Department of Economics

International Capital Flows, Technology Spillovers and Local Credit Markets

Carolina Villegas Sanchez

Thesis submitted for assessment with a view to obtaining the degree of
Doctor of Economics of the European University Institute

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Contents

Introduction

"...[Foreign capital] instead of being viewed as a rival ought to be considered as a most valuable auxiliary, conducing to put in motion greater quantity of productive labour and a greater portion of useful enterprise than could exist without it".

Alexander Hamilton[1]

The last two decades have witnessed an increasingly rapid development in the process of financial globalization (i.e. the integration of international capital markets). Most importantly, in recent years, private equity flows have become more relevant to many developing and emerging countries than aid flows. In particular, foreign direct investment (FDI) has become a major source of foreign capital to many countries. In this context, countries have started to compete in order to attract international investors. But which factors are the driving force behind international capital flows? and what is more important, do all types of foreign capital inflows contribute equally to convergence? Is the interest in attracting FDI justified? On theoretical grounds, FDI has traditionally been regarded as a source not only of physical capital but a potential mechanism through which to increase the overall country's productivity. However, the empirical evidence has not been conclusive on this matter. Based on these facts and open questions, Chapter 1 addresses an old paradox that is still relevant nowadays: "Lucas paradox" or the direction of international capital flows paradox. Once shedding light on the factors shaping international capital movements, Chapters 2 and 3 will investigate the potential spillover effects from MNCs' activities.

Lucas (1990) argues convincingly that the lack of north-south capital flows is inconsistent with the standard neoclassical growth model predictions. According to the neoclassical theory, rates of return to capital in developing countries should

[1]The above quotation was made by the first finance minister of a newly independent developing country nearly two centuries ago. The cabinet officer was Treasury Secretary Alexander Hamilton and the developing country was the United States.

be much higher than those in developed countries therefore promoting north-south flows. In addition, the standard neoclassical growth model suggests that in the absence of convex adjustment costs or irreversibility conditions for physical capital and given perfect capital mobility, once the economy opens up to foreign capital, total capital in the economy should immediately converge towards its steady state level. However, in practice, while there are capital flows from developed to developing countries, those flows are much smaller than what theory predicts and moreover, convergence in output and income per capita is gradual. While much attention has been devoted to study the implications of the neoclassical model in terms of the direction of international capital flows, less emphasis has been placed on the convergence predictions of the model. Chapter 1 incorporates dynamics into the empirical analysis of the neoclassical growth model. The inclusion of dynamics is a step further in the literature on the determinants of international capital flows and provides and empirical framework within which it is possible to study a country's speed of convergence towards its steady state. The main findings are that first, the composition of external liabilities matters for the speed of convergence. Countries with higher FDI inflows converge faster to their steady state. Second, there is heterogeneity in the determinants of international capital flows according to the type of foreign inflow. Foreign equity liabilities are mainly driven by well functioning stock markets while FDI is attracted to countries with higher educational levels.

Chapter 2 presents new microeconomic evidence on the link between financial sector development, financial globalization and productivity. Based on country level studies there is a consensus on the relevance of domestic financial factors if countries are to benefit from financial globalization. However, there is limited microeconomic evidence that supports this hypothesis. The analysis in Chapter 2 fills the gap between macroeconomic and microeconomic evidence. Most of the relevance of FDI for the domestic economy relies on the possibility that domestic firms, by being exposed to the new products and production techniques brought in by the multinational company (MNC), manage to improve their own performance as well. However, the possibility of upgrading technology and production processes heavily relies on the development of local financial markets. In particular, the chapter explores the hypothesis that even if domestic firms would like to undertake investments to adopt

new technologies brought in by foreign investors, they may lack access to the financial resources necessary to do so. Using data of Mexican manufacturing firms operating in 1991, 1999 and 2001 it is found that in general, larger firms benefit from foreign companies operating in their same region. In contrast, domestic firms only enjoy higher productivity if they are relatively large and located in well financially developed regions.

Finally, Chapter 3 explores the potential for FDI export spillovers. More generally, the chapter provides empirical evidence on the determinants of the export decision by Mexican manufacturing firms. Two different sets of variables that might influence the decision to export are considered. First, within a simple dynamic specification sunk costs of entry into the export market are disentangled from observable firm characteristics. Size, productivity, the exposure of the firm to international markets or the ownership structure of the firm are often thought as determinants of the firm export decision. After controlling for firm fixed effects only the exposure to international markets through the acquisition of imported intermediate inputs and the foreign ownership status of the firm are relevant characteristics of the decision to export. However, entry costs are significant for Mexican firms. Exporting today increases the probability of exporting tomorrow by 60%. These high entry costs seem to be mainly driven by exports to North America which account for 80% of the total export value by Mexican manufacturing firms. Second, the chapter analyzes the economic geography hypothesis that the export activities of neighboring firms might reduce the cost of entry. In particular, it focuses on the special role that MNCs might have along this dimension. There is robust evidence of positive and significant spillovers from MNCs export activities. In other words, the decision of domestic firms to export is positively influenced by the export intensity of MNC in the same sector and region.

To summarize, the three chapters of this thesis will show first, that foreign investors are attracted to countries with higher levels of human capital stock. Second, countries attracting foreign investors will manage to enjoy benefits from FDI beyond the increase in physical capital if the domestic financial system is well developed. Finally, there is an additional channel for MNCs spillovers which materialize in the decision of domestic firms to engage in export activities.

CHAPTER 1

The Composition of External Liabilities and Speed of Convergence

ABSTRACT. Despite the predictions of the neoclassical theory, in practice, foreign capital neither flows to developing countries nor contributes to faster income per capita convergence. Cross-section regressions test for steady state permanent effects but are ill-suited to study the convergence implications of the neoclassical model. To gauge the importance of dynamics in the neoclassical growth model, we propose to estimate a partial adjustment model by means of dynamic panel techniques. We find that a country's composition of external liabilities has a heterogeneous effect on the speed of convergence. Foreign direct investment (FDI) inflows, as opposed to equity or debt, contribute to faster convergence. Moreover, the determinants of international capital flows vary according to the type of inflow. Foreign equity liabilities are mainly driven by well functioning stock markets while FDI is attracted to countries with higher educational levels.

KEYWORDS. International capital flows, speed of convergence, composition of foreign stock liabilities.

JEL CLASSIFICATION. F21;F41;O1.

1.1. Introduction

The open economy version of the neoclassical growth model has two main implications for international capital flows. First, the rates of return to capital in developing countries should be much higher than those in developed countries therefore promoting north-south flows. Second, in the absence of adjustment costs or irreversibility conditions for physical capital and given perfect capital mobility, once the economy opens up to foreign capital, total capital in the economy should immediately converge towards its steady state level. However, in practice, while there are capital flows from developed to developing countries, those flows are much smaller than what the theory predicts and moreover, convergence in output and income per capita is gradual. While much attention has been devoted to study the failure of the neoclassical model in explaining current patterns of international investment, less emphasis has been placed on the convergence predictions of the model. The main contribution of this paper is to incorporate dynamics into the empirical analysis of the neoclassical growth model. The inclusion of dynamics constitutes a step further in the literature on the determinants of international capital flows and provides and empirical framework within which it is possible to study a country's speed of convergence towards its steady state. In addition, we show that the composition of external liabilities has an heterogeneous effect on a country's speed of convergence.

Therefore, we study within a dynamic framework the two main predictions of the open economy version of the neoclassical growth model: do countries that received more foreign inflows converge faster? and also, what are the determinants of international capital flows?. In answering both questions, we pay particular attention at the composition of external liabilities. Many previous studies have used either total capital flows or FDI flows only. One notable exception is Faria, Lane, Mauro and Milesi-Ferretti (2007) that underline the importance of a high share of equity in total external liabilities for improving a country's ability to share risk with foreign investors. Similarly, we would expect different types of capital inflows (debt, equity or FDI) to be determined by different country fundamentals and to have a distinctive effect on convergence. In particular, while debt and equity flows have often been blamed for increasing countries macroeconomic instability, FDI might

"crowd in" domestic investment[1] (Mody and Murshid (2005)). FDI can stimulate domestic business opportunities by lowering the cost of adopting new technologies or buying most of their inputs locally.

We use data on total capital stock and foreign stock liabilities for a sample of developed and developing countries from 1970 to 1999. We make use of a partial adjustment model, where current capital inflows serve to fill the gap between the initial capital stock and the economy's steady state capital stock, to specify a law of motion for the total capital stock in the economy and for the foreign stock liabilities. However, we assume that there are capital market imperfections and adjustment costs that prevent immediate convergence. Lately, there has been some new emphasis on the relationship between capital inflows and convergence. Abiad, Leigh, and Mody (2008) suggest that a proper test of the role of international capital flows must recognize its role as influencing the income converge process. Henry (2007) underlines that the lack of empirical evidence supporting the link between capital account liberalization and growth is the result of performing cross-sectional regressions. Cross-sectional regressions test the hypothesis of whether changes in capital account openness have a *permanent* effect on differences in long run growth across countries. However, the predictions derived from the neoclassical growth model refer to whether capital account liberalization in a capital-scarce economy will *temporarily* increase the growth rate of its GDP per capita. This paper adds to this literature by shedding some light on the role of foreign capital inflows in the transition dynamics to the economy's steady state and addresses previous endogeneity concerns by choosing the System GMM estimation strategy proposed by Arellano and Bover (1995) and Blundell and Bond (1998).

By looking at the determinants of international capital flows, the paper is also related to the Lucas paradox literature. Lucas (1990) argues convincingly that the lack of north-south capital flows is inconsistent with the standard neoclassical growth model predictions. As suggested by recent work, almost twenty years after the paradox was first posed, the issue of whether there are substantial differences in the marginal return to capital across countries and its implications for north-south capital flows is still open. Caselli and Feyrer (2007) show that once marginal returns

[1]While the literature has stressed the potential indirect effects of FDI on productivity we do not directly incorporate this channel in the analysis and have to assume that the contribution of the different types of foreign capital inflows to convergence is through capital accumulation.

to capital are adjusted for differences between natural resources and reproducible capital and differences in prices of output goods relative to capital, the marginal product of capital is similar across countries. Alfaro, Kalemli-Ozcan and Volosovych (2008) explore the role of different explanations for the lack of capital flows from rich to poor countries and find that low institutional quality is the leading explanation. Prasad, Rajan and Subramanian (2008) focus on the recent phenomenon of "uphill" flows of capital from nonindustrial to industrial countries. Moreover, they show that there is no evidence that increases in foreign capital inflows directly boost growth since developing countries lack the appropriate absorptive capacities. Finally, Gourinchas and Jeanne (2007) point to a refinement in the paradox by which among developing countries, foreign capital does not flow even to those poor countries with more rapidly growing economies.

We complement this literature in two ways. First, the empirical work that has previously examined Lucas paradox has mainly focused on the long run determinants of foreign investment. Using cross-sectional approaches this literature has found a significant effect of institutions on foreign investment. However, as pointed out by Papaionnau (2008) the use of cross-section analysis casts doubts on this correlation being a causal relationship[2]. First, there might be unobserved country specific characteristics that influence both the foreign investment decision and its determinants. Second, it might not be that countries with better fundamentals attract foreign investors but rather that foreign investment has a positive effect on country fundamentals. Papaionnau (2008) adds the time dimension to this literature and shows that there is a positive causal relationship between institutions and foreign investment after controlling for country specific effects and using instrumental variable techniques. We go one step further and include dynamics into the analysis. The inclusion of dynamics allows to control for country specific characteristics, to address not only the reverse causality of institutions but also the potential endogeneity of all the variables thought as affecting the foreign investment decision. Most importantly, it allows to differentiate among the short and the long run effects of fundamentals and capital market imperfections on foreign investment. Second, by looking at the composition of external liabilities we provide evidence on the country fundamentals and capital market imperfections that are more relevant for attracting each type of

[2]One exception is Alfaro et al (2008) that show how their results are robust to the use of instrumental variable techniques.

capital inflow. If as we shall see foreign inflows contribute differently to the speed of convergence, identifying the determinants of each type of inflow would provide the policy-maker with a set of variables that should be targeted in order to attract one type or another of foreign investor.

The main findings of the paper can be summarized as follows. First, there is heterogeneity in the determinants of international capital flows according to the type of foreign inflow. Foreign equity liabilities are mainly driven by well functioning stock markets while FDI is attracted to countries with higher educational levels. This last results is of particular importance since although there has been wide consensus in the theoretical literature about the importance of a country's level of human capital in attracting international capital flows there is almost no empirical evidence supporting this hypothesis. Previous empirical studies failed to find any effect (see Root and Ahmed (1979), Schneider and Frey (1985), Alfaro et al (2008) one exception is Noorbakhsh, Paloni and Youssef (2001)). Second, there is a strong feed-back effect of past investment on current investment which in turn means a higher long-term effect (compared to the short-run effects) of changes in fundamentals and capital market imperfections in foreign investment. This long-term effect is specially pronounce in the case of FDI. Finally, we find that the composition of external liabilities matters for the speed of convergence. Countries with higher FDI inflows converge faster to their steady state. The evidence on the role of debt and portfolio flows is mixed and suggests that debt flows tend to decelerate the convergence process. However, this result is not robust to alternative specifications.

The paper is organized as follows, section 2 provides a brief introduction to the theoretical model, section 3 describes the empirical framework and estimation technique. Section 4 explains the data used in the analysis and section 5 reports the empirical results, where we first look at the determinants of international capital flows and then study the convergence process.

1.2. Theoretical Foundations

The open economy version of the neoclassical growth model has two main implications. First, regarding the direction of capital flows, if the rate of return to capital associated with the initial level of capital stock to labor ratio is higher than the world interest rate, once the economy opens up to foreign investment, foreign

capital would flow into the country. In fact, with free capital mobility, we should observe large capital flows from developed (capital-abundant) to developing (capital-scarce) countries. Second, as regards the speed of convergence, in the absence of adjustment costs for physical capital, the neoclassical growth model with perfect information and perfect capital mobility envisages immediate convergence of capital to its steady state level. However, despite these theoretical predictions, in practice we do not observe either large north-south capital flows or infinite rates of convergence for capital. In what follows we will show how the lack of North-South capital flows can be explained by differences in fundamentals across countries, that could make returns to capital across developed and developing economies more similar, controls to capital mobility, the existence of capital market imperfections and/or adjustment costs.

1.2.1. The direction of international capital flows. Accounting for differences in fundamentals and policies across countries the following steady state capital market equilibrium condition has to be satisfied for each country i:

$$A_{it}f'(k_{it}, z_{it})(1 - \tau_{it}) = r_t \tag{1.1}$$

where $f()$ is the net of depreciation production function in per capita terms satisfying the neoclassical properties; k_{it} represents the steady state capital stock to labor ratio and r_t is the equilibrium interest rate (equalized across countries in the steady state). Both z_{it} and A_{it} represent differences in fundamentals (country specific factors of production and productivity, respectively) while τ_{it} captures differences in government policies. In particular, z_{it} refers to non-traded country *specific factors of production.* Clemens and Williamson (2000) identify this third factor of production with concepts such as natural resources, specialized intermediate inputs, or social capital while Lucas (1990) emphasizes the importance of country differences in human capital levels when calculating the rate of return to capital investment. Assuming educational level raises the productivity of both capital and labor, capital flows would equalize the rate of return to capital across countries but will not manage to equalize capital-labor ratios and hence neither capital output ratios.

Regarding TFP differences across countries (A_{it}), previous theoretical and empirical literature suggests that TFP is determined by the institutional environment, the degree of openness and the development of the financial system. Lately there has

been a new focus on the role of *institutional quality* in fostering economic growth (See Acemoglu, Simon and Robinson (2001) for a recent review) and even more recently on its role as the driving force behind capital flows. In these models the quality of institutions is assumed to have an effect on total factor productivity A_t, so that the better institutions the higher productivity. Hall and Jones (1999) provide empirical evidence showing that differences in productivity across countries are driven by differences in institutions and government policies. The second factor proposed as enhancing TFP is the economy's exterior exposure. Edwards (1997) shows that there is a positive and significant association between *trade openness* and growth. Openness can make inputs more efficient because larger trade implies greater openness that facilitates the economy's adoption of more efficient production techniques. Finally, Beck, Levine and Loayza (2000) find a robust positive link between *financial development* and TFP growth. According to them, this finding supports the Schumpeterian view that financial intermediaries play a crucial role in economic development because they are responsible of choosing which firms get to use society's savings. Moreover, the domestic level of financial development and its ability to facilitate short and long-term finance can ease inward investment. Garibaldi et al (2001) showed that well-developed financial markets appear to be almost the sole determinant of portfolio inflows. In the case of FDI, results are not so drastic but still better financial institutions can be seen as a complementary factor to foreign investments since domestic financial institutions might result appealing as an alternative source of financing or as providers of a domestic yield curve against which assets can more easily be priced (Griffith-Jones and Leape, 2002).

Finally, differences in government policies not directly aimed at limiting foreign capital flows are captured in τ_{it}. Policies such as taxes, subsidies, or privatization policies although not designed to directly regulate capital flows they may nonetheless generate a distorted rate of return on investment. For instance, a relative increase in the host country tax rates is expected to raise the cost of investment, resulting in lower profitability rates. The effect of government policies on the returns to capital is modeled as representing a country specific tax on capital returns. On the other hand, as we shall see in the next section, we expect policies directly aimed at regulating capital flows and asymmetric information to constrain the amount of foreign capital inflows. As a result we would expect that capital controls and capital

market imperfections will translate into lower speed of convergence but would not directly affect the steady state capital stock.

1.2.2. The speed of convergence. The main contending theories explaining the sluggish speed of convergence are the existence of policies directly aimed at limiting the amount of foreign capital in the economy, the importance of capital market imperfections and the relevance of adjustment costs. Adjustment costs refer to the costs incurred after a change in the production process due to installation of new machinery or reorganization of the workforce and especially, the opportunity costs of foregone output during the period of adjustment (Hamermesh and Pfann, 1996). By capital market imperfections we understand asymmetric information in the investment decision on the part of the foreign investors. Problems of moral hazard, adverse selection or costly state verification can hinder the amount of capital foreign investors are willing to invest. We would expect capital controls and capital market imperfections to limit foreign investment which in turn could potentially decrease the speed of convergence. Similarly, the importance of adjustment costs for the speed of convergence is based on modern investment theory that postulates that firms postpone the adjustment of their capital stocks in response to demand shocks.

Suppose a country initially endowed with k_0 capital stock per worker, producing with a country specific factor of production, characterized by a TPF level and government policies that differ from other countries. Under free capital mobility, perfect information and no adjustment costs, once the economy opens up to foreign capital we should observe an immediate jump from k_0 to the steady state capital stock (k^{SS}) (where the steady state capital stock is the one associated with equation (2.1)). Adjustment costs have two effects. First, the steady state capital stock once we control for adjustment costs should be lower for developing countries where adjustment costs are higher[3]. Second, adjustment costs forbid immediate rates of convergence. Firms adjust periodically their capital stock to achieve the long-run equilibrium gradually.

[3]Chirinko and Mallick (2008) show that the long term marginal product of capital is affected by convex adjustment costs. Although their study focuses on convex adjustment costs they argue that non-convex adjustment costs also influence the returns to capital. Non-convex adjustment costs are thought as an "irreversibility premium" by which the firm is reluctant to invest if she thinks that fixed costs of investing and disinvesting could make her held ex-post more capital than desired.

Now suppose we relax the assumptions of perfect capital mobility and perfect information. The existence of restrictions to capital mobility and asymmetric information, defines a new capital market equilibrium condition where the correspondent capital stock per worker equilibrium level is k^{CM}. In other words, foreign capital flows are not enough to fill the gap between k_0 and k^{SS} and therefore, the steady state capital stock would be reached by progressive domestic investment[4]. The higher the restrictions on capital mobility and the uncertainty about the investment the wider the gap would be and the slower would overall capital stock in the economy converge to the steady state. Consequently it is possible to distinguish between the speed of convergence of overall capital stock in the economy towards the steady state capital stock per worker (k^{SS}) and the speed of convergence of foreign capital towards the open economy capital market equilibrium (k^{CM}).

1.3. Methodology

1.3.1. Description of the empirical model. We adopt a partial adjustment model that assumes that the investment flow adjusts the current capital stock towards the long-term capital stock and therefore, expresses the observed flow as a function of the required flow to close the gap between the capital already invested in the economy and the equilibrium capital stock[5].

We make use of this model to describe both the evolution of overall capital stock in the economy and that of foreign capital stock[6]. Total capital stock in the economy evolves according to:

$$k_{it} - k_{i,t-1} = \gamma^T (k_{it}^{SS} - k_{i,t-1}) \tag{1.2}$$

where k refers to total capital stock to output ratio in the economy, γ^T is the overall speed of convergence and k^{SS} is the economy steady state capital stock to output. We follow Hall and Jones (1999)[7] and write the decomposition of the production function in terms of capital to output ratio rather than capital to labour ratio. As they point out in a capital to labour framework increases in productivity translate

[4]See Wiederholt (2005), based on a Ramsey-Cass-Koopmans model, for a formal derivation of the steady state and capital market equilibrium stocks of capital in the presence of foreign capital and restrictions to capital mobility.

[5]See Cheng and Kwan (2000) for a similar exercise using Chinese FDI data.

[6]See section 4 for a description of the foreign capital stock data.

[7]Based on previous work by Mankiw et al (1992) and Klenow and Rodriguez-Clare (1997).

over time in increases in the capital to labour ratio making impossible to differentiate increases in the marginal return to capital due to productivity amelioration or factor accumulation. Also the capital to output ratio is proportional to the investment rate along the balance growth path providing further grounds to our empirical framework.

Similarly, the dynamics of foreign capital stock can be represented by:

$$k_{it}^F - k_{i,t-1}^F = \gamma^F (k_{it}^{CM} - k_{i,t-1}^F) \tag{1.3}$$

where k^F is foreign capital stock to output ratio in the economy, γ^F is the foreign capital speed of adjustment and k^{CM} is the capital market equilibrium stock of capital to output ratio.

The existence of adjustment costs is represented by the condition $/\gamma/ < 1$[8]. In addition, although we do not directly model the form of adjustment costs, the fact that the speed of adjustment is characterized by a constant parameter, suggests quadratic adjustment costs (QAC) rather than fixed adjustment costs (FAC). With QAC, the firm makes continuous small adjustments every period to achieve the long-run equilibrium gradually. On the contrary, the FAC assumption implies that the firm undertakes a large investment concentrated in one or few periods (Bigsten et al (2005)). It is argued that models on FAC are more consistent with plant-level data (see Caballero and Engel, 1999) however, recent research in Thomas (2002) shows how although individual production units adjust in a discrete manner, at the aggregate level there is smooth adjustment.

Rearranging terms equations (2.2) and (1.3) can be respectively re-expressed as:

$$k_{it} = (1 - \gamma^T) k_{i,t-1} + \gamma^T k_{i,t}^{SS} \tag{1.4}$$

and,

$$k_{it}^F = (1 - \gamma^F) k_{i,t-1}^F + \gamma^F k_{it}^{CM} \tag{1.5}$$

To estimate these equations we need to identify those factors characterizing the steady state stock level (k^{SS}) and those factors determining the capital market equilibrium stock level (k^{CM}). The choice of these variables is based on our previous theoretical discussion, so that based on equation (2.1), k^{SS} is expressed as a function

[8] $/\gamma/ = 1$ immediate convergence; $\gamma < 1$ the existence of adjustment costs make capital not to fully adjust from period $t-1$ to t;$\gamma > 1$ overadjustment.

of differences in fundamentals, government policies and adjustment costs[9]:

$$k_{it}^{SS} = \Phi(A_{it}, z_{it}, \tau_{it}, \phi_i, r_t^{SS}) \tag{1.6}$$

and k^{CM} is determined also by the existence of capital controls and asymmetric information:

$$k_{it}^{CM} = \vartheta(A_{it}, z_{it}, \tau_{it}, \phi_i, CK_{it}, AI_i, r_t^{CM}) \tag{1.7}$$

where ϕ_i refer to adjustment costs, CK_{it} are controls on foreign capital and AI_i represents asymmetric information. Both the long term rate of return (r_t^{SS}) and the world interest rate (r_t^{CM}) are constant in equilibrium.

1.3.2. Econometric specification and estimation technique. The steady state capital stock to output ratio is described by the following equation:

$$k_{it}^{SS} = \pi' y_{it} + \alpha_i + \lambda_t + \varepsilon_{it} \tag{1.8}$$

where $y_{it} = [x_{it}\tau_{it}]$ is a matrix including those variables identified as affecting total factor productivity and specific factors of production (x_{it}) as well as government policies not directly aimed at capital control (τ_{it}), α_i represents country specific time invariant effects, λ_t accounts for time-specific effects and ε_{it} is an error term. Although ideally we would have liked to include a measure of country-time varying adjustment costs, lack of data prevented this possibility. However, Chirinko and Mallick (2008) show that the variation in adjustment costs is across countries[10] and therefore, we would expect country-specific fixed effects to control for the cross-country variation in adjustment costs[11].

Similarly, the capital market equilibrium capital stock to output ratio is described by:

$$k_{it}^{CM} = \Pi' Y_{it} + \alpha_i + \lambda_t + \Sigma_{it} \tag{1.9}$$

[9]See next section for the rationale behind the inclusion of adjustment cost as a determinant of the steady state capital stock.

[10]They suggest a ratio of adjustment costs/net output for rich countries between 4.0% and 5.0%. And a ratio between poor and rich countries of the adjustment costs/net output ratio between 2.00 to 3.00.

[11]Similarly, country specific effects would address Caselli and Feyrer (2007) critique about the role of cross-country differences in natural endowments.

where $Y_{it} = [y_{it} CK_{it}]$ and α_i as in equation (1.8) controls for country specific effects including differences in adjustment costs and asymmetric information. Traditionally, the literature on trade and recently also studies dealing with capital flows has used distance as a measure of asymmetric information[12]. The idea is that the greater the distance between two countries the more difficult to monitor investments and therefore, the greater asymmetric information. Country fixed effects capture cross-country differences in remoteness.

The ultimate models to be estimated can be described as follows. The evolution of overall capital to output ratio is determined by substituting (1.8) into (1.4):

$$k_{it} = (1 - \gamma^T)k_{i,t-1} + \beta' y_{it} + u_{it} \tag{1.10}$$

where $u_{it} = \eta_i + \omega_t + \chi_{it}$; $\beta = \gamma^T \pi$; $\eta_i = \gamma^T \alpha_i$ and $\omega_t = \gamma^T \lambda_t$. Note that γ^T is an adjustment coefficient which measures how k_{it} adjust to changes in the deviations from the steady state and β measures the short run effect of y_{it} on k_{it} given $k_{i,t-1}$. According to this specification it is also possible to differentiate the long term effect of variables affecting the steady state capital stock to output ratio, which is then given by β/γ^T.

The dynamics of foreign capital stock are captured in the following specification, obtained by substituting (1.9) into (2.3):

$$k^F_{it} = (1 - \gamma^F)k^F_{i,t-1} + \sigma' Y_{it} + \xi_{it} \tag{1.11}$$

where $\xi_{it} = \nu_i + o_t + \varsigma_{it}$; $\sigma = \gamma^F \Pi$; $\nu_i = \gamma^F \alpha_i$ and $o_t = \gamma^F \lambda_t$. Again, the estimates for the variables included in Y_{it} correspond to short run effects but we can retrieve the long term effects from σ/γ^F.

Models (1.10) and (1.11) are standard dynamic panel models. The within estimator turns out to be inconsistent in models that include a lagged dependent variable and therefore, we use the GMM-System estimation technique proposed by Arellano and Bover (1995) and Blundell and Bond (1998). This estimator reduces the potential biases associated with the traditional difference estimator by combining, in a system, the regression in differences with the regression in levels[13]. In addition, the GMM estimation technique allowed us to directly tackle a common drawback

[12] See Alfaro et al (2008), Portes and Rey (2005) and Wei and Wu(2002).

[13] All estimations were done in Stata 10. We used Roodman (2006) "xtabond2" program in Stata.

of studies on the determinants of capital flows, the endogeneity of the explanatory variables.

Under the assumptions (i) that the error term is not serially correlated, (ii) that the lagged levels of the explanatory variables are weakly exogenous and (iii) that the differences of the explanatory variables and the errors are uncorrelated[14], the GMM-System estimator uses appropriate lagged levels as instruments for the equations in differences and suitable lagged differences as instruments for the equations in levels. All variables considered are supposed to be endogenous and only the lagged dependent variable and the beginning of the period human capital to be predetermined. Overall instrument validity is examined using the Hansen test for overidentifying restrictions. The Hansen test as opposed to the Sargan test is supposed to be robust to heteroskedasticity and autocorrelation, and therefore a better indicator of whether the instruments as a group appear exogenous. One drawback of the GMM-system estimator is that it tends to generate many instruments compared to the number of observations[15]. We follow Roodman (2006) and "collapse" the instruments. In the standard form, we have as many moment conditions as instrumenting variables for each time period and lag available for that time period. By collapsing the instruments we have one single moment condition per instrumenting variable. Finally, we use the two-step version of the GMM-System estimator, which is more efficient than the one-step estimator, once adjusted by Windmeijer's (2005) finite sample correction of the asymptotic variance.

1.4. Data

1.4.1. The dependent variables: Capital stock data. Data covers the period 1970 to 1999 for a sample of developed and developing countries[16]. Data is averaged over non-overlapping five year periods so that we have six observations per country. Time periods are defined is this way to exploit the time dimension of

[14]Although we can expect the levels of the explanatory variables to be correlated with unobserved country specific effects such as geographical characteristics or cultural norms, which do influence capital accumulation but are fixed in the short and medium terms, the lack of correlation between differences and the fixed effects permits lagged differences to be used as instruments in the levels equations.

[15]The instruments can overfit endogenous variables, failing to expunge their endogenous components and biasing coefficient estimates. The use of "many" lags as instruments can vitiate the Hansen J test for joint validity of those instruments (Roodman (2007)).

