How Does Foreign Direct Investment Promote Economic Growth? Exploring the Effects of Financial Markets on Linkages*

Laura Alfaro
Harvard Business School

Areendam Chanda
Louisiana State University

Sebnem Kalemli-Ozcan
University of Houston and NBER

Selin Sayek
Bilkent University

June 2006

Abstract

The empirical literature finds mixed evidence on the existence of positive productivity externalities in the host country generated by foreign multinational companies. We propose a novel mechanism, which emphasizes the role of local financial markets in enabling foreign direct investment (FDI) to promote growth through backward linkages, shedding light on this empirical ambiguity. In a small open economy, final goods production combines the production processes of foreign and domestic firms, which compete for skilled labor, unskilled labor, and intermediate products. In order to operate a firm in the intermediate goods sector, entrepreneurs must first develop a new variety of intermediate good. Innovation and imitation both require capital costs, which must be financed through the domestic financial institutions. The more developed the local financial markets are, the easier it is for credit constrained entrepreneurs to start their own firms. Thus the number of varieties of intermediate goods increases, causing positive spillovers to the final goods sector. As a result the host country benefits from the backward linkages between foreign and domestic firms since the local financial markets allow these linkages to turn into FDI spillovers. Our calibration exercise confirms our analytical results. In particular, the results show that the same amount of increase in FDI, regardless of the reason of the increase, generates three times more additional growth in financially well-developed countries than in financially poorly-developed countries. The calibration exercise also shows the importance of the other local conditions such as market structure and human capital—the absorptive capacities—for the effect of FDI on economic growth.

JEL Classification: F23, F36, F43, O40
Keywords: FDI spillovers, backward linkages, financial development, economic growth.

*An earlier version of this paper circulated under the title "FDI Spillovers, Financial Markets and Economic Development." Laura Alfaro, Harvard Business School, 263 Morgan Hall, Boston, MA 02163, lalfaro@hbs.edu. Areendam Chanda, Department of Economics, 2107 CEBA, Louisiana State University, Baton Rouge, LA 70803, achanda@lsu.edu. Sebnem Kalemli-Ozcan, Department of Economics, University of Houston, Houston, Texas, 77204, Sebnem.Kalemli-Ozcan@mail.uh.edu. Selin Sayek, Department of Economics, Bilkent University, Bilkent Ankara 06800 Turkey, sayek@bilkent.edu.tr. We are grateful to Pol Antras, Bruce Blonigen, Santanu Chatterjee, Ron Davis, Katheryn Niles Russ, Pietro Peretto, Ahmed Mobarak and seminar participants at NEUDC, 2006 Midwest Macroeconomic Meetings, and University of Oregon for useful comments and suggestions.

1 Introduction

There is a widespread belief among policymakers that foreign direct investment (FDI) generates positive productivity effects for the host countries. The main mechanism for these externalities is the adoption of foreign technology, which can happen via licensing agreements, imitation, competition for resources, employee training, knowledge and export spillovers. These benefits, together with the direct capital financing it provides, suggest that FDI can play an important role in modernizing a national economy and promoting economic development. Yet, the empirical evidence on the existence of positive productivity externalities is sobering.[1]

The macro empirical literature finds weak support for an exogenous positive effect of FDI on economic growth.[2] Recent findings indicate that a country's capacity to take advantage of FDI externalities might be limited by the local conditions, such as development of the local financial markets or the educational level of the country, i.e., absorptive capacities. Borensztein, Gregorio, and Lee (1998) and Xu (2000) show that FDI brings technology, which translates into higher growth only when the host country has a minimum threshold stock of human capital. Alfaro, Chanda, Kalemli-Ozcan and Sayek (2004), Durham (2004), and Hermes and Lensink (2003) provide evidence that only countries with well-developed financial markets gain significantly from FDI in terms of their growth rates.

The micro empirical literature finds ambiguous results for the effect of FDI on firm's productivity. This literature comes in three waves. Starting with the pioneering work of Caves (1974), the first generation papers focus on country case studies and industry level cross sectional studies.[3] These studies find a positive correlation between the productivity of a multinational enterprise (MNE) and average value added per worker of the domestic firms within the same sector.[4] Then comes the second generation studies which use firm level panel data. However, these studies find no effect of foreign presence or find negative productivity spillover effects from the MNE to the developing country firms.[5] The positive spillover effects are found only for developed countries.[6] Based on these negative results, the third generation of studies argue that since multinationals would like to prevent information leakage to potential local competitors but would benefit from knowledge spillovers to their local suppliers, FDI spillovers ought to be between different industries.

[1]See Blomstrom and Kokko (1998); Gorg and Strobl (2001); Lipsey (2002); Barba Navaretti and Venables (2004); Alfaro and Rodriguez-Clare (2004) for excellent surveys of spillover channels and empirical findings.

[2]See Carkovic and Levine (2000).

[3]See Blomstorm (1986), and Moran (2001).

[4]A multinational enterprise (MNE) is a firm that owns and controls production facilities or other income-generating assets in at least two countries. When a foreign investor begins a green-field operation (i.e., constructs new production facilities) or acquires control of an existing local firm, that investment is regarded as a direct investment in the balance of payments statistics. An investment tends to be classified as direct (FDI) if a foreign investor holds at least 10% of a local firm's equity. This arbitrary threshold is meant to reflect the notion that large stockholders, even if they do not hold a majority stake, will have a strong say in a company's decisions and participate in and influence its management. Hence, to create, acquire or expand a foreign subsidiary, the MNE's undertake FDI. In this paper, we often refer to the MNE and FDI interchangeably.

