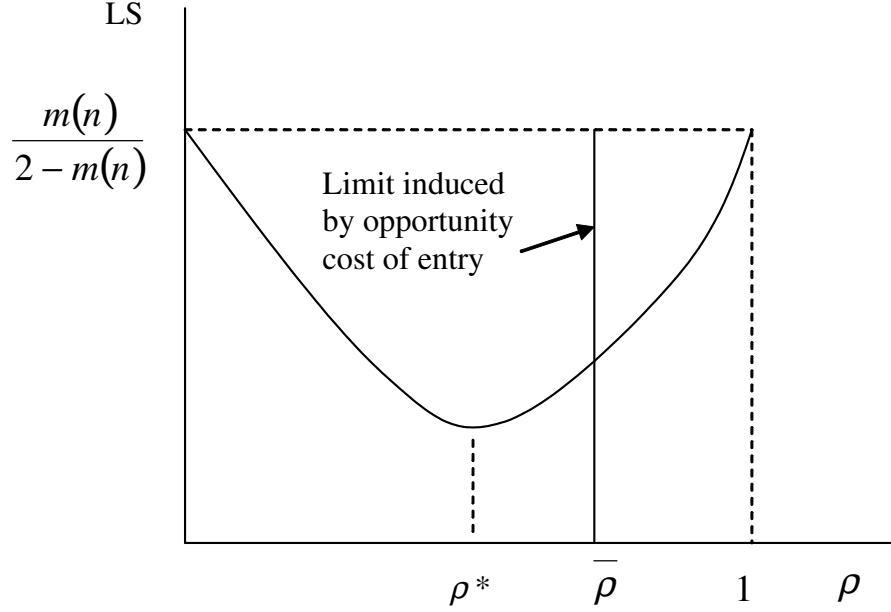


Figure 1: Labor share and proportion of jobs in foreign firms. LS goes from 0 to 1 as  $c_F$  goes from infinity to  $c_R$ . The proportion  $\bar{\rho}$  corresponds to  $c_O = 0$ .

### 3 Extensions and discussions

This section discusses various aspects of our model. We start by examining changes in the labor share between foreign and local firms. Then, we consider four extensions to our model: FDI learning, transfer pricing, technological transfers, and capital choice.

#### 3.1 Micro predictions

In this sub-section, we focus on wages in local and foreign firms. First, foreign firms pay higher wages than local firms. Second, foreign firms may pay higher wages per unit of output, and originate a negative wage externality on local firms.

The labor shares in foreign and local firms can be computed from equations (6), (8), (5) and (7). We obtain:

$$LS_R = \frac{W_R}{Y_R} = \frac{m(1-\rho)}{2-m(1+\rho)} \quad (14)$$

$$LS_F = \frac{W_F}{Y_F} = \frac{m}{2-m\rho} \frac{2(1-\rho)y_R + \rho y_F}{y_F} \quad (15)$$

Average wage paid by type- $i$  firms is  $\bar{w}_i = LS_i y_i$ ,  $i = R, F$ . It follows that  $\bar{w}_F > \frac{m}{2-m\rho} (2-\rho) y_R > \bar{w}_R$ . Foreign firms pay better wages than local firms do. However, the labor share may either be higher or lower in foreign firms. Here, two effects compete. The first effect is intuitive: foreign firms are more productive, which tends to decrease the labor share at given wage. However, they also pay better wages:

each time a foreign and a local firm compete to attract a worker, the worker ends up being paid in the foreign firm, while the job is destroyed in the local firm. For instance, when the proportion of foreign firm is very low,  $\rho \approx 0$ ,  $LS_R \approx m/(2-m)$  and  $LS_F \approx my_R/y_F$ . When the productivity differential is large,  $LS_F < LS_R$  as the former effect suggests. When the productivity differential is low,  $LS_F > LS_R$ .

It is easy to show that  $dLS_R/d\rho < 0$ . The labor share as well as the average wage paid by local firms *decreases* with the proportion of foreign firms. Consider a worker contacted by a local firm. With probability  $1 - m(n)$ , he does not receive an alternative offer. In such a case, he works for his local employer and receives the monopsony wage (0). With probability  $m(n)$ , he receives an alternative offer. With probability  $1 - \rho$ , this offer comes from another local employer. In such a case, the worker is hired by a local firm, and he is paid at marginal product  $y_R$ . With probability  $\rho$ , the offer comes from a foreign employer. Then, the worker is hired by the foreign firm. To summarize, the probability of being hired by a local firm is equal to  $1 - m(n) + m(n)(1 - \rho) = 1 - m(n)\rho$ , while the probability of receiving marginal product conditional on being recruited by a local firm is  $m(n)(1 - \rho)$ . The latter probability goes down with foreign firms' proportion, which explains the declines in labor share and average wage in local firms.

Local firms cannot compete with foreign firms to attract labor services. Local firms that survive an increase in the proportion of foreign firms are firms whose workers are more likely not to benefit from any other offer. Consider the case where the proportion of foreign firms is very large, i.e.  $\rho \approx 1$ . In that case, either the worker does not receive an alternative offer, or he receives an offer from a foreign firm. In the former case, he gets the monopsony wage in the local firm. In the latter case, he works in a foreign firm. Hence, the only workers hired by local firms receive the monopsony wage and the labor share is minimal in such firms (here, 0).

This result is in accordance with the empirical estimates of Aitken et al (1996). They explore the impact of FDI on wages in Mexico, Venezuela and United States. They find that FDI are associated with higher wages. However, in Mexico and Venezuela, foreign investment has a negative impact on the wage paid by domestic firms. This negative effect is statistically significant in Venezuela, while it is not in Mexico. Aitken et al argue that this impact might be due to the fact that foreign firms select the best workers, or to the fact that the entry of foreign investment has coincided with a decline in the productivity of domestically owned plants. We tell another story that is based on matching frictions and wage competition between potential employers.

In foreign firms,

$$dLS_F/d\rho \stackrel{sign}{=} y_F - (2 - m)y_R \quad (16)$$

Hence, the labor share and the average wage paid by foreign firms can either decrease or increase with the proportion of foreign firms. This increases whenever the productivity differential between foreign and local firms is sufficiently large, and/or the matching probability is sufficiently high. For instance, the labor share increases with  $\rho$  when the labor market is perfectly competitive ( $\rho = 1$ ).

### 3.2 Accounting for FDI learning

In this sub-section, we examine the argument according to which foreign firms' entry makes easier the entry of new firms. This may give birth to multiple equilibria: low equilibria with few FDI, small output,

but a high labor share, would coexist with equilibria with large FDI and high output, while the level of the labor share would either be higher or lower. Interestingly, this assumption does not alter the relationship between the labor share and the proportion of foreign firms.

We introduce FDI learning as follows: we assume that foreign firms' entry cost  $c_F$  is decreasing in  $\rho$  – likely through the openness component  $c_o$ . The model is unchanged, but the free-entry equation that defines the proportion of foreign firms. The equilibrium vector  $(\rho, n)$  now solves:

$$c_F(\rho) = \frac{m(n)}{n} \left[ 1 - m(n) + m(n)(1 - \rho) \frac{y_F - y_R}{y_F} \right] \quad (17)$$

$$c_R = \frac{m(n)}{n} [1 - m(n)] \quad (18)$$

The total number of firms  $n$  remains the same: this only depends on local firms' entry cost  $c_R$ . Foreign firms' proportion is defined by equation (17). There is a multiplier effect. Both the right-hand side and the left-hand side of equation (17) are decreasing in  $\rho$ . This effect may originate multiple equilibria, with same number of jobs, same unemployment rate, but different proportions of foreign firms. Equilibria have the following properties. First, given that foreign firms are more productive, equilibria in which foreign firms' proportion is high are also equilibria in which GDP per capita is high. Second, given that the relationship between foreign firms' proportion and the labor share is unchanged, equilibria with a high proportion of foreign firms may feature a higher or lower labor share than equilibria with a low proportion of foreign firms.

This extension has a major implication. Two countries characterized by the same institutions in terms of financial openness may attract very different numbers of foreign firms. It means that *de jure* measures of financial openness may be poorly related to the labor share, while *de facto* measures of foreign capital should be more accurate<sup>5</sup>. In the empirical part of the paper, we mainly focus on such *de facto* measures, even though some of our regressions also include an institutional measure of financial openness among the regressors.

### 3.3 Accounting for transfer pricing

In this sub-section, we introduce transfer pricing into our model, and examine how this alters the non-monotonic relationship between financial openness and the labor share. We show that either the relationship is qualitatively unchanged, or it is strictly increasing.

In our basic framework, we implicitly assume that firms cannot choose where to locate the value-added. There exist lots of fiscal tools for a multinational firm to locate profits of its subsidiaries where taxation is more profitable. The most famous is probably the transfer pricing method. Consider the following example. Suppose that a multinational owns a single subsidiary. The subsidiary sells 100 units of an electronic component to the multinational. The price paid by the multinational is \$10 each for a cost of \$5 each paid by the subsidiary. Using the component as input, the multinational produces a final consumption good which is sold \$1500 to the consumers. There are no taxes on profits in the

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<sup>5</sup>There is another argument that follows the same line. The entry cost  $c_F$  also captures multinationals' opportunity cost of entry. Outside profit opportunities can change drastically even though country-specific financial openness is unchanged.

multinational country of origin whereas those taxes are about 50% in the subsidiary's country. So, after-tax multinational profit is \$500, while after-tax subsidiary profit is \$250. Hence, total profit is \$750. Changing the price of the component, the multinational can increase its total profit. For instance, if component had been sold \$5, the total benefit would have been \$1000. Firms transfer the surplus where taxes are low by changing the transfer price of intra-firm trade.