[16]See Appendix A for a detailed explanation of the countries included in the analysis.

the data avoiding random fluctuations over time. The dependent variables are total capital stock to GDP and the stock of foreign liabilities to GDP (in its different forms: debt, equity and portfolio). The use of the stock as opposed to the flow of capital as well as the normalization by GDP is dictated by the theory outlined in Section 2. As already suggested by Lane and Milessi-Ferretti (2000) in a macroeconomic model the relevant state variable is the stock position and capital flows are the result of closing the gap between desired and actual stock positions.

Figures of total capital stock are obtained from Caselli and Feyrer (2007), where capital is constructed with the perpetual inventory method from time series data on real investment (originally from the PWT) using a depreciation rate of 0.06. In what refers to data on the stock of foreign investment liabilities, Lane and Milesi-Ferreti (2006) have made available a comprehensive dataset of foreign assets and liabilities estimates adjusted to reflect the effect of changes in market prices and exchange rate (see Lane and Milesi-Ferreti (2001) and (2006) for a detailed explanation of how the data is constructed). While foreign assets might be an important element of a country's external capital structure, especially for developed countries, we are concerned with the process of capital accumulation *in* a country and how foreign investments, again *in* a country, affect the speed of convergence. Consequently, we focus on foreign stock liabilities. Lane and Milesi-Ferreti (2006) provide data on total foreign liabilities which include portfolio investment (equity and debt securities), FDI (which refers to equity participations above 10 percent), other investments (which includes debt instruments such as loans, deposits, and trade credits), financial derivatives and reserves. We limit our analysis to the behavior of overall total liabilities, debt, equity and FDI since they are characterized by longer time series. Private refers to the sum of equity and FDI liabilities[17].

Figure 1 shows that Lucas paradox is present irrespective of the type of foreign capital flow although it is more pronounced in the case of equity flows[18]. However, despite the evidence of scarce foreign capital flowing to developing countries, these flows were highly significant in relation to developing countries GDP. Figure 2 shows that this is particularly the case for FDI and debt. Although in the case of debt

[17]Although debt includes private debt, it also considers data on government debt and it is not possible to differentiate among the two.

[18]Flows in Figure 1 were constructed as yearly changes in capital stock liabilities.

flows, recent years have witnessed a sharp decrease in their relative importance in GDP.

Table 1 shows the descriptive statistics for the total capital stock data and the foreign stock liabilities (in their different forms) as a percentage of GDP. Note that the data on total capital stock and foreign stock liabilities are in 1996 constant U.S. dollars however, they are not directly comparable since the foreign stock liabilities have been adjusted for market price and exchange rate valuations. The upper panel of the table refers to data for 99 countries between 1970 and 1999. The original Lane and Milesi-Ferreti (2006) dataset includes 145 countries however, since we average over five non-overlapping years we only keep countries with at least three observations in each five year period. The same methodology was applied to the rest of the regressors and therefore the bottom panel in Table 1 reports summary statistics for the final sample of 41 countries that we will use later on in the analysis. Values across the two samples of countries are very similar. In general, the average share of total capital stock in gdp is 1.67 with a standard deviation of 0.83; 76 with a standard deviation of 74 for the total foreign stock of liabilities; 59 with a standard deviation of 62 for the foreign stock of debt liabilities; 2.52 with a standard deviation of 9.15 for the foreign stock of equity liabilities and finally, 14.55 with a standard deviation of 19.2 for the foreign stock of fdi liabilities. As expected from Figure 2, the data shows large variation in the relative importance of foreign capital stock in GDP. For example there are countries without any foreign equity endowment while in others the share of equity in GDP exceeds a hundred percent.

1.4.2. Regressors.

1.4.2.1. *Fundamentals.* The stock of human capital is a key determinant of the rate of return to capital in the neoclassical theory. Moreover, different studies underline the importance of a well-educated labor force in attracting FDI (See Noorbakhsh et al (2001)). Based on the theoretical specification we use a measure of the stock of human capital per capita rather than its flow. Although data on educational attainment over time are very limited, the Barro and Lee (2001) database is probably up to date the most widely used[19]. The closest proxy for the stock of human capital they provide is the average years of schooling in the population. In particular, we

[19]In addition to Barro-Lee database on education Nehru et al (1995) use annual data based on UNESCO enrolment data but for a shorter period. It is not clear which one is superior but the correlation coefficient between the two exceeds 80%.

use data on the average years of schooling in the total population for age group 15 and over.

Drawing on previous empirical and theoretical evidence total factor productivity is expressed as a function of institutional quality, the degree of openness and financial development. The multidimensional character of the concept of institutions and to certain extent its qualitative nature makes it often difficult to find a proper proxy in empirical work. We measure institutional quality using the Economic Freedom of the World index published in Gwartney and Lawson (2005)[20]. The institutional variables chosen refer to the regulation of credit, labor and business which are definitely crucial in the foreign investment decision[21]. We also looked at longer term institutional variables like legal structure and the security of property rights. Data is reported as an average index disclosed over 5-year intervals which takes values between 1 and 10, where higher values reflect better institutional quality of a country. A priori a positive sign is expected on the estimated institutional quality coefficient of both overall and foreign capital adjustment equations. Better institutions are supposed to serve not only to attract foreign investors but to improve the country's overall investment climate, facilitating simultaneously domestic investment.

Second, we use the ratio of total trade to GDP as an indicator of openness. The sign of the coefficient on this variable in the foreign capital adjustment estimation is not straight forward particularly in the case of FDI liabilities. On the one hand, tariff jumping FDI has been usually associated to horizontal diversification and market seeking investment. In this case we would expect a positive relation among a country tariff restrictions and its capacity to attract FDI. On the other hand, the alternative (and more frequent view) is that foreign investors are attracted by countries with lower trade barriers, so that they are not faced with extra production and distribution costs, suggesting a positive coefficient in this case. Edwards (1990), Singh and Jun (1995) and Gastanaga, Nugent and Pashamova (1998) found a positive significant influence of openness on FDI flows.

[20]Berggren (2003) provides an overview of the index and other studies in which it has been used.

[21]In particular, credit market regulations refer to ownership of banks, foreign bank competition, private sector credit, interest rate controls and/or negative real interest rates; Labor market regulations include minimum wage, hiring and firing regulations, centralized collective bargaining, mandated cost of hiring, mandated cost of worker dismissal and conscription; finally, business regulations include price controls, administrative requirements, bureaucracy costs, starting a business, extra payments/bribes, licensing restrictions and cost of tax compliance

Finally, we include two measures of financial development from the Beck, Demirguc-Kunt and Levine (2000) database. These measures account for the development of credit markets and that of the stock market and are the value of credits by financial intermediaries to the private sector divided by GDP and the value of the stock market capitalization to GDP , respectively. We would expect a well developed financial market to be a positive determinant of capital accumulation and in particular, we would expect equity flows being determined by the development of the stock market.

1.4.2.2. *Government Policies.* We use data from the IMF's Exchange Arrangements and Exchange Restrictions (AREAER) publication on whether the country has multiple exchange rates, controls on current account transactions or surrender of export proceeds requirements. Although these measures are not directly implemented to deter foreign capital inflows they nevertheless have an impact on the foreign investment decision. Asiedu and Lien (2004) find that the exchange rate structure was the only restriction having a significant effect on FDI prior to the 1990s; while all the measures were influential in the 1990s (including restrictions to the capital account). Finally, *inflation volatility* is included in the empirical analysis as a source of uncertainty. High inflation volatility is usually identified as a deterrent of capital flows since it worsens investors' perception of country stability and lowers expected profit. Therefore we would expect that countries with higher inflation volatility would tend to be less attractive to foreign investors.

1.4.2.3. *Capital Controls.* Despite the theoretical benefits of capital mobility, *capital controls* are still implemented by numerous countries for a number of different reasons. Frequent claimed motives are the will of preventing volatile flows or flows that exacerbate distorted incentives in the domestic financial system and domestic protection from foreign companies. Given that capital controls are a common practice in many developing countries, it could be the case that capital restrictions explain the lack of North -South capital flows. We use data from the AREAER on restrictions on capital account transactions.

Table 2 shows the descriptive statistics of all variables used in the analysis, including those used later on in the robustness analysis.

1.5. Empirical Results

We now turn to the empirical investigation of the partial adjustment models by means of dynamic fixed effect panel estimation technique. In what follows we present results from estimating equation (1.10) that sheds light on the economy's overall speed of convergence towards the steady state and (1.11) that attempts to explain the direction of international capital flows.

1.5.1. International Capital Flows and Speed of Convergence. In this section we look at the economy's total capital stock data and the implications of the composition of external liabilities for the overall speed of convergence. Table 3 reports the results from estimating the adjustment of total capital in the economy towards the steady state capital stock to output ratio as expressed in equation (1.10), without considering the role of foreign capital flows. Column (1) reports the coefficients from the estimation in levels. Human capital and the development of the financial sector as indicated by the share of credit to GDP are the main determinants of capital accumulation. The levels estimation does not control for country specific effects though. If there are significant unobserved country effects, OLS will yield inconsistent estimates and, in particular, will produce an upward-biased coefficient on the lagged endogenous variable. In fact, we find that the coefficient on past capital stock is large and highly significant. Therefore, column (2) of Table 3 reports results from the fixed-effects estimation. As expected, the coefficient on the lagged dependent variable is considerably reduced. Regarding the rest of the determinants of capital accumulation only the financial system development retains its significance after controlling for country specific effects. Column (3) of Table 3 reports results from the System-GMM estimation. As expected the coefficient on the lagged dependent variable is between the OLS and the fixed effects estimates. Among the country characteristics, again only the share of credit to GDP is significant. Hence, Table 3 highlights the importance of a well developed financial system in the capital accumulation process.

As we saw in the description of the empirical model, one of the advantages of the partial adjustment model is that it allows to incorporate dynamics into the estimation of the neoclassical model and consequently, to study the speed of convergence. In particular, we would like to address two related questions: do countries that receive higher foreign capital flows converge faster to their steady state? and are there

differences in convergence rates depending on the type of foreign capital inflow? In order to answer these questions we need to establish how the speed of convergence parameter (γ) varies with different capital inflows. Table 4 shows the results from interacting the lagged dependent variable in equation (1.10) with different types of capital inflows. Column (1) looks at aggregate data of foreign liabilities, column (2) focuses on the role of private capital inflows (FDI plus equty) and columns (3), (4) and (5) consider the effect of disaggregated capital inflows (i.e. FDI, equity and debt). Finally, column (6) tries to establish the relative importance of each capital inflow by incorporating the three types of inflow together into the analysis. The speed of converge will vary with capital inflows according to the following specification:

$$TotalEffect = (1 - \gamma^T) + \beta_{CapitalFlow*CapitalStock_{t-1}} * CapitalFlow_{it} \quad (1.12)$$

where $(1 - \gamma^T)$ is the coefficient on the lagged dependent variable and $CapitalFlow$ refers to total capital inflows, private, FDI, equity or debt, correspondingly. Therefore, we will be paying particular attention at the overall significance of the interaction terms and the lagged dependent variable, which is the total effect we are interested in. Moreover, if capital inflows contribute to the country's speed of convergence we would expect the interaction term to be positive. Column (1) shows that the positive total effect from overall foreign capital inflows on the speed of convergence is highly significant. In column (2) we find that this positive effect is mainly driven by private capital inflows, in fact, column (5) shows that countries receiving foreign capital in the form of debt will tend to converge slower. Columns (3) and (4) find an overall positive effect on convergence both from equity inflows and FDI. When looking at the relative importance of each type of inflow for convergence, as expected from the previous results, column (6) shows that while equity and FDI positively contribute to faster speed of convergence, debt inflows decelerate the convergence process.

We explored other sources that could potentially contribute to a higher speed of convergence. First, the theory outlined in section 2 suggested that capital controls would not affect the steady state capital stock but rather the speed of convergence. Table 3 already showed that capital controls are not a significant determinant of the capital accumulation process. However, the interaction between the lagged stock of

capital and the capital controls dummy in the estimation of equation (1.14) turned out to be insignificant. Second, we looked at the effect of other measures of financial and economic integration like the degree of trade openness, multiple exchange rate arrangements, controls on the current account, the surrender of export proceeds and the combined Chin-Ito index on restrictions to capital mobility. None of them had a significant effect on the speed of convergence. The lack of significant results when considering other variables might be due to measurement error problems with the liberalization indicators. For example, as suggested in Henry (2007), the AREAER aggregate data does not specify whether changes in the capital account indicator refer to changes in restrictions on capital inflows or capital outflows. However, that distinction matters since liberalizing capital inflows would translate in a permanent fall of the cost of capital and a temporary increase in the growth rate of capital stock and GDP per capita. On the contrary, liberalizing capital outflows would in theory not have an impact neither in the cost of capital, nor investment or GDP. In this case, the use of direct measures of financial liberalization, like the actual capital inflows, provides strong evidence on the link between financial liberalization and speed of convergence.

1.5.1.1. *Obtaining a Direct Estimate of the Speed of Convergence.* Results in Table 4 have the advantage that can be estimated by dynamic panel System-GMM and therefore, control for the potential endogeneity of all the variables included in the analysis. However, the coefficient on the lagged dependent variable in equation (1.10) is $(1-\gamma^T)$ while the relevant speed of convergence parameter is γ^T. Consequently, to get a direct estimate of the speed of convergence and its interaction with foreign capital flows we re-express equation 1.10 as:

$$k_{it} - k_{i,t-1} = -\gamma^T k_{i,t-1} + \beta' y_{it} + u_{it} \tag{1.13}$$

and estimate:

$$k_{it} - k_{i,t-1} = -\gamma^T k_{i,t-1} + \beta_1 CapitalFlow_{it} + \beta_2 [CapitalFlow_{it} * k_{i,t-1}] + \beta_3' y_{it} + u_{it} \tag{1.14}$$

where k_{it} is total capital stock in the economy as a percentage of GDP; $CapitalFlow$ refers to the flow of total foreign liabilities, debt, private, equity or FDI, depending on the flow we are interested in and; y_{it} includes all the variables characterizing the

steady state. We are interested in how γ^T varies in the presence of different capital inflows therefore, the total effect is:

$$TotalEffect = -[\gamma^T + \beta_2 CapitalFlow_{it}] \tag{1.15}$$

Results from estimating equation (1.14) for different types of capital inflows are presented in Table 5. Notice that equation (1.14) does not include the lagged dependent variable as a regressor anymore since the dependent variable is investment and therefore the estimation method chosen is fixed effects estimation. It is important to highlight at this point that if not interested in a direct estimate of γ, the specification in equation 1.10 would be preferred since it allows to estimate by System-GMM and therefore, control for the endogeneity of all the regressors. Column (1) in Table 5 shows that in general, foreign capital inflows contribute to a faster convergence rate. The coefficients on the lagged capital stock and the interaction term are jointly significant. The total effect as in equation 1.15 is an increasing function of total capital inflows. Therefore, the greater foreign capital inflows into a country the higher the speed of convergence and as shown in Column (2) this is also true for private capital inflows. In fact, a closer look at the data, shows that not all types of foreign capital flows have a significant and positive effect on a country's speed of convergence. Comparing columns (3), (4), (5) and (6) it turns out that FDI inflows are the main driving force behind the results in columns (1) and (2). These results in Table 5 differ slightly from the results shown in Table 4. While the positive effect of equity flows and the negative effect of debt inflows on convergence is still present in columns (4) and (5), respectively, these results are no longer significant. Moreover, the negative effect of debt on convergence although not significant disappears once we control for other sources of foreign investment (see column (6)). Consequently, results in Table 10 indicate that FDI is the sole driving force behind higher speed of convergence.

The main concern related to the estimation of equation (1.14) and the corresponding results in Table 5 is that countries with higher domestic investment might attract foreign investors rather than foreign investment stimulating domestic investment. To deal with this concern we try to find appropriate instruments that are correlated with the foreign investment decision in a particular country but are largely independent of the domestic investment conditions. We follow Mody and

Murshid (2005) that estimate a dynamic version of equation (1.14) where instead of the lagged stock of domestic capital, they include lagged investment. They propose a set of instruments that proxy for changes in the supply of capital. We use the weighted average of capital flows to GDP ratios to other countries in the same region[22] where the weights are the inverse of the distance between the two largest cities in any two countries[23]. Table 6 shows how these variables affect capital inflows and some heterogeneity in their relative importance. The number of observations in Tables 6 to 8 drops to 34 countries because there are six countries with data available only for one time period[24]. Overall, the share of foreign capital available to other countries in the same stage of development positively influences all capital inflows, irrespective of the type. Also, the average of capital flows to other countries in the area is another important determinant of capital flows except in the case of FDI. In general, the set of instruments can explain between 20 and 30 percent of the variation in capital inflows depending on the type of inflow.

Table 7 shows the second stage results, from the two stage least square estimation, when instrumenting for the capital flows data and the interaction between capital flows and the lagged capital stock. Results confirm the findings in Table 5 and suggest a greater impact of foreign capital inflows, in particular of FDI, on convergence. The preferred specification in column (6) shows that the interaction term between FDI inflows and the lagged capital stock is significant at the 1% level and most importantly, the total effect is also significant at the 1% level. The IV estimate is higher (in absolute value) that the panel fixed effect estimate, suggesting a downward bias of the fixed effect estimation due to reverse causality and the short time dimension of the panel. In fact, Tables 6 to 8 include 5-year average data only for the period 1980-1999. Regarding the instrument validity, while the Hansen J-test of overidentifying restrictions suggest that we cannot reject the null hypothesis of instrument validity, the F-statistics in the case of equity and private inflows arise weak instruments concerns. We re-estimate equation (1.14) by means of limited-information maximum likelihood methods that are supposed to outperform

[22]We define 10 regions: Region 1 (EU-15 plus Switzerland, Norway, Cyprus, Malta and Turkey); Region 2 (USA, Canada and Japan); Region 3 (Latin America); Region 4 (Caribbean); Region 5 (Middle East and North Africa); Region 6 (South Asia); Region 7 (East Asia); Region 8 (Sub-Saharan Africa); Region 9 (Pacific); Region 10 (Central and Eastern Europe).

[23]Distance are obtained from CEPII.

[24]These countries are Dominican Republic, El Salvador, Guatemala, Honduras, Nepal and Fiji.

the 2SLS estimation in the presence of weak instruments. The results are reported in Table 8. The capital flows and the interaction term estimates are very similar to the 2SLS ones although slightly higher in absolute value. Our preferred specification in column (6) shows that the positive contribution of FDI inflows to the speed of convergence is robust.

Finally, while the positive and significant effect of FDI inflows on the speed of convergence is robust to different specifications and estimation methods, the changing sign and lack of significance of debt flows is striking and deserves further consideration. The main differences between the System-GMM estimation results in Table 4 and those from the instrumental variable approach in Tables 7 and 8 are the number of countries and the time period. We could think that the 70s and beginning of the 80s was a period where the share of government debt in GDP was considerable for many emerging and developing countries. However, over time the relative importance of government debt as a share of GDP in this group of countries has declined (see figure 2). Moreover, over time there has been an increase in corporate debt over government debt which has different implications for growth and convergence. Therefore, the negative effect of debt on convergence in Table 4 might be the result of including the initial periods. However, re-estimating the results in Table 4 for the sample of 34 countries and the same time period as in Tables 7 to 8 delivered the same negative effect of debt of convergence. Another plausible explanation would be that since government debt flows are often not driven by interest rate differentials but rather by more complex political decisions, the System-GMM estimator purged better the endogeneity of debt flows than the instrumental variable approach. However, given the lack of consistent results regarding the effect of debt flows on convergence we refrain from drawing strong conclusions on this evidence.

1.5.2. The Determinants of International Capital Flows. We finally study the determinants of international capital flows taking dynamics and the external composition of liabilities into account.

1.5.2.1. *Basic Specification.* Table 9 reports the results from estimating equation (1.11) which includes all the variables described in the theoretical analysis as characterizing the capital market equilibrium capital stock to GDP ratio $[k^{CM}]$. In Table 9, each column corresponds to a different foreign capital stock as dependent variable. Columns (1) and (3) refer to aggregated stocks. Column (1) includes the

sum of all foreign stock liabilities in the country while (3) focus only on the evolution of private foreign stock liabilities (i.e. the sum of equity and FDI). Columns (2), (4) and (5) present the results from disaggregated foreign capital stocks into debt, equity and FDI. The coefficient on the lagged dependent variable is highly significant across specifications although it varies in size. The coefficient is greater in the case of FDI suggesting a very strong feedback effect of the variable's past values on its current value. This is in line with the empirical evidence that FDI flows are highly persistent. If we focus on the stock of total foreign liabilities, a coefficient of 0.558 on the lagged dependent variable implies that the long-term effects of changes in variables characterizing the capital market equilibrium on the dependent variable are approximately two and a half times higher than the short-term effects[25].

Column (1) in Table 9, shows that in general foreign capital is attracted to countries where the population has higher average years of education and lower restrictions to capital mobility. However, countries with more restrictions to current account transactions and where the surrender of exports proceeds is an extended practice seem to also attract higher foreign capital. It turns out that looking at aggregated data shrouds different behavior depending on the type of capital flow. Therefore, debt data is behind the significance of the restrictions to the capital account, current account and surrender of exports proceeds while the FDI capital stock data is responsible for the significance of the average years of education. Focusing on private foreign capital stock data (column (3)) a somewhat surprising result arises. Better developed financial systems in terms of higher availability of credit to GDP tend to attract less portfolio inflows and, this is the case both for equity and FDI data. In the case of FDI, this finding corroborates previous results by Fernandez-Arias and Hausman (2000) who state that well functioning financial systems attract capital in general but not FDI in particular. One alternative explanation for the unexpected sign could be the negative correlation between macroeconomic instability and financial liberalization[26] however, this is not supported by the data. The contradictory sign remain even when the variables are included in the analysis one at a time. Moreover, capital account liberalization does not seem to influence the

[25] $\hat{\gamma} = 1 - (1 \hat{-} \gamma)$ in this case:$\hat{\gamma} = 1 - 0.558$. Remember the long run effect is given by β/γ. In addition, results from a Wald test showed that we cannot reject the hypothesis that $(1 \hat{-} \gamma)\epsilon(0, 1)$.

[26] Noorbakhsh et al (2001) suggest that a necessary precondition for financial liberalization is macroeconomic stability and successful inflation control is associated with an increase in private sector's share of domestic credit, so that both variables would be capturing the same effect.

decision of private foreign investment. Since abolishing barriers to capital mobility might not be enough to attract capital in the presence of underdeveloped financial systems, we include an interaction term between restrictions to capital mobility and financial development which turned out to be insignificant. Continuing with the results in Table 9, column (4) shows that the main determinant of equity inflows is the development of the stock market while as already stated, FDI inflows are positively driven by the average years of education in the population aged 15 and over and the degree of trade openness. The finding of human capital as a main determinant of FDI location is of great importance since previous cross-section empirical studies failed to find any effect (see Root and Ahmed (1979), Schneider and Frey (1985), Alfaro et al (2008)). Only Noorbakhsh et al (2001) find that human capital is a statistically significant determinant of FDI inflows, its importance increasing over time. While Noorbakhsh et al (2001) study uses cross-section data, we find that FDI is driven by country's human capital stock even after controlling for country fixed effects[27].

From a policy point of view, the long-run implications and the economic relevance of the results are key. Higher levels of human capital have a substantial positive long-run effect on FDI. A permanent increase of 1% in a country's average years of schooling will translate into a 1.50% increase in FDI inflows to GDP[28]. Moreover, the results seem to be economically relevant even in the short-run. Consider, for example Cameroon. Its average years of schooling in the population aged 15 and over during the period 1970-1999 was 2.6. An exogenous increase that would have brought it to the sample average of 6.31 would have result in about 0.58 percentage point[29] higher inflows of FDI to GDP per year in the short run.

1.5.2.2. *Robustness.* Table 10 shows the results obtained from the fixed effects estimation (i.e. without correcting for the bias introduced by including the lagged dependent variable in the estimation). As expected, the coefficients on the lagged dependent variables are considerably reduced[30]. Overall results remain for the most part the same. The only exception are the results regarding the foreign debt stock

[27]See section 5.1.3. for further discussion.

[28]The long run effect of average years of schooling=$(0.661/(1-0.558))$

[29]This result is obtained as: $0.661 * [ln(6.31) - ln(2.6)] = 0.58$

[30]This reduction is the result not only of the inclusion of a lagged dependent variable but also it arises in part from the biased estimates of the fixed effects model in short panels.

liabilities. In this case, countries with worst business environments but good financial markets seem to attract more foreign debt. This is not surprising if we think that countries with weak policies and weak institutions could have higher levels of debt. And it is in contrast with what other studies have found for private capital flows. Wei and Wu (2001) show that a corrupt country receives substantially less FDI compared to other types of capital flows; and Alfaro et al (2008) affirm institutional quality is the main driving force behind international capital flows. However, controlling for the presence of a lagged dependent variable plus the endogeneity of the regressors wipes away this result.

Table 11 confirms that the main results in Table 9 are robust to other definitions of the regressors or the inclusion of alternative control variables. For brevity we present results for aggregate data referring to the total foreign liabilities stock in the economy and the stock of foreign private liabilities (equity plus FDI). Columns (1) and (2) investigate the effects of using an alternative definition of human capital stock. Column (1) considers the case when the average years of education refer to the population aged 25 and over rather than 15 and over. By looking at the population aged 15 and over and therefore, adding the population between 15 and 25, we might be overestimating the role of primary and secondary education, especially in developing countries. Results in columns (1) and (2) show that this is not the case, the average years of education continues to be one of the main determinants of total and private capital flows.

In columns (3) and (4) we turn to potential concerns with the measure of institutional quality chosen. It might be argued that the business environment is a short term indicator of a country's institutional quality. To consider a longer term indicator of institutional quality we use data published by the Freedom of the World Institute on the legal structure and the security of property rights. In particular, the data is available in an index that combines the following factors: judicial independence, impartial courts, protection of intellectual property, integrity of the legal system and military interference in the rule of law and the political process. Results in columns (3) and (4) show that this measure of institutional quality is not significant either and most importantly, the significance of the main determinants identified in Table 9 remain mostly unchanged.

Similarly, in columns(5) and (6) we include an index of capital openness constructed by Chinn and Ito (2005). This index is based on the IMF's Exchange Arrangements and Exchange Restrictions publication and it combines indicators on the presence of multiple exchange rates, restrictions on current account transactions, restrictions on capital account transactions and requirement of the surrender of export proceeds. It ranges from -2.0 in the case of countries with most controls to 2.5 in the case of countries that have liberalized cross-border capital transactions. Results from including this combined index are shown in columns (5) and (6) and revealed that the index is not statistically significant.

Finally, despite having aggregated the series over 5 non-overlapping years, the coefficient on the lagged stock of FDI liabilities in Table 9, suggest a higher persistence of the FDI capital stock series that could rise concerns about the estimation method chosen. As noticed in Phillips and Sul (2007) the GMM procedure might suffer bias or weak instrumentation problems in the presence of high persistent series. However, a Wald test rejected the hypothesis that the estimated coefficient on the lagged dependent variable equals 1 (p-value: 0.0558). A more thorough analysis of this hypothesis, which would include testing for the presence of unit roots or cointegration among the variables of interest, could not be carried out given the short time dimension of the panel (again notice data has been averaged over 5 non-overlapping years)[31].

1.5.2.3. *Static vs Dynamic Approach.* Traditionally, the literature on the determinants of capital flows has adopted a static approach. The goal of our paper is broader, we are not only concerned with the direction of foreign capital flows but we are also interested in the country's overall speed of convergence. Given these concerns, estimation within the framework of a partial adjustment model turned out to be more relevant. However, in order to asses the value-added of our dynamic model we find it useful to present the results obtained from a pooled OLS and a panel fixed effect analysis that do not consider dynamic effects.

[31]Alternatively, in order to mitigate the biases associated with the GMM estimation of dynamic panels with a non-stationary dependent variable *and* avoid spurious regression caused by any potential cointegration relation among the variables under analysis, we could have re-estimated equation (1.14) in first differences. However, this alternative could not have delivered in any case exactly equivalent results since the differencing shortens the time dimension and in addition, due to the unbalanced nature of the panel it also decreases the sample size. Even in the preferred scenario of having the same periods and sample size results would only be equivalent if the error term follows an MA(1) and the capital stock series is integrated of order one.

When dynamics are not included in the model a better approach is to use as dependent variable the flow of FDI normalized by GDP[32]. The reason is that in this static framework it is not possible to incorporate the adjustment process to the long run capital stock. However, the main concern is still the lack of $capital flows$ to developing countries suggesting that the best way of shedding light on the small North-South capital flows is to identify the factors that foster or hinder capital flows rather than characterizing the optimal capital stock to output ratio.

Tables 12 and 13 report the results from a pooled OLS estimation and a fixed effects estimation, respectively. In Table 12, the degree of trade openness and the lack of restrictions to capital mobility are in general, the main determinants of international capital flows. Once we control for unobserved country specific effects, in Table 13, the degree of trade openness remains a significant factor explaining international capital mobility however, the importance of capital restrictions is limited to the case of total and private foreign liabilities. Most importantly the static approach reveals that under these estimation strategies we would have found no significant effect of human capital on capital flows, finding that is in line with previous cross-sectional studies in the literature. One plausible explanation for the discrepancy between the static and the dynamic results is the changing pattern in the MNCs investment motive. While most of the MNCs during the 70s and mid-80s in developing countries were resource or market seeking, since the mid-80s we have witnessed an increase in the value added of MNCs operating in developing countries as well as a relative skill biased in their production processes (Miyamoto (2003)).

Therefore, the dynamic specification has several advantages: it allows to exploit the time varying dimension of the data, it facilitates a way to control for the endogeneity of all regressors under consideration and it is best suited to test the neoclassical model predictions in terms of convergence.

