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LOCAL HUMAN CAPITAL FORMATION AND OPTIMAL FDI

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ABSTRACT

This paper lends both theoretical and empirical support to the notion of optimal FDI levels. It does so by uncovering an inverted-U-shaped relationship between FDI and human capital formation. The optimality of a particular FDI inflow depends on the educational incentives induced by FDI on the local, heterogeneous population. Our estimates confirm the significance of a positive (linear) and a negative (non-linear) impact of FDI stocks on tertiary schooling, which are exclusively relevant in developing countries.

Keywords**:** *FDI, Human Capital, Skills, Asymmetric Information.*

JEL classification**:** *F23, H52, J24.*

RESUMEN

Este trabajo presta un soporte tanto teórico como econométrico al concepto de niveles óptimos de inversión extranjera directa (FDI). Lo hace mostrando una relación de U invertida entre FDI y la formación de capital humano. La optimalidad de los flujos de entrada de FDI depende de los incentivos a la educación que generen sobre una población local heterogénea. Nuestras estimaciones confirman la significatividad tanto de un impacto positivo (lineal) como de otro negativo (no lineal) de los stocks de FDI sobre la escolarización terciaria, exclusivamente relevante para países en desarrollo.

Keywords**:** *IED, Capital Humano, Competencias, Información asimétrica.*

JEL classification**:** *F23, H52, J24*

LOCAL HUMAN CAPITAL FORMATION AND OPTIMAL FDI

1. INTRODUCTION

It has been widely reported by the literature on multinational corporations (henceforth MNCs) the role played by the latter in the expansion of formal education in the host countries. As emphasized by Blomström and Kokko (2002), "MNCs provide attractive employment opportunities to highly skilled graduates in natural sciences, engineering and business sciences, which may be an incentive for gifted students to complete tertiary training." Abundant empirical studies also suggest that multinational corporations tend to raise the demand for education in developing countries, as their plants are often more skilled-labor intensive than the rest of the economy (see, for instance, Feenstra and Hanson 1997). According to this idea, in order to access the staff of reputed multinationals, potential workers need to qualify as educated labor force. Therefore, even when not all of them will effectively work for such multinationals, this will induce on these workers an effort of human capital formation with significant spillovers for the rest of their countries.

It is indisputable that the potential workers' educational effort will depend on the size of the MNC staff relative to their number. For an extremely small staff size relative to the number of aspirants, it will be necessary for them to be both competitive and fortunate enough to be selected. That will discourage the exertion of effort. On the other hand, if a very large size of the staff guarantees a very high probability of selection, effort will be again reduced by all candidates. The highest possible schooling enrolment rates will be thus achieved for intermediate values of employment in MNCs. There is in principle no reason why the MNCs will tend to maximize the aggregate local efficiency units of human capital, since there are many other strategic priorities for them. Therefore, it may be in the interest of local governments to use some instruments in order to internalize these external effects, which will spill over most of

the productive sectors. Here, as in Docquier and Rapoport (2008) for the case of skilled emigration, we assume that the impact of FDI on the long-run growth potential of the host country can be summarized by the effect on its human capital stock.[1]

Since the workers hired by MNCs remain in the country, we do not rely on any brain "drain" effect connected with market imperfections (to distinguish this mechanism from the brain gain and drain effects introduced by Docquier and Rapoport 2008). Instead, we introduce the possibility that heterogeneous workers manage the extent of their own uncertainty regarding their chances to be hired by multinationals. They will do so by exerting different levels of educational effort. Then, it will be possible for the most talented workers to relax when opportunities are very abundant, which has a negative effect on local human capital formation, even in the absence of human capital externalities on productivity. This implies that inward FDI stocks could turn out to be too high when they exceed a hypothetical optimum for the local economy.

Our main contribution to this literature is twofold. First, we offer a structural description of the mechanism through which FDI affects human capital accumulation in the country. Secondly, and more importantly, we show that this relationship is genuinely causal and not monotone; in particular, we motivate and find empirical support to an inverted-U shape relationship between FDI and human capital formation. Most studies in this strand of the literature, in contrast, reported a monotonic (positive) relationship between FDI and human capital (see, for example, Eicher and Kalaitzidakis 1997; Noorbakhsh, Paloni, and Youssef 2001; Ramos 2001; te Velde 2003; Miyamoto 2003; Gittens 2006; Nembot Ndeffo 2010).

