CAUSALITY AND EXTERNAL VALIDITY
Causality between FDI and Financial Market Development: Evidence from Emerging Markets

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This paper studies the causal relationship between foreign direct investment (FDI) and financial market development (FMD) using panel data from emerging markets. Most studies of the relationship between FDI and FMD have focused on the role of FMD in the link between FDI and economic growth, with no deep understanding of direct causality between FDI and FMD, especially in emerging markets, where financial markets are in the development stage. We document bidirectional causality between FDI and stock market development indicators. For banking sector development indicators, the relationship is ambiguous and inconclusive. Care is therefore needed when analysing the relationship between FMD and FDI, as results may depend on whether the FMD variables used to evaluate causality are stock market or banking sector development indicators. JEL codes: F21, O16

I. Introduction

In general, the literature on the relationship between foreign direct investment (FDI), financial market development (FMD), and economic growth falls into

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two categories. The first finds FDI is only efficient at spurring growth when certain conditions are met, one of which consists of a fairly developed financial sector (e.g., Hermes and Lensink 2003; Alfaro et al. 2004, 2010). The second provides evidence that well-functioning financial sector or market liberalization can help spur growth (Levine and Zervos 1998; Levine et al. 2000; Bekaert et al. 2005; and many others).

In this paper, we study the direct causal relationship between FDI and FMD. We perform an empirical assessment of this relationship using panel data from emerging markets. Our focus on emerging markets has at least four advantages. First, data are available for almost all the countries of our sample. Second, the quality of institutions is less diverse in these countries than it would be in a sample that included developed markets, therefore a common explanatory variable that can link economic development and other variables in given economy (such as GDP per capita) will have less effect on the results. Third, our focus on emerging economies allows us to study stock market and other financial development variables often used in the literature. And fourth, emerging markets are the most relevant sample with which to study our topic: developed markets are irrelevant, and less developed or the poorest countries may have difficulty attracting FDI even if they have a well functioning financial sector, because their smaller market power or lack of resources make them less attractive.

We use a system of simultaneous equations to explore the causality link between FDI and FMD, where the key endogenous variables are FDI and FMD, while controlling for other factors that drive inflows of FDI and the development of financial markets. We document bidirectional causality between FDI and stock market development variables. Hence, studies involving both FDI and FMD, especially stock market development, must account for potential problems of endogeneity. For FMD variables other than variables related to the development of the stock market, such as banking sector development indicators, the relationship is ambiguous and inconclusive. For that reason, care is needed when analysing the relationship between FMD and FDI, as results may depend on whether the FMD variables used measure development of the stock market or development of the banking sector.

The rest of this paper is structured as follows. In Section 2, we describe the data and discuss the empirical analysis results. We conclude in Section 3.

II. EMPIRICAL ANALYSIS

Data

Our sample is composed of the following 29 emerging markets: Argentina, Brazil, Chile, China, Colombia, Czech Republic, Egypt, Hong Kong, Hungary, India, Indonesia, Iran, Israel, Jordan, Malaysia, Mexico, Morocco, Peru, Philippines, Poland, Russia, Saudi Arabia, Singapore, South Africa, Tunisia, Turkey, Vietnam, Thailand, and South Korea. These markets are located in Africa (four countries), Asia (15 countries), Eastern Europe (four countries) and

Latin America (six countries). Our data cover 1994 to 2006. We began in 1994 because some countries in our sample are former communist nations that did not have a stock market before 1994. After 2007, because of the financial crisis, the data are too instable to use.

We consider the ratio of FDI to GDP (FDIGDP) as the indicator of FDI. As for FMD, we divided five indicators into two subgroups: the stock market development (SMD) indicators subgroup and the banking sector development (BSD) indicators subgroup. The SMD indicators consist of (i) the ratio of stock market capitalization to GDP (STKMKTCAP) and (ii) the ratio of stock value traded as a percentage of GDP (STKVALTRA).[1] The BSD indicators consist of (i) the ratio of private credit by deposit money banks and other financial institutions to GDP (CREDIT), (ii) the liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and non-bank financial intermediaries) divided by GDP (LLIAB), and (iii) the ratio of commercial bank assets divided by commercial bank plus central bank assets (CCB). We extracted the data for these variables from the World Bank's World Development Indicators and Global Development Finance databases and the International Monetary Fund's International Financial Statistics database. The complete definition and the sources of these variables are provided in Table 1. The table also lists the control variables used in the regression analysis below.