1.6. Conclusion

The neoclassical theory predictions in terms of the direction of international capital flows and speed of convergence are not supported by the empirical evidence. While most of the previous empirical work is based on a cross-sectional approach, we

[32]The flow is computed as the difference in capital stock levels so it is not possible to rule out negative values. This computational procedure excludes the use of a log-log linear form for estimation. Instead, we use a semi-log transformation.

go one step further in the literature and add dynamics to the analysis of the predictions of the open-economy version of the neoclassical growth model. In particular, we address to questions: what are the determinants of international capital flows? and do countries that receive higher foreign inflows converge faster to their steady state? Moreover, we establish the importance of looking at the composition of external liabilities, not all foreign inflows are attracted by the same country fundamentals and not all foreign inflows have an heterogeneous effect on convergence. Using data on total capital and foreign capital stock liabilities from 1970 to 1999 we estimate a partial adjustment model by means of GMM-System estimation techniques.

The main findings of the paper are that countries with higher FDI inflows converge faster to their steady state. The evidence on the contribution of equity and debt to the speed of converge is mixed. In addition, there is heterogeneity in the country fundamentals that are relevant for attracting either type of inflow. Foreign equity liabilities are attracted to countries with well-functioning stock markets while FDI is driven by higher educational levels.

The evidence on FDI inflows contributing to faster convergence adds to the theoretical and empirical literature on the growth-enhancing effects of FDI. In this respect, although we find that countries attracting higher FDI inflows converge faster to their steady state, additional work should be done on whether absolute convergence is also facilitated by FDI inflows. Similarly, we have assumed that capital is homogenous. This consideration is of particular importance in the open economy context where foreign and domestic capital are considered perfect substitutes. Consequently, it is implicitly assumed that the effect of foreign capital on growth is solely through capital accumulation and not through a potential indirect effect on total factor productivity. In a way, abstracting from the effect of FDI on productivity means an underestimation of the total effect of FDI on convergence if FDI has a positive effect on productivity.

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APPENDIX A

Countries and Variable Definition

Sample of Countries

United States of America†*	*Chile*	*HongKong**	*Mali*
United Kingdom†*	*Colombia*	*India*†	*Mauritius*
Austria†*	*CostaRica*†	*Indonesia*	*Morocco*
*Belgium**	*DominicanRepublic*†	*Korea*†	*Mozambique*
Denmark†*	*Ecuador*†	*Malaysia*†	*Niger*
France†*	*ElSalvador*†	*Nepal*†	*Nigeria*
Italy†*	*Guatemala*†	*Pakistan*†	*Zimbadwe*
Netherlands†*	*Haiti*	*Philippines*†	*Rwanda*
Norway†*	*Honduras*†	*Singapore**	*Senegal*
Sweden†*	*Mexico*†	*Thailand*†	*Namibia*
*Switzerland**	*Nicaragua*	*Algeria*	*Tanzania*
Canada†*	*Panama*†	*Angola*	*Togo*
Japan†*	*Paraguay*†	*Botswana*	*Tunisia*
Finland†*	*Peru*	*Cameroon*	*Uganda*
Greece†*	*Uruguay*	*Chad*	*BurkinaFaso*
Ireland†*	*Jamaica*†	*Benin*	*Fiji*†
*Portugal**	*TrinidadandTobago*†	*EquatorialGuinea*	*PapuaNewGuinea*
*Spain**	*Iran*	*Ethiopia*	*China*
Turkey	*Israel**	*Gabon*	*Poland*
Australia†*	*Jordan*	*Ghana*†	*Romania*
NewZealand†*	*Syria*	*Guinea*	
SouthAfrica†	*Egypt*†	*Coted'Ivoire*	
Argentina	*Bangladesh*	*Kenya*†	
Bolivia	*SriLanka*†	*Madagascar*	
Brazil	*Taiwan**	*Malawi*	

There are 99 countries for which data on foreign stock liabilities and capital stock is available for at least two time periods within each five year period series. $*$ Refers those countries identified as developed by the World Bank in 2000. † Refers to the the final sample of 41 countries that is used in the empirical part. The sample drops to 41 countries due to data constraints.

Variable Sources

	Description	Unit	Source
Human Capital 15	Average years of schooling in the population aged 15 and over	years	Barro and Lee (2001):*http* : *//www.cid.harvard.edu/ciddata/ciddata.html*
Human Capital 25	Average years of schooling in the population aged 25 and over	years	Barro and Lee (2001):*http* : *//www.cid.harvard.edu/ciddata/ciddata.html*
Business Environment	Regulation of credit, labor and business	index	Economic Freedom of the World *http* : *//www.freetheworld.com/datasets$_e$fw.html*
Legal Property Rights	legal structure and the security of property rights	index	Economic Freedom of the World*http* : *//www.freetheworld.com/datasets$_e$fw.html*
Openness	Share of export plus imports to GDP	percentage	World Development Indicators
CreditGDP	Private Credit by Deposit Money Banks to GDP	percentage	Financial Structure Database*http* : *//econ.worldbank.org/staff/tbeck*
StockMktGDP	Stock Market Capitalization to GDP	percentage	Financial Structure Database*http* : *//econ.worldbank.org/staff/tbeck*
Inflation volatility	Standard Deviation of Inflation over a 5 year window		World Development Indicators
MER	Multiple Exchange Rates	dummy 0/1	AREAER: IMF publication on Exchange Arrangements and Exchange Restrictions
Carest	Controls on the Current Account	dummy 0/1	AREAER: IMF publication on Exchange Arrangements and Exchange Restrictions
Karest	Controls on the Capital Account	dummy 0/1	AREAER: IMF publication on Exchange Arrangements and Exchange Restrictions
SURR	Surrender of Export Proceeds	dummy 0/1	AREAER: IMF publication on Exchange Arrangements and Exchange Restrictions
Capital Index	Chinn-Ito Capital Openness Index	index	A New Measure of Financial Openness*http* : *//www.ssc.wisc.edu/ mchinn/research.html*

APPENDIX B

Figures

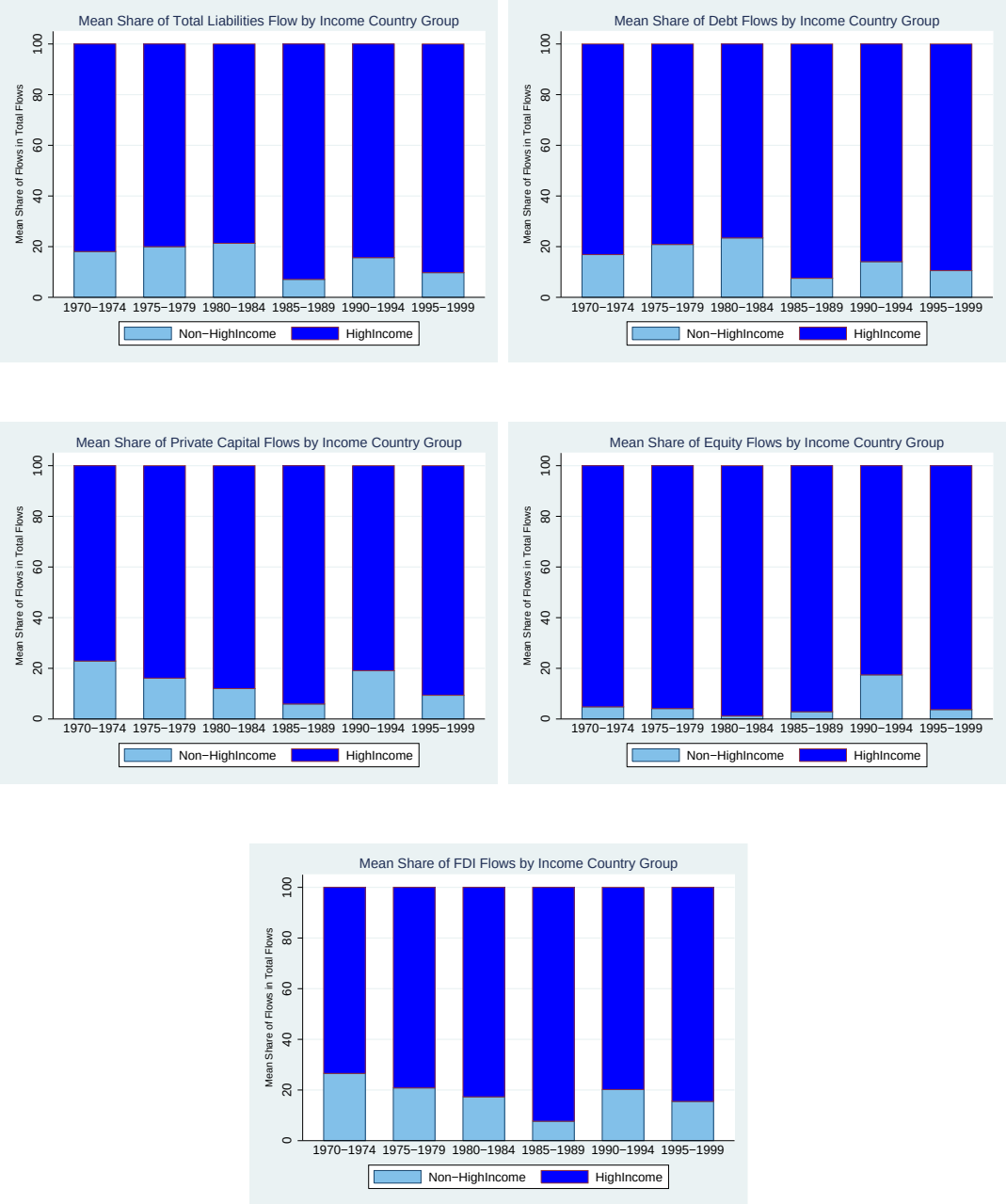

FIGURE B.1. Lucas Paradox: Mean Share of Flows in Total Flows by Income Group

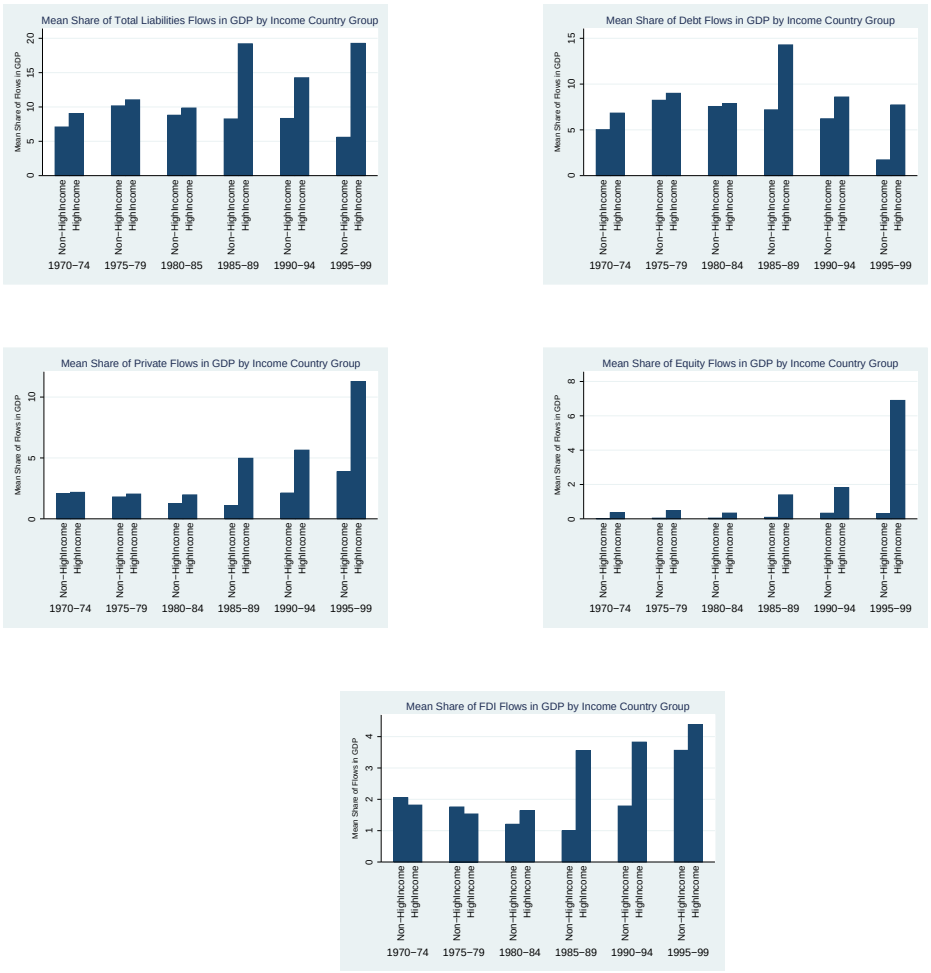

FIGURE B.2. Economic Relevance of Foreign Capital Flows

APPENDIX C

Tables

Table 1 - Descriptive Statistics: Dependent Variables
(Variables expressed as percentage of GDP)

	Total Capital	Foreign Liabilities	Foreign Debt	Foreign Equity	FDI
	Panel A: Sample of 99 countries				
Mean	1.67	76.62	59.49	2.52	14.55
Std Dev	0.83	73.64	62.21	9.15	19.20
Min	0.12	0.55	0.00	0.00	0.00
Max	4.47	1046.95	1035.20	171.50	252.29
	Panel B: Sample of 41 countries				
Mean	1.93	72.98	54.04	3.66	15.31
Std Dev	0.77	74.29	62.03	9.54	17.26
Min	0.45	1.99	1.50	0.00	0.34
Max	3.62	661.78	596.62	96.08	108.94

All variables are stock data. Capital refers to total capital stock in the economy. Liabilities refers to total foreign liabilities (sum of foreign debt liabilities (column 3), foreign equity liabilities (column 4), foreign fdi liabilities (column 5), foreign derivatives liabilities and other foreign liabilities). See the text for a description of the variables. Note data on total capital stock and foreign liabilities stock are not directly comparable. Panel A includes those countries with at least two observations available in every five year period for all the dependent variables under consideration. Panel B includes those countries used in the final estimations (i.e. countries for which data on the rest of regressors is available.

Table 2 - Descriptive Statistics: Other Variables
(Sample of 41 countries)

	Observ.	Mean	St. Dev	Min	Max
Foreign Liabilities Flow to GDP	246	9.97	15.45	-46.38	170.49
Foreign Debt Flow to GDP	246	7.02	13.21	-44.06	159.43
Foreign Pivate Flow to GDP	240	2.84	4.68	-5.39	46.82
Foreign Equity Flow to GDP	240	0.91	3.35	-0.28	33.78
FDI Flow to GDP	246	2.04	2.49	-2.33	13.97
Investment/GDP	246	0.08	0.05	-0.03	0.27
Human Capital 15	245	6.31	2.65	0.20	11.89
Human Capital 25	245	6.03	2.80	0.04	12.18
Business Environment	218	5.97	1.11	3.09	8.66
Legal and Property Rights	214	6.32	2.48	1.20	9.89
Openness	246	47.64	23.20	7.38	170.95
Private Credit to GDP	246	0.40	0.31	0.02	2.07
Stock Market to GDP	122	0.35	0.39	0.01	1.98
Inflation Volatility	246	5.17	6.22	0.25	44.82
Multiple Exchange Rates	246	0.19	0.35	0	1
Current Account Restrictions	246	0.39	0.44	0	1
Capital Account Restrictions	246	0.67	0.44	0	1
Surrender of Export Proceeds	246	0.63	0.46	0	1
Chin-Ito Capital Openness Index	244	0.25	1.44	-1.80	2.54

Table 3 - Determinants of Total Capital Stock Accumulation
(Dependent variable: log of the stock of Capital to GDP)

	OLS (1)	Fixed Effects (2)	System-GMM (3)
Lagged Dependent Variable$(1-\gamma^T)$	0.907***	0.606***	0.839***
	(0.036)	(0.144)	(0.183)
Human Capital	0.086**	0.077	0.057
	(0.038)	(0.073)	(0.151)
Business Environment	-0.052	-0.058	0.183
	(0.066)	(0.085)	(0.166)
Openness	0.018	0.093	0.111
	(0.017)	(0.078)	(0.128)
Credit to GDP	0.063***	0.106***	0.121**
	(0.020)	(0.027)	(0.052)
Stock Market to GDP	-0.013	-0.035	-0.025
	(0.010)	(0.023)	(0.027)
Inflation volatility	0.019*	0.018	0.047
	(0.011)	(0.021)	(0.030)
Multiple Exchange Rates	-0.017	0.070**	-0.027
	(0.040)	(0.030)	(0.136)
Current Account Restrictions	-0.044*	-0.019	0.077
	(0.026)	(0.041)	(0.077)
Surrender of Export Proceeds	-0.014	-0.022	0.011
	(0.032)	(0.028)	(0.095)
Capital Account Restrictions	0.027	-0.005	-0.032
	(0.026)	(0.036)	(0.103)
Observations	122	122	122
Groups	41	41	41
R2	0.9694	0.6734	
AR1			0.077
AR2			0.239
Hansen			0.385

Note:Standard errors in parenthesis.* Significance at the 10% level; ** Significance at the 5% level;*** Significance at the 1% level. Time dummies are included in all specifications. All regressors are expressed in logs, except the capital controls. Dynamic System-GMM estimation with "collapsed" instruments (see text for further explanation).AR1: Arellano-Bond test for first order serial autocorrelation; AR2: Arellano-Bond test for second order serial autocorrelation; Hansen: test for overidentifying restrictions.

Table 4 - Capital Flows and Speed of Convergence
(Dependent variable: log of the stock of Capital to GDP)

	(1)	(2)	(3)	(4)	(5)	(6)
$CapitalStock_{t-1}$	0.839***	0.781***	0.853***	0.816***	0.923***	0.785***
	(0.125)	(0.164)	(0.140)	(0.186)	(0.128)	(0.168)
$TotalLiabilities$	-0.010					
	(0.008)					
$TotalLiabilities * CapitalStock_{t-1}$	0.005					
	(0.010)					
$PrivateLiabilities$		-0.025**				
		(0.009)				
$PrivateLiabilities * CapitalStock_{t-1}$		0.025**				
		(0.011)				
$FDILiabilities$			-0.020*			-0.020
			(0.012)			(0.020)
$FDILiabilities * CapitalStock_{t-1}$			0.015			0.001
			(0.026)			(0.031)
$EquityLiabilities$				-0.063***		-0.021
				(0.022)		(0.030)
$EquityLiabilities * CapitalStock_{t-1}$				0.063**		0.026
				(0.026)		(0.040)
$DebtLiabilities$					0.009	-0.004
					(0.013)	(0.011)
$DebtLiabilities * CapitalStock_{t-1}$					-0.024	-0.005
					(0.023)	(0.015)
Human Capital	0.085	0.050	-0.015	0.051	0.142	0.227*
	(0.126)	(0.125)	(0.137)	(0.175)	(0.160)	(0.115)
Business Environment	-0.163	0.020	0.099	0.100	-0.785	-0.158
	(0.169)	(0.272)	(0.177)	(0.331)	(0.675)	(0.305)
Openness	0.172***	0.149*	0.080	0.135	0.067	0.183*
	(0.054)	(0.081)	(0.122)	(0.113)	(0.242)	(0.108)
Credit to GDP	0.035	0.049	0.062	0.034	0.048	0.033
	(0.045)	(0.056)	(0.059)	(0.057)	(0.122)	(0.082)
Stock Market to GDP	-0.020	-0.004	0.014	-0.011	0.045	-0.019
	(0.032)	(0.033)	(0.037)	(0.035)	(0.050)	(0.034)
Inflation volatility	-0.015	-0.007	0.024	-0.012	-0.023	-0.016
	(0.032)	(0.046)	(0.026)	(0.043)	(0.057)	(0.037)
Multiple Exchange Rates	-0.083	-0.064	-0.054	-0.104	-0.132	-0.119
	(0.072)	(0.116)	(0.097)	(0.106)	(0.101)	(0.071)
Current Account Restrictions	0.025*	0.007	0.013	0.029	-0.141	-0.039
	(0.091)	(0.141)	(0.101)	(0.121)	(0.154)	(0.120)
Capital Account Restrictions	-0.098	-0.021	-0.040	0.014	-0.091	-0.020
	(0.051)	(0.076)	(0.068)	(0.091)	(0.147)	(0.083)
Surrender of Export Proceeds	0.016	0.004	0.048	-0.020	0.037	-0.027
	(0.056)	(0.070)	(0.087)	(0.119)	(0.097)	(0.136)
Observations	122	122	122	120	122	120
Gtoups	41	41	41	41	41	41
AR1	0.073	0.029	0.05	0.076	0.077	0.026
AR2	0.249	0.681	0.325	0.152	0.334	0.561
Hansen	0.846	0.286	0.592	0.580	0.300	0.985
$JointSignificance$	0.000	0.000	0.000	0.000	0.000	
$JointSignificance^1$						0.000
$JointSignificance^2$						0.000
$JointSignificance^3$						0.0001
$JointSignificance^4$						0.0001

Note:Standard errors in parenthesis.* Significance at the 10% level; ** Significance at the 5% level;*** Significance at the 1% level. Time dummies are included in all specifications. All regressors are expressed in logs, except the capital controls and the capital flows. Dynamic System-GMM estimation with "collapsed" instruments (see text for further explanation).AR1: Arellano-Bond test for first order serial autocorrelation; AR2: Arellano-Bond test for second order serial autocorrelation; Hansen: test for overidentifying restrictions. Total, Private, FDI, Equity and Debt Liabilities refer to flow data. $JointSignificance$ variables:$CapitalStockt_{t-1}$ and $CapitalFlows * CapitalStock_{t-1}$ the $CapitalFlows$ variable varying in each column accordingly. $JointSignificance^1$ variables: $CapitalStockt_{t-1}$ and $FDILiabilities*CapitalStock_{t-1}$, $EquityLiabilities*CapitalStock_{t-1}$, $DebtLiabilities*CapitalStock_{t-1}$; $JointSignificance^2$ variables: $CapitalStockt_{t-1}$ and $FDILiabilities*CapitalStock_{t-1}$; $JointSignificance^3$ variables: $CapitalStockt_{t-1}$ and $EquityLiabilities*CapitalStock_{t-1}$; $JointSignificance^4$ variables: $CapitalStockt_{t-1}$ and $DebtLiabilities * CapitalStock_{t-1}$.

Table 5 - Robustness: Alternative Specification
(Dependent variable: Log of Total Investment to GDP)

	(1)	(2)	(3)	(4)	(5)	(6)
$CapitalStockt_{t-1}$	-0.754	-0.948	-1.333	-1.063	-1.476	-0.860
	(1.116)	(1.125)	(1.243)	(1.084)	(1.150)	(1.192)
$TotalLiabilities$	0.046***					
	(0.016)					
$TotalLiabilities * CapitalStock_{t-1}$	-0.067***					
	(0.021)					
$PrivateLiabilities$		0.078**				
		(0.029)				
$PrivateLiabilities * CapitalStock_{t-1}$		-0.105***				
		(0.023)				
$FDILiabilities$			0.122***			0.102***
			(0.029)			(0.033)
$FDILiabilities * CapitalStock_{t-1}$			-0.161***			-0.147***
			(0.044)			(0.042)
$EquityLiabilities$				0.062		0.057
				(0.064)		(0.062)
$EquityLiabilities * CapitalStock_{t-1}$				-0.091		-0.083
				(0.054)		(0.053)
$DebtLiabilities$					0.001	0.011
					(0.029)	(0.027)
$DebtLiabilities * CapitalStock_{t-1}$					0.015	-0.005
					(0.042)	(0.040)
Human Capital	0.220	0.254	0.176	0.202	0.087	0.256
	(0.542)	(0.520)	(0.522)	(0.536)	(0.575)	(0.527)
Business Environment	-0.491	-0.711	-0.539	-0.583	-0.301	-0.729
	(0.691)	(0.644)	(0.664)	(0.572)	(0.579)	(0.653)
Openness	0.435	0.549	0.468	0.571	0.494	0.507
	(0.327)	(0.358)	(0.362)	(0.397)	(0.388)	(0.336)
Credit to GDP	0.039	0.043	0.162	0.003	0.095	0.063
	(0.154)	(0.157)	(0.174)	(0.154)	(0.160)	(0.156)
Stock Market to GDP	0.311**	0.247*	0.235*	0.250*	0.219	0.239*
	(0.136)	(0.144)	(0.138)	(0.146)	(0.145)	(0.141)
Inflation volatility	-0.375***	-0.441***	-0.371***	-0.435***	-0.360***	-0.436***
	(0.118)	(0.103)	(0.113)	(0.107)	(0.111)	(0.103)
Multiple Exchange Rates	0.317	0.295	0.311	0.236	0.233	0.304
	(0.192)	(0.202)	(0.216)	(0.206)	(0.205)	(0.217)
Current Account Restrictions	-0.473*	-0.302	-0.323	-0.405	-0.469*	-0.301
	(0.244)	(0.216)	(0.204)	(0.243)	(0.236)	(0.234)
Capital Account Restrictions	0.181	0.016	0.194	0.059	0.232	0.010
	(0.204)	(0.193)	(0.292)	(0.204)	(0.249)	(0.204)
Surrender of Export Proceeds	-0.153	-0.011	-0.210	-0.042	-0.213	-0.006
	(0.257)	(0.266)	(0.326)	(0.256)	(0.288)	(0.290)
Observations	118	118	118	116	118	116
Groups	40	40	40	40	40	40
R2within	0.5347	0.5446	0.5220	0.5225	0.4971	0.5496
$JointSignificance$	0.0076	0.0002	0.0008	0.1977	0.4375	
$JointSignificance^1$						0.0037
$JointSignificance^2$						0.0013
$JointSignificance^3$						0.1498
$JointSignificance^4$						0.7595

Note:Standard errors in parenthesis.* Significance at the 10% level; ** Significance at the 5% level;*** Significance at the 1% level. Time dummies are included in all specifications. All regressors are expressed in logs, except the capital controls and the capital flows. Dynamic System-GMM estimation with "collapsed" instruments (see text for further explanation).AR1: Arellano-Bond test for first order serial autocorrelation; AR2: Arellano-Bond test for second order serial autocorrelation; Hansen: test for overidentifying restrictions. Total, Private, FDI, Equity and Debt Liabilities refer to flow data. $JointSignificance$ variables:$CapitalStockt_{t-1}$ and $CapitalFlows * CapitalStock_{t-1}$ the $CapitalFlows$ variable varying in each column accordingly. $JointSignificance^1$ variables: $CapitalStockt_{t-1}$ and $FDILiabilities*CapitalStock_{t-1}$, $EquityLiabilities*CapitalStock_{t-1}$, $DebtLiabilities*CapitalStock_{t-1}$; $JointSignificance^2$ variables: $CapitalStockt_{t-1}$ and $FDILiabilities*CapitalStock_{t-1}$; $JointSignificance^3$ variables: $CapitalStockt_{t-1}$ and $EquityLiabilities*CapitalStock_{t-1}$; $JointSignificance^4$ variables: $CapitalStockt_{t-1}$ and $DebtLiabilities * CapitalStock_{t-1}$.

Table 6 - The Relevance of the Instrument Set
(Dependent variable: *CapitalFlows* to GDP)

	(1)	(2)	(3)	(4)	(5)
	Foreign Liabilities	Foreign Private	FDI	Foreign Equity	Foreign Debt
CapitalFlows Weighted Average of Flows to the Region	499.294***	690.706***	260.535	782.257***	383.038***
	(141.855)	(218.224)	(175.529)	(213.110)	(131.644)
Share of *CapitalFlows* Available to High Income, Emerging or Developing	41.742**	5.388*	5.219**	3.776**	31.054***
	(15.893)	(2.980)	(2.424)	(1.778)	(11.164)
Lagged *CapitalFlows*	0.096***	-0.116	-0.078	0.416	0.092***
	(0.010)	(0.246)	(0.097)	(0.995)	(0.008)
Observations	136	132	136	132	136
Groups	34	34	34	34	34
R2	0.2137	0.3969	0.2854	0.2813	0.1784

Note:Standard errors in parenthesis.* Significance at the 10% level; ** Significance at the 5% level;*** Significance at the 1% level. Time dummies and country fixed-effect are included in all specifications. *CapitalFlows* refers to total liabilities, private, FDI, portfolio or equity inflows accordingly.

TABLE 7 - IV RESULTS: TWO STAGE LEAST SQUARE ESTIMATION
(Dependent variable: Log of Total Investment to GDP)

	(1)	(2)	(3)	(4)	(5)	(6)
$CapitalStockt_{t-1}$	-0.185	0.199	-1.081	-0.573	-1.118	-0.083
	(0.662)	(1.035)	(0.910)	(0.982)	(0.829)	(0.753)
$TotalLiabilities$	0.073**					
	(0.036)					
$TotalLiabilities * CapitalStock_{t-1}$	-0.107*					
	(0.056)					
$PrivateLiabilities$		0.078				
		(0.059)				
$PrivateLiabilities * CapitalStock_{t-1}$		-0.170*				
		(0.098)				
$FDILiabilities$			0.152			0.167***
			(0.077)			(0.054)
$FDILiabilities * CapitalStock_{t-1}$			-0.245**			-0.312***
			(0.100)			(0.069)
$EquityLiabilities$				-0.009		-0.001
				(0.085)		(0.093)
$EquityLiabilities * CapitalStock_{t-1}$				-0.061		-0.046
				(0.104)		(0.079)
$DebtLiabilities$					0.038	0.036
					(0.052)	(0.054)
$DebtLiabilities * CapitalStock_{t-1}$					-0.055	-0.048
					(0.086)	(0.085)
First Stage Tests						
$CapitalFlows$						
Partial R2	0.446	0.117	0.168	0.118	0.687	
F-test	37.41	1.88	3.08	8.32	110.88	
$CapitalFlows$*$CapitalStock_{t-1}$						
Partial R2	0.295	0.068	0.110	0.099	0.512	
F-test	29.09	0.95	6.33	3.81	47.84	
Overidentification	0.262	0.389	0.353	0.349	0.224	0.6255
$JointSignificance$	0.086	0.109	0.015	0.423	0.329	
$JointSignificance^1$						0.0002
$JointSignificance^2$						0.000
$JointSignificance^3$						0.7424
$JointSignificance^4$						0.8402
Countries	34	34	34	34	34	34
Observations	103	103	103	103	103	101

Note:Standard errors in parenthesis.* Significance at the 10% level; ** Significance at the 5% level;*** Significance at the 1% level. Time dummies are included in all specifications. All regressions include the steady state capital determinants: human capital, business environment, openness, credit to GDP, stock market to GDP, inflation volatility and restrictions to capital mobility. Total, Private, FDI, Equity and Debt Liabilities refer to flow data. The complete set of external instruments is: $CapitalFlow_{t-1}$,$CapitalFlow * CapitalStock_{t-1_{t-1}}$, $CapitalFlowsWeightedAverageofFlowstoRegion$, $CapitalFlowsWeightedAverageofFlowstoRegion * CapitalStock_{t-1}$, Share of Capital Flows Available to High Income, Emerging or Developing. $JointSignificance$ variables:$CapitalStockt_{t-1}$ and $CapitalFlows * CapitalStock_{t-1}$ the $CapitalFlows$ variable varying in each column accordingly. $JointSignificance^1$ variables: $CapitalStockt_{t-1}$ and $FDILiabilities * CapitalStock_{t-1}$, $EquityLiabilities * CapitalStock_{t-1}$, $DebtLiabilities * CapitalStock_{t-1}$; $JointSignificance^2$ variables: $CapitalStockt_{t-1}$ and $FDILiabilities * CapitalStock_{t-1}$; $JointSignificance^3$ variables: $CapitalStockt_{t-1}$ and $EquityLiabilities * CapitalStock_{t-1}$; $JointSignificance^4$ variables: $CapitalStockt_{t-1}$ and $DebtLiabilities * CapitalStock_{t-1}$.