There are legal limits to transfer pricing, which is considered as fiscal escape. In developing countries, local authorities do not want to lose fiscal takings. In developed countries, custom officers do not want to lose part of tax receipts due to tariffs on international trade. Custom officers are in charge to verify that intra-firm trade is achieved at market prices<sup>6</sup>. However, countries differ in how much they enforce transfer pricing rules, and there is evidence of transfer price manipulation (see Hines, 1997, 1999).

If multinationals use transfer pricing to make profit of their subsidiaries lower, our story may not work any longer. Consider the case of a multinational that opens a subsidiary in a developing country very closed to foreign investments. In our story, output increases by a lot, but wages do not change very much. Hence the labor share goes down. However, if the multinational locates its profits in another country through transfer pricing, the labor share increases, because most of registered production achieved by the subsidiary corresponds to wage payments<sup>7</sup>.

Our framework must be enriched to account for profit shifting. We assume that foreign firms can locate a proportion  $1 - \lambda$  of their profits in another country. The model is unchanged, but the definition of output produced by foreign firms. Indeed, the value-added located within the country corresponds to the wage bill plus the share  $\lambda$  of the profits:

$$Y_F = m(n)^2 \rho^2 y_F + 2m(n)^2 \rho(1 - \rho) [y_R + \lambda(y_F - y_R)] + 2m(n)\rho(1 - m(n))\lambda y_F \quad (19)$$

After simplification, the labor share is worth:

$$LS = \frac{m(n) [\rho^2 y_F + (1 - \rho^2)y_R]}{(1 - \rho) [2 - m(n)(1 + \rho) + 2m(n)\rho(1 - \lambda)] y_R + \rho [2\lambda - m(n)\rho(2\lambda - 1)] y_F} \quad (20)$$

When the country is closed (i.e.  $c_F$  is sufficiently large so that there are only local firms and  $\rho = 0$ ), we have the same result as before:

$$LS|_{\rho=0} = \frac{m(n)}{2 - m(n)} \quad (21)$$

When the country is perfectly open (i.e.  $c_F = c_R$  so that there are only foreign firms and  $\rho = 1$ ), the labor share becomes:

$$LS|_{\rho=1} = \frac{m(n)}{m(n) + 2(1 - m(n))\lambda} > LS|_{\rho=0} \quad (22)$$

Hence, the labor share should be larger when the economy is perfectly open than when it is perfectly closed. More generally, transfer-pricing reduces the size of the technological rent effect. This does not

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<sup>6</sup>In case of homogeneous goods, the transfer price can be compared easily to the world market price. Controls are more difficult when the good is very differentiated from competitors. There are two methods in this case. First, if a firm sells the same good to several other firms in the same multinational structure, the transfer price must be the same for all firms. The second method is to apply a mark-up on average cost to define a theoretical transfer price.

<sup>7</sup>Bartelsman and Beetsma (2003) make use of this fact to evaluate the response of profit shifting to changes in corporate taxes in OECD countries.

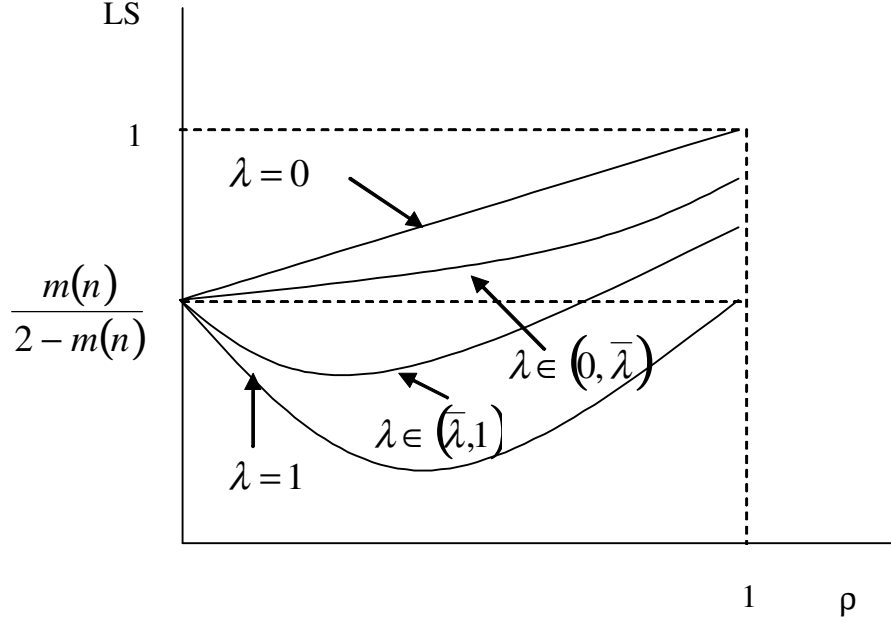


Figure 2: Labor share and proportion of jobs in foreign firms – the role of transfer pricing. Transfer pricing decreases with  $\lambda$ . As far as  $\lambda < \bar{\lambda}$ , the relationship is strictly increasing.

alter the qualitative relationship between LS and the proportion of foreign firms unless multinationals manage to relocate their profits massively. In such a case, LS strictly increases with financial openness. Figure 2 depicts the relationship between LS and the proportion of foreign firms as  $\lambda$  increases.

The relationship is U-shaped if and only if

$$\lambda > \frac{1 - m(n)}{(y_F - y_R)/y_R + 1 - m(n)} \equiv \bar{\lambda} \quad (23)$$

This condition is satisfied when the productivity differential  $(y_F - y_R)/y_R$  between foreign and local firms is large.

The main message of this extension is that profit shifting cannot artificially create a negative or U-shaped relationship between financial openness and the LS. In the empirical part of the paper, we find such a U-shaped relationship, which, therefore, cannot be due to transfer pricing.

### 3.4 Accounting for technological transfers

In this sub-section, we introduce technological transfers from foreign to local firms and examine how they alter the relationship between the proportion of foreign firms' entry cost and the labor share. As far as foreign firms have positive spillover effects on local firms, the technological rent effect tends to decrease with the size of the spillover effect.

We assume that output produced by local firms depends on the proportion  $\rho$  of foreign firms, i.e.  $y_R = y_R(\rho)$ . The spillover may be either positive – in case of technological transfers – or negative – in

case foreign firms reduce the ability of local firms to attract local investors, or destroy the network of connections that local firms have<sup>8</sup>.

A positive spillover has a stabilizing effect. An increase in the proportion of foreign firms reduces the technological gap between foreign and local firms. Foreign firms must pay a higher wage as a result, which reduces the incentives to further invest in the country. A negative spillover has a multiplier effect. An increase in the proportion of foreign firms raises the technological gap. Wages go down in foreign firms. This attracts new foreign investors. When this effect is sufficiently strong, there maybe multiple equilibria: equilibria with a large number of foreign firms and low wages, and equilibria with a low number of foreign firms and high wages.

As far as there exists a unique equilibrium, a decrease in entry cost  $c_F$  raises the proportion of foreign firms. We can still study the derivative of the labor share with respect to such a proportion:

$$\begin{aligned} \frac{dLS}{d\rho} &\stackrel{sign}{=} -\frac{\partial Y}{\partial \rho} \times LS + \frac{\partial W}{\partial \rho} + \left( -\frac{\partial Y}{\partial y_R} \times LS + \frac{\partial W}{\partial y_R} \right) y'_R(\rho) \\ &\stackrel{sign}{=} \underbrace{-(1 - \rho m(n)) (y_F - y_R) LS}_{\text{technological gap effect}} + \underbrace{\rho m(n) (y_F - y_R)}_{\text{wage competition effect}} + \underbrace{(1 - \rho) \{m(1 + \rho) - [2 - m(1 + \rho)] LS\}}_{\text{technological transfer effect}} y'_R(\rho) \end{aligned} \quad (24)$$

As  $LS < m(n) / (2 - m(n))$ , the technological transfer effect has the sign of  $y'_R(\rho)$ . The sign as well as the size of the technological transfer effect depends on the sign and magnitude of the spillover. When the spillover is positive, the technological transfer effect tends to reduce the technological gap effect. Conversely, when the spillover effect is negative, the technological transfer effect tends to magnify the technological gap effect.

This extension delivers a major lesson. If one wants to capture the relationship between the proportion of foreign firms and the labor share, one should also control for the technological differential between foreign and local firms.

### 3.5 Accounting for capital choice

Our basic model abstracts from capital choice. In this sub-section, we allow firms to set their capital intensity. We also make the difference between foreign and local firms, which may face different capital costs. Provided that the elasticity of substitution between capital and labor is lower than one, a decrease in foreign firms' entry cost can raise the labor share by increasing average capital intensity.

Let  $k$  denote capital intensity, and assume that output is  $y(k)$ , with  $y(0) = 0$ ,  $y'(k) > 0$ , and  $y''(k) < 0$ . The elasticity of output with respect to capital intensity is  $\alpha(k) \equiv ky'(k)/y(k) \in (0, 1)$ . The rental cost of capital is asymmetric. Local firms face the price  $r_R$ , while foreign firms face the price  $r_F \leq r_R$ . To simplify, capital investment is made once the worker is recruited.

Capital intensity results from the equality between marginal productivity and marginal cost of capital:

$$y'(k_i) = r_i, \quad i = F, R$$

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<sup>8</sup>See Blomström and Kokko (2003) for a survey of the empirical evidence. They conclude that spillovers of foreign technology and skills to local industry is not an automatic consequence of foreign investment. Harrison and McMillan (2003) for instance show that foreign firms crowd local firms out of domestic capital market in Ivory Coast.