We offer a brief empirical examination of the main implications of our model. Evidence, from a sample of developing countries, confirms the model's prediction of an inverted-U shape relationship between FDI and human capital accumulation. However, such relationship is not confirmed for a different sample of advanced countries; this fact suggests that the incentives for

[1] For a formal justification, see e.g. Docquier and Rapoport (2012).

human capital formation may well be different in developed economies. They could be linked to the higher chances to reach higher quality (managerial) jobs for the local population in the West. The rest of the paper is organized as follows: the following section outlines the basic mechanism through which FDI affects human capital; section 3 describes the data used in this study; section 4 discusses the estimation procedure and provides the main study results; and section 5 concludes.

2. AN ILLUSTRATIVE MODEL

The decision making in this model corresponds to the candidates to work for the multinational. The exploration of the candidates' behavior yields the optimal staff size from the point of view of the human capital formation in the host country. These candidates need to learn for an entry examination. When they get a job, their remuneration will be the wage w (we assume that the remuneration in a domestic firm would be, without loss of generality, zero). They can choose their personal level of education e. If they learn e they will, when tested, get a random grade uniformly distributed in $[e-1, e+1]$.

There are various types of candidates, characterized by their ability, i.e. by their costs of learning level e. For type η it costs $c(\eta, e)$ to learn level e. We assume that $c(\eta, e)$ increases with e but decreases with η - for the higher types it costs less to learn. Moreover, apart from $c_e^{'} > 0 > c_\eta^{'}$, we will also assume $c_{ee}^{''} > 0 > c_{e\eta}^{''}$.

There is a continuum of candidates and e is assumed to be a continuous variable. The employer (MNC) sets a benchmark b, such that all those who achieve a grade higher than b will get a job. There will be a one-to-one relation between the benchmark and the number of positions available (the latter to be proxied by the level of FDI in the country).

The candidates are divided into 3 groups:

- Those whose preferred level of education is high ($e > b + 1$), so that they will obtain a job with probability one. Since lower education levels are less costly, they will reduce their education level to the lowest for which they will be accepted with probability one, i.e. $e = b + 1$.
- Those whose preferred level of education provides them with a position with a positive probability, lower than one. For these individuals, $b - 1 < e < b + 1$. When studying at a level e, their probability of being selected will be $\frac{e+1-b}{2}$.
- Those who will not study for the examination, since their preferred level of education is such that $e < b - 1$. That is, they have a zero probability to be hired.

How do the candidates choose their level of education?

We assume that all of them are risk neutral. If type η chooses a level of education e, where $b - 1 \leq e \leq b + 1$, his probability of getting a job is $\frac{e+1-b}{2}$ and his expected payoff:

$$w\frac{e+1-b}{2} - c(\eta, e) \quad (1)$$

That is maximized when

$$c_e^{'}(\eta, e) = \frac{w}{2} \quad (2)$$

In order to have a maximum we have previously assumed convexity of $c(.,.)$. Furthermore, given a level e we can find the type $\eta = \eta(e)$ that solves the above equation. Our previous assumptions imply that the type $\eta(e)$ increases with e.

When the employer lowers the benchmark b (i.e., when FDI increases), there are three basic effects: those aspirants with a preferred effort above $(b + 1)$ will lower their education level; those below the level $(b + 1)$, who were previously accepted with a certain probability, will keep their effort level but obtain a job with a higher probability than before; additionally, some new candidates, who so far did not study, will enter the competition by acquiring some education.

Whether the overall level of education has increased or decreased depends on the changes in the education levels and the number of competitors who changed their levels. For example, it is quite clear that when the benchmark is sufficiently low, the number of competitors with preferred education level above the benchmark (those who have a job for sure) is high, and they all will lower their level when the benchmark falls. This will then have a negative effect on the total education level. This is likely to happen when the initial benchmark is low, that is, when the number of jobs is large. On the other hand, when the benchmark is high, there are few individuals above the benchmark. They will lower their education when the benchmark lowers, but their effect will be small (due to their small numbers) compared to those who newly joined the competition, hence the total effect is likely to be an increase in education.