Table 8 - IV Results: Limited Information Maximum Likelihood
(Dependent variable: Log of Total Investment to GDP)

	(1)	(2)	(3)	(4)	(5)	(6)
$CapitalStockt_{t-1}$	-0.015	0.785	-0.841	-0.147	-1.028	0.156
	(0.763)	(1.803)	(1.072)	(1.745)	(0.834)	(1.043)
$TotalLiabilities$	0.082*					
	(0.047)					
$TotalLiabilities * CapitalStock_{t-1}$	-0.122					
	(0.075)					
$PrivateLiabilities$		0.086				
		(0.087)				
$PrivateLiabilities * CapitalStock_{t-1}$		-0.216				
		(0.181)				
$FDILiabilities$			0.154			0.174**
			(0.099)			(0.080)
$FDILiabilities * CapitalStock_{t-1}$			-0.321*			-0.431**
			(0.191)			(0.191)
$EquityLiabilities$				-0.011		0.055
				(0.143)		(0.175)
$EquityLiabilities * CapitalStock_{t-1}$				-0.096		-0.086
				(0.254)		(0.133)
$DebtLiabilities$					0.050	0.023
					(0.058)	(0.100)
$DebtLiabilities * CapitalStock_{t-1}$					-0.076	-0.036
					(0.099)	(0.149)
WeakIdentification	6.107	0.641	4.931	0.437	6.564	
(Stock-Yogo critical value=4.32)						
Overidentification	0.28	0.5848	0.3767	0.4391	0.2175	0.7187
$JointSignificance$	0.1201	0.3329	0.0529	0.6846	0.3322	
$JointSignificance^1$						0.095
$JointSignificance^2$						0.0731
$JointSignificance^3$						0.8036
$JointSignificance^4$						0.9696
Countries	34	34	34	34	34	34
Observations	103	103	103	103	103	101

Note:Standard errors in parenthesis.* Significance at the 10% level; ** Significance at the 5% level;*** Significance at the 1% level. Time dummies are included in all specifications. All regressions include the steady state capital determinants: human capital, business environment, openness, credit to GDP, stock market to GDP, inflation volatility and restrictions to capital mobility. Total, Private, FDI, Equity and Debt Liabilities refer to flow data. The complete set of external instruments is: $CapitalFlow_{t-1}$,$CapitalFlow * CapitalStock_{t-1t-1}$, $CapitalFlowsWeightedAverageofFlowstoRegion$, $CapitalFlowsWeightedAverageofFlowstoRegion * CapitalStock_{t-1}$, Share of Capital Flows Available to High Income, Emerging or Developing. $JointSignificance$ variables:$CapitalStockt_{t-1}$ and $CapitalFlows * CapitalStock_{t-1}$ the $CapitalFlows$ variable varying in each column accordingly. $JointSignificance^1$ variables: $CapitalStockt_{t-1}$ and $FDILiabilities * CapitalStock_{t-1}$, $EquityLiabilities * CapitalStock_{t-1}$, $DebtLiabilities * CapitalStock_{t-1}$; $JointSignificance^2$ variables: $CapitalStockt_{t-1}$ and $FDILiabilities * CapitalStock_{t-1}$; $JointSignificance^3$ variables: $CapitalStockt_{t-1}$ and $EquityLiabilities * CapitalStock_{t-1}$; $JointSignificance^4$ variables: $CapitalStockt_{t-1}$ and $DebtLiabilities * CapitalStock_{t-1}$.

Table 9 - Determinants of International Capital Flows: Dynamic Panel Estimation
(Dependent variable: Log of the stock of foreign liabilities to GDP)

	(1)	(2)	(3)	(4)	(5)
	Foreign Liabilities	Foreign Debt	Foreign Private	Foreign Equity	FDI
Lagged Dependent Variable$(1-\gamma^F)$	0.558***	0.461***	0.647***	0.523**	0.722***
	(0.196)	(0.134)	(0.133)	(0.254)	(0.141)
Human Capital	0.645**	0.672	0.788**	-1.072	0.661**
	(0.320)	(0.522)	(0.352)	(2.457)	(0.276)
Business Environment	0.195	-0.324	0.187	-4.917	0.593
	(0.813)	(0.606)	(0.710)	(3.689)	(0.634)
Openness	0.286	0.426	0.241	-0.286	0.487*
	(0.222)	(0.479)	(0.223)	(0.774)	(0.273)
Credit to GDP	0.155	0.208	-0.501***	-1.391**	-0.479***
	(0.263)	(0.264)	(0.157)	(0.606)	(0.170)
Stock Market to GDP	0.010	-0.033	0.164*	1.359***	0.062
	(0.074)	(0.112)	(0.089)	(0.493)	(0.095)
Inflation volatility	0.076	0.059	-0.169**	-0.689	-0.052
	(0.074)	(0.120)	(0.069)	(0.703)	(0.070)
Multiple Exchange Rates	0.097	0.066	-0.243	-3.941	-0.201
	(0.191)	(0.172)	(0.183)	(2.757)	(0.195)
Current Account Restrictions	0.537**	0.638***	0.220	-1.034	0.235
	(0.212)	(0.204)	(0.241)	(1.279)	(0.413)
Surrender of Export Proceeds	0.449**	0.348*	0.374**	-0.447	0.179
	(0.208)	(0.191)	(0.167)	(1.052)	(0.164)
Capital Account Restrictions	-0.640***	-0.509**	-0.210	-0.154	-0.063
	(0.186)	(0.234)	(0.349)	(1.269)	(0.160)
Observations	122	122	119	119	122
Groups	41	41	41	41	41
AR1	0.038	0.044	0.058	0.087	0.038
AR2	0.37	0.174	0.232	0.37	0.931
Hansen	0.576	0.887	0.742	0.715	0.887

Note:Standard errors in parenthesis.* Significance at the 10% level; ** Significance at the 5% level;*** Significance at the 1% level. Time dummies are included in all specifications. All regressors are expressed in logs, except the capital controls. Dynamic System-GMM estimation with "collapsed" instruments (see text for further explanation).AR1: Arellano-Bond test for first order serial autocorrelation; AR2: Arellano-Bond test for second order serial autocorrelation; Hansen: test for overidentifying restrictions.

Table 10 - Robustness Checks (1): Fixed Effects Estimation
(Dependent variable: Log of the stock of foreign liabilities to GDP)

	(1)	(2)	(3)	(4)	(5)
	Foreign Liabilities	Foreign Debt	Foreign Private	Foreign Equity	FDI
Lagged Dependent Variable$(1-\gamma^F)$	0.377***	0.262***	0.529***	0.062	0.453***
	(0.083)	(0.076)	(0.095)	(0.125)	(0.072)
Human Capital	-0.020	-0.158	0.311*	2.595**	0.384**
	(0.160)	(0.281)	(0.184)	(1.280)	(0.160)
Business Environment	-0.634**	-0.649**	-0.177	-1.470	-0.047
	(0.238)	(0.285)	(0.259)	(2.548)	(0.283)
Openness	0.153	0.148	-0.104	-1.473	0.135
	(0.138)	(0.141)	(0.121)	(0.952)	(0.148)
Credit to GDP	0.123	0.217**	-0.457***	0.646	-0.286***
	(0.073)	(0.096)	(0.097)	(0.688)	(0.092)
Stock Market to GDP	0.001	-0.020	0.187***	0.741*	0.018
	(0.048)	(0.049)	(0.060)	(0.415)	(0.074)
Inflation volatility	0.006	0.064	-0.130**	0.267	-0.057
	(0.043)	(0.052)	(0.053)	(0.271)	(0.049)
Multiple Exchange Rates	-0.057	0.038	-0.217***	-1.108*	-0.247**
	(0.092)	(0.092)	(0.057)	(0.638)	(0.099)
Current Account Restrictions	0.513***	0.560***	0.347**	-0.161	0.292**
	(0.108)	(0.110)	(0.130)	(0.807)	(0.114)
Surrender of Export Proceeds	0.158	0.097	0.265*	-0.366	0.134
	(0.103)	(0.090)	(0.148)	(0.601)	(0.106)
Capital Account Restrictions	-0.314***	-0.286***	-0.152	-0.332	-0.099
	(0.114)	(0.100)	(0.148)	(0.500)	(0.120)
Observations	122	122	120	122	120
Groups	41	41	41	41	41
R2-within	0.7933	0.6522	0.9137	0.7513	0.8651

Note:Standard errors in parenthesis.* Significance at the 10% level; ** Significance at the 5% level;*** Significance at the 1% level. Time dummies are included in all specifications. All regressors are expressed in logs, except the capital controls.

TABLE 11 - ROBUSTNESS CHECKS (2): ALTERNATIVE VARIABLE DEFINITION
(Dependent variable: Log of the stock of foreign liabilities to GDP)

	Human Capital		Institutions		Capital Openness	
	Foreign Liab. (1)	Foreign Private (2)	Foreign Liab. (3)	Foreign Private (4)	Foreign Liab. (5)	Foreign Private (6)
Lagged Dependent Variable	0.487***	0.700***	0.506**	0.678***	0.672***	0.707***
	(0.146)	(0.157)	(0.193)	(0.122)	(0.179)	(0.132)
Human Capital	0.635**	0.634**	0.697*	0.880**	0.471**	1.089**
	(0.285)	(0.265)	(0.363)	(0.396)	(0.209)	(0.527)
Business Environment	-0.084	-0.189	-0.038	-0.060	0.312	-0.416
	(0.862)	(0.503)	(0.426)	(0.339)	(0.651)	(0.774)
Openness	0.285	0.348	0.239	0.046	0.181	0.224
	(0.188)	(0.404)	(0.403)	(0.396)	(0.201)	(0.338)
Credit to GDP	0.050	-0.447**	0.082	-0.561*	0.010	-0.370***
	(0.221)	(0.190)	(0.172)	(0.284)	(0.160)	(0.134)
Stock Market to GDP	0.034	0.156*	-0.134	0.232**	-0.055	0.081
	(0.064)	(0.081)	(0.142)	(0.091)	(0.098)	(0.109)
Inflation volatility	0.040	-0.158*	-0.080	-0.184	-0.100	-0.110
	(0.069)	(0.083)	(0.112)	(0.134)	(0.112)	(0.096)
Multiple Exchange Rates	-0.001	-0.373	-0.038	-0.152		
	(0.124)	(0.325)	(0.151)	(0.262)		
Current Account Restrictions	0.516**	0.383	0.269	0.141		
	(0.241)	(0.381)	(0.354)	(0.393)		
Surrender of Export Proceeds	0.393**	0.221	0.304*	0.481**		
	(0.193)	(0.207)	(0.158)	(0.212)		
Capital Account Restrictions	-0.574***	-0.239	-0.386*	-0.401		
	(0.151)	(0.461)	(0.206)	(0.438)		
Capital Openness Index					-0.102	-0.023
					(0.078)	(0.084)
Observations	122	119	122	119	122	119
Groups	41	41	41	41	41	41
AR1	0.037	0.089	0.026	0.087	0.037	0.089
AR2	0.263	0.304	0.253	0.198	0.332	0.464
Hansen	0.667	0.477	0.213	0.607	0.614	0.708

Note:Standard errors in parenthesis.* Significance at the 10% level; ** Significance at the 5% level;*** Significance at the 1% level. Time dummies are included in all specifications. All regressors are expressed in logs, except the capital controls. All the variables correspond to the variable definition of Table 3 except: in columns (1) and (2) the human capital stock variables is the average years of schooling in the population 25 and over; in columns (3) and (4) the variable capturing institutional quality is an index of legal structure and the security of property rights combining: judicial independence, impartial courts, protection of intellectual property, integrity of the legal system and military interference in the rule of law and the political process; finally, columns (5) and (6) use the Chin-Itto capital controls index. Dynamic System-GMM estimation with "collapsed" instruments (see text for further explanation).AR1: Arellano-Bond test for first order serial autocorrelation; AR2: Arellano-Bond test for second order serial autocorrelation; Hansen: test for overidentifying restrictions.

Table 12 - Static vs Dynamic Approach: Pooled OLS Results
(Dependent variable: Flow of foreign liabilities to GDP

	(1)	(2)	(3)	(4)	(5)
	Foreign Liabilities	Foreign Debt	Foreign Private	Foreign Equity	FDI
Human Capital	0.830	0.139	0.622	0.546	0.153
	(2.586)	(1.790)	(1.147)	(0.879)	(0.480)
Business Environment	4.235	2.514	2.006	-0.078	1.977
	(7.186)	(4.936)	(3.182)	(2.318)	(1.493)
Openness	6.726*	3.633*	3.062**	1.477	1.585***
	(3.493)	(2.115)	(1.454)	(1.178)	(0.371)
Credit to GDP	-1.433	0.020	-1.376	-0.435	-0.935*
	(1.651)	(1.212)	(1.253)	(1.012)	(0.542)
Stock Market to GDP	0.989	-0.190	1.138**	0.779*	0.360
	(1.022)	(0.767)	(0.499)	(0.420)	(0.226)
Inflation volatility	-1.659*	-0.718	-0.843	-0.875	0.024
	(0.956)	(0.682)	(0.755)	(0.659)	(0.323)
Multiple Exchange Rates	-1.654	-1.103	-0.580	0.332	-0.931
	(2.007)	(1.294)	(1.029)	(0.618)	(0.605)
Current Account Restrictions	1.590	1.085	0.487	0.676	-0.123
	(2.105)	(1.359)	(1.145)	(0.853)	(0.476)
Surrender of Export Proceeds	-0.589	-1.812	1.211	0.210	1.013**
	(1.794)	(1.123)	(0.945)	(0.760)	(0.397)
Capital Account Restrictions	-6.171*	-2.388	-3.717***	-1.483*	-2.243***
	(2.818)	(2.112)	(1.045)	(0.830)	(0.484)
Observations	122	122	120	120	122
R2	0.2609	0.1853	0.3428	0.2159	0.4237

Note:Standard errors in parenthesis.* Significance at the 10% level; ** Significance at the 5% level;*** Significance at the 1% level. Time dummies are included in all specifications. All regressors are expressed in logs, except the capital controls.

TABLE 13 - STATIC VS DYNAMIC APPROACH: FIXED EFFECTS RESULTS
(Dependent variable: Flow of foreign liabilities to GDP

	(1)	(2)	(3)	(4)	(5)
	Foreign Liabilities	Foreign Debt	Foreign Private	Foreign Equity	FDI
Human Capital	2.529	3.627	-0.752	-1.132	0.059
	(3.492)	(3.720)	(2.945)	(2.284)	(0.545)
Business Environment	-13.185***	-6.388	-6.568	-5.192	-0.455
	(4.758)	(4.259)	(4.353)	(3.681)	(0.740)
Openness	6.205**	3.506	2.725*	0.335	0.802**
	(2.908)	(2.887)	(1.422)	(1.070)	(0.363)
Credit to GDP	-4.226*	0.343	-4.471**	-2.473	-1.283***
	(2.166)	(1.376)	(2.140)	(2.218)	(0.286)
Stock Market to GDP	2.354	1.005	1.381	1.173	0.181
	(1.728)	(1.516)	(1.122)	(1.011)	(0.188)
Inflation volatility	-3.325***	-0.566	-2.630**	-2.044	-0.266**
	(1.012)	(0.697)	(1.012)	(1.038)	(0.104)
Multiple Exchange Rates	-4.282**	-2.138	-2.237*	0.147*	-1.046***
	(1.828)	(1.321)	(1.242)	(0.913)	(0.325)
Current Account Restrictions	2.713	1.481	1.127	1.957	0.036
	(1.774)	(1.441)	(1.559)	(1.191)	(0.423)
Surrender of Export Proceeds	4.149	-0.737	4.681*	3.733	0.042
	(2.471)	(1.694)	(2.589)	(2.560)	(0.265)
Capital Account Restrictions	-6.005**	-1.056	-4.725*	-3.151	0.030
	(2.608)	(1.720)	(2.549)	(2.252)	(0.291)
Observations	122	122	120	122	120
Groups	41	41	41	41	41
R2-within	0.3402	0.3217	0.4799	0.3409	0.6373

Note:Standard errors in parenthesis.* Significance at the 10% level; ** Significance at the 5% level;*** Significance at the 1% level. Time dummies are included in all specifications. All regressors are expressed in logs, except the capital controls.

CHAPTER 2

FDI Spillovers and the Role of Local Financial Markets: Evidence from Mexico

ABSTRACT. This paper presents new microeconomic evidence on the link between financial sector development, financial globalization and productivity. Using data of Mexican manufacturing firms operating in 1991, 1999 and 2001 it is found that in general, larger firms benefit from FDI in their same region of activity. However, domestic firms only enjoy productivity increases from FDI if they are relatively large *and* located in financially developed regions. All the findings are robust to instrumenting for financial development using historical conditions.

KEYWORDS. Productivity, FDI Spillovers, Financial Development.

JEL CLASSIFICATION. D24, F23, O16

2.1. Introduction

In recent years a literature on the benefits and costs of financial globalization for developing countries has proliferated. In a recent review of the literature, Kose, Prasad, Rogoff and Wei (2006) suggest four sets of structural and policy-related country features that seem to determine whether countries will be able to benefit from financial globalization: financial sector development, overall institutional quality, macroeconomic policy framework and trade integration. In particular, the financial sector development is found not only to enhance the growth prospects but also reduce vulnerability to crises through direct and indirect channels. Based on country level studies there is a consensus on the relevance of domestic financial factors if countries are to benefit from financial globalization. However, there is limited microeconomic evidence that supports this hypothesis. This paper fills the gap between macroeconomic and microeconomic evidence. It studies the effects of foreign direct investment (FDI) on firm level productivity and shows that in general, larger firms benefit from foreign companies operating in their same region. In contrast, domestic firms only enjoy higher productivity if they are relatively large and located in well financially developed regions.

The theoretical benefits from FDI are based on the assumption that FDI not only brings in physical capital and employment opportunities but foreign affiliates posses a set of non-tangible assets, such as technological know-how, management skills and production techniques that confer them higher productivity than their domestic counterparts. Most of the relevance of FDI for the domestic economy relies on the possibility that domestic firms, by being exposed to the new products and production techniques brought in by the multinational company (MNC), manage to improve their own performance as well. However, despite the extensive empirical literature on FDI spillovers, studies focusing on developing and emerging countries fail to find any evidence of positive externalities derived from foreign presence in their *same* sector or region of activity[1].

[1]The following studies either fail to find an effect or hint to the existence of negative spillovers: Haddad and Harrison (1993) on Morocco, Aitken and Harrison (1999) on Venezuela, Djankov and Hoekman (2000) on Czec Republic and Konings (2001) on Bulgaria, Romania and Poland. More encouraging results have been found for firms operating in developed countries: Haskel, Pereira and Slaughter (2007) for the UK or Keller and Yeaple (2003) for the US.

Given the limited evidence on horizontal or regional FDI spillovers, I explore the role of local financial markets. In particular, this paper concentrates on the hypothesis that even if domestic firms would like to undertake investments to adopt new technologies brought in by foreign investors, they may lack access to the financial resources necessary to do so. Alfaro, Chanda, Kalemli-Ozcan and Sayek (2004) study this dimension of host country conditions at a macro level. Using cross-country data from 1975 to 1995 they show that the contribution of FDI to economic growth is ambiguous. However, countries with well-developed financial markets gain significantly from FDI. They suggest the following ways in which financial markets matter for FDI spillovers. First, in order to take advantage of new knowledge, domestic firms will need to undertake investments that allow them to reorganize their structure or upgrade their technology. Although some local firms will be able to finance these investments with internal funds, others will need external resources that in most cases are confined to domestic sources. Second, workers of foreign firms can learn the insights of the business from the MNC and if financial markets are well developed decide to set up their own business fostering the appearance of new entrepreneurs. Finally, well functioning financial markets can enhance the potential for FDI to create backward linkages. If foreign firms acquire most of their supplies in the domestic market, access to external finance can benefit those firms that were already producing inputs in the industry but also it can encourage the creation of new firms. More recently, Javorcik and Spatareanu (2008) find for a sample of 319 Czech firms supplying 88 MNCs operating in the Czech Republic that domestic firms supplying MNCs are less credit constrained than non-suppliers. Moreover, they argue that this results from less constrained firms self-selecting into becoming MNC suppliers rather than the benefits being derived from the supplying relationship.

I focus on the experience of Mexico during the 1990s. Although Mexico had started its liberalization process before the 1994 North American Free Trade Agreement (NAFTA), the agreement was particularly successful in stimulating large FDI inflows especially into the manufacturing sector. FDI inflows in Mexico increased from a yearly average of $4.5 billion between 1988 and 1993 to a yearly average of $13 billion between 1994 and 2002, and about half of the FDI flowed into manufacturing. At the same time, there were two simultaneous forces that made access to

credit become more difficult especially for small and medium size companies. First, in order to attract FDI the government prioritized the control of inflation which translated into an overvalued exchange rate and high interest rates[2]. Second, the chronical inefficiency of the domestic banking system in allocating credit created shortages of credit for domestic firms (Gallagher and Zarsky (2004)). I will show that these difficulties in accessing credit vary widely across Mexican states due to legal and historical reasons.

I use firm level data from three cross-section surveys carried out by the Mexican national statistical office in 1992, 1999 and 2001. The fact that the surveys include micro and small establishments helps determining the role of size in FDI spillovers. Once, it has been established that it is larger firms that benefit from FDI, a small subsample of mainly medium and large firms that could be linked across surveys, is used to confirm that the main results are robust to controlling for firm specific effects. However, it is important to note that this subsample refers mainly to larger firms and therefore, the focus on the cross-section results is crucial in order to determine the importance of size. On the methodological side, to obtain firm level estimates of total factor productivity, the paper follows the literature on the structural identification of production functions, using a new approach that improves upon the Levinsohn and Petrin (2003) methodology. Finally, the endogeneity of financial development is addressed using historical instruments. I argue that there are differences in the legal framework and historical differences across the Mexican states that can explain current disparities in the regional banking sector development. In particular, Laeven and Woodruff (2008) show that the quality of legal institutions is lower in states where the indigenous population was more prevalent one hundred years ago. In addition, I argue that the Mexican government preferential credit program to small and medium firms from 1956 to 1989 shaped current regional differences in access to credit.

The paper is organized as follows. Section 2 describes the data and the estimation strategy. From the description of the estimation strategy it would be clear that in order to conduct the analysis firm level TFP estimates and an indicator of local financial development are required. Section 3 deals with the productivity estimation technique and results while Section 4 explains the construction of the

[2]Interest rates averaged 22% between 1994 and 2002.

financial development index and the effect of a well-developed financial system on productivity. Finally, Section 5 reports the results from the spillover effects and the role of local credit markets and Section 6 concludes.

2.2. Data and Estimation Strategy

2.2.1. Data. The data use in this study come from the Encuesta Nacional de Empleo, Salarios, Tecnologia y Capacitacion (ENESTyC) [National Survey of Employment, Wages, Technology and Training], which is a survey carried out by the Mexican National Statistical Office (INEGI). The analysis focuses on three waves of the survey, implemented in 1992, 1999 and 2001, which were designed as independent cross-sections.

The following characteristics make the ENESTyC survey ideal for the purposes of this study[3]. First, it is possible to identify the sector and region in which firms operate. There are 52 ramas (branches) of activity[4] and 32 regions corresponding to the different Mexican federal states. Second, the surveys do not only include medium and large firms but extend the analysis to micro and small establishments which are crucial to detect financial difficulties. According to the INEGI classification micro establishments are those with less than 16 employees; small establishments have between 16 and 100 employees; medium establishments are those that have between 100 and 250 employees and finally, large establishments report more than 250 employees[5]. Panel A of Table 1 presents data on the final number of firms according to their size and year of survey. Third, maquiladora plants[6] are included in the surveys reflecting their rising importance in Mexico. According to aggregate INEGI data on employment in exporting maquiladora sectors, between 1991 and 2000 maquiladora employment grew 197 percent. Correspondingly, in the ENESTyC dataset the percentage of employment in maquila plants increased by 230 percent during the same

[3]See Appendix I for a detailed description of the data and cleaning procedure.

[4]The industrial classification is based on the Clasificacion Mexicana de Actividades y Productos (CMAP) [Mexican Classification of Activities and Products]. Industries are grouped in 6-digit industries called clases (classes), 4-digit industries called ramas (branches), and 2-digit industries called divisiones (divisions).

[5]The survey is conducted at the establishment level. However, through out the analysis the words establishment, firm and plant will be used indistinctively.

[6]Maquiladora or maquila plants are assembly plants that participate in a Mexican government export promotion program.

period. Finally, and most importantly, firms provide detailed information about their ownership structure in each survey.

Panel B in Table 1 provides some basic information on foreign ownership. Foreign firms are defined as those whose capital share owned by foreign investors is at least 10 percent[7]. On average, the share of foreign investors in total manufacturing establishments remains almost unchanged over time however; the fraction of manufacturing output accounted for by foreign affiliates grew from 39% in 1991 to 52% in 2000.

Table 2A shows the industrial variation in foreign employment and output share. Similarly, Table 2B reports the regional variation. According to Table 2A, foreign investors account for most of the production and employment in sectors like Textiles, Chemicals and Machinery and Equipment. In addition, over time, Textiles and Non Metallic Minerals industries have experienced the greatest increase. With respect to the regional variation, Table 2B shows that the contribution of foreign investment to employment and output is greater in the border states, the Federal District and its adjacent states and in the north-center states.

The data have two important limitations. First, the share of micro establishments grew by more than 15 percentage points between the 1992 and 2001 surveys (Panel A in Table 1). This is the result of an increasing interest on the part of the Mexican authorities to study the behavior of micro establishments. However, this change in the sample composition could lead to erroneous conclusions and therefore, it seemed convenient to exclude micro establishments from the general analysis[8]. Second, the sample was designed to be representative at the sectoral level. However, the wide coverage of the survey and the fact that large and medium firms were included with certainty make it possible to focus on regional aspects. A potential concern may arise if micro and small firms were drawn systematically from some particular regions. In order to rule out this possibility, I compared the contribution of sampled firms in each region to total value added with aggregate INEGI data on the share of regional GDP in total GDP and found no significant differences.

[7]Results are robust to alternative percentage thresholds (i.e. 30 percent and 50 percent) which in turn suggests limited effects of the extent of foreign ownership. See section 5.4. for a complementary note to this comment.

[8]Micro establishments will only be considered in Section 4 when constructing the measure of regional financial development. In this case, only data from the 1999 and 2001 surveys is used and as shown in Panel A of Table 1, these are comparable in terms of sample composition.

2.2.2. Estimation Strategy. To examine the relationship between the productivity of domestic firms and FDI in their same sector/region of activity the standard approach followed in other studies is to estimate an equation of the following form:

$$lnTFP_{ijrt} = \alpha + \beta_1 Spillover_{\psi t} + \alpha_t + \alpha_r + \alpha_j + \varepsilon_{ijrt} \tag{2.1}$$

where TFP_{ijrt} stands for the total factor productivity of firm i operating in sector j and region r at time t, $Spillover$ is a variable that proxies the extent of foreign presence at time t in region r if $\psi = r$ or in sector j if $\psi = j$. α_t, α_r and α_j are time, regional and sector-specific controls, respectively. The convention is to define the spillover variable as the ratio of foreign firms' sales over total sales in industry j or region r[9]. In addition, following Javorcik (2004) it is possible to take into account the share of foreign equity so that the final proxy for spillovers is:

$$Spillover_{\psi t} = \frac{\sum_{i \forall i \epsilon \psi} ForeignShare_{it} * Y_{it}}{\sum_{i \forall i \epsilon \psi} Y_{it}} \tag{2.2}$$

where $ForeignShare$ represents the share of capital owned by foreign investors, ψ can represent either sector or region and Y_{it} is deflated output by firm i at time t. There is no theoretical consensus on how broadly regional and sectoral spillovers should be defined. I distinguish between 32 regions that correspond to the 31 Mexican federal states and the Federal District to compute regional spillovers. Regarding sectoral spillovers, I focus on the 4-digit CMAP industry classification and therefore, consider 52 branches of activity. Unfortunately, measures of vertical spillovers[10] could not be computed since the most recent Input-Output table is dated in 1980 while the period of analysis refers to the 90s. However, as we will see there is strong evidence suggesting the existence of regional FDI spillovers and considering that most of the supplier/distributor contacts are local in scope, it is most probable that these regional spillovers in fact take place through backward and forward linkages. Although, this is an open question given the impossibility of distinguishing between horizontal and vertical spillovers. Finally, in line with theories underlying the role of dynamics in technology diffusion (see Kugler (2006) for a particular application

[9]Similarly one can use employment as weights (see Aitken and Harrison (1999)).