Figure 1 shows scatter plots of FDI and FMD variables, where we computed the average of each variable for each country. From this figure, a linear relationship between stock market development variables (STKMKTCAP and STKVALTRA) and FDIGDP seems to exist. We observe the same linear relationship between FDIGDP and banking sector development variables (CREDIT, LLIAB and CCB).

Causality Analysis

Studying causal relationships when using panel data is always a challenge because one must consider dynamics. Like Arellano (2003), we consider various specifications of a bivariate VAR(2) model for the FDI and FMD variables, denoted FDI_{it} and FMD_{it} respectively. Individual and time effects are included in both equations. The form of the model is

$$FDI_{it} = \delta_{1t} + \alpha_1 FDI_{i(t-1)} + \alpha_2 FDI_{i(t-2)} + \beta_1 FMD_{i(t-1)} + \beta_2 FMD_{i(t-2)} \\ + \eta_{1i} + \nu_{1it}, \tag{1}$$

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1. Note that stock market turnover, another indicator of stock market development, is related to stock market liquidity and equals the total value of domestic shares traded divided by market capitalisation. As such, it is obtained by combining STKMKTCAP and STKVALTRA. For that reason, we omit stock market turnover from our analysis.
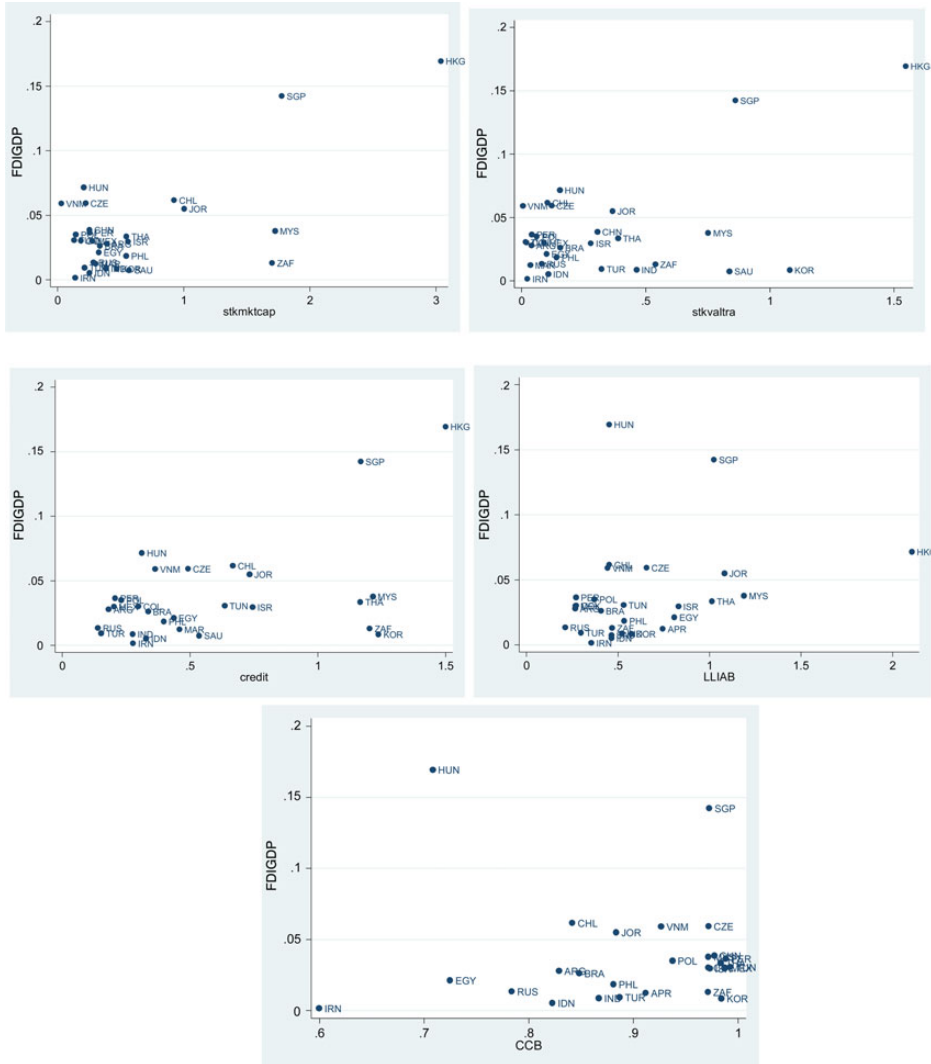
T ABLE 1 . Descriptions of the Variables and of the Sources of Data