This implies that foreign firms are more productive than local firms, simply because the former can invest at lower marginal cost than the latter. The labor share is:

$$\text{LS} = \frac{m(n) [\rho^2 (1 - \alpha_F) y_F + (1 - \rho^2) (1 - \alpha_R) y_R]}{\rho [2 - m(n)\rho] y_F + (1 - \rho) [2 - m(n)(1 + \rho)] y_R} \quad (25)$$

where  $y_i = y(k_i)$ , and  $\alpha_i = \alpha(k_i)$ ,  $i = F, R$ . As  $r_R$  tends to  $r_F$ , foreign and local firms are no longer different, and the labor share tends to

$$\text{LS} = (1 - \alpha(k)) \frac{m(n)}{2 - m(n)} \quad (26)$$

The labor share is composed of two terms, of which the first is the elasticity of output with respect to labor, and the second accounts for monopsony power derived from search frictions. As  $m(n) \rightarrow 1$ , the second term tends to one and we are back to the competitive model.

A marginal increase in  $\rho$  induced by a marginal decline in  $c_F$  has the following impacts:

$$\frac{d\text{LS}}{d\rho} \stackrel{\text{sign}}{=} \underbrace{-(1 - \rho m(n)) (y_F - y_R) \text{LS}}_{\text{technological gap effect}} + \underbrace{\rho m(n) [(1 - \alpha_F) y_F - (1 - \alpha_R) y_R]}_{\text{wage competition effect}} \quad (27)$$

The wage competition effect now depends on the competitive wage differential  $(1 - \alpha_F) y_F - (1 - \alpha_R) y_R$ , rather than on the output differential  $y_F - y_R$ . Given that  $k_F > k_R$ , we have  $\alpha_R > \alpha_F$  whenever the elasticity of substitution between capital and labor is lower than one. The wage competition effect is magnified when capital and labor are complementary. This point has important implications for the empirical analysis. In the empirical part of the paper (next section), changes in  $\rho$  are captured by changes in FDI stock to GDP ratio. This means that changes in  $\rho$  and changes in total capital held by foreign firms are observationally equivalent. This may induce a spurious positive impact of FDI stock to GDP ratio on the labor share: an increase in such a ratio may simply raise aggregate capital intensity. It follows that one must control for changes in aggregate capital intensity while trying to find an empirical relationship between the proportion of foreign firms and the labor share. In the empirical part of the paper, regressions include a proxy for capital intensity.

### 3.6 From the theory to the empirical analysis

The theoretical model explains the labor share of income as a function of exogenous parameters, among which the degree of financial openness, foreign firms' opportunity cost of entry, and the cost to set up jobs. However, these parameters only affect the labor share because they have an impact on endogenous variables like the vacancy/unemployment ratio, or the proportion of jobs in foreign firms. Formally, the labor share is a function  $\text{LS}(\rho, m(n), k, \Gamma)$  where  $\Gamma$  is a set of exogenous parameters. Our empirical analysis consists in estimating a linearized version of this equation, allowing for a quadratic impact of the variable  $\rho$ .

## 4 Empirical analysis

This section examines the relationship between the size of economic activity due to foreign firms and the labor share. We use panel data covering developing countries. Fixed effects estimations show that



the stock of inward FDI to GDP has a non-monotonic impact on the labor share: decreasing at first, and then increasing. The threshold above which the labor share starts increasing with FDI is in the range 150-180%. Most of the countries are stuck in the decreasing part of the curve. This relationship appears robust to the consideration of outliers, to endogeneity and autocorrelation problems, and to the introduction of globalization variables. The other determinants of the labor share are in line with the theoretical model, especially the technological gap (-), unemployment rate (-), and capital intensity (weakly +).

## 4.1 Data

The data set covers 94 developing countries over the period 1980-2000. We consider all available countries whose GDP per capita was lower than 60% of the US one in 1980. Our preferred estimates are achieved on yearly data to keep the maximum number of observations. The number of observations depends on the number of variables included in the regression. The basic regression with country fixed effects, FDI stock and a proxy for the technological gap is run over 1189 observations. Adding controls and instrumenting some of the explicatives lower the number of observations according to data availability. Data sources are detailed in the Appendix.

The dependent variable is the labor share. Following Ortega and Rodriguez (2002), and Daudey (2005), we compute it from the UNIDO dataset. This dataset only covers the manufacturing sector. The data are collected through a survey in more than 180 countries and cover a period from 1963 to 2003 (with gap). There are several reasons why we use the UNIDO dataset. First, UNIDO harmonizes data definitions and computations across countries. Second, this dataset allows to abstract from changes in the sectorial composition of output. Third, the UNIDO dataset minors the measurement problems associated with self-employment<sup>9</sup>. There are very few self-employed workers in the manufacturing sector. Furthermore, there is a cut-off concerning the number of employees under which the firm is excluded from the survey. The main drawback of this variable is that wages do not include employers' contributions. This tends to underestimate the labor shares. This problem is not very serious for our purpose, because we do not proceed to international comparisons. All our estimates include country fixed effects. Fixed effects models use within country variations to estimate the desired parameters. However, there may be changes over time in the labor shares that are only driven by changes in employers' contribution rates. Part of these changes will be captured by time dummies and by a variable that is highly correlated to GDP per capita.

The key explicative variable is the proportion of foreign firms. We use two different proxies: the ratio of (inward) FDI stock to GDP (FDI/Y), and the ratio of FDI stock to total capital stock (FDI/K). The former ratio is available from UNCTAD for 200 countries over the period 1980-2005. The latter ratio is computed from UNCTAD data on FDI stock and from Klenow and Rodriguez-Clare (2005) for the capital stock. FDI refers to equity participation over 10%. Such investments indicate that foreign investors play

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<sup>9</sup>The labor share is the ratio of wage bill to value-added. The self-employed contribute to the denominator, but typically do not appear in the denominator. There are several ways to impute a fictitious wage to the self-employed (see Bernanke and Gürkayanak, 2001, and Gollin, 2002). These methods require strong assumptions on such a fictitious wage, as well as data on self-employment. Focusing on the manufacturing sector does not require to manipulate the gross wage bill to output ratio.

an active role in the management of the firm. These firms are more likely to benefit from technological advance. Of course, other firms may also benefit from foreign investment. The presumption here is that the percentage of jobs concerned by our analysis is highly correlated with the ratio of FDI stock to GDP and/or the ratio of FDI stock to capital.

Stocks are computed from the historical record of FDI inflows given by the balance of payments. Capital account data have been criticized recently on the ground that they fail to account for the valuation effect<sup>10</sup>. We also use data on FDI stocks provided by Lane and Milesi-Ferretti (2006), which correct for the valuation effect. These data are available over the longer period 1970-2005 and allow us to test the robustness of our results.

The theoretical model suggests that the impact of FDI on the labor share depends on the technological gap  $TG = (y_F - y_R) / y_F$  between the host economy which receives FDI and the home-based transnational firm. Unfortunately, there are no statistics for the mean productivity differential  $y_R / y_F$  between local and foreign firms. As a proxy for this variable, we use the ratio of local GDP per capita to US GDP per capita, both measured at purchasing power parity. The technological gap variable is measured accordingly by one minus the latter ratio.

The labor share also depends on the matching probability  $m(n)$ . This probability shapes workers' ability to generate wage competition for their services. This probability is not available as such. However, we use the following property of our model. The probability of staying unemployed coincides with the unemployment rate. It is equal to  $UNR = (1 - m(n))^2$ . Therefore, we use the unemployment rate as a proxy for (one minus) the matching probability. This variable is available for a limited number of years and countries.

Finally, we must separate the impact of FDI from changes in overall capital intensity, as discussed in subsection 3.5. We consider the ratio of capital stock to output  $K/Y$  rather than the ratio of capital stock to labor. The former ratio is governed by changes in the ratio of capital stock to effective units of labor. Unfortunately, the UNIDO dataset does not allow us to compute a reliable capital stock series – in many cases, the number of observations is clearly insufficient. Therefore, we use the ratio  $I/Y$  of investment to value added. We perform sensitivity regressions with the overall capital to output ratio.

Some regressions include a measure of trade openness ( $OPENT$ , the usual openness degree, that is the ratio of imports plus exports to GDP), a measure of de jure capital account openness ( $OPENK$ ) (the composite index constructed by Chinn and Ito, 2006), a dummy variable ( $CRISIS$ ) that takes the value 1 when the exchange rate falls by more than 25%.

Descriptive statistics for the core variables used in our regressions are shown in Table 1.

TABLE 1

## 4.2 Core regressions

Let  $i$  denote the country and  $t$  the period. We aim to estimate the following fixed effects model:

$$LS_{it} = a_i^0 + a_t^1 + a^2 FDI/Y_{it} + a^3 (FDI/Y_{it})^2 + a^4 TG_{it} + a^5 UNR_{it} + a^6 K/Y_{it} + \varepsilon_{it} \quad (28)$$

<sup>10</sup>When a country is indebted in foreign money (dollars), changes in parity alter the debt level. This phenomenon is very large for the US.

where  $a_i^0$  is the country fixed effect, and  $a_1^t$  is a period dummy. The error term  $\varepsilon_{it}$  is supposed serially uncorrelated. The validation of our model requires that  $a^2 < 0$ ,  $a^3 > 0$ ,  $a^4 < 0$ ,  $a^5 < 0$ . This statistical model assumes that the different regressors have the same impact in each country. In particular, the relationship between financial openness and the labor share must be the same throughout the sample. This prediction differs a bit from the theoretical model, whereby the magnitude of the relationship depends on output gap. We also present regressions in which the variable FDI/Y is replaced by the interaction term FDI/Y×TG.