[10]Vertical spillovers are nter-industry spillovers that usually take the form of backward linkages or contacts between clients and suppliers. Evidence of FDI spillovers through backward linkages has been found in Blalock (2001) for Indonesia, Javorcik (2004) for Lithuania and Kugler (2006) for Colombia.

to FDI spillovers) it would have been more suitable to use lagged values of sectoral and regional spillovers rather than testing the contemporaneous effect. However, the cross-section nature of the ENESTyC survey made this exercise impossible. Nevertheless, the empirical literature does find a contemporaneous effect and if anything, using lagged values translates in larger estimates and higher statistical significance. Therefore, estimates from using current values of FDI spillovers are a lower bound to the greater positive effects that could take place over time.

As mentioned in the introduction, the traditional approach in search for horizontal or regional spillovers has not been very successful in finding positive effects from MNC presence. This paper concentrates on the role of financial markets as a channel for FDI spillovers. In particular, the following equation will be estimated:

$$lnTFP_{ijrt} = \alpha + \beta_1 Spillover_{\psi t} + \beta_2 (Spillover_{\psi t} * FinDev_r) + \alpha_t + \alpha_r + \alpha_j + u_{ijrt} \tag{2.3}$$

where $FinDev$ is a measure of financial development at the state level[11]. Since the specification controls for regional and industry specific effects the only effects that are identified are those relative to variables that vary over time. Therefore, although the direct effect of financial development on productivity cannot be identified, following Rajan and Zingales (1998) estimation strategy, it is still possible to estimate the effect of FDI conditional on different regional levels of financial development. Regional dummies α_r would capture overall region specific characteristics including differences in the financial system. In theory, we would expect β_2 to be positive and significant so that controlling for sectoral/regional FDI, domestic firms located in states characterized by easier access to external funds will benefit more from MNC presence.

2.3. Productivity Estimation

2.3.1. Theoretical Background. Firm-level productivity estimates are obtained by estimating a Cobb-Douglas production function:

$$y_{it} = \beta_l l_{it} + \beta_m m_{it} + \beta_k k_{it} + \omega_{it} + u_{it} \tag{2.4}$$

[11]See Section 4 for a description of how this variable is constructed.

where y_{it}, l_{it}, m_{it} and k_{it} denote the logarithm of deflated output, labor, deflated material inputs and deflated capital[12], respectively. The firm specific error can be decomposed into a term capturing firm specific productivity ω_{it} and an additional term that reflects measurement error or an unexpected productivity shock u_{it}. We are interested in estimating ω_{it}. Given the characteristics of the ENESTyC survey the main concern related to the estimation of ω_{it} is simultaneity bias[13]. Productivity is known by the firm but ignored by the econometrician, so if the firm knowing its own productivity chooses inputs accordingly, OLS will deliver a bias estimate. The direction of the bias will depend on the correlation between inputs and the correlation of inputs and productivity. In general, if more productive firms tend to hire more workers, buy more materials or invest more in capital, OLS may lead to an upward bias of the input coefficients. To control for the simultaneity bias I use a version of the Levinsohn and Petrin (2003) semiparametric estimator (LP hereafter) developed by Ackerberg, Caves and Frazer (2006) (ACF hereafter) where I consider a gross output production function rather than a value added production function[14].

ACF propose to "give up" the estimation of β_l in the first stage of the LP procedure and they formulate the following timing assumptions. First, as in the LP procedure, k_t is chosen at time $t-1$ however, l_{it} is assumed to be chosen at time $t-b$ $(0 < b < 1)$ prior to the choice of m_{it} at time t. In other words, labor is considered a "less flexible" input than materials which they argue is consistent with firms needing time to train new workers or needing to give some period of notice before firing[15]. In addition, it is assumed that ω_{it} evolves according to a first order

[12]See Appendix I for a description of the variables and price deflators used. Note that including separately skilled and unskilled labor was not possible due to lack of data referring to previous years.

[13]Sample selection due to exit should not be a problem given the cross-section and random selection nature of the survey. In addition, the "omitted price bias" derived from proxing physical output by deflated sales using an industry price deflator should be mitigated. The proxy for output used is not sales but the value of production priced at "factory" price. Moreover, Katayama, Lu and Tybout (2003) show that traditional TFP estimates are highly correlated with their proposed measure of TFP that accounts for imperfect competition. Finally, the ranking provided by the estimated measures of productivity would still be valid as long as more productive firms charge higher markups.

[14]See Ackerberg et al (2006) for a discussion on the advantages and disadvantages of output versus value added production functions.

[15]Even in the context of high labor flexibility it is reasonable to assume that labor is less variable than material inputs.

Markov process between the subperiods $t-1$, $t-b$ and t so that:

$$p(\omega_{it}|I_{it-b}) = p(\omega_{it}|\omega_{it-b}) \tag{2.5}$$

and

$$p(\omega_{it-b}|I_{it-1}) = p(\omega_{it-b}|\omega_{it-1}) \tag{2.6}$$

where I_{it-b} is the information set at time $t-b$ and I_{t-1} is the information set at time $t-1$. Given these timing assumptions, the firm's material input demand function can be expressed as a function of l_{it}[16]:

$$m_{it} = f_t(\omega_{it}, k_{it}, l_{it}) \tag{2.7}$$

were f_t represents input prices and/or product market conditions that are allowed to vary over time but not across firms. Inverting this function it is possible to obtain an expression for ω_{it}, that substituted in the production function generates the following first stage equation:

$$y_{it} = \beta_k k_{it} + \beta_l l_{it} + \beta_m m_{it} + f_t^{-1}(m_{it}, k_{it}, l_{it}) + \epsilon_{it} \tag{2.8}$$

Although β_l, β_k and β_m are not identified at this stage it is possible to recover an estimate of the composite term $\hat{\Phi}_{it}$,

$\hat{\Phi}_{it}(m_{it}, k_{it}, l_{it}) = \beta_k k_{it} + \beta_l l_{it} + \beta_m m_{it} + f_t^{-1}(m_{it}, k_{it}, l_{it})$

Equation (9) is estimated as a partially linear model including a third order polynomial in capital, labor, materials and the corresponding cross products, to approximate the unknown functional form of f_t^{-1} and obtain as estimates of $\hat{\Phi}_{it}$ the predicted residuals of this regression.

Given that no coefficient is identified in the first stage three independent moment conditions are required for identification in the second stage. From the first order Markov assumption on the evolution of productivity is it the case that

$$\omega_{it} = E[\omega_{it}|I_{it-1}] + \xi_{it} = E[\omega_{it}|\omega_{it-1}] + \xi_{it} \tag{2.9}$$

which simply decomposes ω_{it} into its conditional expectation at time $t-1$, $E[\omega_{it}|I_{it-1}]$ and a deviation from that expectation, ξ_{it}, which is often referred to as the "innovation" component of ω_{it}. Since by assumption, capital was determined at time $t-1$

[16]See Levinsohn and Petrin (2003) for a description of the conditions under which the material input demand function is a strictly increasing function of current productivity ω_{it}.

this implies that ξ_{it} is orthogonal to k_{it}, which is the same moment condition that LP uses to identify the capital coefficient. Regarding the identification of β_m, as m_{t-1} was decided at $t-1$ and hence part of I_{it-1}, ξ_{it} should be uncorrelated with m_{t-1}. Finally, the identification of β_l is based on the observation that lagged labor l_{it-1}, was chosen at time $t-b-1$ and hence, it is in the information set I_{it-1} which is uncorrelated with ξ_{it}[17]. Therefore, the final moment conditions are:

$$E[\xi_{it} \cdot \begin{pmatrix} k_{it} \\ m_{it-1} \\ l_{it-1} \end{pmatrix}] = 0 \tag{2.10}$$

In practice, the implementation of these moment conditions is analogous to the second stage of the LP procedure. First, candidate values for $(\beta_l, \beta_m, \beta_k)$ are to be chosen, say $(\beta_l^*, \beta_m^*, \beta_k^*)$ which in this case correspond to the OLS estimates from a Coob-Douglas production function. I compute estimates of ω_{it} as:

$\hat{\omega}_{it} = \hat{\Phi}_{it} - (\beta_l^* l_{iy} + \beta_m^* m_{it} + \beta_k^* k_{it})$

and regress non-parametrically $\hat{\omega}_{it}(\beta_l, \beta_m, \beta_k)$ on $\hat{\omega}_{it-1}(\beta_l, \beta_m, \beta_k)$ which implies regressing $\hat{\omega}_{it}$ on a third order polynomial of $\hat{\omega}_{it-1}$ and a constant term. Second, the predicted residuals from this regression, $\hat{\xi}_{it}(\beta_l, \beta_m, \beta_k)$, are used to form the sample analogue of the theoretical moment conditions:

$$\frac{1}{T}\frac{1}{N}\sum_t \sum_i \hat{\xi}_{it}(\beta_l, \beta_m, \beta_k) \cdot \begin{pmatrix} k_{it} \\ m_{it-1} \\ l_{it-1} \end{pmatrix} = 0 \tag{2.11}$$

and use non-linear least squares to estimate the $(\hat{\beta}_l, \hat{\beta}_m, \hat{\beta}_k)$ that minimize this sample analogue.

2.3.2. Productivity Results. The production function is estimated separately for each industry [18]. Table 3 reports the estimated coefficients based on OLS, LP and ACF. In general, all estimation strategies provide estimates that are highly significant for all input variables and for all 9 different sectors. Although it is not possible to establish precisely the direction of the OLS bias in a setting with more than two inputs, comparing the OLS and the ACF results by sector reveals that

[17] Ackerberg et al (2006) propose to use wither contemporaneous labor or lagged labor as identifying conditions. In this case given the short time dimension of the data I opted for lagged labor values.

[18] In order to have enough observations for the estimation I use the 2-digit sector classification.

OLS tends to overestimate the coefficient on the more flexible inputs. Regarding capital, there is only one sectors (36) where the ACF coefficients are higher than the corresponding OLS ones. As suggested in Ackerberg et al (2006) this result corresponds to a case where labor is more "variable" than capital and as a result l_{it} is more correlated with ω_{it} than k_{it}. Comparing the ACF results to the LP results, the most significant finding as in Ackerberg et al (2006) is that the LP estimates of the labor coefficient are smaller than their ACF counterparts. This result hints the possibility that the LP labor coefficients from the first stage might be downward bias.

Finally, to obtain a measure of total factor productivity as the difference between actual and predicted output[19], I use the input coefficients from the ACF estimation:

$$tfp_{it} = y_{it} - \hat{\beta}_l l_{it} - \hat{\beta}_m m_{it} - \hat{\beta}_k k_{it} \tag{2.12}$$

Furthermore, following Pavnick (2002) I normalized the productivity estimate obtained from equation (12) so as to obtain a measure that describes firm productivity over time and firm's relative position compared to a reference plant. The normalization consists in subtracting to each plant's productivity, the productivity of a reference plant, which in this case is chosen to be a domestic plant with mean output and mean input level in 1989[20]:

$$tfp_r = \bar{y}_{89} - \hat{\beta}_l \bar{l}_{89} - \hat{\beta}_m \bar{m}_{89} - \hat{\beta}_k \bar{k}_{89} \tag{2.13}$$

where the bar denotes the mean in year 1989. Therefore, unless otherwise indicated, the measure of total factor productivity used from now onwards corresponds to:

$$IndTFP_{it} = tfp_{it} - tfp_r \tag{2.14}$$

2.4. Financial Development

The ENESTyC survey contains very limited information regarding the easiness with which firms access credit. Although, there is an extensive literature studying

[19]Rigorously, to obtain an accurate estimate of ω_{it} one should substract an estimate of error term u_{it}. However, given that $E(u_{it}) = 0$ this is generally ignored. Van Biesebroeck (2007) proposes a way to purge the random noise from the productivity estimates obtained by the Olley and Pakes (1996) procedure.

[20]The 1992 survey includes questions on the production process from 1989 to 1991.

the interaction between financial markets and economic growth across countries[21] there are very few studies looking at within country differences in financial development[22]. One exception is Guiso, Sapienza and Zingales (2004) that develop a new indicator of the soundness of the local financial system across different Italian provinces. Better developed financial markets are defined as those that grant individuals and firms easier access to external funds. Following their estimation strategy I obtain a similar indicator for the various Mexican states.

2.4.1. Financial Development Indicator Methodology. The 1999 and 2001 surveys contain the following two questions:

1. "Mainly, which type of machinery and/or equipment did the establishment acquire in order to carry out the production process?"

2. "In case the establishment did not acquire any machinery or equipment, what was the main reason?"

Firms could choose among various options to answer question 2: (1) Because they did not need it; (2) Lack of financing; (3) Importing problems; (4) Trade union opposition; (5) Other; (6) Do not know. I am interested in option (2) where firms state that they did not invest in machinery and equipment because they lacked financial resources. Around seventy percent of the sampled firms did buy machinery and equipment, of the 30% remaining that did not buy machinery, 32% (1,311 firms) did not acquire it because of lack of external funds. In order to estimate the probability that a firm lacks access to external funds I consider a final sample of 11,574 firms that either acquired machinery or wanted to buy machinery but were prevented from doing so because of financial problems. Table 4 reports summary statistics of the distribution of firms across regions and the proportion of them that state difficulties in accessing credit. The Southern states of Chiapas, Guerrero and Oaxaca together with states from the Yucatan area like Tabasco and Campeche are the ones with the highest proportion of firms reporting difficulties in accessing credit. In addition, the availability of credit does not only vary across regions but also across sectors. Table 5 shows the sectoral distribution of firms and the percentage of them that report difficulties in financing their investment projects.

[21] See King and Levine (1993), Beck, Levine and Loayza (2000) and Levine, Loayza and Beck (2000).

[22] Jayaratne and Strahan (1996); Dehejia and Lleras-Muney (2003); Guiso, Sapienza and Zingales (2004); Bertrand, Schoar and Thesmar (2004); Cetorelli and Strahan (2006).

Sectors 35 (Chemicals), 37 (Basic metals), 38 (Machinery and Equipment) and 32 (Textiles) are in this order the ones with the lowest percentage of firms reporting financial problems.

Following Guiso et al (2004), I estimate a linear probability model of the likelihood a firm cannot buy machinery and equipment because of lack of financial resources. Controlling for firm characteristics and including regional dummies, it is possible to obtain an indicator of how much more likely a firm is to have difficulties in financing machinery investment in one state compared to another. The measure of financial development will be the ranking provided by the coefficients of the regional dummies included in the estimation[23]. Note that the choice of a regional financial development indicator rather than directly using the answers to the credit questions provided at the firm level is based on two issues. First, the credit questions were only included in the 1999 and 2001 surveys which would prevent the use of the 1992 survey[24]. Second, the subsample of credit constrained firms is as expected mainly composed of micro establishments. In fact, of the 1,311 firms that report some difficulty in financing machinery and equipment, 62% correspond to micro establishments and 19% to small establishments, while medium and large firms only represent a 13 and 6 percentage, respectively. Using a firm level measure of access to credit would mean restricting the analysis to mainly micro and small establishments which are later shown to be less likely to benefit from MNCs' activities. However, the information reported by these firms is still a valid indicator of the cross-regional variation in access to credit.

Table 6 reports the results from the linear probability model. As in Beck, Demirguc-Kunt, Laeven and Maksimovic (2006), older and bigger firms are less likely to have problems in accessing credit. Moreover, in the case of age there is an additional non-linear effect captured by the significance and positive sign of Age^2. This result indicates that there is a threshold age level above which the probability of having access to finance decreases. The difference with the Beck et al. (2006) study is that foreign ownership is not a significant determinant of access to external funds. The export status of the firm and whether the firm belongs to a group or not

[23]The choice of a linear probability model was done for ease of interpretation but since the object of interest is the ranking provided by the regional dummies, the same results were obtained from an exponential model.

[24]See the last paragraph of the section for a discussion on the validity of the financial development indicator over time.

both decrease the probability of being credit constrained. In addition to these firm-specific characteristics, the estimation also controls for sector specific characteristics that might make firms in particular sectors more prone to financial constraints. First, the estimation includes the share of total credit in output by sector. This variable turns out to significantly decrease the probability of experiencing borrowing difficulties. Second, to further control for sectoral differences in the availability of credit, a dummy variable for sectors that benefited from the FOGAIN program is included[25]. If commercial banks specialized in lending to particular sectors, we would expect firms in those sectors to have easier access to credit. In fact, the estimated coefficient for the FOGAIN variable is statistically significant and signed in the expected direction. Finally, to control for the possibility that sectors with low financial constraints are also sectors with limited external dependence, the external dependence index developed by Rajan and Zingales (1998) is added to the estimation. Unexpectedly, according to the results in Table 6, sectors in higher need of external funds are less prone to financial constraints[26].

The financial development indicator is based on the coefficient estimates of the regional dummies from the previous regression which are reported in Table 7. The reference region is Oaxaca that is situated in the South of Mexico and according to the results is the state where firms have more difficulties in accessing credit. In all other regions, the coefficient on the regional dummy is negative and significant at the 1 percent level, suggesting that compared to Oaxaca it is easier to access credit in any other state[27]. In order to have a measure of financial development that varies between 0 and 1, I normalize the regional coefficients according to:

$$FinDev = \frac{RegionalCoefficient}{min(RegionalCoefficient)} \tag{2.15}$$

[25]See section 5.2 for a description of the FOGAIN program. FOGAIN equals 1 in the food industry (31), textiles, leather and shoes (32), the basic metal industry (37), the chemical industry (35) and that of electric apparel (383) (Assidon and Estrada Calderon (2006)).

[26]An unsolved issue is that of overlending. If in certain states banks tend to lend more irrespective of the creditworthiness of the borrower, the financial development indicator would be higher but it would not reflect a better financial system. In order to avoid this potential bias, Guiso et al (2004) include in the estimation a measure of the percentage of non-performing loans on total loans by state. Unfortunately, this data in Mexico is not available and therefore, in some sense this measure reflects more credit availability than financial development.

[27]Only the regional dummy referring to the state of Colima is not significant, suggesting no differences between Oaxaca and Colima in access to credit.

Column (2) of Table 7 reports the final measure of financial development used in the rest of the analysis. The indicator of financial development displays great variation across different states, disregarding the extremes, it ranges from 0.449 in Tlaxcala to 0.991 in Nayarit. Although border states seem to be the ones with better credit markets the division is not clear cut. Figure 1 in Appendix III shows the regional distribution of the financial development indicator. Some Northern states like Coahuila, Chihuaha or BCS show a lower financial development indicator than we would expect while the opposite phenomenon occurs with southern states like Guerrero.

Finally, there are some issues associated with the financial development indicator. First, the measure might overstate the availability of credit. The reason is that it is not possible to know whether firms that financed the acquisition of machinery with external funds, obtained as much resources as they would have liked. However, the ranking provided by the indicator would be valid for our purposes if banking systems, in which firms cannot undertake investment projects because of lack of resources, are also systems that tend to pose greater difficulties in obtaining the full amount of credit. Second, the indicator is constructed using data only from the last two surveys (1999 and 2001) and does not vary over time. There are two main changes in the banking system during the 90s that could cast doubt on the validity of the ranking provided by the financial development indicator over time. First, in 1991 the banking system was privatized. Before, banks had channeled most lending to the federal government so private credit was very low. Once privatized, banks increased their lending to the private sector, especially to risky projects seeking high returns. However, soon after the privatization the country was shaken by the 1994 Tequila Crisis. The crisis mined the ability of borrowers to repay their debt which in turn made banks more vulnerable to the crisis and increased their reticence to lend. Consequently, from 1994 onwards, there has been a sharp decrease in private credit. These events show how, although for different reasons, the low lending rates in 1991 were also characteristic from the late 90s. The second major change in the banking system during the 90s was the entry of foreign banks in 1997. However, foreign banks contributed to the recapitalization of the banking sector after the crisis but, there is no evidence that they alleviated the credit crunch. Figure 2 shows the percentage of banking credit to the industrial sector as a fraction of GDP and it can

be observed that the low figures of 1991 (only 5% of GDP) were still characteristic of the late 90s. Finally, if firms could access credit in markets other than the local one, local market conditions would become irrelevant. Empirical evidence suggests that distance matters in the provision of credit and matters even more for small firms (Petersen and Rajan (2002), Guiso, Sapienza and Zingales (2004)). In the case of Mexico, high information costs make the local credit market even more pertinent. Moreover, results in Table 6 show statistical and highly significant coefficients of the regional dummies, suggesting regional differences on the probability of reporting financial problems.

2.5. Estimation Results

2.5.1. Baseline Specification. Table 8 and Table 9 report the results from estimating equation (3) when considering sectoral and regional spillovers, respectively. Here, sectoral spillovers refer to the 4-digit industry classification. The case for spillovers from foreign firms operating in the same sector and region turned out to be not significant and therefore is not reported[28]. In addition, all estimation equations include GDP per capita at the state level[29] to control for time varying regional characteristics and the Herfindahl index (HHN)[30] to control for industry concentration. It is argued that foreign entry can lead to more competition resulting in an improvement of domestic firms' productivity. This pro-competitive effect might be regarded as an spillover effect but since our primary concern is the existence of productivity spillovers due to knowledge transfer, the HHN index is supposed to help disentangling both effects. Finally, provided the main interest of this paper is the productivity performance of domestic firms, results are reported separately for the whole sample of firms and for the sample of domestic firms only.

[28]However, when considering the case of spillovers from firms operating in the same 2-digit sector and region (i.e. a broader sector classification), results were this time significant. This in turn, would hint to the existence of vertical spillovers, since the broader sector definition comprises sectors that do not compete with each other. Nevertheless, these results were not robust to the instrumental variable approach and therefore were not carry on further.

[29]The first available year for state level GDP is 1993 therefore I use it as an approximation for the state level GDP in 1991.

[30]The index is defined as the sum of the squares of the market shares of each individual firm. To make the index vary between 0 and 1, it is normalized as $HHN = \frac{H-(1/N)}{1-(1/N)}$

Regarding the estimation technique, results were obtained by weighted least squares (WLS). The weights used in estimation are firm's share of sectoral employment. The advantage of WLS is that it allows attaching greater importance to larger plants which might be crucial in the context of FDI spillovers if certain technology sophistication is necessary to benefit from MNCs activities[31]. In addition, all reported standard errors are clustered for all observations in the same 4-digit industry and year or region and year depending on the estimated regression. In the absence of clustering, Moulton (1990) showed that when an aggregated variable is used as a regressor in equations estimated at a micro level, OLS standard errors will be downward bias and will tend to find that the aggregate variable is statistically significant.

Table 8 shows the basic results when sectoral spillovers are considered. Columns (1) and (2) consider the total sample of firms while (3) and (4) look only at the sample of domestic firms. Moreover, in order to unmask any potential concern about the choice of productivity measure, columns (1) and (3) correspond to exploratory regressions where the dependent variable is $ln(output)$ and the explanatory variables include labor, materials, capital, whether the firms is foreign owned or not and proxies for spillovers, the interaction between spillovers and financial development, industry concentration and regional GDP. Similarly, columns (2) and (4) report results when the dependent variable is $lnTFP$ from the ACF estimation. It is reassuring that results across estimation strategies are highly consistent. In particular, it is shown that foreign owned firms are more productive than their domestic counterparts. However, as shown in column (2), there is only a marginal positive significant effect from foreign companies on firm productivity after conditioning on regional financial development. More importantly this marginal significant effect disappears once the sample of domestic firms is considered (see column (4)).

The lack of sectoral spillovers is consistent with results from previous studies using data from developing and emerging economies. However, there are reasons for productivity spillovers being geographically limited. Most of the channels for FDI spillovers are local in scope. Contacts between clients and suppliers are usually at

[31]In addition to the economic reasoning behind the choice of WLS a Breusch-Pagan test for heteroskedasticity on size (firm number of workers) rejected the null hypothesis of homoskedasticity.

the local level, labor mobility is rather limited across regions[32] and according to the economic geography literature tacit knowledge is transmitted more efficiently over small distances.

Consequently, Table 9 reports the basic results when considering regional spillovers. The structure of the table is similar to Table 8 and again, there is consistency between the results obtained with $ln(output)$ as dependent variable (columns (1) and (3)) and results where the dependent variable is $lnTFP$ (columns (2) and (4)). Table 9 highlights the importance of local financial markets conditions if firms are to benefit from FDI (i.e. the interaction term between the measure of spillovers and financial development is positive and significant both for the total sample of firms and the sample of domestic firms.).

The importance of local financial markets conditions if firms are to benefit from FDI is a key result given the little success of previous studies in finding significant effects of foreign presence in the same region on the TFP of domestic firms. However, at this point financial market development is not exogenous to firm level total factor productivity and before going into the interpretation of the results next section addresses endogeneity concerns.

2.5.2. Endogeneity Issues and Economic Relevance. One of the main concerns when studying the relationship between firm level TFP and indicators of financial development is that of reverse causality. In other words, it might not be that better financial systems contribute to higher firm level productivity but more productive firms might attract banking opportunities. In the case of Mexico, it is possible to find instruments that deal with the potential endogeneity of the financial development indicator, based on legal and historical factors shaping state differences in access to credit.

Regional differences in accessing credit are explained by two different sets of factors. First, differences in the legal framework across states can generate differences in the ease of accessing credit. The World Bank publication "Doing Business in Mexico 2007" reports significant differences in the time and costs involved in the signing and registering of the collateral required to obtain credit across Mexican states. Similarly, Laeven and Woodruff (2008) argue that state laws also vary on

[32]Esquivel (1999) shows that in Mexico the response of domestic labor migration flows to regional income differentials is small. Similarly, Chiquiar (2008) shows that NAFTA did not induce a significantly faster migration flow toward the border.

the ease with which collateral can be claimed by a victor in a court decision. Based on these legal factors shaping state differences in access to credit, I use a historical instrument that according to Laeven and Woodruff (2008) explain state-level variation in legal enforcement. They show that the quality of legal institutions is lower where the indigenous population was more prevalent at the beginning of the century[33]. In states where the share of indigenous population was higher, European settlers were more likely to develop institutions designed to exploit local labor and hence, establish a worse institutional environment. Therefore, I use their data from 1900[34] on the percentage of indigenous population at the state level.

Second, there are various historical reasons to think that the financial system varies across states. Although currently banks can branch freely across different states, from the end of the 19th century and during most of the 20th century the Mexican banking system was greatly segmented. At the beginning of the twentieth century, there were only two big banks, Banamex and Banco de Londres y Mexico, that were allowed to branch across state lines. As for the rest, each state had a bank that was given a local monopoly thanks to Federal Government restrictions to entry (Haber (2003)). In addition, the evolution of the regional banking system was affected by the development policies of the central government. From 1953 to 1989, the Mexican government channeled preferential credit (in the sense of availability at a lower interest rate) to targeted sectors and regions through commercial banks. Among different initiatives, the government set up a public fund named FOGAIN that granted preferential credit to small and medium firms[35]. In 1989, as part of

[33]Laeven and Woodruff (2008) also find that lower quality levels in the legal framework are characteristic from states with higher production of agricultural crops with high economies of scale (i.e. sugar, coffee, rice and cotton.). Therefore, they suggest as a potential instrument the number of the aforementioned crops by state in 1939. However, first stage results showed that this variable is not significant and consequently I did not include it in the analysis.

[34]The states of Quintana Roo and Baja California were created after 1900. For these states data from the 1930 census, the first census after they became states, is used (Laeven and Woodruff (2008)).

[35]FOGAIN: Fondo de Garantia para la Industria Mediana y Pequenia (Small and Medium enterprise Fund). The criterion used to defined small and medium firms was based on the social capital of the firm. During the first years of the program, the social capital required to benefit from the program was between 25,000 and 5 millions of pesos. The social capital requirement was modified thereafter, so that in 1979 in accounted to a figure between 50,000 and 40 millions of pesos and in 1980 a final upper limit of 60 million of pesos.

a general attempt to reform the financial system the Mexican government eliminated this directed credit program[36]. However, given the high information costs characterizing the Mexican financial system, commercial banks previously doing the intermediary function may have continued lending from their own funds, to firms in earlier targeted sectors and regions. In fact, according to Galindo and Schiantarelli (2002), in Latin America access to credit does not only depend upon favorable balance sheet characteristics but also upon the closeness of the relationship between firms and banks. To the extent that credit allocation was driven by personal and political interests the effectiveness of the program in fostering widespread economic growth has been often questioned. However, the program strengthened the banking system by forcing contacts between private banks and credit seekers. By increasing the volume of operations in commercial banks of particular regions, the program generated an asymmetric evolution in the local banking system. Therefore, the second instrument only for the sample of domestic firms will be the average of the credit allocated under the FOGAIN programm during 1960 to 1989 to the manufacturing sector by state and normalized by the state population in year 1980[37].

Table 10 shows the results of estimating equation (3) instrumenting for the interaction term between regional spillovers and financial development. Standard errors are clustered at the region-time level[38]. The first stage regression is reported at the bottom of the table.

Column (1) of Table 10 refers to the total sample of firms and instruments the interaction term with the interaction between spillovers and the share of indigenous population in 1900. The instrument is significant, with the expected sign and

[36]Although the direct credit program was eliminated the development bank continued to offer rediscounting operations until 1994.

[37]The year 1980 is the earliest year for which population data is disaggregated by state. Normalizing by state level GDP would have been more relevant unfortunately, data was not available. I would like to thank Juan Estrada Calderon who kindly provided the data from the FOGAIN program.