Variable	Description	Source of Data
FDI variables		
FDIGDP	FDI / GDP	The World Bank's World Development Indicators and Global Development Finance databases
FMD variables		
STKMKTCAP	Stock market capitalisation / GDP	The World Bank's Global Development Finance[2] database and the International Monetary Fund's International Financial Statistics database
STKVALTRA	Value traded as a percentage of GDP	
CREDIT	Total credit by financial intermediaries to the private sector / GDP	
LLIAB	Liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and non-bank financial intermediaries) / GDP	
CCB	Ratio of commercial bank assets / commercial bank plus central bank assets	
Economic and policy variables		
INFLATION	Percentage change in GDP deflator	The World Development Indicators database of the World Bank; the UNESCO database (EDUCATION only)
INFRAS	Log(Phones per 1000 population)	
OPENNESS	(Import + Export) / GDP	
$LOG(GDP_{t-1})$	Logarithm of lagged real GDP	
NATRES	Share of fuel and minerals in exports	
EXHRATE	Exchange rate	
BALANCE	Current account balance / GDP	
INTRATE	Lending interest rate adjusted for inflation as measured by the GDP deflator	
EDUCATION	Gross enrolment ratio for all levels of education	
Governance and institutional quality variables		
GOVERNANCE	The GOVERNANCE index is the average of six Worldwide Governance Indicators:	The Worldwide Governance Indicators project (see http://info.worldbank.org/governance/wgi/index.asp)
	(1) Voice and accountability	
	(2) Political stability and absence of violence	
	(3) Regulatory quality	
	(4) Government effectiveness	
	(5) Rule of law	
	(6) Control of corruption	

Note: FDI = foreign direct investment; GDP = gross domestic product.

2. The link to the Global Development Finance data is http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:20696167~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html

FIGURE 1. Scatter Plots of Foreign Direct Investment and Financial Market Development

Notes: FDIGDP is the ratio of foreign direct investment (FDI) to gross domestic product (GDP). STKMKTCAP is the ratio of stock market capitalization to GDP. STKVALTRA is the ratio of stock value traded as a percentage of GDP. CREDIT is the ratio of private credit by deposit money banks and other financial institutions to GDP. LLIAB is the liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and non-bank financial intermediaries) divided by GDP. CCB is the ratio of commercial bank assets divided by commercial bank plus central bank assets.

$$FMD_{it} = \delta_{2t} + \gamma_1 FMD_{i(t-1)} + \gamma_2 FMD_{i(t-2)} + \lambda_1 FDI_{i(t-1)} + \lambda_2 FDI_{i(t-2)}$$
$$+ \eta_{2i} + \nu_{2it}, \tag{2}$$

where δ_{1t} and δ_{2t} capture the time effect and η_{1i} and η_{2i} capture the individual effect. The hypothesis that FDI does not Granger-cause FMD, conditional on individual and time effects imposes the restrictions $\lambda_1 = \lambda_2 = 0$. Conversely, to test whether FMD Granger-causes FDI, we examine the restrictions $\beta_1 = \beta_2 = 0$.

Practically, we first estimate the VAR system consisting of equations (1) and (2) and then use a Wald-type test to verify these two non-causality restrictions. We use Arellano (2003, p. 118)'s two-step generalized method of moments (GMM) estimator. More precisely, we use two variants of this estimator: (i) the two-step GMM in differences (which we denote by GMM2—Diff.), which captures the effect of greater persistence and is consistent with the presence of unobserved heterogeneous intercepts; and (ii) the two-step GMM in level and differences (denoted by GMM2—Level Diff.) proposed by Arellano and Bover (1995) and Blundell and Bond (1998). This last estimation technique is appropriate for capturing mean stationarity. Note, however, that both estimation methods are two-step GMM. The two-step estimator is useful in this context because it both solves endogeneity issues as well as observed heterogeneity.