The previous analysis clarifies that, when job opportunities in multinationals become very abundant, not only could the aggregate schooling of the population decay, but also (if the most talented are many, and sufficiently better than the least talented) the aggregate schooling of the labor force could fall. That is, too many good jobs may reduce the aggregate stock of human capital employed by the economy. This happens because the employability of the worst types implies necessarily some relaxation on the part of the best workers.

3. DATA

The main part of the data on which our analysis is based come from Beine, Docquier, and Rapoport (2008), henceforth BDR.[2] We augment these data to include the main variables in our analysis, using different sources. In particular, data about land area and the population come from the World Bank's World Development Indicators.[3] Data on FDI stocks come from the United Nations Conference on Trade and Development.[4] Missing data on population and land

[2] We are greatly thankful to Frederic Doquier and his coauthors for providing us with their data.
[3] See http://data.worldbank.org/data-catalog/world-development-indicators.
[4] See http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx?sCS_referer=&sCS_ChosenLang=en.

area were complemented from the CIA world factbook.[5] Our sample focuses on 124 developing countries, out of the original 127-countries sample of BDR—these are the countries with positive (or non-missing) FDI data.

We also consider 28 developed countries from the original sample of BDR (which were excluded from their analysis in the respective study), to test whether the relationship in question, and the underlying mechanism, apply for these countries as well. See the appendix for a complete list of the included countries in this study, in the major sample of developing countries and the secondary sample of developed countries.

Human capital in this study, as in BDR, is defined as the share of high-skilled (i.e., with tertiary education) among the total native population. Investment in human capital (the growth rate in human capital) is the difference between the (logs of) these levels in 2000 and 1990. Table 1 provides the summary statistics of the main variables in this study.

Table 1. Summary Statistics of Main Variables

Variable	Definition	Mean	Std. Dev.	Minimum	Maximum
FDI	The inward stock of Foreign Direct Investment in 1990 (billions of USD)	2.125	5.075	0	37.1
FDI^2	FDI squared	30.063	140.381	0	1379.6
ln(*H90*)	Log of the share of the tertiary-educated in the population	-3.215	1.120	-6.6	-1.4
$\Delta \ln(H)$	The growth rate of human capital (between 1990 and 2000)	0.424	0.323	-0.29	1.88
SSAD	Dummy for Sub-Saharan African country	0.363	0.483	0	1
ln(*Pop90*)	Log of the population size in 1990	15.236	2.199	9.6	20.9
DENS90	Population density in 1990 (people per sq. Km of land area)	99.570	144.994	1	845
ln(*p90*)	Log of the skilled migration rate in 1990	-2.149	1.373	-6.4	-.03
Land	Land size (millions of Km-sq.)	0.611	1.247	.0002	9.3

[5] See https://www.cia.gov/library/publications/the-world-factbook.

GNID	Dummy for low-income country (below $900 GNI per-capita)	0.492	0.502	0	1

Notes: the sample includes 124 developing countries. These are the same countries used in BDR excluding Benin, Iraq, and Somalia for which FDI values are missing.

Source: own elaboration.

4. ESTIMATION AND RESULTS

4.1. Empirical Model

We use a β-convergence empirical model to test the main implication of our theoretical model, by regressing the growth rate in human capital between 1990 and 2000 on the stock of FDI in 1990, its squared levels, and a host of explanatory variables measured in 1990, as follows:

$$\Delta \ln(H_{00-90})_i = \beta_0 + \beta_1 FDI90_i + \beta_2 FDI90_i^2 + \beta_3 \ln(H90)_i + \beta_4 SSAD_i + \beta_5 \ln(POP90)_i + \beta_6 DENS90_i + \beta_7 \ln(p90)_i + \varepsilon_i$$

Where H_i stands for human capital (the share of high-skilled in the population) in country i, SSAD is a regional dummy for sub-Saharan Africa, POP is the population size, DENS is the population density, ln(p) is the log of the skilled migration rate, and ε is the error term. This model is almost identical to BDR's equation (5), with the exception that we add our main variables of interest, FDI and FDI^2, beside the population size. Standard errors in all estimation results and statistical tests are corrected for White-heteroskedasticity.