[38]The number of clusters (96 clusters=32regions*3time periods) is smaller than the sum of exogenous regressors and excluded instruments and therefore, the covariance matrix of orthogonality conditions is not of full rank. To sidestep this problem, I follow Baum, Stillman and Schaffer (2003). They argue that by the Frisch-Waugh-Lovell theorem "partialling out" the exogenous regressors from all the other variables and constant, the two-step GMM estimation provides coefficients for the remaining regressors that are the same as if the variables would not have been partialled out. However, the IV identification tests are affected by the partialling out procedure since they depend on the number instruments and exogenous regressors used in the estimation. Hence, the F-test and Hansen test correspond to the equivalent regression without adjusting for clustering.

explains 24% of the variation in access to credit conditional on regional foreign presence. Compared with the WLS results in column (2) of Table 9, the interaction term remains positive and highly significant and the WLS-IV estimated coefficients are more than three times larger than the WLS counterparts in absolute terms[39]. Column (2) of Table 10 repeats the estimation for the sample of domestic firms using as instruments again the interaction between spillovers and the share of indigenous population in 1900 and adding the interaction between spillovers and the normalized FOGAIN data. The instruments are both significant, signed as expected and explain 46% of the variation in domestic firms' access to credit conditional of foreign presence in the region. The Hansen statistic confirms that the instruments pass the test of overidentification restrictions. The interaction term between spillovers and financial development remains significant and again comparing this WLS-IV results with the WLS results of column (4) in Table 9 shows that estimates almost tripled.

Although the overidentification test provides some confirmation of the validity of the instruments, there is some remaining concern with exclusion restrictions. In particular, the current share of indigenous population is highly correlated with the share in 1900. This will pose an identification problem if the current share of indigenous population is also correlated with firm level productivity. As suggested by Laeven and Woodruff (2008) I included the share of indigenous population in 2000 in the estimation and it turned out not to be statistically significant leaving the estimates and significance levels of the spillover and interaction variables unchanged.

As already mentioned, the lack of sectoral spillovers is consistent with previous studies using data from developing and emerging countries however, the existence of positive productivity spillovers at the regional level contrasts with the findings of Aitken and Harrison (1999) for Venezuela or recent evidence by Hale and Long (2007) using Chinese firm level data. The case of Mexico might in fact reflect positive agglomeration effects from FDI or be the result of a multicollinearity effect between the spillover variable and the measure of financial development. If foreign firms tend to locate in regions with better developed financial systems, the interaction term between the regional spillover variable and financial development will tend to

[39]As suggested by Tabellini (2005) the increase in the size coefficient after IV estimation, can be the result of measurement error in the financial development indicator or as indicated by Heckman (1997) the result of "heterogenous treatment effect". In the later case, if the instrument is correlated with the heterogeneity in the treatment, then IV estimates are inconsistent even with valid instruments.

overestimate the impact of MNC presence in that region. However, the correlation between these two variables is only 0.3418 and, as we will show later, foreign firms operating in Mexico do not seem to depend on the local banking system to finance their activities [40].

Despite the positive and significant coefficient on the interaction term, the direct effect from FDI is negative and therefore, the total effect from FDI is not linear and depends on the level of financial development. According to the F-test reported in Table 10, the null hypothesis that the spillover variable and interaction term are jointly insignificant is rejected by the data. The total effect of the spillover variable on firm level TFP is derived from equation (3) and is given by[41] $\beta_{total} = \beta_1 + \beta_2 * FinDev$. Figures 3 and 4 show the total effect and confidence intervals for the total sample of firms and that of domestic firms, corresponding to the estimated coefficients in columns (1) and (2) of Table 10, respectively. Results from considering the total sample of firms, indicate that the total spillover effect is only positive and statistically significant for financial development values greater than 0.806. Regarding the sample of domestic firms, the WLS-IV results reveal a loss in significance of the total positive spillover effect. Why do results for the total sample of firms and that of domestic firms differ? There are two possible explanations. The first one asks whether foreign firms crowd out domestic firms from the credit market and whether it is foreign firms that are to benefit from being located in a region with a well developed financial system. In fact, re-estimating column (1) in Table 10 including interaction terms between $spillover$, $spillover * FinDev$ and whether the firm is foreign owned or not confirms that this does not seem to be the case. The insignificance of the triple interaction term between whether the firm is foreign owned or not, the regional measure of spillovers and the indicator of financial development shows that there is no significantly different effect for foreign firms. Foreign firms do not appear to crowd out domestic firms from local access to credit. This finding is in line with previous empirical evidence by Desai, Foley and Hines (2004) who showed for a sample of US foreign affiliates that affiliates were financed with less external debt in countries with underdeveloped capital markets or weaker creditor

[40] The additional concern by which foreign firms might choose more developed regions to locate should be mitigated by the inclusion of regional fixed effects and GDP per capita.

[41] The corresponding standard errors are computed as
$sd(\beta_{total}) = \sqrt{Var(\beta_1) + FinDev^2 * Var(\beta_2) + 2FinDev * Cov(\beta_1, \beta_2)}$

rights. The second interpretation is methodological, since results are obtained by WLS attaching greater importance to larger firms, once only the sample of domestic firms is considered we are left with a subsample of firms with lower average number of workers[42] and therefore, the scope for positive spillovers conditional on financial development is also lower. Section 5.3.2 pays particular attention to the role of size and column (2) in Table 12 shows results when only the sample of medium and large firms is considered. Figure 5 shows the corresponding total effect and significance levels derived from these estimates. The threshold level of financial development above which FDI spillovers are positive is very similar to the one when considering the total sample of firms (0.898). There are 6 regions in which financial development values are high enough to foster positive and significant productivity spillovers from FDI (Guanajuato, Nayarit, Nuevo Leon, Sinaloa, Jalisco and Baja California Norte). In addition, the magnitude of the effect is economically meaningful, an exogenous 20 percent increase in the regional spillover variable (around one standard deviation of the regional spillover variable) would increase the productivity of medium and large domestic firms in a region with a well developed financial system like Durango (in the 75 percentile of the financial development distribution) by 17 percent compared to a region with low financial development levels like Michoacan (in the 25 percentile of the financial development distribution).[43]

2.5.3. Robustness Checks and Main Implications. So far I have shown evidence that larger firms located in financially developed regions manage to benefit from FDI in their same region. In what follows I will provide some robustness checks for the previous statement in particular for the sample of domestic firms. Table 11 shows the results from repeating the estimation in column (2) of Table 10 under different specifications that tackle potential estimation and interpretation concerns. All regressions are estimated by WLS-IV where instruments are the interaction between the spillover variable and the share of indigenous population and the FOGAIN data, respectively.

[42]The average number of employees for the sample of foreign firms is 670 while the corresponding figure for the sample of domestic firms is 282.

[43]This result is obtained from the coefficients from column (2) in Table 12 as:
$$Effect = (\beta_{Spillover*FinDev} * \Delta_{Spillover} * [FinDev_{High} - FinDev_{Low}]) * 100$$

Column (1) in Table 11 repeats the estimation excluding both HHN and GDP per capita, since they are rarely significant across specifications. There is no apparent change in the results, if anything coefficients on the interaction term and the spillover variables become more significant and the total effect is positive and significant for lower values of financial development. Therefore, by including HHN and GDP per capita we are obtaining a conservative measure of the total effect of foreign presence in a region conditional on regional financial development. Similarly, column (2) considers the possibility that GDP per capita could in itself be endogenous to financial development and therefore, it is substituted by regional population with again no significant change in the main results. Finally, there are some remaining concerns regarding whether the measure of financial development does actually capture financial development or some other broader regional characteristic. Column (3) re-estimates the same specification inserting a dummy variable equal to one for regions located in the South of Mexico. As suggested by Guiso et al (2004) this procedure is important in order to ascertain that the estimated effect is not simply a North-South difference. The South dummy is negative but not statistically significant and what is more important it does not impact the size of the coefficient of the interaction term. Nevertheless, columns (4) and (5) repeat the same regression using an alternative measure of financial development: the ratio of private credit to GDP in 2000 by state. A spearman rank correlation test rejects the hypothesis that this measure and the one we obtained from the linear probability model are independent. The main drawback of the credit to GDP measure is that due to internal reporting procedures at Mexican banks, part of the bank lending taking place outside Mexico City is attributed to the Federal District (Laeven and Woodruff (2008)). Column (4) confirms the previous findings and shows that there is a positive and significant effect from the interaction between foreign presence and financial development and a negative and significant direct effect from foreign presence in the region. Given that the measure of private credit to GDP overstate the bank activity in the Federal District, column (5) confirms that results are robust to excluding the observations from the Federal District.

Once the robustness of the main results has been confirmed it is possible to turn to the main implications of these findings. First, it seems reasonable to ask about

the importance of local financial markets. Second, I will analyze the importance of size.

2.5.3.1. *The Role of Financial Development.* Would spillovers have taken place regardless of the local financial market conditions? To answer this question Table 12 shows the results from estimating equation (1) both by OLS and WLS (which attaches greater weight to larger firms). When the total sample of firms is considered (columns (1) and (2)) the positive spillover effect from MNCs gains significance in the WLS estimation, underlying the importance of size. These results indicate that in general larger firms would benefit from MNCs operating in their same region regardless of local banking conditions. However, domestic firms would have not benefit unconditionally from foreign companies, not even larger domestic firms (see columns (3) and (4)). It is only once we condition on financial development (see columns (5) to (7) in Table 12) that there are positive productivity spillovers for domestic firms located in regions where access to credit is relatively easier.

In addition, despite the statistically insignificant results from OLS and WLS in columns (3) and (4), it is worth noting the sign discrepancy. Traditionally, the negative sign from OLS estimation was associated with the way the spillover measure is constructed. If domestic productivity is procyclical, a negative shock that translates in lower production of domestic firms but has no effect or takes time to affect the production of foreign firms could mistakenly be interpreted as a negative spillover effect from MNC presence (Aitken and Harrison (1999)). WLS and OLS estimations were repeated including the numerator and denominator of the spillover variable separately in the regression and similar results to the ones reported in Table 12 were obtained. Moreover, this explanation would have only accounted for the negative sign of the OLS results but would have not explained the positive spillover effects from WLS. The sign discrepancy between WLS and OLS estimation strategies might reflect the role of size or point to the possibility that WLS, by giving more weight to larger firms, hides two types of sample composition bias. First, if regions with low inflows of FDI are also characterized by a high proportion of small firms, which are usually endowed with lower productivity levels than larger firms, OLS will tend to find a negative effect of FDI on productivity that will not be present in the WLS estimation. Figure 6 plots the percentage of small firms by region against the extent of foreign presence in that region. It is clear that overall the relationship

is flat, except in the case of five regions: Baja California Sur (3), Campeche (4), Quintana Roo (23), Chiapas (7) and Colima (6). Excluding these regions from the estimation still reveals an insignificant but negative spillover effect for the sample of domestic firms and WLS estimation results remain unchanged. Second, the negative coefficient from OLS estimation might reflect sample selection. Cross-section studies focusing in the sample of domestic firms tend to find downward bias estimates of FDI spillovers. If foreign firms do not invest at random and choose the most productive domestic firms ("cherry picking" phenomenon), *expost* the TFP distribution of domestic firms is upper truncated. The higher the share of foreign firms in the sector or region, the lower the truncation point and hence, the more likely to find a negative effect from foreign presence. Given the difficulties in finding valid instruments, panel estimation studies have opted for fixed effect estimation hoping that unobserved firm level characteristics correlated with the presence of foreign firms are relatively fixed over time. The cross-section nature of the ENESTyC dataset makes it impossible to control for this dimension at this point however, section 5.4. presents panel fixed effects results for a subsample of firms that confirm the sample selection hypothesis (i.e. once individual fixed effects are controlled for the estimated coefficient on the spillover variable for the sample of domestic firms although not significant is positively signed (see columns (1) and (4) in Table 14).

Most importantly, results in Table 12 highlight the importance of local credit markets for domestic firms. In the absence of a good financial system we would have found no significant effect of foreign companies on domestic firm level productivity. Moreover, results repeating the estimation in column (2) but adding an interaction term between whether the firm is foreign owned or not and the spillover variable turned out to be positive and highly significant, showing that foreign firms tend to benefit more from the presence of other foreign firms than domestic firms, irrespective of local credit conditions. This in turn favors the hypothesis outlined in the previous section by which foreign firms do not depend as much on local financial market conditions in order to finance their investment projects.

2.5.3.2. *The Role of Size.* The previous results suggest the existence of regional FDI spillovers given relatively good state level access to credit and firm size. Table 13 shows how relevant firm size is in the previous findings. Considering the sample of domestic firms only, columns (1) and (2) repeat the estimation for the sample

of small (between 16 and 100 employees) and medium and large firms (more than 100 employees), respectively[44]. It is clear that the positive regional spillover effect conditioned on financial development is due to medium and large firms. These results reinforce the hypothesis that positive spillovers are concentrated in larger firms, which is consistent with theories in which larger firms are able to compete more efficiently with foreign entrants or where the technology gap between large domestic firms and foreign entrants is relatively smaller. In fact, following Girma (2005) I define the absorptive capacity of a firm as the ratio between its own productivity and the productivity of a firm in the 99 percentile of the productivity distribution within an industry[45]. In theory, we would expect firms with higher absorptive capacity to benefit more from the presence of foreign companies and this is actually, what it is shown in column (4) of Table 13. According to these results, FDI will have a higher positive impact on the productivity levels of those firms with higher absorptive capacities. Contrary to the findings of Aghion, Blundell, Griffith, Howitt and Prantl (2006) including a sectoral measure of the technology gap between domestic and foreign firms did not turn out to be significant, meaning that in the case of Mexico irrespective of the technology endowment of the sector is the firm specific technology gap that matters for FDI spillovers. Moreover, we would expect the effect of FDI to be even greater for firms with higher absorptive capacities that have relative good access to credit. Hence, column (5) in Table 13 shows the effect of FDI on firm level productivity conditioned on firm's absorptive capacity and regional financial development. A test for the joint significance of the terms involving the spillover variable cannot be rejected which in turn confirms the hypothesis that FDI is more relevant for firms operating close to the sector technology frontier and with better prospect of accessing credit.

However, there are some caveats associated to these results. First, it is somewhat counterintuitive to think that larger firms are the ones benefiting from better access to credit provided that usually these firms are less financially constrained. It is reasonable to think that larger firms can finance their investment projects internally

[44]Size categories are the official ones provided by INEGI however, although not the scope of this paper a more thorough analysis of the cutoff points could follow a threshold regression analysis approach.

[45]Girma (2005) uses the maximum productivity level and corrects for outliers ex-post. By taking the 99 percentile I expect to avoid the problem of outliers.

or can more easily tap the local banking system. In fact, column (3) in Table 13 shows that the result does not hold for the sample of very large firms[46]

Second, one could be concerned that this evidence corresponds to a situation in which smaller firms tend to locate in or are the result of less financially developed regions. If this was the case, the lack of positive spillovers in less financially developed regions does not arise from worse conditions in accessing credit but from the abundance of small firms that will not in any case benefit from the MNC presence. Figure 7 shows the correlation between the percentage of small firms by region and the financial development indicator and it rules out this possibility. The percentage of small firms is roughly the same regardless of the financial development indicator values and, it is only particularly high in some regions characterized by medium financial development indicator values[47]. The only problematic region a priori would be Colima (6) that is characterized by low levels of financial development and a high proportion of small firms. I repeated the estimation excluding the observations from Colima with no apparent statistical different results.

Finally, as already mentioned, there are some issues related to the use of cross-section data. In particular, the potential bias associated to unobserved firm specific characteristics, especially when considering the sample of domestic firms. However, once the importance of size has been highlighted and in particular once it has been confirmed that it is medium and large firms that are to benefit from regional FDI and financial development, it is possible to consider a subsample of mainly large and medium firms in a panel context.

2.5.4. Panel Fixed Effect Results. The advantage of focusing on large and medium firms is that it is possible to link firms across the three different surveys, 1991, 1999 and 2001 and have a balanced panel of firms with data for 1991, 1997,

[46]The threshold level of 500 employees was chosen based on the facts that the average size within the sample of large firms (those with more than 250 employees) is 620 employees and the median is 450 employees.

[47]This evidence seems to contradict a priori the Laeven and Woodruff (2008) results. They find that lower quality institutions limit the size of an entrepreneur's firm. However, the difference might be the result of the different samples used. While here the paper focus on manufacturing firms, Laeven and Woodruff (2008) use census data including manufacturing, commerce, services and construction sectors. In fact, they show that changes in the quality of the legal system impact sectors where proprietorships predominate (such as services) more than sectors where corporations predominate (such as manufacturing of basic metals).

1998, 1999 and 2000[48]. Having a panel of firms allows to control for firm-specific unobservable characteristics that do not vary over time and therefore, partially tackles the potential endogeneity of foreign acquisitions (cherry picking).

The total number of firms that could be linked across surveys is 945. Table 14 reports the results from panel fixed effect estimation. It turned out that being foreign owned or not was not a significant determinant of firm level productivity however, the percentage of foreign capital owned by a foreign investor had a positive and significant effect and was therefore, the variable included in the estimation. This result confirms previous empirical findings in which the extent of foreign ownership mattered for FDI spillovers (see Javorcik (2004)). Results corroborate the findings of the cross-section estimation even after instrumenting for financial development. Figure 8 reports the total effect when all sampled firms are considered corresponding to the FE-IV estimation in column (3). Similarly, Figure 9 shows the total effect associated with coefficients in column (6) of Table 14 for the sample of domestic firms. Comparing Figure 3 (WLS-IV estimation for the subsample of medium and large domestic firms) and Figure 9 (FE-IV estimation for the subsample of domestic firms) shows the same threshold level of financial development above which domestic firms benefit from FDI. Moreover, the overall economic impact is also highly similar. Repeating the same exercise as in section 5.2., an exogenous increase in the regional spillover variable of 20 percent would increase the productivity of domestic firms in a region with relative good access to credit by 14 percent compared to domestic firms in regions with low financial development values.

2.6. Conclusion

During the last two decades developing and emerging countries have implemented policies to attract FDI flows as a means of development and growth. This competition for FDI flows is based on the believe that the growth-enhancing effects of FDI go beyond the natural increase in the capital stock of the host country and involve spillovers stemming from the introduction of new processes and technologies by foreign affiliates. Despite theoretical predictions regarding the positive externalities of FDI, in general, in the case of emerging and developing countries empirical studies find no evidence of horizontal or regional FDI spillovers taking place. This

[48]The sample design of the ENESTyC surveys guarantees that medium and large firms are included with certainty.

is the case of Mexico, which despite large flows of FDI and the consolidation of the openness process during the 90s through the NAFTA agreement, has not been able to reap off the benefits of globalization.

Results in this study confirm that in contrast to previous empirical findings, in Mexico, there is a positive spillover effect from MNCs operating in the same region, conditioned on firm size. In the case of domestic firms they do not only need to be large but also operate in a region with a well functioning financial system. A 20 percent increase in the FDI spillover variable would increase the productivity of domestic firms in financially advanced regions by 17 percent compared to domestic firms located in less financially developed regions.

The results of this paper suggest that countries involved in the process of attracting FDI should not disregard policies aimed at improving local financial market conditions. Maximum benefits could be attained through the right combination of policies fostering the attraction of foreign capital flows and reasonable access to credit by domestic firms.

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APPENDIX A

Data

-***Output***: Manufacturing plants: Value of production priced at "factory price"(ENESTyC). Maquila plants (99/01): Value of production in pesos according to the exch. Rate in place at the moment of the transaction (ENESTyC). - ***Labor***: Average number of workers (ENESTyC). - ***Materials***: Expenditure in materials (ENESTyC) -***Capital***: Value of Total Assets (ENESTyC). -***Age***: Number of years since the beginning of operation (ENESTyC). ***Foreign***: Dummy equal 1 if the capital owned by foreign investors is more than 10% (ENESTyC). -***Exporter***: Dummy equal 1 if firm sells to non domestic markets (ENESTyC). -***Group***: Dummy equal 1 if the firm belongs to a group (ENESTyC). -***SectCred***: Share of commercial credit on value of production by sector of activity (Central Bank of Mexico and INEGI). -***ExtDepen***: External Depedence Index (Rajan and Zingales (1998)). -***FOGAIN***: Variable that equals one in sectors 31, 32, 35, 37 and 383 (Electrical Apparel) (Own Construction). -***Fogainpop***: Credit allocated by NAFINSA from 1960 to 1989 by state and normalized by population (Juan Estrada Calderon from NAFINSA reports) -***Indigenous1900***: Share of indigenous population in total population in 1900 (Laeven and Woodruff (2007)) -***lGDPpc***: Logarithm of GDP per capita by state level expressed in constant pesos of 1993 (INEGI).

APPENDIX B

Cleaning Procedure

The following establishments were removed: 1. Establishments that report zero or missing values for Output, Materials, Average employment and/or Total Assets. This means removing a total of 216 firms in 1992, 822 in 1999 and 640 in 2001. 2. Establishments fully or partially owned by the government. 3. In order to make more comparable the surveyed samples in 1992, 1999 and 2001, I remove establishments in sector 3511 "Basic Petrochemicals" and sector 3530 "Oil refinery" because these sectors were only included in the 2001 survey.

In addition, following Angrist and Krueger (1999) I winsorize the main variables at the tails. The key variables are the real value of output, the real value of materials expenditure, the real value of total assets and the average number of workers. I replace values in the lower and upper 1% tails with values at the 1st and 99th percentiles, respectively. However, I use different samples to determine the critical values. In the case of real assets and average number of employees I consider the distribution of all firms included in the sample. Since maquila establishments use mainly imported materials in their production process and I have use different price deflators for domestic and imported materials, I winsorize differently the variable real materials for the sample of maquila plants and the sample of nonmaquila plants. Finally, regarding the process of winsorizing real output first, I winsorize the real output corresponding to the sample of all firms included in the 1992 survey and only those included in the manufacturing surveys of 1999 and 2001. Second, I winsorize real output for the sample of maquila plants identified in 1999 and 2001.

APPENDIX C

Price Index

Ideally, for output, materials and capital we would need data on physical quantities rather than values. Unfortunately this data is not available in the ENESTyC survey hence, in order to approximate quantities and express all monetary variables in real terms I use industry wide price index deflators.

Output: I express the value of production priced at the "factory" price (venta de fabrica) in pesos of 2003 using producer price index (PPI) data breakdown by industry, facilitated by the Central Bank of Mexico. The Central Bank of Mexico uses a different industry classification (CMAE, Clasificacion Mexicana de Actividades Mexicanas) than the one used in the ENESTyC (CMAP). I use a table of correspondence between CMAE and CMAP provided by INEGI and a PPI deflator at the branch level. In order to obtain the PPI at the branch level, for each branch I take the average over the corresponding classes belonging to that branch. In addition, I deflate differently output from maquila plants included in the surveys of 1999 and 2001. In these two years, the survey was conducted separately for manufacturing and exporting maquila plants. The questionnaire was the same for both types of plants and therefore all variables of interest are equivalent except for the value of production. In fact, rather than providing the value of production priced at the factory price, maquila plants were required to provide the value of production in pesos according to the exchange rate in place at the moment of the commercial transaction. There is no export price deflator breakdown by industry readily available so I follow Lach, Roberts and Tybout (1998) and Fernandes and Isgut (2005) in the construction of export price indexes. As in Lach et at (1998) I use data from the United Nations COMTRADE database on the values and quantities of manufactured exports from Mexico to the rest of the world by product category, and I conduct the following exercise. First, I develop a correspondence between the UN ISIC Rev3 classification and the Mexican CMAP branch classification by careful examination of the product descriptions in each system. Second, I compute unit

export values for each ISIC category by dividing the trade value figures by the trade quantity figures. These unit export values are expressed in current US dollars so I convert them into unit values in pesos using the average nominal ER between peso and dollar. Third, following Fernandes and Isgut (2005) I regress the log of the unit export price on 2-digit sector dummies, year dummies and year-sector fixed effects. The estimation is done by weighted least squares, with weights corresponding to the square root of the share of each product category trade value in the total 2-digit sector trade value. From this regression I obtain predicted log unit export prices for each UN ISIC Rev3 category. Finally, using the previous weights and the correspondence between the ISIC classification and the CMAP classification I compute a weighted average of the predicted unit values belonging to the same 2-digit sector CMAP classification. I normalize the export price series for each industry to the same base year as the domestic producer price index.

Materials: I express the expenditure in materials in pesos of 2003 using a materials price index (MPI) provided by the Central Bank of Mexico. In particular, I use the MPI according to which sector consumes those materials. Again, the industry classification of the Central Bank of Mexico is the CMAE and I use the same previous table of correspondence between CMAE and CMAP to obtain the CMAP figures at the branch level. Although this price index might be relevant for plants that buy their materials domestically it might as well be misleading in the case of plants that import most of their raw materials. To avoid such a bias, I use different price indexes for the expenditure in materials paid at home and the expenditure in imported materials. To obtain a price index for imports at the CMAP branch level I follow the same procedure as for the export price index, this time using Mexican imports from the rest of the world by product category.

Capital: The ENESTyC survey does not differentiate among different types of capital stock and therefore I use the PPI to deflate the value of total assets.

APPENDIX D

Tables

TABLE 1 — BASIC CHARACTERISTICS OF THE SAMPLE

Panel A: Number of firms by size and year			
	1991	1998	2000
Large	1,701	2,177	2,195
Medium	1,548	1,814	1,942
Small	942	1,098	1,648
Micro	528	1,434	2,243
Total	4,719	6,523	8,028
Panel B: Foreign Ownership Statistics			
	1991	1998	2000
Domestic	3,223	3,916	4,547
Foreign	968	1,173	1,238
Total	4,191	5,089	5,785
% Employment(a)	36	41	42
% Output(b)	39	42	52
Maquila (Total)	383	572	588
Maquila (Foreign)	306	467	453

(a) Percentage of Employment in Foreign Plants

(b) Percentage of Output produced by Foreign Plants

TABLE 2A — SHARE OF FOREIGN OUTPUT BY INDUSTRY

code	Sector	1991	1998	2000
31	Food, Beverages and Tobacco	0.19	0.17	0.19
32	Textiles	0.18	0.34	0.35
33	Wood products	0.15	0.27	0.27
34	Paper and Printing products	0.35	0.20	0.26
35	Chemicals	0.58	0.52	0.57
36	Non Metallic Mineral Products	0.10	0.18	0.26
37	Basic Metals	0.10	0.08	0.07
38	Machinery and Equipment	0.56	0.68	0.74
39	Other Manufacturing	0.25	0.35	0.46

Table 2B — Share of Foreign Output by Region

code	State	1991	1998	2000
1	Aguascalientes	0.19	0.41	0.44
2	BCN	0.73	0.75	0.80
3	BCS	0.05	0.29	0.19
4	Campeche	0.00	0.13	0.02
5	Coahuila	0.23	0.50	0.50
6	Colima	0.00	0.00	0.41
7	Chiapas	0.00	0.19	0.23
8	Chihuahua	0.70	0.79	0.77
9	DF	0.47	0.46	0.42
10	Durango	0.10	0.32	0.22
11	Guanajuato	0.15	0.21	0.28
12	Guerrero	0.01	0.01	0.03
13	Hidalgo	0.10	0.23	0.21
14	Jalisco	0.34	0.26	0.38
15	Edo	0.37	0.34	0.39
16	Michoacan	0.08	0.06	0.12
17	Morelos	0.68	0.71	0.74
18	Nayarit	0.00	0.09	0.27
19	Nuevo	0.22	0.33	0.45
20	Oaxaca	0.01	0.00	0.00
21	Puebla	0.13	0.29	0.35
22	Queretaro	0.49	0.46	0.57
23	Quintana	0.00	0.20	0.00
24	San	0.19	0.24	0.34
25	Sinaloa	0.02	0.00	0.03
26	Sonora	0.33	0.66	0.68
27	Tabasco	0.33	0.04	0.00
28	Tamaulipas	0.73	0.78	0.87
29	Tlaxcala	0.27	0.27	0.34
30	Veracruz	0.17	0.26	0.30
31	Yucatan	0.06	0.03	0.19
32	Zacatecas	0.04	0.03	0.25

Table 3 — Production Function Estimates

	Sector 31			Sector 32			Sector 33			Sector 34			Sector 35		
	OLS	LP	ACF	OLS	LP	ACF	OLS	LP	ACF	OLS	LP	ACF	OLS	LP	ACF
bL	0.405***	0.312***	0.364***	0.712***	0.449***	0.674***	0.645***	0.417***	0.632***	0.716***	0.430***	0.478***	0.543***	0.414***	0.676***
	(0.022)	(0.018)	(0.022)	(0.024)	(0.018)	(0.024)	(0.071)	(0.045)	(0.067)	(0.055)	(0.042)	(0.044)	(0.028)	(0.022)	(0.028)
bM	0.645***	0.773***	0.502***	0.541***	0.393***	0.495***	0.590***	0.715***	0.543***	0.609***	0.034	0.550***	0.586***	0.000	0.545***
	(0.017)	(0.127)	(0.016)	(0.014)	(0.151)	(0.013)	(0.032)	(0.238)	(0.022)	(0.030)	(0.180)	(0.023)	(0.019)	(0.279)	(0.020)
bK	0.237***	0.240***	0.176***	0.169***	0.172***	0.024**	0.147***	0.259**	0.005	0.123***	0.148**	0.083***	0.235***	0.098**	0.076***
	(0.014)	(0.055)	(0.016)	(0.011)	(0.038)	(0.012)	(0.029)	(0.114)	(0.033)	(0.018)	(0.053)	(0.017)	(0.015)	(0.044)	(0.019)
obs	2885	5770	5770	2617	5234	5234	597	1194	1194	1064	2128	2128	2344	4688	4688

	Sector 36			Sector 37			Sector 38			Sector 39		
	OLS	LP	ACF	OLS	LP	ACF	OLS	LP	ACF	OLS	LP	ACF
bL	0.372***	0.346***	0.336***	0.543***	0.379***	0.640***	0.768***	0.590***	0.704***	0.697***	0.520***	0.599***
	(0.047)	(0.042)	(0.034)	(0.070)	(0.059)	(0.224)	(0.019)	(0.017)	(0.018)	(0.094)	(0.061)	(0.091)
bM	0.801***	0.651***	0.679***	0.652***	0.305**	0.616***	0.516***	0.000	0.368***	0.468***	0.332	0.353***
	(0.027)	(0.131)	(0.050)	(0.032)	(0.212)	(0.096)	(0.012)	(0.059)	(0.016)	(0.051)	(0.269)	(0.033)
bK	0.091***	0.071	0.104***	0.161***	0.067	0.039	0.183***	0.153***	0.124***	0.271***	0.218	0.143***
	(0.019)	(0.092)	(0.038)	(0.028)	(0.091)	(0.145)	(0.010)	(0.045)	(0.015)	(0.031)	(0.131)	(0.037)
obs	694	1388	1388	387	774	774	4233	8466	8466	244	488	488

Notes: OLS: Ordinary Least Squares; LP: Levinhson and Petrin; ACF: Ackerberg, Caves and Frazer. Standard errors in parenthesis. ACF bootstrapped using 1000 replications. * Significant at the 10-percent level;** Significant at the 5-percent level;*** Significant at the 1-percent level.