From the unit root tests, we know that STKMKTCAP and LLIAB are I(1) processes. Given that the Granger causality test can only be performed on stationary variables, we have performed the causality test between FDIGDP and the first difference of STKMKTCAP (denoted by D.STKMKTCAP) and LLIAB (denoted by D.LLIAB).

Table 2 presents the result of causality with the appropriate method for each case. It shows that D.STKMKTCAP Granger-causes FDIGDP at least at the 6.7% confidence level, independently of the type of instrument used. We also observe that FDIGDP causes D.STKMKTCAP at the 5.1% confidence level. Intuitively, these results suggest that if a country experiences a large increase in its stock market capitalisation, it will tend to attract more FDI in following years. Similarly, everything else being equal, countries that have attracted large amounts of FDI in recent years will tend to increase the speed of their stock market capitalisation. Moreover, it appears that STKVALTRA Granger-causes FDI at the 10% confidence level, but that FDIGDP does not Granger-cause STKVALTRA.

For the BSD, at best, we find a unidirectional relationship. More precisely, CREDIT Granger-causes FDIGDP, but FDIGDP does not Granger-cause CREDIT. We also find that FDIGDP Granger-causes D.LLIAB, but D.LLIAB does not Granger-cause FDIGDP. There seems to exist no causal relationship between FDIGDP and CCB, whatever the estimation method and whatever the direction. Thus, these two variables may be determined exogenously.

In sum, stock market development variables interact differently with FDIGDP. While there is a bidirectional causal relationship between STKMKTCAP and FDIGDP, the causality test between FDIGDP and STKVALTRA seems unidirectional. The causality tests between banking sector development indicators and FDI are inconclusive. Below, we perform further multivariate analyses of the causal relationship between FDI and FMD indicators by way of endogenous simultaneous multivariate regressions.

TABLE 2. Causality Test Results

A	B	Chi-square test	Df	*P*-value	Observations	Number of ncode
GMM2—Diff						
D.STKMKTCAP	FDIGDP	5.42*	2	0.067	248	28
FDIGDP	D.STKMKTCAP	5.94*	2	0.051	248	28
CCB	FDIGDP	0.63	2	0.729	254	27
FDIGDP	CCB	0.01	2	0.993	253	26
GMM2—Level. Diff						
STKVALTRA	FDIGDP	4.74*	2	0.093	306	29
FDIGDP	STKVALTRA	3.87	2	0.141	301	29
CREDIT	FDIGDP	32.51*	2	0.000	302	28
FDIGDP	CREDIT	0.0256	2	0.987	302	28
D.LLIAB	FDIGDP	3.45	2	0.178	275	28
FDIGDP	D.LLIAB	13.70*	2	0.001	275	28

Notes: FDIGDP is the ratio of foreign direct investment (FDI) to gross domestic product (GDP). STKMKTCAP is the ratio of stock market capitalization to GDP. STKVALTRA is the ratio of stock value traded as a percentage of GDP. CREDIT is the ratio of private credit by deposit money banks and other financial institutions to GDP. LLIAB is the liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and non-bank financial intermediaries) divided by GDP. CCB is the ratio of commercial bank assets divided by commercial bank plus central bank assets. D.STKMKTCAP and D.LLIAB denote the first difference of STKMKTCAP and LLIAB, respectively. ***$p < .01$; **$p < .05$; *$p < .1$, if $p < .1$ then A Granger-causes B.

REGRESSION MODEL SPECIFICATION AND RESULTS

To achieve our objective of studying the relationship between FDI and FMD, and given the likelihood of endogeneity problems between the two set of variables, we turn to the following system of simultaneous equations:

$$
\begin{aligned}
FDI_{it} = a_0 &+ a_1 FMD_{it} + a_2 EDUCATION_{it} + a_3 INFLATION_{it} \\
&+ a_4 EXHRATE_{it} + a_5 GOVERNANCE_{it} + a_6 LOG(GDP_{it-1}) \\
&+ a_7 OPENNESS_{it} + a_8 NATRES_{it} + a_9 INFRAS_{it} + \varepsilon_{it},
\end{aligned} \tag{3}
$$

$$
\begin{aligned}
FMD_{it} = b_0 &+ b_1 FDI_{it} + b_2 EDUCATION_{it} + b_3 INFLATION_{it} \\
&+ b_4 EXHRATE_{it} + b_5 GOVERNANCE_{it} + b_6 Log(GDP_{it-1}) \\
&+ b_7 BALANCE_{it} + b_8 INTRATE_{it} + v_{it}.
\end{aligned} \tag{4}
$$