The main coefficients of interest are β_1 and β_2. A negative β_2 would indicate a concave relationship between FDI and human capital. Unlike simple procedures to test for a mere concavity of the relationship, however, we use the test for U-shape relationships developed by Lind and Mehlum (2010), which is based on the framework provided by Sasabuchi (1980), and tests for the presence of a U-shaped or an inverse-U-shaped relationship. In particular, a significant Sasabuchi-Lind-Mehlum (SLM) statistic means that the relationship eventually changes direction: from an increasing to a decreasing relation or vice versa, within the interval

of studied values in the data.[6] This is clearly a stronger conclusion than the simple statement of a concave (probably monotonically increasing) relationship between FDI and human capital accumulation.

Omitted variables, measurement error of FDI, or reverse causality in the FDI-human capital relationship might render FDI endogenous. In which case, all the coefficients in general, and our coefficients of interest in particular, would not be consistently estimated by OLS. To address these concerns we estimate the given relationship using instrumental variables approach (2SLS).[7]

The instrument we use for FDI is land area of the country, beside an interaction term of land with a dummy variable for "poor country," GNID, defined as a country with GNI per capita less than $900. To be a valid instrument, land has to be significantly correlated with FDI, and uncorrelated with the error term, ε. While multinational corporations might take into account the physical country size in their investment considerations, there is no a priori reason why human capital (or any unexplained part of it) should be correlated with the land area of the country.

The following equation reports the OLS regression results of FDI on land and its interaction with the poor-country-dummy, GNID (robust standard errors in parentheses):

$$FDI = \underset{(.228)}{0.36} + \underset{(.377)}{4.40} \times Land - \underset{(.530)}{2.63} \times (Land \times GNID)$$

$$R^2 = 0.654;\ \ Nobs = 124;\ \ F = 83.73$$

The instruments are statistically significant at all conventional levels, individually (as shown by the resulting t-statistics) and jointly (as shown by the F-statistic results). Bigger countries (in terms of land area) seem to attract more FDI than smaller ones. Also, land explains about 65% of the variation in FDI: considered in light of the current cross-sectional context, is an evidence

[6] Lind and Mehlum (2010) use the likelihood ratio approach of Sasabuchi (1980) to build a test for the joint hypotheses given by $H_0: (a + 2bx_{min} \leq 0) \cup (a + 2bx_{max} \geq 0)$ vs. $H_1: (a + 2bx_{min} > 0) \cap (a + 2bx_{max}) < 0$ where *a* and *b* come from a quadratic function of *x*: $f(x; z) = c + ax + bx^2 + z'\beta$.

[7] Because our estimation involves a nonlinear endogenous variable, namely FDI^2, we perform the 2SLS in two special variations to avoid the "forbidden regression" problem. See Wooldridge (2010) for more details.

of a strong instrument. (R-squared from the long regression of FDI on all explanatory variables in the model is 0.683.)

4.2. Results

Table 2 reports the main results of our analysis. Along with the 2SLS estimates, the table also reports the simple OLS estimates as a benchmark. We report estimation results of the fully specified model as well as of the shorter model resulting from omitting the insignificant variables from the full model, DENS90 and ln(p90).