Table 4 — Regional Distribution of Firms with Financing Problems

code	State	Total	NLF	LF	%LF
1	Aguascalientes	317	265	52	16.4
2	BCN	389	376	13	3.3
3	BCS	33	28	5	15.2
4	Campeche	35	27	8	22.9
5	Cohauila	380	346	34	8.9
6	Colima	27	17	10	37.0
7	Chiapas	85	65	20	23.5
8	Chihuahua	452	427	25	5.5
9	DF	1,886	1,669	217	11.5
10	Durango	230	200	30	13.0
11	Guanajuato	607	559	48	7.9
12	Guerrero	111	84	27	24.3
13	Hidalgo	177	153	24	13.6
14	Jalisco	1007	910	97	9.6
15	Edo Mexico	1781	1590	191	10.7
16	Michoacan	247	195	52	21.1
17	Morelos	138	118	20	14.5
18	Nayarit	27	24	3	11.1
19	Nuevo Leon	1,030	978	52	5.0
20	Oaxaca	78	48	30	38.5
21	Puebla	568	452	116	20.4
22	Queretaro	275	248	27	9.8
23	Quintana Roo	26	21	5	19.2
24	San Luis Potosi	249	226	23	9.2
25	Sinaloa	140	125	15	10.7
26	Sonora	225	210	15	6.7
27	Tabasco	38	30	8	21.1
28	Tamaulipas	300	287	13	4.3
29	Tlaxcala	156	124	32	20.5
30	Veracruz	281	230	51	18.1
31	Yucatan	204	170	34	16.7
32	Zacatecas	75	61	14	18.7
	Total	11,574	10,263	1,311	11.3

Notes: NLF: Firms that did not lacked financial resources. LF: Firms that lacked financial resources. %LF: Percentage of firms that lacked financial resources.

Table 5 — Sectoral Distribution of Firms with Financing Problems

	Sector	Total	NLF	LF	%LF
31	Food, Beverages and Tobacco	2,358	2,053	305	12.9
32	Textiles	1,830	1,639	191	10.4
33	Wood Products	643	511	132	20.5
34	Paper and Printing Products	760	668	92	12.1
35	Chemicals	1,600	1,507	93	5.8
36	Non Metallic Mineral Products	683	517	166	24.3
37	Basic Metals	233	215	18	7.7
38	Machinery and Equipment	3,252	2,977	275	8.5
39	Other Manufacturing	215	176	39	18.1
	Total	11,574	10,263	1,311	11.3

Notes: NLF: Firms that did not lacked financial resources. LF: Firms that lacked financial resources. %LF: Percentage of firms that lacked financial resources.

Table 6 — The Determinants of Limited Access to Credit (Dependent Variable: "LackFin")

	LackFin
Age	-0.0022***
	(0.0005)
Age2	0.00002***
	(0.0000)
Labor	-0.00004***
	(0.0000)
Foreign	-0.0101
	(0.0072)
Group	-0.0519***
	(0.0057)
Exporter	-0.0936***
	(0.0093)
SectCred	-2.9504**
	(1.0816)
ExtDepen	-0.4736**
	(0.2286)
FOGAIN	-0.5110**
	(0.2118)
Obs	11,565

Notes: Robust standard errors clustered for each region are presented in parenthesis. Regression includes industry, year and region fixed effects. *Significant at the 10-percent level; ** Significant at the 5-percent level;*** Significant at the 1-percent level.

Table 7 — The Financial Development Indicator

code	State	Coeff. Regional Dummy	Financial Development Indicator
11	Guanajuato	-0.253	1
18	Nayarit	-0.251	0.991
19	Nuevo Leon	-0.238	0.941
25	Sinaloa	-0.236	0.934
14	Jalisco	-0.230	0.909
2	BCN	-0.227	0.898
26	Sonora	-0.217	0.856
10	Durango	-0.208	0.821
28	Tamaulipas	-0.205	0.810
24	San Luis Potosi	-0.205	0.809
8	Chihuahua	-0.204	0.806
22	Queretaro	-0.199	0.784
9	DF	-0.192	0.760
15	Edo Mexico	-0.192	0.759
13	Hidalgo	-0.191	0.756
5	Cohauila	-0.191	0.756
12	Guerrero	-0.189	0.748
17	Morelos	-0.184	0.729
32	Zacatecas	-0.178	0.705
3	BCS	-0.170	0.672
23	Quintana Roo	-0.169	0.666
1	Aguascalientes	-0.167	0.658
31	Yucatan	-0.163	0.642
16	Michoacan	-0.156	0.615
30	Veracruz	-0.153	0.605
27	Tabasco	-0.151	0.598
21	Puebla	-0.150	0.593
4	Campeche	-0.122	0.481
7	Chiapas	-0.121	0.479
29	Tlaxcala	-0.114	0.449
6	Colima	-0.013	0.052
20	Oaxaca	0.000	0

Table 8 — FDI Sectoral Productivity Spillovers and Financial Development

	All		Domestic	
	(1) Output	(2) Productivity	(3) Output	(4) Productivity
Foreign	0.225***	0.129***		
	(0.033)	(0.035)		
Spillover	-0.004	-0.004	-0.005	-0.004
	(0.004)	(0.004)	(0.003)	(0.003)
Spillover*FinDev	0.010**	0.009*	0.007*	0.006
	(0.005)	(0.005)	(0.004)	(0.004)
HHN	-0.144	-0.320	0.043	-0.073
	(0.192)	(0.208)	(0.134)	(0.139)
lGDPpc	1.703***	1.902***	0.426	0.505
	(0.528)	(0.552)	(0.451)	(0.482)
cons	-15.050***	-18.171***	-2.875	-4.765
	(5.082)	(5.328)	(4.352)	(4.675)
Obs	15,043	15,043	11,673	11,673
R2	0.859	0.2025	0.8876	0.2214

Notes: Standard errors in parenthesis have been corrected for clustering at the 4 digit sector level. In columns (1) and (3) the dependent variable is ln firm output and the right hand side includes ln labor, ln materials and ln capital. In columns (2) and (4) the dependent variable is normalized TFP from the ACF estimation. All regressions include 4 digit sector, region and time fixed effects. Weights in the WLS estimation are firm share of employment in total 4-digit sectoral employment.

Table 9 — FDI Regional Productivity Spillovers and Financial Development

	All		Domestic	
	(1) Output	(2) Productivity	(3) Output	(4) Productivity
Foreign	0.238***	0.141***		
	(0.033)	(0.033)		
Spillover	-0.016*	-0.016	-0.015**	-0.017**
	(0.009)	(0.010)	(0.006)	(0.007)
Spillover*FinDev	0.028**	0.027**	0.020**	0.022**
	(0.012)	(0.013)	(0.009)	(0.010)
HHN	0.053	-0.134	0.051	-0.035
	(0.203)	(0.223)	(0.161)	(0.175)
lGDPpc	1.460*	1.676**	0.349	0.440
	(0.738)	(0.765)	(0.274)	(0.268)
cons	-12.826*	-16.109**	-2.085	-4.066
	(7.119)	(7.380)	(2.640)	(2.600)
Obs	15,043	15,043	11,673	11,673
R2	0.8586	0.2008	0.8876	0.2213

Notes: Standard errors in parenthesis have been corrected for clustering at the region time level. In columns (1) and (3) the dependent variable is ln firm output and the right hand side includes ln labor, ln materials and ln capital. In columns (2) and (4) the dependent variable is normalized TFP from the ACF estimation. All regressions include 4 digit sector, region and time fixed effects. Weights in the WLS estimation are firm share of employment in total 4-digit sectoral employment.

TABLE 10 — FDI REGIONAL PRODUCTIVITY SPILLOVERS AND FINANCIAL DEVELOPMENT: INSTRUMENTAL VARIABLE APPROACH
(Dependent variable: Normalized firm total factor productivity from ACF estimation)

	(1) All	(2) Domestic
Foreign	0.141***	
	(0.032)	
Spillover	-0.047**	-0.031**
	(0.019)	(0.012)
Spillover*FinDev	0.066***	0.039**
	(0.025)	(0.016)
HHN	-0.132	-0.052
	(0.222)	(0.172)
lGDPpc	1.608**	0.402
	(0.774)	(0.276)
First Stage: Spillover*FinDev		
Indigenous1900*spillover	-0.452***	-0.309***
	(0.106)	(0.049)
Fogainpop*Spillover		0.108***
		(0.016)
Spillover	0.829***	0.694***
	(0.020)	(0.023)
HHN	-0.021	0.144
	(0.156)	(0.138)
lGDPpc	0.724	-0.375
	(2.015)	(1.393)
Foreign	0.009	
	(0.013)	
Hansen (p-value)		0.540
F-test	396.710	509.040
Joint Significance (p-value)	0.009	0.040
Partial R2	0.243	0.461
R2	0.199	0.221
Obs	15,043	11,673

Notes: Standard errors in parenthesis have been corrected for clustering at the region-time level. All regressions include 4 digit sector, region and time fixed effects. Weights in the WLS estimation are firm share of employment in total 4-digit sectoral employment. * Significant at the 10-percent level; ** Significant at the 5-percent level; *** Significant at the 1-percent level

TABLE 11 — ROBUSTNESS CHECKS: SAMPLE OF DOMESTIC FIRMS
(Dependent variable: Normalized firm total factor productivity from ACF estimation)

	(1)	(2)	(3)	(4)	(5)
Spillover	-0.033***	-0.032***	-0.031**	-0.009***	-0.008***
	(0.012)	(0.012)	(0.012)	(0.003)	(0.003)
Spillover*FinDev	0.043***	0.043***	0.039**	0.061**	0.063***
	(0.016)	(0.016)	(0.016)	(0.024)	(0.024)
HHN		-0.053	-0.052	-0.054	0.068
		(0.170)	(0.172)	(0.170)	(0.210)
lGDPpc			0.402	0.543	0.438
			(0.276)	(0.264)	(0.292)
lpop		0.029			
		(0.276)			
South			-0.060		
			(0.148)		
Hansen (p-value)	0.522	0.519	0.540	0.518	0.525
F-test	539.04	492.29	509.04	3251.45	3052.37
Joint Significance (p-value)	0.024	0.031	0.040	0.030	0.013
R2	0.220	0.220	0.221	0.222	0.219
Obs	11,673	11,673	11,673	11,673	9,273

Notes: Standard errors in parenthesis have been corrected for clustering at the region time level. All regressions include 4 digit sector, region and time fixed effects. Weights in the WLS estimation are firm share of employment in total 4-digit sectoral employment. WLS-IV: Weighted least squares- instrumental variable approach. Instruments are $spillover * indigenous1900$ and $spillover * fogainpop$. Columns (4) and (5) use as measure of financial development, commercial credit by region as a percentage of regional GDP.

TABLE 12 — REGIONAL FDI SPILLOVERS: THE ROLE OF FINANCIAL DEVELOPMENT
(Dependent variable: Normalized firm total factor productivity from ACF estimation)

	All		Domestic				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	WLS	OLS	WLS	OLS	WLS	WLS-IV
Foreign	0.115***	0.141***					
	(0.020)	(0.032)					
Spillover	0.003*	0.005**	-0.001	0.0002	-0.012**	-0.017**	-0.031**
	(0.002)	(0.003)	(0.002)	(0.002)	(0.006)	(0.007)	(0.012)
Spillover*FinDev					0.014*	0.022**	0.039**
					(0.008)	(0.010)	(0.016)
HHN	0.058	-0.136	0.133	-0.029	0.134	-0.035	-0.052
	(0.104)	(0.223)	(0.095)	(0.177)	(0.095)	(0.175)	(0.172)
lGDPpc	0.788	1.724**	0.088	0.492*	0.053	0.440	0.402
	(0.524)	(0.753)	(0.200)	(0.266)	(0.202)	(0.268)	(0.276)
Hansen (p-value)							0.540
F-test							509.040
Joint Significance (p-value)						0.0624	0.040
R2	0.165	0.2001	0.169	0.2208	0.1694	0.2213	0.221
Obs	15,043	15,043	11,673	11,673	11,673	11,673	11,673

Notes: Standard errors in parenthesis have been corrected for clustering at the region time level. All regressions include 4 digit sector, region and time fixed effects. Weights in the WLS estimation are firm share of employment in total 4-digit sectoral employment. Columns (4) corresponds to column (5) in Table 9 and Column (5) corresponds to column (2) in Table 10.

Table 13 — The Role of Size and Absorptive Capacity: Sample of Domestic Firms
(Dependent variable: Normalized firm total factor productivity from ACF estimation)

	Size			Absorptive Capacity	
	(1) Small	(2) Medium /Large	(3) +500	(4) Total Domestic	(5) Total Domestic
Spillover	-0.001	-0.030**	-0.030	-0.001	-0.044***
	(0.012)	(0.012)	(0.019)	(0.001)	(0.016)
Spillover*FinDev	0.002	0.040**	0.041		0.055***
	(0.015)	(0.016)	(0.026)		(0.021)
AbsCap				0.130*	0.139
				(0.073)	(0.322)
AbsCap*Spillover				0.003**	0.0002
				(0.002)	(0.020)
AbsCap*FinDev					0.024
					(0.397)
AbsCap*Spillover*FinDev					0.003
					(0.025)
HHN	0.299**	-0.139	-0.316	0.250	0.275*
	(0.130)	(0.197)	(0.283)	(0.162)	(0.155)
lGDPpc	0.534	0.344	0.531	0.185	0.003
	(0.326)	(0.299)	(0.794)	(0.240)	(0.249)
Hansen (p-value)	0.233	0.734	0.361		0.145
F-test	147.014	491.469	84.911		15.255
$JointSignificance^1$	0.984	0.039	0.285		0.019
$JointSignificance^2$				0.000	0.000
$JointSignificance^3$				0.031	0.022
R2	0.263	0.232	0.245	0.324	0.326
Obs	3,406	8,292	1,637	11,673	11,673

Notes: Standard errors in parenthesis have been corrected for clustering at the region time level. The dependent variable is normalized TFP from the ACF estimation. All regressions include 4 digit sector, region and time fixed effects. Columns (1) and (2) have estimated by weighted least squares where weights are firm share of employment in total 4-digit sectoral employment. *AbsCap* refers to the variable $AbsorptiveCapacity$. $JointSignificance^1$ refers to a test for the joint significance of spillover and spillover*FinDev. $JointSignificance^2$ refers to a test for the joint significance of AbsCap, AbsCap*Spillover,AbsCap*FinDev and AbsCap*Spillover*FinDev. $JointSignificance^3$ refers to a test for the joint significance of spillover, spillover*FinDev, AbsCap*Spillover and AbsCap*Spillover*FinDev. * Significant at the 10-percent level; ** Significant at the 5-percent level; *** Significant at the 1-percent level

TABLE 14 — PANEL FIXED EFFECT ESTIMATION
(Dependent variable: Normalized firm total factor productivity from ACF estimation)

	All			Domestic		
	(1)	(2)	(3)	(4)	(5)	(6)
	FE	FE	FE-IV	FE	FE	FE-IV
Foreign	0.001*	0.001*	0.001*			
	(0.001)	(0.001)	(0.001)			
Spillover	0.002	-0.014**	-0.016***	0.001	-0.021***	-0.027***
	(0.001)	(0.005)	(0.006)	(0.001)	(0.007)	(0.010)
Spillover*FinDev		0.019***	0.022***		0.027***	0.034***
		(0.006)	(0.008)		(0.008)	(0.012)
HHN	0.328	0.308	0.305	0.170	0.171	0.165
	(0.219)	(0.216)	(0.211)	(0.159)	(0.153)	(0.150)
lGDPpc	-0.298	-0.394	-0.410	-0.029	-0.170	-0.186
	(0.396)	(0.348)	(0.346)	(0.397)	(0.330)	(0.333)
Hansen (p-value)			0.000			0.165
F-test			209.64			182.48
Joint Significance (p-value)		0.0009	0.0089		0.0004	0.0135
R2-within	0.1014	0.104	0.104	0.107	0.113	0.112
Groups	945	945	945	834	834	834
Obs	4,725	4,725	4,725	3,877	3,877	3,877

Notes: Standard errors in parenthesis have been corrected for clustering at the region time level. The dependent variable is normalized TFP from the ACF estimation. All regressions include time fixed effects.* Significant at the 10-percent level;** Significant at the 5-percent level;*** Significant at the 1-percent level.

APPENDIX E

Figures

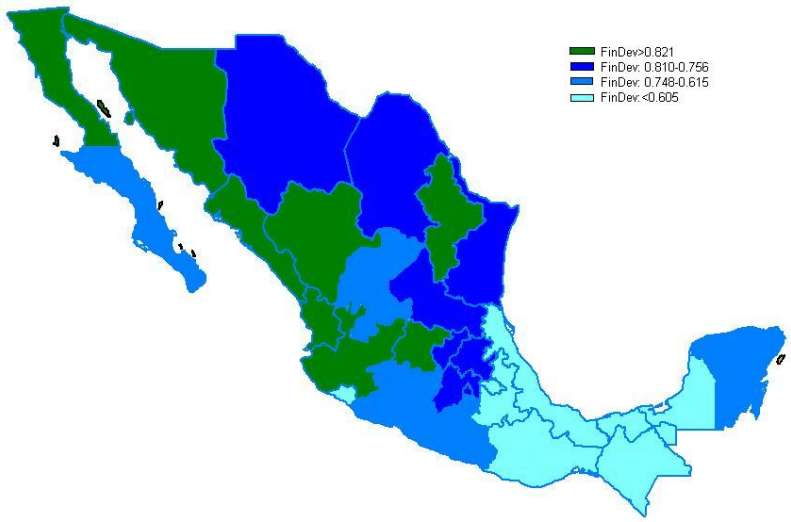

FIGURE E.1. Financial Development by Region

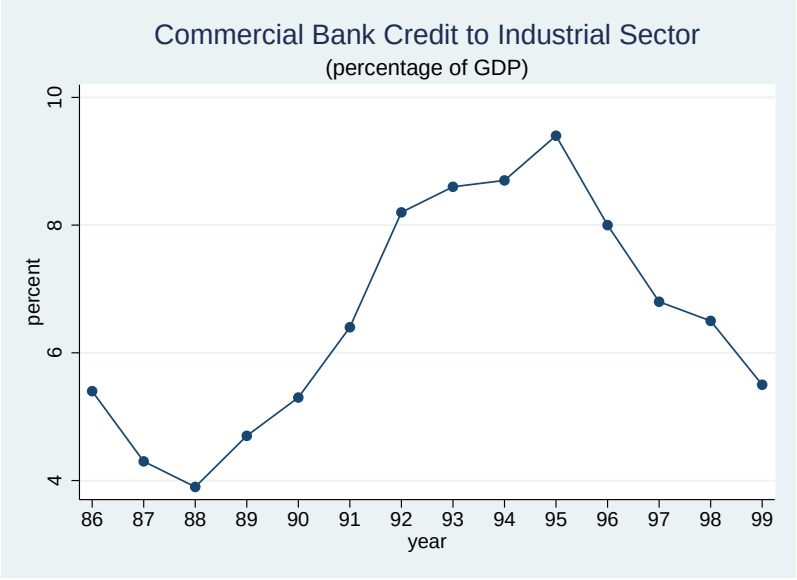

FIGURE E.2. Commercial Bank Credit to the Industrial Sector as a percentage of GDP

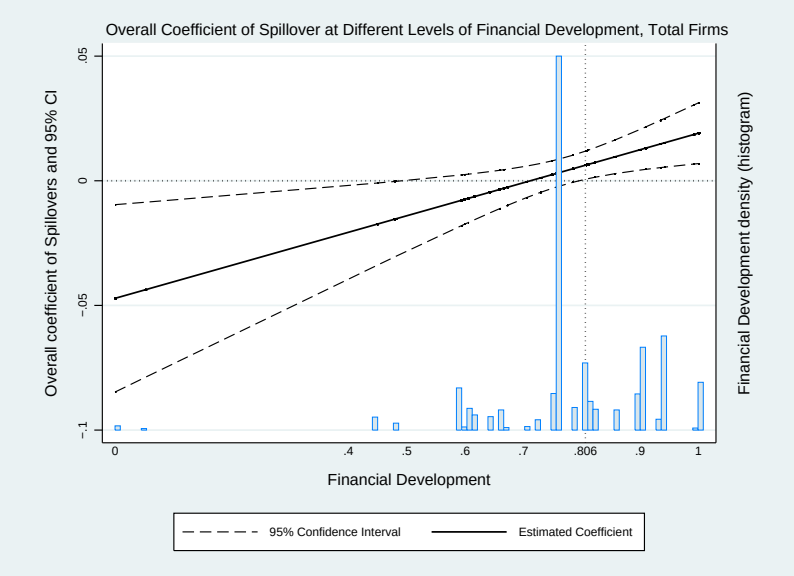

FIGURE E.3. WLS-IV Estimation, Total Sample of Firms

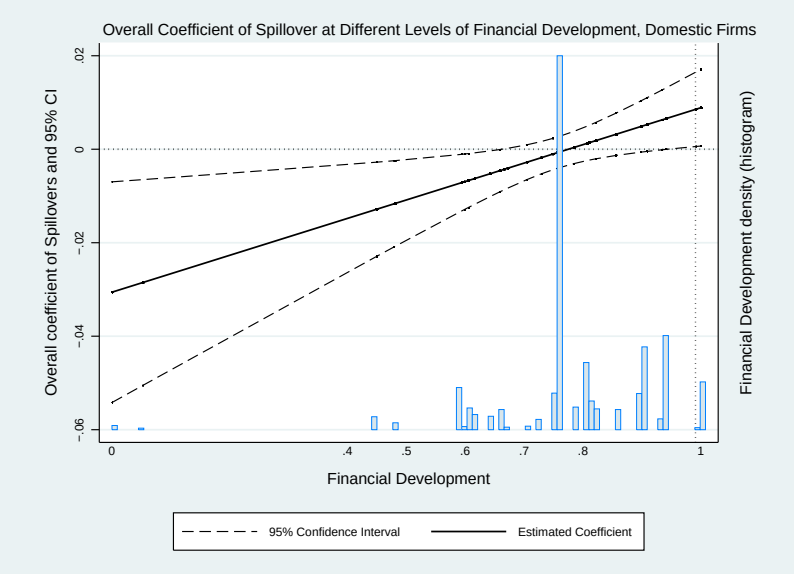

FIGURE E.4. WLS-IV Estimation, Domestic Sample of Firms

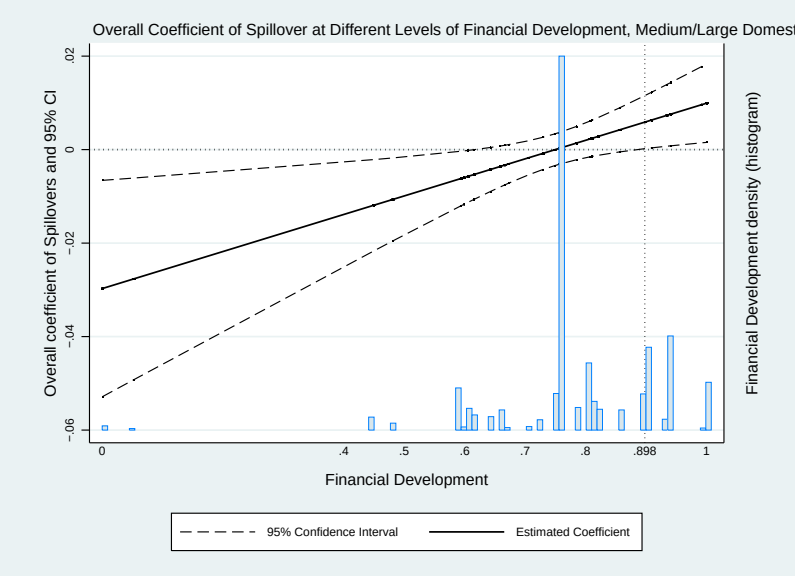

FIGURE E.5. WLS-IV Estimation, Medium/Large Domestic Sample of Firms

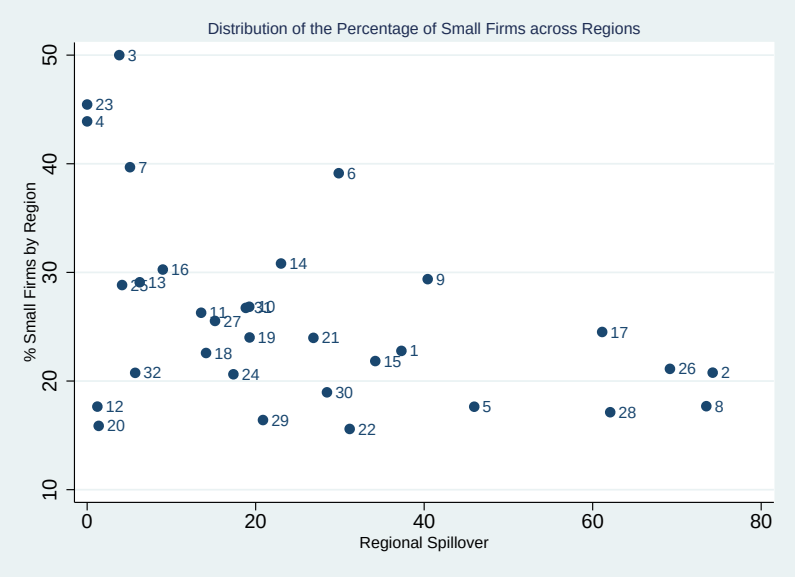

FIGURE E.6. Percentage of Small Firms and Regional Spillovers by Region

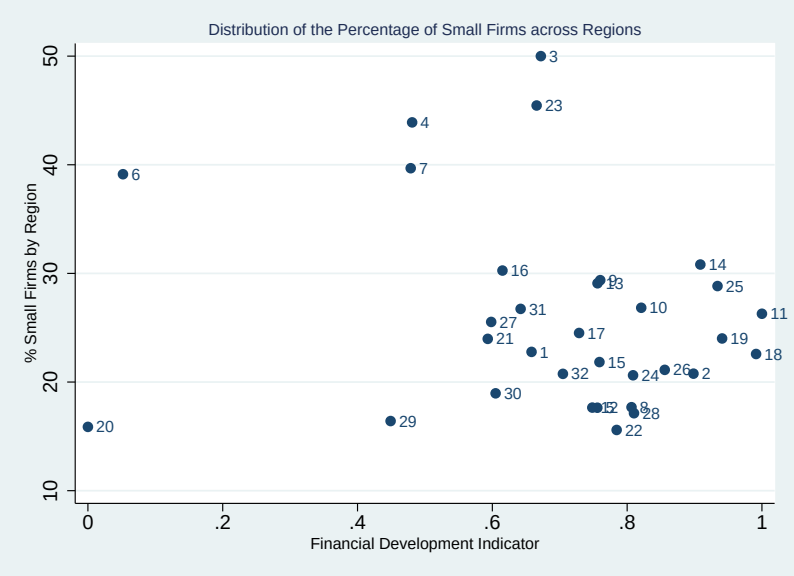

FIGURE E.7. Percentage of Small Firms and Financial Development Indicator by Region

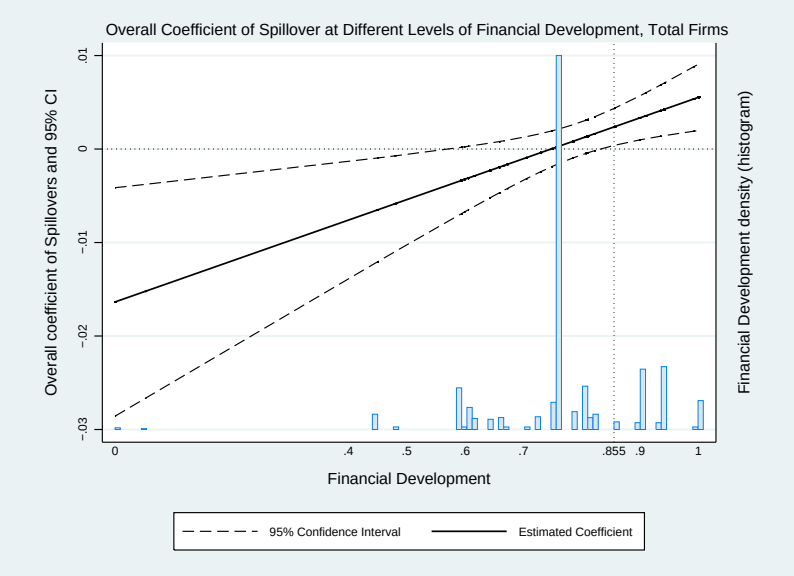

FIGURE E.8. Panel FE-IV Estimation, Total Sample of Firms

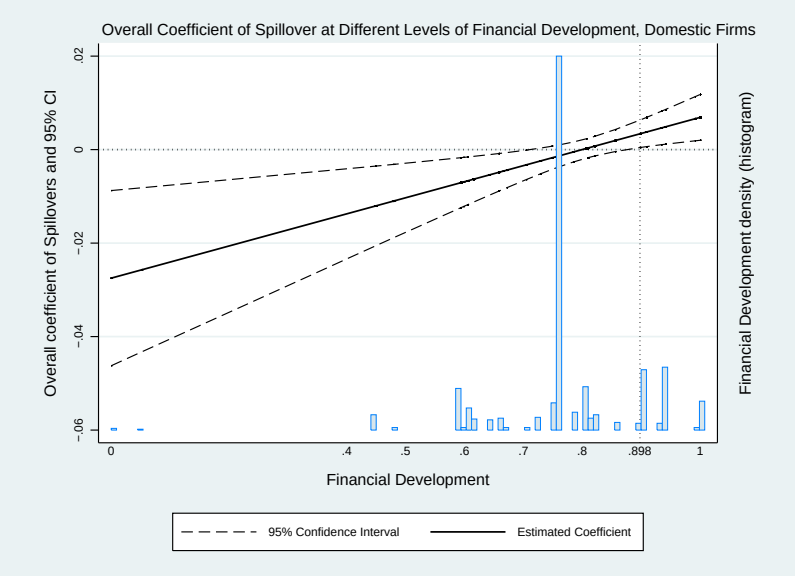

FIGURE E.9. Panel FE-IV Estimation, Domestic Sample of Firms

CHAPTER 3

Explaining Firm Export Behavior: Is there a Role for Export Spillovers?