Table 2 depicts our main results. Each column is associated to a particular specification. In column a, we estimate the relationship without controlling for capital intensity (this assumes a Cobb-Douglas technology), unemployment rate and time dummies. In column b, we add time dummies. In column c, we include capital intensity (this allows for CES technologies for instance). In column d, we add the unemployment rate – and lose half the observations. In columns e and f, we replace the regressor FDI/Y by an interaction term between FDI/Y and technological gap. In columns b to f, regressors are one-period lagged. This allows to control for potential contemporaneous correlation between the regressors and the error term. Squared errors are robust to arbitrary heteroskedasticity between countries.

TABLE 2

The results can be commented along five dimensions.

First, the estimations validate the existence of a U-shaped relationship between FDI/Y and the labor share. The coefficient associated to FDI/Y is negative, while the coefficient associated to FDI/Y<sup>2</sup> is positive. This relationship is robust to country fixed effects, time dummies, and to our different control variables. FDI have two opposite effects on the labor share, in line with our theoretical model. Our estimates also imply that the threshold above which an increase in FDI stock to GDP starts increasing the labor share is very high. This threshold can be computed as follows:  $-a^2 / (2a^3)$ . It varies between 150% and 180%. This is far above the mean ratio in developing countries.

Second, the quantitative impact of FDI is substantially large. Consider a country that is characterized by the mean value of FDI/Y (given by Table 1) and experiences an increase of one standard deviation in this ratio, *everything else equal*. Estimates in columns a to d imply a fall in the labor share that varies between 3.5 to 7 points. This impact amounts between 11% to 22% of the mean labor share of our sample.

Third, the two other variables that our model emphasizes have the predicted negative impact. In columns a to d, the technological gap (TG) has a negative sign, in line with the argument whereby foreign firms use their technological advance to derive extra rents on the labor market. Consider a country that experiences a decline in technological gap of one standard deviation. The labor share should increase by 1.5 to 5.5 points. However, TG is highly correlated to GDP per capita, which means that TG captures a variety of factors that are embodied in GDP per capita. The unemployment rate (UNR) has a strong negative impact on the labor share.

Fourth, the parameter associated to capital intensity ( $K/Y$ ) has a positive sign – yet it is not always significant. This indicates that the elasticity of substitution between capital and labor is lower than one. The fact that capital and labor are complementary in output is not controversial, at least in developing countries (see for instance Duffy and Papageorgiou, 2000).

Fifth, Table 2 displays strong interaction effects between  $FDI/Y$  and  $TG$ . Columns e and f show that  $TG$  loses significance and impact once we replace the regressor  $FDI/Y$  by the interaction term  $FDI/Y \times TG$ , and the regressor  $FDI/Y^2$  by  $(FDI/Y^2) \times TG$ . This has two implications. On the one hand, the technological gap mainly affects the labor share through magnifying the effects of  $FDI/Y$ . This is in line with the theoretical model and strengthens the view according to which the technological gap variable is more than a simple proxy for time-varying country-specific features that are correlated with GDP per capita. On the other hand, the magnitude of the relationship between FDI and the labor share is conditional on  $TG$ . The higher the technological gap, the larger the impact of foreign firms on the labor share. Note that these estimates do not invalidate the magnitude of the effects reported in columns a to d. For instance, consider a country characterized by the mean technological gap and the mean ratio  $FDI/Y$ , and assume that this country experiences an increase in  $FDI/Y$  of one standard deviation. According to columns e and f, this would reduce the labor share by 7 to 10 points.

### 4.3 Understanding the results

In this sub-section, we check the robustness of the relationship between FDI stock to GDP and the labor share. There are three main reasons why this statistical relationship may be spurious: existence of outliers, endogeneity and autocorrelation biases, and omitted globalization variables that causes both FDI and the labor share.

We first start with outliers. Figure 3 plots the partial relationship between the labor share and the ratio of FDI stock to GDP.<sup>11</sup> This displays two main features. First, there are some outliers, but they do not seem to drive the global negative impact of FDI. Second, Figure 3 visually confirms that most of the sample is below the threshold. The flat and increasing parts of the curve are due to a very few countries.

The countries that drive the positive part of the curve are Hong-Kong, Ireland, Macao, and Singapore. These countries have two characteristics: they have experienced impressive growth rates over the period, and they have attracted enormous amounts of FDI. These two features are related. High growth rates imply high profit opportunities for the multinationals and foreign investors in general. In terms of our model, the effective cost of entry  $c_F$  is very low in these countries, not only because of financial openness  $c_O$ , but also because alternative profits  $\bar{\pi}$  are relatively low. Conversely, effective costs of entry are very large in the other countries despite financial openness, because opportunity costs of entry are very high. Put otherwise, FDI lower the labor shares throughout the developing world because most of the FDI have been captured by booming countries in East-Asia and Europe. In terms of economic policy, multinationals' opportunity cost of entry limits the effectiveness of policies designed to attract FDI.

<sup>11</sup> Actually, the Figure as well as estimates displayed by Table 2 excludes three observations that were clear outliers: Salvador in 1997, when the labor share goes from 26 to 81 before going back to 31; Israel in 1986, when the labor share goes from 58 to 39 before reaching 63; Macedonia in when the labor share goes from 48 to 81 and then to 82. Of course, estimating the model with these observations marginally affects the coefficients and their squared errors.

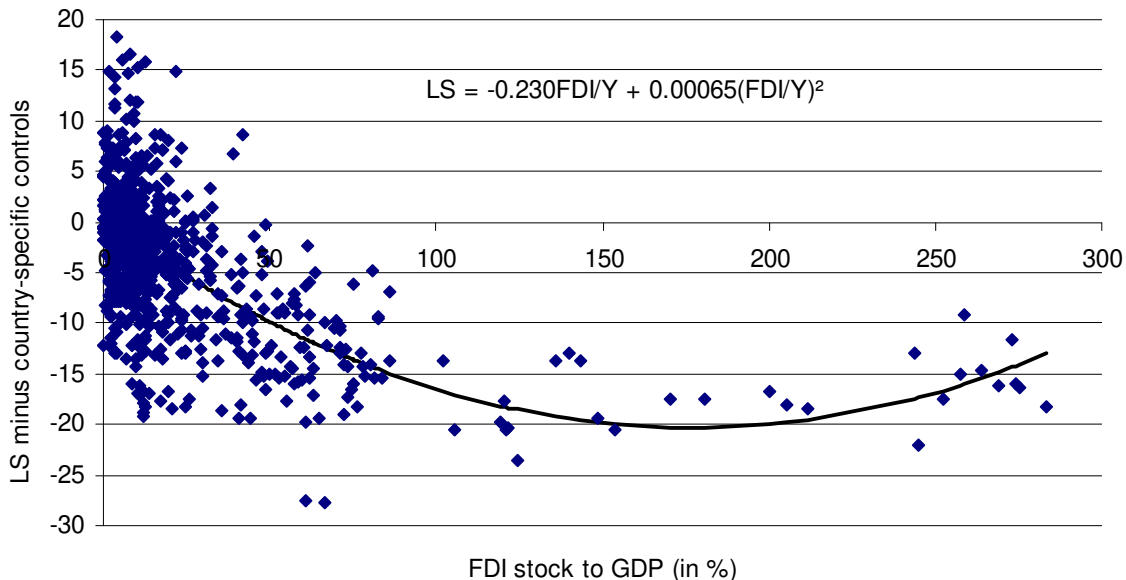


Figure 3: Partial relationship between labor share and FDI stock to GDP. Country-specific controls are TG, I/Y, time effects, and country fixed effects.

To confirm that view, we run the regressions over various alterations of the initial sample. Table 3 displays the results. We first compute the empirical distribution of percentage change in LS ( $\Delta LS_{it}/LS_{it}$ ). Then, we omit the observations belonging to the top 5 and top 10 percentile of this distribution, and run fixed effects regressions. The results are reported in columns a and b. The magnitude of the relationship between FDI/Y and LS is slightly reduced, but still significant. Columns c and d omit observations where the FDI stock to GDP is larger than 100% and 75% respectively<sup>12</sup>. As expected, these regressions fail to identify the positive part of the curve. Column e restricts the sample to countries whose GDP per capita was lower than 50% of the US one in 1980. The results are very similar to the initial estimates.

TABLE 3

We then discuss endogeneity and autocorrelation biases.

Endogeneity may arise for two reasons. On the one hand, the regressors may be correlated with the error terms in the fixed effects model. The explicative variables and the labor share are general equilibrium variables. As such, they may be affected by correlated shocks, generating a statistical bias in the fixed effects estimator. Regressions displayed in Table 2 and Table 3 address this potential endogeneity bias by considering lagged regressors. This method is based on the idea that the regressors are strongly autoregressive, so that we do not lose too much information. The main advantage is that we do not

<sup>12</sup>We have also run regressions omitting the countries where such extreme changes have occurred. The results are very similar.

lose many observations, and we do not bias the sample towards richer countries. On the other hand, the labor share may directly alter FDI incentives for reasons that our model leaves apart. For instance, a high labor share may mean a very good social climate, which lowers investment risk and attracts foreign investors. If this relationship were true, the negative impact of FDI would be underestimated, while the increasing part of the curve would reflect the causal effect of the labor share on FDI. This type of bias cannot be addressed by lagging the regressors, because the lagged regressors would also be correlated with the error terms.

Autocorrelation is a serious problem with panel data. Table 2 accounts for heteroskedasticity, but not for autocorrelation. Dealing with autocorrelation requires to add the lagged labor share to the set of regressors. However, the fixed-effect estimator is biased in finite samples because the residuals are correlated with the new regressor. The size of the bias is typically magnified in small-T-large-N panel datasets as ours.