Table 2: Estimation Results. (Dependent variable is the gross investment in human capital)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
$FDI90$	.0331***	.0335***	.0404*	.0396*	.0481*	.0477*
	(.0117)	(.0115)	(.0241)	(.0223)	(.0255)	(.0246)
$FDI90^2$	-.0009***	-.0010***	-.0010*	-.0010*	-.0012**	-.0012**
	(.0003)	(.0003)	(.0006)	(.0005)	(.0006)	(.0006)
$\ln(H90)$	-.2693***	-.2708***	-.2740***	-.2750***	-.2779***	-.2792***
	(.0354)	(.0357)	(.0354)	(.0359)	(.0354)	(.0360)
$SSAD$	-.3822***	-.3852***	-.3774***	-.3824***	-.3744***	-.3805***
	(.0862)	(.0829)	(.0834)	(.0801)	(.0821)	(.0790)
$\ln(POP90)$	-.0682***	-.0709***	-.0736***	-.0760***	-.0780***	-.0809***
	(.0140)	(.0139)	(.0163)	(.0166)	(.0178)	(.0177)
$DENS90$	-.0001		-.00001		-.00001	
	(.0001)		(.0001)		(.0001)	
$\ln(p90)$	.0127		.0138		.0143	
	(.0202)		(.0203)		(.0204)	
Constant	.7269***	.7313***	.7812***	.7840***	.8232***	.8327***
	(.1648)	(.1607)	(.1784)	(.1807)	(.1952)	(.1942)
R^2	.487	.484	.483	.481	.476	.474
Shea's Partial R^2						
FDI						
FDI^2			.2799	.2915	.2144	.2294
			.4022	.4145	.3208	.3387
Endogeneity F-test			2.74	2.67	3.84	3.94
			(.0685)	(.0734)	(.0244)	(.0221)
SLM test	2.62	2.66	1.68	1.78	1.89	1.94
(p-value)	(.0049)	(.0044)	(.0481)	(.0389)	(.0308)	(.0272)
Fieller 90%	[13.9;	[14.1;	[2.4; 21.4]	[9.2; 21.0]	[13.7;	[14.5;
confidence interval	22.3]	21.8]			21.9]	21.4]
Nobs	124	124	124	124	124	124

Notes: robust standard errors in parentheses. OLS regressions in Columns 1 and 2. Land, Land*GNID, and squares of these, are used to produce the 2SLS estimates in columns 3 and 4. Columns 5 and 6 also report 2SLS estimates but from using "predicted FDI" and its square, along with land and its interaction with GNID, as instruments. (GNID is a dummy for countries with GNI below $900.) SLM is the Sasabuchi-Lind-Mehlum test for an inverse-U shape relationship: a significant test statistic not only indicates a concave relationship, but that it attains a maximum within

the data interval. *H90* is the human capital in 1990 (*ex ante* proportion of educated). *SSAD:* sub-Saharan African dummy. *POP90:* the population in 1990. *DENS90:* population density in 1990. *p90:* skilled emigration rate in 1990. Fieller interval is the 90% confidence interval for the optimal level of *FDI*.
* p<10%, ** p<5%, *** p<1%

Source: own elaboration.

Column (1) reports OLS results of estimating the fully-specified model, in which the coefficients of *DENS90* and ln*(p90)* are not statistically different from zero, and therefore are omitted in column (2) which also reports the OLS estimates of the remaining coefficients. Columns 3-4 report the 2SLS estimates (where $FDI$and FDI^2 are instrumented by the instruments land and land-poor interaction term, along with their squared values). Columns 5 and 6 also report 2SLS estimates, where "predicted FDI" and its squared value are used as instruments, along with land and land-poor interaction. Estimation is carried out for the fully-specified and parsimonious models, respectively.

The results from the table support our theoretical prediction that FDI positively affects human capital, but at a decreasing rate; moreover, as the SLM test results (also reported in the table) show, we reject the null hypothesis of U-shaped or monotonic relationship between FDI and human capital in favor of the alternative hypothesis that this relationship is an inverse-U shaped, at all conventional significance levels.[8]

Incidentally, other statistically significant coefficients have signs and magnitudes that are in line with theory and the existing literature. In particular, the coefficient of Sub-Saharan regional dummy is negative at the level of -0.38, similar to the estimates reported by BDR—who report that this outcome confirms the findings of Easterly and Levine (1997) that the formation of human capital in Sub-Saharan countries is weak. Also, the negative coefficient of $\ln(H90)$, estimated at -0.27, is very close to BDR's estimate, and indicates a convergence in human capital among the analyzed countries. Furthermore, more populated countries seem to fare slightly worse in terms of human capital accumulation.

[8] Asali and Cristobal Campoamor (2011) used WDI cross-sectional data, for the year 2005; they likewise found evidence supporting a concave relationship between FDI and tertiary education enrollment.