ABSTRACT. This paper provides empirical evidence on the factors that increase firms' propensity to export. Using a panel of Mexican manufacturing firms from 1997 to 2000, we test for the role of sunk entry costs, firm observable characteristics and export spillovers. We find that entry costs into the export market are particularly relevant in the case of Mexican firms. Moreover, we find robust evidence of positive and significant spillovers from MNEs export activities.

KEYWORDS. Export decision, Exporting Spillovers, Multinational Firms.

JEL CLASSIFICATION. D21, F23, L60

3.1. Introduction

In this paper, we provide empirical evidence on the export decision by Mexican manufacturing firms. We explore two different sets of variables that might influence the decision to export. First, within a simple dynamic specification we disentangle sunk costs of entry into the export market from observable firm characteristics. Size, productivity, the exposure of the firm to international markets or the ownership structure of the firm are often thought as determinants of the firm export decision. We find that after controlling for firm fixed effects only the exposure to international markets through the acquisition of imported intermediate inputs and the foreign ownership status of the firm are relevant characteristics of the decision to export. However, we find that entry costs are significant for Mexican firms. Exporting today increases the probability of exporting tomorrow by 60%. These high entry costs seem to be mainly driven by exports to North America which account for 80% of the total export value by Mexican manufacturing firms.

Second, we turn to analyze the economic geography hypothesis that the export activities of neighboring firms might reduce the cost of entry. In particular, we will focus on the special role that MNEs might have along this dimension. The literature on FDI spillovers assumes that MNEs are endowed with a set of non-tangible assets (i.e. managerial skills) that make them more productive than their domestic counterparts. Domestic firms by being exposed to the new technologies and production techniques brought in by the MNEs might in turn decide to upgrade their own production process which might lead to an increase in their productivity. An alternative spillover mechanism is the impact of MNEs on the export behavior of domestic firms. We will explore the possibility MNE presence affects the export propensity of domestic firms. Aitken, Hanson and Harrison (1997) using a panel data of Mexican manufacturing firms from 1986 to 1990 were the first ones to analyze the role of MNE export activities in the export decision of domestic firms. They find evidence of spillovers from multinational companies but not from general export activity. Similarly, Clerides, Lach and Tybout (1998) found some evidence that firms in Colombia are more likely to export if they belong to an export-intensive industry or region but do not analyze the role of MNE.

As in Aitken et al (1997) we find evidence that the decision of domestic firms to export is positively influenced by the export intensity of MNE in the same sector

and region. However, we improve upon earlier findings by considering a dynamic specification, addressing the potential endogeneity of all regressors and controlling for firm unobserved specific effects. In addition, we provide evidence of heterogeneity in the factors shaping firm's decision to export according to export destination.

The paper is organized as follows. Section 2 describes the data. Section 3 deals with the empirical methodology and the description of the variables used in the analysis. Section 4 contains the main results and finally, section 5 concludes.

3.2. Data

The data used in this study come from the National Survey of Employment, Salaries, Technology, and Training (ENESTYC) implemented by the National Institute for Statistics, Geography and Informatics (INEGI). The surveys were carried out in 1992, 1995, 1999 and 2001 as independent cross-sections however, given the sampling design it is possible to link firms with more than 100 employees across surveys. Based on the estimation strategy requirements (the dynamic specification will include lag values of the dependent variable) we will make use of the panel generated from linking the surveys of 1999 and 2001. The original 1999 survey has data on 6,840 firms while that of 2001 reports data for 8,181 firms. The resulting panel corresponds to 2,552 firms over the period 1997-2000. Firms have more than 100 employees and do not include firms in the export maquiladora sector[1]. Therefore, these firms are not representative of the overall manufacturing population since they are bigger than the average firm. However, in 2000, they accounted for 78% of total employment in the manufacturing sector, around 60% of sales and 46% of export sales. Table 1 shows the characteristics of the sample and shows that exporters represent 60% of the sampled firms. Although the short time dimension of the panel makes it hard to draw conclusions on entry or exit behavior there seems to be an increasing number of firms exiting the export market in 1998 (after the Asian crisis) while 1999, in the aftermath of the peso depreciation, witnessed an increase in the number of new exporters. These entry and exit rates are considerably below the 39.4% rate found by Bernard and Jensen (2004) in their sample of US firms but it is in line with the findings of Aitken et al (1997) in the case of Mexico.

[1]Maquiladora plants are assembly plants that re-export most of their production. We decided to exclude these firms from the analysis since they are set up to export and therefore do not face any export decision.

Table 1 -Summary Statistics of Exporters in the Sample

	1997	1998	1999	2000	Total
Exporters	1,587	1,622	1,489	1,495	6,193
NonExporters	965	930	1,063	1,057	4,015
Total	2,552	2,552	2,552	2,552	10,208
%Exporters	62.19	63.56	58.35	58.58	60.67
Starters		68	127	45	240
Stoppers	33	260	39		332

Moreover, exporters in the sample share the same characteristics previously found in the literature for exporters operating in other countries (see Bernard and Jensen (1995) for US, Isgut (2001) for Colombia, Alvarez and Lopez (2004) for Chile, Van-Biesebroeck (2006) for Sub-Saharan countries and De Loecker (2007) for Slovenia). Table 2 shows the results from estimating the following equation by OLS:

$$charact_{ijrt} = \alpha + \beta Exporter_{ijrt} + \gamma l_{ijrt} + \Sigma_t \delta_t year + \Sigma_j \lambda_j Sector_j + \epsilon_{ijrt} \quad (3.1)$$

where $charact_{ijrt}$ refers to characteristics of firm i, in sector j, region r, at time t; $Exporter_{ijrt}$ is a dummy variable that takes the value of 1 if the firm exports and 0 otherwise; l_{ijrt} is the log of firm level employment and δ_t and λ_j correspond to time and sectoral dummies. The coefficient of interest is β that represents the percentage differential between exporters and non-exporters. Table 2 shows the results from estimating equation (1).

Table 2 -Characteristics of Exporters vs Non-Exporters

	β	Obs	R2
Value Added per worker	0.2755	10,208	0.2147
Total Factor Productivity	0.0385	10,208	0.3643
Capital per worker	0.3403	10,208	0.2359
Average Wage	0.1186	5,326	0.2139
Ratio of Skilled Workers	0.1084	4,504	0.2152
Employment	0.4235	10,208	0.1798

Note: All coefficients are significant at the 1% level. All regressions include size effects except for the employment regression. The number of observations in the average wage and ratio of skilled workers regressions is lower due to missing values and to the fact that this information is only available in years 1998 and 2000.

Exporters operate on a larger scale (42%), employ more qualified workers (10%), pay higher wages (11%) and are more capital intensive (34%). In addition, using

value added per capita as an approximative measure of productivity, exporting firms are on average 27% more productive. However, productivity differentials between exporters and non-exporters reduce to a mere 3% once we consider a measure of total factor productivity (TFP) that accounts for capital intensity and corrects for the simultaneity bias often encounter in the estimation of production functions[2]. Given the narrow productivity differential between exporters and non-exporters in the sample it seems reasonable to investigate the determinants of engaging in exporting activities paying particular attention to the role of MNE export activities.

3.3. Empirical Methodology

The empirical strategy follows closely Bernard and Jensen (2004) which in turn base their estimation procedure in the theoretical model proposed by Roberts and Tybout (1997). In their model, a firm exports ($Y_{it} = 1$) if current and expected revenues are greater than current costs plus sunk costs of entry. Consequently, in order to identify the factors that affect the probability of exporting the following model will be estimated:

$$Y_{ijrt} = \begin{cases} 1 & if \quad \gamma Y_{irjt-1} + \beta X_{ijrt} + \delta Z_{jrt} + \epsilon_{ijrt} > 0 \\ 0 & otherwise \end{cases} \tag{3.2}$$

where Y_{ijrt} is a dummy variable that takes the value of 1 if the firm i, in sector j and region r, exports at year t; Y_{it-1} corresponds to the lagged dependent variable, X_{ijrt} refers to firm specific characteristics and Z_{jrt} will capture the sector-region activities of other exporters and other MNCs exporting. The more natural choice to estimate equation (2) would be some binary-choice parametric framework like probit or logit. However, there are two main problems related to the estimation of equation (2) by these means. The first one relates to the existence of unobserved plant level effects while the second one refers to the potential bias generated by the inclusion of a lagged dependent variable in the model.

The existence of unobserved plant specific heterogeneity (κ_i) translates in the following equation:

$$p[Y_{ijrt} = 1] = \gamma Y_{irjt-1} + \beta X_{ijrt} + \delta Z_{jrt} + \kappa_i + \epsilon_{ijrt} \tag{3.3}$$

[2]TFP is estimated following Ackerberg, Caves and Frazer (2006). See Villegas-Sanchez (2008) for a detailed explanation on the methodology applied to this dataset.

In the case of the probit model, the firm fixed effects can not be conditioned out of the likelihood and the unconditional model, treating each fixed effect as a dummy, results in biased estimates. Consistent estimates for the random-effects probit exist, but this model imposes distributional assumptions on the firm fixed effect. In particular the random-effects model requires that the firm specific effects are uncorrelated with the regressors. This requirement is most likely violated in the export decision case since unobserved firm characteristics like managerial capability are correlated with plant characteristics like size, ownership structure, organizational structure or productivity. In the case of the logit model, it is possible to derive a likelihood conditional on the firm fixed effects which is the analog of taking all observations as differences from the mean. However, neither strategy is able to account for the potential bias arising from the inclusion of a lagged dependent variable in the model. Heckman (1981) proposes a dynamic ramdon-effects probit estimator but again we need to assume that the firm-specific effects are random[3].

Instead we follow Bernard and Jensen (2004) and estimate a linear probability model first ignoring unobserved firm-specific effects. Then, estimating the corresponding fixed effect model. Finally, employing the dynamic panel System-GMM estimator proposed by Arrellano and Bover (1995) and Blundell and Bond (1998). This estimator uses appropriate lagged levels as instruments for the equations in differences and suitable lagged differences as instruments for the equations in levels.

3.3.1. Firm Characteristics. We divide firm specific characteristics affecting the probability of exporting in those that reflect previous success of firm performance and those that are indicators of the previous exposure of the firm to international goods and capital markets[4]. Table A in the Appendix provides a detailed explanation of all the variables used in the analysis.

Firm performance is measured by size and total factor productivity. Empirical evidence suggests that high productivity precedes entry into the export market. Roberts and Tybout (1997) relate this pre-entry condition with the existence of sunk entry costs into the export markets, so that only the most productive firms find it profitable to incur the export sunk cost. Similarly, in the Melitz (2003) model the existence of fixed and variable costs guarantee that only those firms with

[3]See section 4.3.

[4]All variables are lagged one period to avoid potential contemporaneous correlation between the export status and firm characteristics.

productivity draws above a certain productivity cutoff will find it profitable to export in equilibrium. Therefore, we would expect that firms with higher productivity levels would be more likely to export. In the same flavor, according to the economies of scale theory a minimum firm size will be required for firms to be able to undertake the fixed cost of exporting. Only firms that are large enough can reap the benefits of economies of scale. Larger firms are expected to be more likely to export or have a higher export share (Wakelin (1998)).

Regarding firm's exposure to globalization we will study two different sets of variables. The first set considers whether the firm has previously engaged in importing activities either of intermediate inputs or of machinery. We would expect that firms that have previous contact with international goods markets will be more likely to engage in exporting activities. The second set of variables looks at the internal organization of the firm and controls for whether the firm is foreign owned or whether it belongs to a group. These variables are meant to capture different motives behind the foreign investment decision that might in turn affect the firm decision to export. The theory on the location of MNE suggests two main reasons for MNE activity. First, market-seeking or horizontal FDI, where foreign investment takes place to serve the host country domestic market. Second, factor-seeking or vertical FDI that seeks to exploit country differences in factor prices. In this later situation, it is often the case that production is re-exported to the home country.

3.3.2. Spillovers. There is a substantive empirical literature on export externalities and the extent to which firms' export decision is influenced by nearby exporters. In particular, a subset of these papers concentrate on the effect of exporting MNE on the probability that domestic firms export. A firm's export decision might be influenced by other exporters operating in the same sector or region through two different channels. First, the existence of other exporters in the same sector-region may increase the diffusion of information about foreign markets and export activity. In particular, foreign affiliates are often thought of having easier access to foreign markets information because they in turn form part of a foreign group. As already pointed out exporting involves fixed costs (i.e. including distribution networks, transport infrastructures, advertising, foreign market consumers taste research or research on competitors and foreign regulations) and the innate exposure

of MNE to international markets confers them information advantages. Information spillovers would take place if this knowledge leaks to domestic firms and as a consequence domestic firms engage in exporting activities. The second channel through which MNE can impact domestic firms' decision to export is by, as a result of competitive pressures, stimulating domestic firms' research and innovation activities which are shown to impact the probability of exporting (see Constantini and Melitz (2007) for a theoretical model).

The evidence however, is mixed. Aitken, et al (1997) within a static framework find evidence of spillovers from MNCs but not from general export activity. Clerides et al (1998) apply a dynamic specification with sunk cost to Colombian manufacturing data and find weak support for regional or sectoral spillovers. Barrios, Gorg and Strobl (2003) using Spanish data find that domestic firms' decision to export is positively related to the presence of other exporters in the same sector of activity but not by multinational firms. Similarly, Bernard and Jensen (2004), using the same dynamic framework as Clerides et al (1997) find no evidence of export spillovers for a sample of US manufacturing firms. Finally, Greenaway, Sousa and Wakelin (2004) find positive spillover effects from MNCs on the decision to export of UK firms as well as on their export propensity.

Second, as suggested in Bernard and Jensen (2004) the presence of other exporters might increase the availability of specialized capital and labor which in turn would lower the cost of production.

3.4. Results

3.4.1. Baseline Specification. Table 3 reports results from a basic specification that only considers the role of observable firm specific characteristics in determining the firm's probability of exporting. Column (1) reports results from pooled OLS, column (2) shows the within estimation results and finally, column (3) includes the results from the System-GMM dynamic specification.

The levels results in column (1) of Table 3, show that as suggested by the economies of scale theory, larger firms are more likely to become exporters. However, surprisingly enough, past productivity values do not seem to affect the propensity to export. This result might be due to the characteristics of the sample. First, the short time dimension makes it less likely to observe entry and exit from the export

Table 3 - The Decision to Export: Plant Characteristics and Entry Costs
(Dependent variable: Dummy 0/1 on whether the firm exports at time t)

	OLS	FE	Dynamic
	(1)	(2)	(3)
Exporter	0.793***	0.272***	0.594***
	(0.009)	(0.025)	(0.020)
Importer	0.018**	0.045***	0.043**
	(0.008)	(0.014)	(0.018)
Importer Machinery	0.013*	-0.001	0.008
	(0.007)	(0.008)	(0.019)
Employment	0.016***	0.006	0.017
	(0.004)	(0.013)	(0.058)
Productivity	0.009	-0.001	-0.011
	(0.007)	(0.009)	(0.022)
Foreign	0.052***	0.015	0.190**
	(0.009)	(0.017)	(0.079)
Group	-0.003	0.004	0.006
	(0.007)	(0.011)	(0.029)
Year Dummies	Yes	Yes	Yes
Sector Dummies	Yes		
Regional Dummies	Yes		
R2	0.7275	0.7024	
Obs	7656	7656	7656
Groups		2552	2552
Hansen			0.897

Note: All firm characteristics are lagged one period. ***, **, * indicate significance at the 1%, 5% and 10%, respectively. Standard errors are heteroskedastic-consistent.

market. Second, as we saw in Table 2, exporters are only 3% more productive that non-exporters which in turn highlights the importance of, holding productivity differentials constant, identifying those factors driving the decision to export. Bernard and Jensen (2004) find similar results in their sample of US firms once they control for firm fixed effects. In their case they also focus in a sample of firms that are substantially larger than that of general manufacturers which might explain the lack of a significant effect from past productivity values on the probability of exporting. Regarding other firm characteristics, firms that imported in the previous year both intermediate inputs and machinery seem to be more likely to export. Finally, being a foreign firm increases the probability of exporting however, belonging to a group does not affect this probability.

Most importantly, as suggested in Clerides et al (1998) the lagged dependent variable measures the discount on entry costs that firms with previous exporting experience enjoy over firms with no exporting experience. This proxy of sunk costs

turns out to be positive and highly significant. However, the existence of unobserved firm specific effects makes the OLS estimate of the lagged dependent variable upward-biased. In fact, the estimated coefficient suggest that exporting last year raises the probability of exporting today by almost 80%. Column (2) of Table 3 reports the results from the within estimation of equation (3). The coefficient on lagged export status is greatly reduced to 0.272. As in Bernard and Jensen (2004) controlling for firm fixed effects makes the other observable firm specific characteristics no longer significant. However, whether the firm imported intermediate inputs in the previous year is still positively and statistically significantly related to the probably that the firm exports today.

Finally column (3) of Table 3 reports the results from the System-GMM dynamic panel estimation. Again most of the firm characteristics are no longer significant except for the importer status of the firm and whether the firm is foreign owned or not. As expected the size of the coefficient on the lagged dependent variable is between the OLS and the within estimator 0.594. This means that having exported last year increases the probability of exporting this year by 59%. Although this effect is relatively large it should be kept in mind that the panel considers firms only from 1997-2000. Including lagged values of the regressors reduces the time dimension to $T = 3$ and by taking differences $T = 2$ which might explain the high persistence of the export status. The important fact is that even after controlling for firm fixed effects entry costs play the main role.

3.4.2. The Role of Spillovers. Table 4 shows the results from considering the role of other exporters in the same sector and region[5]. Column (1) reports the results when the total sample of firms is considered, while column (2) looks at the spillover effect for the sample of domestic firms. In both specifications, firm specific characteristics retain the same estimated coefficients and significance levels as in the base specification of column (3) in Table 3. Spillovers from exporters are defined as the share of domestic exports in the same sector and region over total sales in that sector-region while spillovers from foreign exporters concentrate in the share

[5]We distinguish 32 regions that correspond to the 32 federal states in which Mexico is divided and 9 sectors of activity according to the Mexican Classification of Activities and Products (CMAP): 31 Food and Beverages; 32 Textiles; 33 Wood Products; 34 Paper and Printing; 35 Chemicals; 36 Production of Non-Metallic goods; 37 Basic Metallic Industry; 38 Machinery and Equipment and 39 Other. Results from exporters operating in the same sector or exporters operating in the same region turned out to be insignificant.

of exports by foreign multinationals in a particular sector-region over total sales in that sector-region. Similarly to the findings of Aitken, et al (1997), we find evidence of spillovers from MNCs but not from general export activity. However, our specification has several advantages over that of Aitken et al (1997). We explicitly consider a dynamic framework, endogeneity concerns are directly addressed by the use of lagged values as instruments and finally, the GMM-System estimation controls for firm unobserved specific effects. Most importantly, the positive effect of MNCs' export activities are higher and more statistically significant for the sample of domestic firms. One additional concern in Aitken et al (1997) was that an alternative spillover measure considering the general MNC activity in the sector-region, was also positive and statistically significant. Therefore, the probability of exporting seemed to be affected by the presence of MNCs in general and not by their export activities in particular. In this case, including a measure foreign spillovers at the sector-region turned out to be insignificant corroborating the finding that firms' decision to export depends on the export activity of MNCs and not on their presence in general.

If the export activities of foreign companies in a particular sector-region decrease the sunk entry costs into the export market for domestic firms we should observe a positive correlation between the share of foreign firms exports to a particular destination and the probability that domestic firms export to that destination. One advantage of the ENESTyC survey is that firms are asked to report the percentage of net income sales that was derived from domestic sales and exports. In addition, within the export category it is possible to know which percentage of the exports where destined to North America, Central America, South America, Europe, Asia and Other destinations[6]. Table 5 shows the number of foreign and domestic firms exporting to each category. Moreover, the last row in Table 5 shows that the bulk of Mexican exports are directed to North America.

Results from the System-GMM estimation of the probability that a domestic firm exports to a particular destination are shown in Table 6. Here we repeat the estimation of equation (3) as in the results presented in Table 4 but this time

[6]Closer look at aggregate Mexican exports data shows that the Other destinations category should be mainly driven by exports to Dominican Republic and/or Netherlands Antilles.

Table 4 - The Decision to Export: The Role of Spillovers
(Dependent variable: Dummy 0/1 on whether the firm exports at time t)

	System-GMM Estimation	
	All	Domestic
	(1)	(2)
Exporter	0.583***	0.609***
	(0.018)	(0.018)
Importer	0.032***	0.043***
	(0.015)	(0.013)
Importer Machinery	0.010	0.006
	(0.018)	(0.020)
Employment	0.039	0.055
	(0.046)	(0.053)
Productivity	-0.012	-0.017
	(0.011)	(0.012)
Foreign	0.217***	
	(0.065)	
Group	0.007	-0.018
	(0.028)	(0.032)
Region-Sector Domestic Exporters	0.080	0.035
	(0.096)	(0.122)
Region-Sector Foreign Exporters	0.088**	0.153***
	(0.040)	(0.041)
Obs	7656	6033
Groups	2552	2011
Hansen	0.963	0.961

Note: All regressors are lagged one period. ***, **, * indicate significance at the 1%, 5% and 10%, respectively. Standard errors are heteroskedastic-consistent.

Table 5 - Number of Observations by Export Destinations in 2000.

	North America	Central America	South America	EU	Asia	Other
Total	1239	496	333	232	115	72
Domestic	898	345	193	119	55	46
Foreign	341	151	140	113	60	26
Share of Exports	0.80	0.05	0.03	0.06	0.04	0.01

Note: Firms can export to more than one destination and therefore the sum of firms does not correspond to the total number of exporters in 2000.

we differentiate according to export destination. Results show that the lagged dependent variable is positive and highly significant irrespective of destination, suggesting that sunk entry cost into the export market are relevant for any type of target market. However, firms exporting to North America seem to experience higher persistence than firms exporting to other destinations. Regarding the role of spillovers from other exporters and MNE, we include three different variables: *MNCs exporting to destination X* (share of exports to destination X by MNE in the same sector-region in total region-sector sales), *Domestic firms exporting to X*

(share of exports to destination X by domestic firms in the same sector-region in total region-sector sales) and *Firms exporting to other than X* (share of exports by firms in the same sector-region to any destination but X in total region-sector sales).

Columns (1), (2) and (3) show that there is a positive and significant effect from MNE exports activities on the probability to export to North America, Central America and South America. However, despite the positive effect of MNCs exporting to South America on the probability that domestic firms will in turn export to that particular destination, the effect of other domestic exporters on the probability of exporting to South America is negative hinting the possibility of competition effects among local exporters. The fact that MNC export activities influence the decision of domestic firms to export to North America is highly important since 80% of the Mexican exports are directed to North America. Columns (5) and (6) show that instead, the main determinant of exports to Asia and Other destinations (recall Other refers to Dominican Republic/ Netherland Antilles) are the export activities of domestic exporters exporting to those destinations. Finally, the main determinant of the probability that domestic firms will export to the EU is firm productivity. The fact that exporting to the EU is mainly driven by productivity differentials is not surprising if we think that the EU market is distant and has probably high quality standards.

3.4.3. Extensions. As mentioned in section 3, the linear probability model is usually not the natural choice when considering dichotomous dependent variables. In this section we explore the results from a pooled probit and a random-effects probit estimator that are shown in Table 7. Column (1) in Table 7 shows the pooled probit results controlling for year, sector and regional fixed effects. In columns (2) we find the results from estimating a random-effects probit that assumes the firm specific effects are not correlated with the rest of regressors. In both cases the coefficient on the lagged dependent variable is extremely high (2.760). Heckman (1981) already suggested that the random-effects probit estimator in the presence of large heterogeneity of the unobserved firm effects would result in an upward biased coefficient on the lagged dependent variable. Despite the potential biases arising from these estimation methods it is worth noting that the export activity of MNCs still has a positive and highly significant impact on the probability that domestic

Table 6 - The Decision to Export by Destination Market: The Role of Spillovers
(Dependent variable: Dummy 0/1 on whether the firm exports to destination X at time t)

	System-GMM Estimation: Sample of Domestic Firms					
	NA	CA	SA	EU	Asia	Other
	(1)	(2)	(3)	(4)	(5)	(6)
Exporter to X	0.582***	0.476***	0.400***	0.415***	0.408***	0.272***
	(0.022)	(0.020)	(0.0250	(0.030)	(0.039)	(0.041)
Importer	0.026*	0.043***	0.034***	0.026***	0.008	-0.003
	(0.014)	(0.013)	(0.011)	(0.010)	(0.006)	(0.004)
Importer Machinery	0.006	-0.005	-0.006	-0.009	0.004	0.002
	(0.021)	(0.015)	(0.008)	(0.010)	(0.007)	(0.006)
Employment	0.171**	0.018	0.084	-0.090	0.008	0.046**
	(0.070)	(0.077)	(0.065)	(0.055)	(0.036)	(0.022)
Productivity	-0.030	-0.019	-0.008	0.025**	0.013	-0.003
	(0.022)	(0.019)	(0.013)	(0.013)	(0.017)	(0.009)
Group	-0.036	-0.003	0.014	-0.007	-0.007	-0.008
	(0.034)	(0.028)	(0.013)	(0.019)	(0.013)	(0.012)
MNC exporting to X	0.111**	3.864**	1.029*	-0.896	-0.044	0.138
	(0.055)	(1.932)	(0.582)	(0.631)	(0.144)	(0.160)
Domestic Firms Exporting to X	-0.130	-0.645	-2.896**	0.049	1.663*	0.355*
	(0.144)	(1.096)	(1.376)	(0.230)	(0.917)	(0.186)
Firms exporting to other than X	0.275	-0.044	-0.053	0.086	0.087	0.041
	(0.507)	(0.097)	(0.101)	(0.154)	(0.122)	(0.036)
Obs	6,033	6,033	6,033	6,033	6,033	6,033
Groups	2,011	2,011	2,011	2,011	2,011	2,011
Hansen	0.573	0.423	0.507	0.332	0.279	0.112

Note: All regressors are lagged one period. ***, **, * indicate significance at the 1%, 5% and 10%, respectively. Standard errors are heteroskedastic-consistent. Destination X refers to North America (NA), Central America (CA), South America (SA), European Union (EU), Asia and Other, respectively.

firms export. In addition, results from the probit estimation results show that the decision to export is also positively and significantly influenced by the neighboring export activities of other domestic exporters.

3.5. Conclusion

In this paper we investigate the determinants of exporting. We find evidence that foreign ownership and whether the firm imported intermediate inputs in the past are the main firm level characteristics determining the export status of the firm. Surprisingly, but similarly to the findings of Bernard and Jensen (2004) for the US, firm level total factor productivity does not play a major role once firm fixed effects are taken into account. Instead, we find a predominant role of past export experience. Having exported last period increases the probability of exporting today

Table 7 - The Decision to Export: Probit Specifications
(Dependent variable: Dummy 0/1 on whether the firm exports at time t)

	Pooled Probit		Random-Effects	
	(1)	Marginal Effect	(2)	Marginal Effect
Exporter	2.760***	0.832	2.760***	0.840
	(0.059)		(0.052)	
Importer	0.130**	0.052	0.157***	0.061
	(0.058)		(0.052)	
Importer Machinery	0.082	0.033	0.094*	0.038
	(0.056)		(0.053)	
Employment	0.187***	0.074	0.124***	0.049
	(0.040)		(0.035)	
Productivity	0.099*	0.039	0.070	0.028
	(0.057)		(0.046)	
Group	-0.090	-0.036	-0.111**	-0.045
	(0.057)		(0.051)	
Region-Sector Domestic Exporters	1.105***	0.439	1.293***	0.502
	(0.318)		(0.245)	
Region-Sector Foreign Exporters	0.580**	0.230	0.762***	0.298
	(0.266)		(0.144)	
Year Dummies	Yes		Yes	
Sector Dummies	Yes			
Regional Dummies	Yes			
Obs	6,012		6,033	
Groups			2,011	

Note: All regressors are lagged one period. ***, **, * indicate significance at the 1%, 5% and 10%, respectively.

by 59%. Finally, firms' decision to export is positively influenced by the presence of exporting MNE in their same sector and region.

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Table A - Variables

Variable	Definition
Exporter	1 if firm exported
Importer	1 if firm imported intermediate inputs
Importer Machinery	1 if firm imported machinery
Employment	Log(average number of workers)
Productivity	Log of total factor productivity from a 2-digit industry-specific production function estimated using Ackerberg, Caves and Frazer (2006) technique.
Foreign	1 if at least 10% of the firm capital structure is owned by a foreign investor.
Group	1 if the firm belongs to a group.
Region-Sector Domestic Exporters	(Deflated Export Sales by Domestic Firms)/(Deflated Total Sales) for firms operating in the same 2-digit sector and region.
Region-Sector Foreign Exporters	(Deflated Export Sales by Foreign Firms)/(Deflated Total Sales) for firms operating in the same 2-digit sector and region.
MNC exporting to X	(Deflated Export Sales by Foreign Firms to destination X)/(Deflated Total Sales) for firms operating in the same 2-digit sector and region.
Domestic firms exporting to X	(Deflated Export Sales by Domestic Firms to destination X)/(Deflated Total Sales) for firms operating in the same 2-digit sector and region.
Firms Exporting to other than X	(Deflated Export Sales by Firms to any other destination than X)/(Deflated Total Sales) for firms operating in the same 2-digit sector and region.