To address these two sources of bias, we use the system-GMM estimator due to Blundell and Bond (1998). This estimator reveals more stable to sample and instrument alterations than the Arellano-Bond difference estimator. Formally, the model is written as follows:

$$\begin{aligned}\Delta LS_{it} &= a^1 \Delta LS_{it-1} + a^2 \Delta FDI/Y_{it} + a^3 \Delta (FDI/Y_{it})^2 + a^4 \Delta TG_{it} + a^6 \Delta K/Y_{it} + \Delta \varepsilon_{it} & (29) \\ LS_{it} &= a^1 LS_{it-1} + a^2 FDI/Y_{it} + a^3 (FDI/Y_{it})^2 + a^4 TG_{it} + a^6 K/Y_{it} + \varepsilon_{it} & (30)\end{aligned}$$

where all the variables have been centered in their period mean to account for common period shocks. The model has two components: the difference and level submodels. In both components, the lagged dependent variable is correlated with the error terms and must be instrumented. In addition, FDI terms may also be weakly exogenous, which also requires an instrumenting strategy. In the lack of good instruments, the set of instruments only contains lagged endogenous regressors and exogenous variables. In the difference submodel, the differenced lagged labor share is instrumented by past levels of the labor share (from  $LS_{it-2}$ ), while the lagged labor share is instrumented by past differences of the labor share in the level submodel (from  $\Delta LS_{it-1}$ ). This generates a large number of instruments in GMM-style. The set of instruments is finally reduced by collapsing the matrix of GMM-style instruments<sup>13</sup>.

The model is estimated by two-step GMM, while reported squared errors feature Windmeijer correction. This method corrects for individual heteroskedasticity, arbitrary patterns of autocorrelation within individuals, and downward squared-error bias in finite sample.

TABLE 4

Table 4 reports the results. In columns a to e,  $FDI/Y$  and  $FDI/Y^2$  are presumed weakly exogenous, i.e.  $FDI/Y_{it}$  is correlated with  $\varepsilon_{it}$ . The regressors  $\Delta FDI/Y_{it}$  and  $\Delta (FDI/Y_{it})^2$  are instrumented by  $FDI/Y_{it-2}$  and  $(FDI/Y_{it-2})^2$  in the difference equation, while the regressors  $FDI/Y_{it}$  and  $(FDI/Y_{it})^2$

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<sup>13</sup>The number of instruments increases with the time index of each observation. The total number of instruments is quadratic in the number of periods as a result. Collapsing allows to reduce such a number, while exploiting the same information displayed by the dataset (see Roodman, 2006).

are instrumented by  $\Delta \text{FDI}/Y_{it-1}$  and  $\Delta (\text{FDI}/Y_{it-1})^2$  in the level equation. In columns f and g,  $\text{FDI}/Y$  and  $\text{FDI}/Y^2$  are presumed predetermined. The various regressors containing  $\text{FDI}/Y_{it}$  are replaced by their first lags – like in the fixed effects regressions. However, they may be correlated with  $\varepsilon_{it-1}$ , and still need to be instrumented (for the same reason  $\text{LS}_{it-1}$  needs to be instrumented). The instruments are the same as in the case where  $\text{FDI}/Y_{it}$  and  $(\text{FDI}/Y_{it})^2$  are weakly exogenous.

The various columns differ in the number of lags that we consider for the various endogenous variables. The number of instruments goes from 69 to 12. Clearly, 69 is too much with respect to the number of countries, 61. Column h displays the results of a standard fixed effects regression, where we restrict the sample to the one effectively used by system-GMM estimations.

The results are remarkably consistent across the various system-GMM estimations. Parameter  $a^1$  is about 0.65, which is lower than a unit root, but sufficiently high to prefer the system-GMM estimator rather than the difference estimator. Specification tests like the Sargan and Hansen tests of overidentifying restrictions, and the Arellano-Bover test of second-order autocorrelation, suggest that the model is well specified most of the times. This leads us to prefer the estimates with the smallest number of instruments, and in particular the one where  $\text{FDI}/Y$  and  $\text{FDI}/Y^2$  are predetermined<sup>14</sup>. The estimated relationship between  $\text{LS}$  and  $\text{FDI}/Y$  is qualitatively similar to the one displayed by Table 2. Quantitatively, the magnitude of the parameters associated to  $\text{FDI}$  variables is in the range 50-75% of the initial one. This may receive three interpretations. First, we lose more than 60 observations, and selection bias may lead to a different estimation. Our model predicts that the threshold and the magnitude of the relationship should be governed by the technological gap. If the selected sample is richer than the initial sample,  $\text{FDI}$  have a smaller effect on the labor share as the typical productivity differential between foreign and local firms is lower. The fixed effects regression shows that the relationship between  $\text{FDI}/Y$  and  $\text{LS}$  is 10% smaller than the initial one. Second, endogeneity affects both the decreasing and increasing parts of the curve. Once purged from endogeneity bias, the true relationship reveals more modest by 10-40%. Third, the statistical method itself may weaken the relationship. For those reasons, we interpret the GMM findings as a lower bound on the magnitude of the true relationship between  $\text{FDI}$  and the labor share.

Finally, we discuss other globalization variables. They have received some attention in the recent past, and they may be correlated with both  $\text{FDI}$  and the labor share. Table 5 introduces a new set of regressors that deal with these various aspects of globalization: institutional financial openness, international trade, and, following Diwan (2000, 2002), exchange rate crises.

TABLE 5

Table 5 shows that globalization variables do not affect the relationship between  $\text{FDI}$  and the labor share. In particular, institutional financial openness does not lower the labor share. The variable  $\text{OPENK}$  is Chinn and Ito (2006) index of financial openness. Other studies (see Harrison, 2002, Ortega and Rodriguez, 2002, Lee and Jayadev, 2005) point out that capital account openness can deteriorate the labor share through increased capital mobility, thereby improving the bargaining position of capital owners. In

<sup>14</sup>Column g shows that the P-value of the Hansen test of overidentifying restrictions is 0.953. This is obtained with a remarkably low number of instruments, which suggests that this value does not suffer from upward bias.

line with such a theory, they report positive impacts of capital controls. Our model suggests that such effects of capital openness should disappear once we account for actual changes in foreign capital stocks. Indeed, column b displays a positive coefficient for the index of capital openness. Our model does not predict anything regarding trade flows. However, trade flows are associated to multinationals. Therefore, it is difficult to disentangle the impact of trade from the impact of foreign firms. Harrison (2002) and Ortega and Rodriguez (2002) estimate a negative effect of trade on the labor share in developing countries. However, Harrison considers FDI flows (rather than stocks as we do), and Ortega and Rodriguez do not control for FDI variables. Table 5 displays a non-significant parameter.

#### 4.4 Sensitivity analysis

In this sub-section, we further investigate the robustness of our results. We proceed in four steps. First, we consider various definitions of the FDI variable. Second, we extend our dataset to richer countries, and we consider the ratio of aggregate capital stock to output as a proxy for capital intensity. Third, we estimate our model on 4-year mean data rather than yearly data, we estimate a probit version of the regression, and we perform cluster estimates of the coefficients.

In Table 6, we consider several alterations in the main explicative variable, i.e. the ratio of FDI stock to GDP. Column a reproduces our benchmark regression: FDI stock is from UNCTAD, and it is divided by GDP. In column b, FDI stock is from Lane and Milesi-Ferretti (2007) – hereafter LMF. In column c and d, the two FDI stock variables are divided by the total capital stock rather than GDP. Results are qualitatively unchanged: all the different parameters have the same sign and significance.

TABLE 6

Tables 7a to 8b show different sensitivity tests. In Tables 7a and 8a, the regressions do not include the unemployment rate, while it is included in Tables 7b and 8b.

TABLE 7a

TABLE 7b

In columns a and b of each Table, regressions are run on developed rather than developing countries. We have included the countries whose technological gap was below 40% in 1980. There is no relationship between FDI and the labor share as a result. Interestingly, trade openness has a negative impact, as suggested by the HOS theory of international trade.

Columns c and d consider 4-year mean data rather than yearly data. Such regressions are not very meaningful, given the very low number of countries and observations – this especially true when we include the unemployment rate among the regressors. However, the P-values of the estimated parameters associated to  $FDI/Y$  and  $FDI/Y^2$  are surprisingly high. Consistent with this, regressions, not reported here, have been run on 2-year and 3-year averages: the magnitude of parameters is unchanged, while significance increases.



Columns e and f consider a probit transformation of the labor share variable<sup>15</sup>. Although such a transformation cannot be derived from linearizing the theoretical model, this allows to test whether the U-shaped relationship only captures some convexity or not. Results are very similar to the baseline regressions (in particular, the threshold above which the labor share starts increasing with FDI/Y is virtually unchanged).

Columns g to j show cluster estimates. Clustering allows a particular form of heteroskedasticity that can vary between groups (clusters) of observations (see Wooldridge, 2003). We consider two cases: either the sample is clusterized by country, or it is clusterized by income class. As expected, squared errors are much larger and many variables are no longer significant. The variables FDI/Y and FDI/Y<sup>2</sup> do not avoid this decline in statistical significance, yet they perform quite well compared to the other regressors. This strengthens the thesis according to which FDI is a major determinant of the labor shares in developing countries.

In columns k and l, the ratio of investment to output in the manufacturing sector is replaced with the aggregate ratio of capital to output. This does not affect the estimates.

TABLE 8a

TABLE 8b

## 5 Conclusion

This paper addresses the impact of FDI on the factor distribution of income in developing countries. We build on the idea that FDI increase productive heterogeneity within firms acting in the host country. Foreign firms are more productive, and, in a frictional labor market, only need to pay slightly more than local competitors to attract workers. This explains why the labor share falls with FDI. At some point, the magnitude of foreign firms in host activity may become so large that productive heterogeneity starts going down. The labor share would then increase with FDI. The paper offers a search-theoretic model that allows to discuss these two effects, and tests the main predictions on aggregate data through fixed effect and system-GMM estimations.