This system of endogenous simultaneous equations has been set to achieve identification that is at least theoretically sound. We chose the explanatory control variables on the basis of the existing literature on the determinants of FDI and FMD (e.g., Hermes and Lensink 2003; Alfaro et al. 2004; Kholdy and Sohrabian 2008; Al Nasser and Soydemir 2010; Asiedu and Lien 2011). The control

variables we used to estimate the determinants are given in Table 1 with their definition and source of data.

Our analysis uses the 2SLS method as the main estimation method for the panel data. Table 3 presents the regression results of the 2SLS panel regressions of equations (3) and (4). We see that FDIGDP and the SMD indicators (STKMKTCAP and STKVALTRA) impact each other positively and significantly. In all the regressions, we see that the BSD variables do not affect FDIGDP. We also note that FDIGDP only negatively and significantly affects CREDIT at the 5% confidence level, but it does not significantly affect the other BSD variables. In other words, over the 1994–2006 period, BSD variables had no significant effect on FDI, nor did FDI significantly affect BSD indicators. For CREDIT, the impact of FDI on BSD is even negative. The negative significant impact of FDI on CREDIT is less obvious and may be explained by the fact that an increase in FDI translates into an increase in the country's GDP: since the CREDIT variable has GDP as its denominator, a marginal increase in the amount of credit to the private sector (the numerator) that is smaller than the marginal increase in GDP following an increase in FDI means that more FDI will cause the ratio of credit to the private sector over GDP (i.e., CREDIT) to fall. The other determinants of the FDI and FMD indicators have the expected signs.

For robustness, we also run our regressions by controlling for the fact that some FMD variables are I(1) processes. We use the 2SLS estimation method with Error Correction Model panel regressions to see if earlier results still hold. As additionally robustness analysis, we also use the 3SLS estimation method to estimate our system of simultaneous equations. Given that almost no software has implemented the 3SLS method for panel data, we have used the 3SLS method with pool data, having assumed that the data can be pooled. Because previous analyses have proven the relevance of FMD indicators' growth rates, we focus on the first differences of FMD indicators. The results for these additional analyses, available from the authors upon request, are almost the same as in the first specification but the amplitude of the effect of some variables differs.

III. CONCLUSION

This paper is an empirical study of the relationship between foreign direct investment and financial market development. We considered 29 emerging market economies over the 1994–2006 period, using two indicators of stock market development and three indicators of banking sector development.

Given the endogenous nature of the linkage between FDI and FMD, we run a system of simultaneous equations using panel data. We find that FDI and stock market development indicators positively impact each other at the same time. When we use banking sector development indicators to measure financial market development, however, causality is ambiguous and inconclusive. We must