The quadratic form of the estimated model allows us to calculate an "optimal level" of FDI at which human capital is maximized, given the inverted-U shape (and not only concave) relationship between FDI and human capital. 90% Fieller confidence intervals of these optimal levels of FDI are reported in the table as well. The OLS estimated optimal FDI stock is around 17.5 (billion USD), and that from 2SLS is 19.4.[9] The stock of inward FDI in almost all the countries in our sample (97.6%) is below this level. Consequently, all surveyed developing countries will be experiencing a positive relationship between FDI and human capital, at least in the foreseeable future. This might explain the general finding in the literature surveyed earlier, as to the positive monotonic relationship between FDI and human capital.

Finally, it is worth emphasizing that the relationship in question does *not* hold for more advanced economies. To show this we carried out similar analyses to the remaining developed countries in the BDR sample. Table 3 summarizes these results.

Table 3: Results for Developed Countries

Variable	(1)	(2)	(3)
$FDI90$	-.0004	.0007	.0018
	(.0004)	(.0014)	(.0020)
$FDI90^2$	.000001*	-	-.000002
	(7.8e-7)	.0000002	(3.2e-6)
		(2.3e-6)	
$\ln(H90)$	-.0881***	-.1186***	-.1267***
	(.0279)	(.0367)	(.0463)
$SSAD$	--	--	--
$\ln(POP90)$	.0008	-.0172	-.0301
	(.0073)	(.0230)	(.0337)
$DENS90$	.0001***	.0001***	.0001***
	(8e-6)	(9.7e-6)	(1.2e-5)
$\ln(p90)$	.0261	.0208	.0088
	(.0162)	(.2473)	(.0208)
Constant	.1214	.2920	.4182
	(.1284)	(.2473)	(.3624)

[9] The lower bound of optimal FDI in these intervals is around $13b. The OLS outcomes seem to be slightly downward biased, if at all. This supports the measurement-error explanation of the endogeneity of FDI, rather than the omitted-variables or the reverse-causality explanations.

R^2	.656	.613	.480
Shea's Partial R^2			
FDI		.0792	.0864
FDI^2		.0801	.0949
Endogeneity F-test (pv)		.96 (.403)	1.27 (.304)
SLM test	0.91	0	.48
(p-value)	(.186)	(1.0)	(.319)
Nobs	28	27	27

Notes: dependent variable is the gross investment in human capital. Column 1 reports OLS results; columns 2 and 3 report two variations of 2SLS estimates. See notes of Table 2.

Source: own elaboration.

As is clear from the table, FDI and human capital in developed countries are not related in any similar way to that in developing countries. The coefficients are not statistically or economically significant, and the SLM test fails to reject the null hypothesis that the FDI-human capital relationship is not described by a strict U-shape or inverted-U shape. In fact, the effect of FDI on the individuals' incentives to invest in human capital depends not only on the quantity of jobs in multinationals, but also on the quality. Education is also important to get a *good* job in these firms. Obviously, not all applicants can get good jobs, since they will partly be allocated according to education. This effect counteracts the negative effects from our observed "quantity mechanism."

That is probably the reason why our inverted-U relationship is not observed for a different sample of OECD countries that host important inward stocks of FDI. As revealed by Hahn, Hayakawa and Ito (2013), the proportion of local managers in South Korean multinationals is twice higher for *high income* recipient countries, as opposed to low income countries. This means that the relevance of the abovementioned "quality mechanism" is likely to dominate our "quantity mechanism" in OECD economies.

4.3. Placebo Analysis

If the correlation between FDI and human capital is genuinely causal, so that an increase in FDI causes an increase or decrease in the level of human capital in the country, a future FDI shall

not have a significant effect on the current human capital formation. We carry out this simple placebo analysis by estimating a similar model, but replacing FDI of 1990 with FDI of 2010 (ten years after our dependent variable, the "growth in human capital," is calculated). Namely, we estimate the following regression:

$$\Delta \ln(H_{00-90})_i = \beta_0 + \beta_1 FDI10_i + \beta_2 FDI10_i^2 + \beta_3 \ln(H90)_i + \beta_4 SSAD_i + \beta_5 \ln(POP90)_i + \varepsilon_i$$

where FDI10 is the stock of inward FDI in 2010. The 2SLS results of this estimation are as follows (with robust standard errors in parentheses):