Policy implications of our work are non-ambiguous. Average wage always increases with financial openness, whether the labor share increases or not. Workers' welfare improves as a result. In addition, the negative effects of FDI decline with FDI stock to GDP ratio. The largest effects of FDI on the labor share arise at early stages of financial openness. Such negative effects should not be considered at the time of evaluating the impact of a further increase in financial openness, unless one is willing to considerably overestimate them.

We point out a negative relationship between productive heterogeneity and the labor share of income. This relationship naturally arises in the context of globalization where modern firms can meet technologically obsolete and under-equipped competitors. However, this also happens in times of rapid technological change with emerging industries. To some extent, the information revolution and ICT investments may

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<sup>15</sup>Ortega and Rodriguez (2002) run all their regressions with this transformation. The dependent variable is  $\ln[(1 - LS) / LS]$  rather than LS.

have contributed to the downward trend in labor shares in OECD countries. We leave this extrapolation of our paper to future work.

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## APPENDIX

- Capital stock K: Klenow and Rodriguez-Clare (2005)
- FDI/Y = Ratio of Foreign Direct Investment stock to GDP  
Source: UNCTAD and Lane and Milesi-Ferretti (2007) for FDI  
Data available at <http://www.imf.org/external/pubs/ft/wp/2006/data/wp0669.zip>
- FDI/K = Ratio of Foreign Direct Investment stock to total capital stock  
Source: UNCTAD and Lane and Milesi-Ferretti (2007) for FDI  
Data available at <http://www.imf.org/external/pubs/ft/wp/2006/data/wp0669.zip>
- I/Y = Ratio of Investment to value-added in the manufacturing sector  
Source: UNIDO industrial statistics database INSTAD3 2005 ISIC Rev.2  
Values lower than 0 have been omitted from the sample
- K/Y = Ratio of total capital stock to total GDP  
Source: Klenow and Rodriguez-Clare (2005)
- LS: Labor share = Ratio of wages and salaries to value added ( $\times 100$ )  
Source: UNIDO industrial statistics database INSTAD3 2005 ISIC Rev.2
- OPENK: Chinn and Ito financial openness index. Composite index varying between 2.62 (very open) and -1.75 (close). It is based on four dummy variables reflecting the four major categories on the restrictions on external accounts: presence of multiple exchange rates, restrictions on current account transactions, restrictions on capital account transactions, requirement of the surrender of export proceed.  
Source: Chinn and Ito (2006)
- OPENT = Ratio of total exports and imports to GDP  
Source: World bank. World development indicators 2005
- TG: Technological gap = One - percentage gap between local GDP (PPP) per capita and US GDP per capita ( $\times 100$ )  
Source: World bank. World development indicators 2005
- UNR: Unemployment rate = Ratio of unemployed workers to total labor force  
Source: World bank. World development indicators 2005

- List of the countries used in Table 2 (column a): Algeria, Argentina, Bangladesh, Barbados, Belize, Bolivia, Botswana, Brazil, Bulgaria, Burkina-Faso, Burundi, Cameroon, Central African Republic, Chile, China, China (Hong Kong), China (Macao), Colombia, Congo, Costa Rica, Cote d'Ivoire, Croatia, Cyprus, Dominican Republic, Ecuador, Egypt, El Salvador, Eritrea, Ethiopia, Fiji, Gabon, Gambia, Ghana, Guatemala, Honduras, Hungary, India, Indonesia, Iran, Ireland, Israel, Jamaica, Jordan, Kenya, Korea, Latvia, Lesotho, Madagascar, Malawi, Malaysia, Malta, Mauritius, Mexico, Mongolia, Morocco, Namibia, Nepal, Nicaragua, Niger, Nigeria, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Russian Federation, Rwanda, Senegal, Sierra Leone, Singapore, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, Swaziland, Syrian Arab Republic, Tanzania, Thailand, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Uganda, Uruguay, Venezuela, Zambia, Zimbabwe
- List of the developed countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Italy, Japan, Kuwait, Netherlands, New Zealand, Norway, Sweden, United Kingdom, United States of America

**Table 1: Descriptive statistics of the main variables used in regressions**

Variables	Obs	Groups	Mean	Stand dev	Min	Max
Labor share (LS)	1189	94	33.53	13.99	2.23	85.33
Foreign Direct Investment stock						
FDI/GDP (FDI/Y, UNCTAD)	1189	94	20.97	34.45	0	283.61
FDI/GDP (FDI/Y, LMF)	1392	84	18.35	25.26	0	275.44
FDI/capital stock (FDI/K, UNCTAD)	940	70	15.33	22.90	0	193.95
FDI/capital stock (FDI/K, LMF)	1122	67	14.27	16.26	0	147.35
(FDI/GDP)*TG (UNCTAD)	1189	94	1372.20	1723.43	0	14966.42
(FDI/GDP)*TG (Lane)	1392	84	1268.63	1297.06	0	8344.61
(FDI/K)*TG (UNCTAD)	940	70	1120.7	1545.39	0	17714.39
(FDI/K)*TG (Lane)	1122	67	1068.71	1079.49	0	6399.84
Model variables						
Technological gap (TG)	1189	94	78.41	17.44	17.82	98.50
Unemployment rate (UNR)	646	67	9.05	5.73	1.1	42.2
Capital output ratio (K/Y)	942	70	1.34	0.53	0.18	3.67
Investment output ratio (I/Y)	855	78	0.28	0.45	-0.174	5.23
Globalization variables						
Trade openness index (OPENT))	1163	93	75.53	47.69	6.32	294.65
Financial openness index (OPENK)	1113	88	-0.32	1.32	-1.75	2.62
Crisis dummy	1083	86	0.18	0.38	0	1

For sources and/or calculations see Appendix.



**Table 2: Fixed effects regressions**

Specification	(a)	(b)	(c)	(d)	(e)	(f)
FDI/Y	-0.219*** (0.036)	-0.147*** (0.042)	-0.230*** (0.033)	-0.266*** (0.052)		
(FDI/Y) <sup>2</sup>	0.00076*** (0.00012)	0.00048*** (0.00012)	0.00065*** (0.00010)	0.00072*** (0.00014)		
FDI/Y*TG					-0.0034*** (0.00051)	-0.0049*** (0.00089)
(FDI/Y) <sup>2</sup> *TG					9.56e-06*** (1.65e-06)	0.000013*** (2.36e-06)
TG	-0.108 (0.072)	-0.207*** (0.069)	-0.341*** (0.073)	-0.229*** (0.076)	-0.216*** (0.074)	-0.010 (0.078)
I/Y			0.726 (0.613)	4.781* (2.596)	0.797 (0.610)	4.991** (2.540)
UNR				-0.633*** (0.158)		-0.758*** (0.166)
Fixed effects	yes	yes	yes	yes	yes	yes
Time dummies	no	yes	yes	yes	yes	yes
R-squared	0.048	0.179	0.269	0.323	0.272	0.338
No observations	1189	1051	775	445	775	445
No countries	94	87	73	52	73	52

Robust standard errors in brackets. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.  
In regressions b to f, all regressors are one-period lagged.

**Table 3: In search for outliers**

Specification	(a) 95 percentile	(b) 90 percentile	(c) FDI/Y<100	(d) FDI/Y<75	(e) TG>50
FDI/Y	-0.194*** (0.035)	-0.187*** (0.034)	-0.364*** (0.086)	-0.304*** (0.096)	-0.277*** (0.047)
(FDI/Y) <sup>2</sup>	0.00053*** (0.00010)	0.00051*** (0.00010)	0.0020** (0.00090)	0.00096 (0.0011)	0.00077*** (0.00012)
TG	-0.321*** (0.084)	-0.322*** (0.079)	-0.351*** (0.075)	-0.386*** (0.082)	-0.438*** (0.082)
I/Y	0.263 (0.677)	0.017 (0.658)	0.664 (0.624)	0.665 (0.625)	0.508 (0.644)
Fixed effects	yes	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes
R-squared	0.265	0.290	0.269	0.274	0.324
No observations	637	604	747	734	701
No countries	65	65	72	72	69

Notes: Robust standard in brackets. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.  
All regressors are one-period lagged.

For columns a and b, we compute the distribution of % change in LS.

We then omit the observations corresponding to the top 5% and top 10% of such a distribution.

**Table 4: Accounting for endogeneity and autocorrelation**

Specification	(a) endogenous	(b) endogenous	(c) endogenous	(d) endogenous	(f) predetermined	(g) predetermined	(h) FE
LS-1	0.667*** (0.087)	0.719*** (0.101)	0.713*** (0.112)	0.635*** (0.093)	0.722*** (0.077)	0.652*** (0.090)	
FDI/Y	-0.104** (0.051)	-0.107** (0.046)	-0.110** (0.050)	-0.150** (0.070)	-0.085** (0.039)	-0.187** (0.077)	-0.208*** (0.038)
FDI/Y <sup>2</sup>	0.00023* (0.00013)	0.00023** (0.00011)	0.00024** (0.00012)	0.00028* (0.00014)	0.00022 (0.00012)	0.00033* (0.00018)	0.00057*** (0.00011)
TG	-0.192*** (0.049)	-0.158*** (0.059)	-0.156** (0.061)	-0.236*** (0.071)	-0.149*** (0.042)	-0.250*** (0.071)	-0.361*** (0.062)
I/Y	0.520 (0.956)	0.223 (1.183)	-0.077 (1.103)	0.339 (1.108)	-0.444 (0.699)	-1.007 (0.898)	0.801 (0.644)
No observations	735	735	735	735	735	735	641
No countries	67	67	67	67	67	67	65
Sargan	0.056	0.326	0.509	0.726	0.095	0.533	
Hansen	0.579	0.083	0.618	0.966	0.550	0.932	
AR(2)	0.545	0.575	0.574	0.595	0.501	0.548	
No instruments	69	36	21	12	69	12	
Lags	(2 max)	(2 11)	(2 6)	(2 3)	(2 max)	(2 3)	

Notes: \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

Columns a to f report two-step system-GMM estimates with robust standard errors in brackets. In a to e, FDI/Y and FDI/Y<sup>2</sup> are considered exogenous. They are supposed predetermined in f. The set of instruments contains levels and differences of the specified lags of the various endogenous regressors, and levels and differences of exogenous explicatives. Estimations have been achieved using the Stata command xtabond2.