TABLE 3. Two-Stage Least Squares (2SLS) Panel Regression Results

Variables	(1) FDIGDP	(2) STKMKTCAP	(1) FDIGDP	(2) STKVALTRA	(1) FDIGDP	(2) CREDIT	(1) FDIGDP	(2) LLIAB	(1) FDIGDP	(2) CCB
FDIGDP		8.350*** (2.0900)		7.578*** (2.1500)		−3.725*** (1.3640)		0.0296 (0.5510)		0.0478 (0.4170)
STKMKTCAP	0.0448*** (0.0154)									
STKVALTRA			0.0463*** (0.0164)							
CREDIT					−0.443 (0.4780)					
LLIAB							1.975 (5.2600)			
CCB									0.845 (0.6970)	
EDUCATION	−0.000773 (0.0007)	0.00407 (0.0078)	−0.000659 (0.0008)	0.003 (0.0081)	−0.00121 (0.0017)	−0.00325 (0.0047)	−0.0117 (0.0274)	0.00482** (0.0019)	−0.00327 (0.0021)	0.00277* (0.0015)
INFLATION	−0.000309 (0.0004)	0.00957** (0.0044)	6.68E-06 (0.0004)	0.00252 (0.0046)	0.000875 (0.0013)	0.00267 (0.0027)	−0.00137 (0.0043)	0.00112 (0.0011)	0.00408 (0.0034)	−0.00466*** (0.0009)
EXHRATE	2.25E-06 (0.00001)	−4.01E-05 (0.00012)	−4.31E-07 (0.00001)	4.97E-06 (0.00012)	2.48E-05 (0.00005)	3.59E-05 (0.00005)	−8.47E-05 (0.00019)	4.63e-05** (0.00002)	−1.04E-05 (0.00002)	−3.82E-06 (0.00002)
NATRES	0.0288 (0.0721)		0.063 (0.0775)		−0.118 (0.2680)		0.0569 (0.3580)		0.00551 (0.1580)	
GOVERNANCE	0.0146 (0.0154)	−0.227 (0.1730)	0.0032 (0.0170)	0.0313 (0.1780)	0.0759 (0.0742)	0.166 (0.1040)	0.0159 (0.0808)	0.00106 (0.0419)	−0.0998 (0.1020)	0.125*** (0.0343)
LOG(GDP$_{t-1}$)	−0.0116 (0.0250)	0.404* (0.2400)	−0.00142 (0.0258)	0.231 (0.2490)	0.156 (0.1750)	0.333** (0.1590)	−0.543 (1.4720)	0.192*** (0.0641)	−0.133 (0.1100)	0.153*** (0.0431)
OPENNESS	0.00060*** (0.00021)		0.00061*** (0.00022)		−0.00039 (0.00139)		0.00007 (0.00222)		0.00093** (0.00041)	
INFRAS	1.28E-05 (0.00013)		−1.82E-05 (0.00015)		−0.000136 (0.00043)		0.00152 (0.00374)		6.51E-05 (0.00027)	
BALANCE		−0.0209*** (0.0066)		−0.0223*** (0.0068)		−0.0037 (0.0039)		−0.000123 (0.0016)		−0.00131 (0.0013)

(Continued)

Table 3. Continued

Variables	(1) FDIGDP	(2) STKMKTCAP	(1) FDIGDP	(2) STKVALTRA	(1) FDIGDP	(2) CREDIT	(1) FDIGDP	(2) LLIAB	(1) FDIGDP	(2) CCB
INTRATE		−0.00465		−0.00342		−0.000611		8.19E-05		−0.000514
		(0.0028)		(0.0029)		(0.0017)		(0.0007)		(0.0006)
Observations	167	167	165	165	165	165	165	165	165	165
R-square	0.279	0.254	0.227	0.164	−3.415	−0.662	−18.824	0.345	−2.147	0.501
Number of ncode	25	25	25	25	24	24	24	24	24	24

Notes: FDIGDP is the ratio of foreign direct investment (FDI) to gross domestic product (GDP). STKMKTCAP is the ratio of stock market capitalization to GDP. STKVALTRA is the ratio of stock value traded as a percentage of GDP. CREDIT is the ratio of private credit by deposit money banks and other financial institutions to GDP. LLIAB is the liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and non-bank financial intermediaries) divided by GDP. CCB is the ratio of commercial bank assets divided by commercial bank plus central bank assets. The other variables are described in Table 1. Standard errors are in parentheses. ***$p < .01$; **$p < .05$; *$p < .1$.

therefore exercise great caution when analysing the relationship between FMD and FDI, as findings may depend on whether the FMD variables used to determine causality indicate stock market development or banking sector development.

There are several ways to explain the bidirectional link between FDI and stock market development in these emerging economies. On one hand, foreign investment helps develop local stock markets by its investment spillover effects. This is because more foreign investment increases the likelihood that the affiliates of multinationals involved in FDI activities will be listed on local stock markets, since multinationals tend to hail from industrialised countries where financing through the stock market is a tradition. Furthermore, consistent with the political economy argument, one can conjecture that FDI inflows encourage the country's political elite to adopt market-friendly regulations—especially investor protection and better governance regulations: this promotes the development of the stock market. On the other hand, a relatively well-developed stock market helps attract foreign investors, as such a market is perceived as a sign of vitality, of openness on the part of country authorities, and of a market-friendly environment. This is especially true in emerging markets, whose stock markets are more developed than are the markets of other developing countries.

These findings suggest a key policy recommendation: that policies to attract more FDI be accompanied by market-friendly regulations, especially stock market regulations such as mechanisms to improve governance and protect investors. This will allow countries to maximise the benefits of the spillover effects of FDI.

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