$$\Delta \ln H_{00-90} = \underset{(.32)}{.84} + \underset{(.0031)}{.0031} FDI10 - \underset{(.000005)}{.000005} FDI10^2 - \underset{(.05)}{.29} \ln(H90) - \underset{(.08)}{.38} SSAD - \underset{(.03)}{.08} \ln(POP90)$$

$$Nobs = 115, \qquad R^2 = 0.488, \qquad Wald = 63.95 \ (pv = 0.0000)$$

The respective p-values of the coefficients of FDI and FDI^2 are 0.327 and 0.315. Therefore, not only the magnitude of the coefficients is of a much lower order than the correct estimates (11 times and 164 times less, respectively), but also these effects are not statistically different from zero. This finding lends support to a causal interpretation of the relationship between FDI and human capital.

5. CONCLUSIONS

The connection between rapid foreign direct investment (FDI) inflows and the development of new skills by the labor force of the host countries has been carefully studied (see, for particular cases like Ireland, Barba Navaretti and Venables 2004). Whether the relationship between foreign direct investments and the human capital in the host country was the focus in these studies, which was seldom the case, or an incidental aspect of them, the studied relationship was shown to be, or assumed to be, monotonically increasing.

In this paper, in addition to describing a mechanism that explains the relationship between FDI and human capital, we argue that human capital formation may effectively increase with the new activity of multinational corporations, though at a decreasing rate, and possibly uncovering the

optimality of limited stocks of inward FDI.

Our empirical analysis confirms this point and calls our attention to the possibility that, focusing on the long-run growth prospects for the host economy, FDI inflows are crucial component and vital but only up to an optimal level. This conclusion, however, is not immediately effective for most of our studied countries whose stock of inward FDI is below its predicted optimal level.

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Appendix: Included Countries

Main sample, developing countries:

Afghanistan; Albania; Algeria; Angola; Antigua and Barbuda; Argentina; Bahrain; Bangladesh; Barbados; Belize; Bhutan; Bolivia; Botswana; Brazil; Bulgaria; Burkina Faso; Burma (Myanmar); Burundi; Cambodia; Cameroon; Cape Verde; Central African Republic; Chad; Chile; China; Colombia; Comoros; Congo, Dem. Rep. of the; Congo, Rep. of the; Costa Rica; Cote d'Ivoire; Cuba; Djibouti; Dominica; Dominican Republic; Ecuador; Egypt; El Salvador; Equatorial Guinea; Ethiopia; Fiji; Gabon; Gambia, The; Ghana; Grenada; Guatemala; Guinea; Guinea-Bissau; Guyana; Haiti; Honduras; Hungary; India; Indonesia; Iran; Jamaica; Jordan; Kenya; Kiribati; Laos; Lebanon; Lesotho; Liberia; Libya; Madagascar; Malawi; Malaysia; Maldives; Mali; Marshall Islands; Mauritania; Mauritius; Mexico; Micronesia, Federated States of; Mongolia; Morocco; Mozambique; Namibia; Nepal; Nicaragua; Niger; Nigeria; Oman; Pakistan; Palau; Panama; Papua New Guinea; Paraguay; Peru; Philippines; Poland; Romania; Rwanda; Saint Kitts and Nevis; Saint Lucia; Saint Vincent and the Grenadines; Samoa; Sao Tome and Principe; Saudi Arabia; Senegal; Seychelles; Sierra Leone; Solomon Islands; South Africa; Sri Lanka; Sudan; Suriname; Swaziland; Syria; Tanzania; Thailand; Togo; Tonga; Trinidad and Tobago; Tunisia; Turkey; Uganda; Uruguay; Vanuatu; Venezuela; Vietnam; Yemen; Zambia; Zimbabwe

Short sample, developed countries:

Australia; Austria; Belgium; Brunei; Canada; Denmark; Finland; France; Germany; Greece; Iceland; Ireland; Italy; Japan; Kuwait; Malta; Netherlands; New Zealand; Norway; Portugal; Qatar; Singapore; Spain; Sweden; Switzerland; United Arab Emirates; United Kingdom; United States.

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