The number of GMM-style instruments has been reduced using the option collapse.

Lines Sargan and Hansen provide the P-values for the Sargan and Hansen tests of overidentifying restrictions.

The null is that instruments are not correlated with the residuals.

Line AR(2) is the P-value for the Arellano-Bond second-order auto-correlation test.

The null is that errors in the difference regression do not exhibit second-order correlation.

Lags' indicates the range of lags that has been considered for the endogenous variables. The first figure is the first lag, and the second figure is the last lag.

Column h reports the estimates of a standard fixed-effect regression on the subsample data effectively used by system-GMM estimates.

**Table 5: Globalization**

Specification	(a)	(b)	(c)	(d)	(e)
FDI/Y	-0.230*** (0.033)	-0.238*** (0.050)	-0.247*** (0.054)	-0.274*** (0.052)	-0.277*** (0.070)
(FDI/Y) <sup>2</sup>	0.00065*** (0.00010)	0.00069*** (0.00013)	0.00071*** (0.00014)	0.00078*** (0.00014)	0.00079*** (0.00018)
TG	-0.341*** (0.073)	-0.400*** (0.078)	-0.398*** (0.093)	-0.293*** (0.088)	-0.291*** (0.099)
I/Y	0.726 (0.613)	1.271* (0.713)	1.330* (0.717)	0.935 (0.759)	8.455** (3.743)
OPENK		1.458*** (0.369)	1.385*** (0.384)	0.759* (0.392)	0.350 (0.503)
OPENT			-0.010 (0.023)	0.0097 (0.023)	-0.013 (0.029)
CRISIS				-3.020*** (0.837)	-4.383*** (1.096)
UNR					-0.571*** (0.182)
Fixed effects	yes	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes
R-squared	0.269	0.284	0.285	0.289	0.376
No observations	775	723	699	649	373
No countries	73	69	68	64	43

Robust standard errors in brackets. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. All regressors are one-period lagged.

**Table 6: Changes in FDI variable**

Specification	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
Data	UNCTAD	LMF	UNCTAD	LMF	UNCTAD	LMF	UNCTAD	LMF
FDI/Y	-0.274*** (0.052)	-0.205*** (0.053)			-0.277*** (0.070)	-0.259*** (0.072)		
(FDI/Y) <sup>2</sup>	0.00078*** (0.00014)	0.00059*** (0.00014)			0.00079*** (0.00018)	0.00069*** (0.00020)		
FDI/K			-0.507*** (0.071)	-0.385*** (0.071)			-0.486*** (0.085)	-0.486*** (0.119)
(FDI/K) <sup>2</sup>			0.0022*** (0.00028)	0.0017*** (0.00040)			0.0020*** (0.00033)	0.0020*** (0.00060)
TG	-0.293*** (0.088)	-0.362*** (0.071)	-0.296*** (0.096)	-0.414*** (0.086)	-0.291*** (0.099)	-0.424*** (0.103)	-0.294*** (0.106)	-0.486*** (0.116)
I/Y	0.935 (0.759)	1.018 (0.702)	1.432* (0.863)	1.159 (0.756)	8.455** (3.743)	4.116 (3.292)	12.574*** (4.786)	5.332 (4.975)
OPENK	0.759* (0.392)	0.124 (0.356)	0.669* (0.390)	0.031 (0.370)	0.350 (0.503)	0.601 (0.496)	0.360 (0.519)	0.670 (0.522)
OPENT	0.0097 (0.023)	-0.028 (0.024)	0.0088 (0.023)	-0.023 (0.023)	-0.013 (0.029)	0.029 (0.030)	-0.031 (0.030)	0.034 (0.032)
CRISIS	-3.020*** (0.837)	-3.885*** (0.874)	-2.934*** (0.851)	-3.970*** (0.890)	-4.383*** (1.096)	-4.474*** (1.194)	-4.126*** (1.039)	-4.071*** (1.173)
UNR					-0.571*** (0.182)	-0.340** (0.161)	-0.596*** (0.182)	-0.403** (0.166)
Fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes
R-squared	0.289	0.247	0.323	0.260	0.376	0.312	0.443	0.367
No observations	649	763	557	662	373	373	340	340
No countries	64	60	53	50	43	42	39	38

Robust standard errors in brackets. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

All regressors are one-period lagged.

**Table 7a: Sensitivity analysis with FDI/Y and without the unemployment rate**

Specification	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
Data	Developed UNCTAD	Developed LMF	4-year UNCTAD	4-year LMF	Probit UNCTAD	Probit LMF	cluster 1 UNCTAD	cluster 1 LMF	cluster 2 UNCTAD	cluster 2 LMF	K/Y UNCTAD	K/Y LMF
FDI/Y	0.224 (0.368)	-0.037 (0.222)	-0.316** (0.141)	-0.212 (0.225)	-0.014*** (0.0024)	-0.010*** (0.0024)	-0.274** (0.125)	-0.205 (0.128)	-0.274** (0.135)	-0.205 (0.157)	-0.263*** (0.056)	-0.152*** (0.051)
(FDI/Y) <sup>2</sup>	-0.014 (0.010)	-0.0095 (0.0065)	0.0010*** (0.00037)	0.00088 (0.00075)	0.000040*** (6.76e-06)	0.000031*** (7.05e-06)	0.00078** (0.00032)	0.00059* (0.00035)	0.00078** (0.00034)	0.00059 (0.00041)	0.00082*** (0.00015)	0.00044*** (0.00015)
TG	-0.175** (0.086)	0.042 (0.039)	-0.281 (0.190)	-0.302** (0.152)	-0.015*** (0.0040)	-0.019*** (0.0030)	-0.293 (0.196)	-0.362** (0.176)	-0.293 (0.184)	-0.362*** (0.088)	-0.173* (0.099)	-0.227*** (0.076)
I/Y	23.455*** (6.539)	21.141*** (6.238)	-0.211 (2.443)	0.238 (2.183)	0.037 (0.038)	0.039 (0.035)	0.935 (1.981)	1.018 (1.838)	0.935 (1.481)	1.018 (1.234)	3.075* (1.830)	-0.669 (1.322)
OPENK	0.728 (0.765)	1.069** (0.535)	0.881 (1.306)	-0.574 (0.949)	0.046** (0.021)	0.021 (0.019)	0.759 (0.601)	0.124 (0.448)	0.759 (0.825)	0.124 (0.433)	0.871** (0.378)	-0.014 (0.323)
OPENT	-0.172* (0.094)	-0.097 (0.060)	0.012 (0.051)	0.054 (0.090)	0.00059 (0.0010)	-0.00084 (0.0011)	0.0097 (0.041)	-0.028 (0.057)	0.0097 (0.051)	-0.028 (0.080)	-0.0086 (0.021)	-0.048** (0.020)
CRISIS	1.000 (2.358)	0.746 (2.240)	-6.963** (2.880)	-5.190* (2.814)	-0.133*** (0.044)	-0.183*** (0.044)	-3.020*** (1.064)	-3.885** (1.539)	-3.020** (1.300)	-3.885** (1.816)	-2.932*** (0.766)	-3.706*** (0.753)
Fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-squared	0.361	0.350	0.443	0.349	0.301	0.270	0.289	0.247	0.289	0.247	0.234	0.195
No observations	258	336	123	140	649	763	649	763	649	763	748	924
No countries	20	19	48	48	64	60	64	60	64	60	64	62

Robust standard errors in brackets unless specified. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. All regressors are one-period lagged, but columns d and e.

Developed means that the sample only contains countries whose GDP per capita was larger than 60% of the US one in 1980.

Probit means that we consider a logistic transform of the dependent variable.

Columns g to j feature clusterized estimates. 'cluster 1' means that each country is a cluster, while 'cluster 2' means that the sample is clusterized by income class.

**Table 7b: Sensitivity analysis with FDI/Y and with unemployment rate**

Specification	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
Data	Developed UNCTAD	Developed LMF	4-year UNCTAD	4-year LMF	Probit UNCTAD	Probit LMF	cluster 1 UNCTAD	cluster 1 LMF	cluster 2 UNCTAD	cluster 2 LMF	K/Y UNCTAD	K/Y LMF
FDI/Y	0.123 (0.325)	-0.320 (0.267)	-0.094 (0.180)	-0.145 (0.231)	-0.012*** (0.0031)	-0.011*** (0.0031)	-0.277* (0.166)	-0.259 (0.162)	-0.277 (0.175)	-0.259 (0.227)	-0.210*** (0.066)	-0.182** (0.074)
(FDI/Y) <sup>2</sup>	-0.010 (0.0090)	-0.0024 (0.0066)	0.00035 (0.00053)	0.00037 (0.00073)	0.000036*** (8.54e-06)	0.000031*** (8.87e-06)	0.00079* (0.00043)	0.00069 (0.00045)	0.00079* (0.00045)	0.00069 (0.00060)	0.00066*** (0.00017)	0.00044** (0.00020)
TG	-0.237 (0.164)	-0.199 (0.169)	-0.236 (0.280)	-0.332 (0.281)	-0.015*** (0.0048)	-0.022*** (0.0052)	-0.291 (0.222)	-0.424 (0.262)	-0.291 (0.262)	-0.424 (0.292)	-0.171 (0.130)	-0.295** (0.128)
I/Y	37.257** (16.292)	35.597** (16.252)	52.689*** (15.005)	44.72*** (16.69)	0.350* (0.179)	0.159 (0.172)	8.455 (5.473)	4.116 (5.670)	8.455** (3.586)	4.116 (7.851)	2.515 (2.797)	-1.665 (2.135)
OPENK	1.280 (0.897)	1.347 (0.899)	1.955 (2.015)	1.811 (2.219)	0.030 (0.030)	0.041 (0.030)	0.350 (0.675)	0.601 (0.600)	0.350 (0.633)	0.601 (0.530)	0.471 (0.501)	0.394 (0.491)
OPENT	-0.320*** (0.093)	-0.265*** (0.093)	0.0088 (0.057)	0.061 (0.101)	-0.00029 (0.0013)	0.0016 (0.0014)	-0.013 (0.048)	0.029 (0.054)	-0.013 (0.050)	0.029 (0.081)	0.0064 (0.027)	0.020 (0.028)
CRISIS	1.639 (2.664)	1.141 (2.615)	-9.543* (5.266)	-7.618* (4.355)	-0.206*** (0.058)	-0.210*** (0.062)	-4.383*** (1.574)	-4.474** (1.898)	-4.383*** (1.262)	-4.474*** (1.078)	-4.684*** (1.073)	-4.309*** (1.117)
UNR	0.703** (0.357)	0.688* (0.359)	-0.242 (0.536)	-0.094 (0.414)	-0.026*** (0.026)	-0.017** (0.0079)	-0.571** (0.280)	-0.340 (0.264)	-0.571 (0.357)	-0.340 (0.221)	-0.371** (0.166)	-0.089 (0.147)
Fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-squared	0.327	0.342	0.673	0.512	0.372	0.308	0.376	0.312	0.376	0.461	0.252	0.203
No observations	224	223	57	57	373	373	373	373	373	373	429	428
No countries	20	19	22	21	43	42	43	42	43	42	44	43

Robust standard errors in brackets unless specified. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. All regressors are one-period lagged, but columns d and e.

Developed means that the sample only contains countries whose GDP per capita was larger than 60% of the US one in 1980.

Probit means that we consider a logistic transform of the dependent variable.

Columns g to j feature clusterized estimates. 'cluster 1' means that each country is a cluster, while 'cluster 2' means that the sample is clusterized by income class.

**Table 8a: Sensitivity analysis with FDI/K and without unemployment rate**

Specification	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
Data	Developed UNCTAD	Developed LMF	4-year UNCTAD	4-year LMF	Probit UNCTAD	Probit LMF	cluster 1 UNCTAD	cluster 1 LMF	cluster 2 UNCTAD	cluster 2 LMF	K/Y UNCTAD	K/Y LMF
FDI/K	2.845*** (1.071)	-0.244 (0.436)	-0.536*** (0.153)	-0.467** (0.211)	-0.022*** (0.0032)	-0.016*** (0.0034)	-0.507*** (0.188)	-0.385*** (0.142)	-0.507*** (0.158)	-0.385** (0.156)	-0.446*** (0.068)	-0.318*** (0.061)
(FDI/K) <sup>2</sup>	-0.253*** (0.077)	-0.032 (0.026)	0.0025*** (0.00058)	0.0029** (0.0014)	0.000099*** (0.000012)	0.000075*** (0.000019)	0.0022*** (0.00071)	0.0017** (0.00060)	0.0022*** (0.00057)	0.0017*** (0.00054)	0.0021*** (0.00028)	0.0012** (0.00042)
TG	-0.264** (0.129)	-0.129 (0.093)	-0.265 (0.198)	-0.290* (0.175)	-0.015*** (0.0045)	-0.021*** (0.0040)	-0.296 (0.223)	-0.414* (0.227)	-0.296 (0.250)	-0.414*** (0.151)	-0.192** (0.095)	-0.268*** (0.075)
I/Y	8.331 (11.366)	16.085 (10.338)	-0.458 (1.999)	-0.283 (1.771)	0.058 (0.043)	0.048 (0.039)	1.432 (2.353)	1.159 (1.965)	1.432 (1.893)	1.159 (1.445)	1.177 (1.819)	-2.193* (1.299)
OPENK	0.614 (0.766)	1.311** (0.565)	0.923 (1.234)	-0.382 (0.958)	0.040* (0.022)	0.013 (0.020)	0.669 (0.606)	0.031 (0.499)	0.669 (0.802)	0.031 (0.532)	0.830** (0.368)	-0.062 (0.321)
OPENT	-0.272*** (0.089)	-0.078 (0.063)	0.014 (0.047)	0.017 (0.089)	0.00068 (0.0010)	-0.00072 (0.0010)	0.0088 (0.045)	-0.023 (0.055)	0.0088 (0.051)	-0.023 (0.085)	0.000065 (0.020)	-0.031* (0.018)
CRISIS	1.623 (2.182)	1.267 (2.138)	-6.892** (2.876)	-5.591** (2.706)	-0.127*** (0.046)	-0.184*** (0.045)	-2.934*** (1.006)	-3.970** (1.571)	-2.934* (1.585)	-3.970** (1.793)	-2.717*** (0.754)	-3.547*** (0.735)
Fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-squared	0.330	0.316	0.505	0.388	0.311	0.261	0.323	0.260	0.323	0.260	0.263	0.224
No observations	229	298	107	123	557	662	557	662	557	662	748	924
No countries	17	17	39	40	53	50	53	50	53	50	64	62

Robust standard errors in brackets unless specified. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. All regressors are one-period lagged, but columns d and e.

Developed means that the sample only contains countries whose GDP per capita was larger than 60% of the US one in 1980.

Probit means that we consider a logistic transform of the dependent variable.

Columns g to j feature clusterized estimates. 'cluster 1' means that each country is a cluster, while 'cluster 2' means that the sample is clusterized by income class.

**Table 8b: Sensitivity analysis with FDI/K and with unemployment rate**

Specification	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
Data	Developed UNCTAD	Developed LMF	4-year UNCTAD	4-year LMF	Probit UNCTAD	Probit LMF	cluster 1 UNCTAD	cluster 1 LMF	cluster 2 UNCTAD	cluster 2 LMF	K/Y UNCTAD	K/Y LMF
FDI/K	1.915** (0.929)	-0.754 (0.557)	-0.246 (0.220)	-0.259 (0.375)	-0.020*** (0.0039)	-0.021*** (0.0055)	-0.486** (0.207)	-0.486* (0.250)	-0.486*** (0.184)	-0.486 (0.308)	-0.420*** (0.080)	-0.405*** (0.122)
(FDI/K) <sup>2</sup>	-0.180*** (0.068)	-0.0020 (0.027)	0.0012 (0.0010)	0.00084 (0.0021)	0.000092*** (0.000015)	0.000093*** (0.000028)	0.0020*** (0.00077)	0.0020* (0.0011)	0.0020*** (0.00064)	0.0020* (0.0012)	0.0020*** (0.00033)	0.0015** (0.00064)
TG	-0.446*** (0.160)	-0.365** (0.168)	-0.201 (0.288)	-0.311 (0.277)	-0.015*** (0.0051)	-0.024*** (0.0056)	-0.294 (0.245)	-0.486 (0.314)	-0.294 (0.331)	-0.486 (0.347)	-0.179 (0.127)	-0.336*** (0.127)
I/Y	16.463 (16.124)	28.892* (16.109)	49.865*** (15.761)	40.735** (16.012)	0.519** (0.235)	0.206 (0.262)	12.574* (6.860)	5.332 (7.743)	12.574 (7.761)	5.332 (13.186)	1.521 (2.749)	-3.068 (2.125)
OPENK	1.191 (0.842)	1.578* (0.893)	2.092 (2.040)	1.719 (2.138)	0.031 (0.031)	0.045 (0.031)	0.360 (0.659)	0.670 (0.701)	0.360 (0.589)	0.670 (0.719)	0.401 (0.487)	0.471 (0.491)
OPENT	-0.300*** (0.089)	-0.210** (0.094)	-0.0045 (0.058)	0.089 (0.101)	-0.00099 (0.0013)	0.0018 (0.0015)	-0.031 (0.052)	0.034 (0.058)	-0.031 (0.052)	0.034 (0.077)	0.0053 (0.026)	0.034 (0.027)
CRISIS	1.356 (2.577)	0.919 (2.600)	-8.903* (5.187)	-7.301* (4.240)	-0.198*** (0.057)	-0.194*** (0.062)	-4.126*** (1.336)	-4.071** (1.742)	-4.126*** (0.212)	-4.071*** (0.1.243)	-4.521*** (1.016)	-3.985*** (1.066)
UNR	0.770** (0.313)	0.775** (0.358)	-0.342 (0.521)	0.089 (0.419)	-0.027*** (0.0086)	-0.021** (0.0083)	-0.596** (0.287)	-0.403 (0.297)	-0.596 (0.383)	-0.403 (0.283)	-0.343** (0.164)	-0.090 (0.147)
Fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-squared	0.354	0.350	0.774	0.538	0.422	0.349	0.443	0.367	0.443	0.509	0.290	0.240
No observations	216	216	53	53	340	340	340	340	340	276	429	428
No countries	17	17	19	19	39	38	39	38	39	34	44	43

Robust standard errors in brackets unless specified. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. All regressors are one-period lagged, but columns d and e.

Developed means that the sample only contains countries whose GDP per capita was larger than 60% of the US one in 1980.

Probit means that we consider a logistic transform of the dependent variable.

Columns g to j feature clusterized estimates. 'cluster 1' means that each country is a cluster, while 'cluster 2' means that the sample is clusterized by income class.