[5]See Aitken and Harrison (1999), Haskel, Pereira and Slaughter (2002), Keller and Yeaple (2003).

[6]Haskel, Pereira and Slaughter (2002) find positive spillovers from foreign to local firms in a panel data set of firms in the UK; Gorg and Strobl (2002) find that foreign presence reduces exit and encourages entry by domestic-owned firms in the high-tech sector in Ireland.

Hence one must look for the existence of vertical (inter-industry) externalities instead of horizontal (intra-industry) externalities. This means the externalities from FDI will manifest themselves through forward or backward linkages, i.e., contacts between domestic suppliers of intermediate inputs and their multinational clients in downstream sectors (backward linkage) or between foreign supplier of intermediate inputs and their domestic clients in upstream sectors (forward linkage).[7] Javorcik (2004) and Alfaro and Rodriguez-Clare (2004) find evidence for the existence of backward linkages between the downstream suppliers and the MNE in Lithuania and in Venezuela, Chile, Brazil respectively. These results are consistent with FDI spillovers between different industries.

The purpose of this study is twofold. First in a theoretical framework we formalize the mechanism through which FDI leads to a higher growth rate in the host country via backward linkages, which is consistent with the micro evidence found by Javorcik (2004) and Alfaro and Rodriguez-Clare (2004). The mechanism depends on the extent of the development of the local financial sector. Financial markets act as a channel for the linkage effect to be realized and create positive spillovers, which is consistent with the macro literature cited above that shows the importance of absorptive capacities. Specifically, we model a small open economy where final goods production combines the production processes of foreign and domestic firms. Both types of firms employ domestically supplied unskilled labor, skilled labor, and domestically produced intermediate goods to produce their respective outputs. The intermediate goods are characterized by Dixit-Stiglitz-Ethier love of variety production function. Production of intermediate goods is carried out by local entrepreneurs in a monopolistically competitive market. In order to be able to operate a firm in the intermediate good sector, entrepreneurs must first engage in R&D to develop a new variety of intermediate goods. In a developing country context R&D can be thought as the imitation and adaptation process or simply a setup cost. This setup process in the intermediate good sector requires upfront capital expenditures which must be financed by borrowing from domestic financial institutions. If the local financial markets are developed enough, credit constrained entrepreneurs will start their own firms. This process increases the number of varieties of intermediate goods thereby generating positive spillover effects to the final good sector. In other words, in our model more FDI increases the demand for intermediate goods, and well-developed financial markets ease the cost constraint for fulfilling this increased demand. Our model also implies the existence of horizontal spillovers in the final good sector since the greater availability of intermediate inputs not only benefits the foreign firms but also raises the total factor productivity of domestic firms thus creating a horizontal spillover as an indirect result of the backward linkage.[8]

In the second half of the paper, we use the formal model to quantitatively gauge how the

[7] Hirschman (1958) argues that the linkage effects are realized when one industry may facilitate the development of another by easing conditions of production in the other, thereby setting the pace for further rapid industrialization. He also argues that in the absence of linkages, foreign investments could have limited or even negative effect in an economy (the so called enclave economies).

[8] Like Hirschman (1958), we view linkages here as pecuniary externalities. In contrast to knowledge spillovers, pecuniary externalities take place through market transactions. In our model, linkages are associated with pecuniary externalities in the production of inputs. The existence of such pecuniary externalities has been noted by Barba Navaretti and Venables (2004, p.41). Hobday (1995), in a case study of developing East Asia, finds many situations in which MNEs investment created backward linkages effects to local suppliers.

response of growth to FDI varies with the level of development of the financial markets. To the best of our knowledge, this paper is unique in this respect. We find that a) for the same share of foreign production in total output, countries with more developed financial markets exhibit growth rates that are at least twice as high, and b) when we consider an increase in the amount of FDI (or the technology gap between foreign-owned firms and domestically owned firms), the increase in the growth rate of total output is much higher for more financially developed countries. These results hold for two alternative sources of increase in the extent of MNE presence in the economy; namely, an increase on account of improvements in the productivity of foreign firms or an increase on account of increases in the share of foreign production.[9] Numerically, the results show that for the same magnitude of increase in the foreign presence the additional growth effects generated in the financially well-developed countries is triple that of those generated in the financially poorly-developed countries. This results prevails across a wide range of exercises, and regardless of the source of the increase in the extent of foreign presence. The calibration section also shows the importance of the other local conditions such as market structure and human capital, the so-called absorptive capacities, for the effect of FDI on economic growth. Hence our quantitative results are consistent with the empirical papers such as Borensztein, Gregorio, and Lee (1998) that highlights the critical role of human capital. Overall our analysis is unique in the sense that it is consistent with both micro and macro empirical evidence.

Theoretical models of FDI spillovers via backward linkages include Rodriguez-Clare (1996), Markusen and Venables (1999), and Lin and Saggi (2006).[10] None of these models investigate the critical role played by local financial markets. Also they do not focus on the growth effects of FDI spillovers. Instead, these are static models.Our model closely follows Grossman and Helpman's (1990, 1991) small open economy setup of endogenous technological progress resulting from the innovation in the intermediate goods sector. We modify their basic framework to incorporate foreign firms and financial intermediation. The standard Grossman-Helpman setting is preferred since it provides the most transparent solution and interpretation of our hypothesis. Gao (2005) also incorporates FDI into a growth model that closely follows Grossman and Helpman (1991). He does not model the role of domestic financial markets in allowing FDI benefits to materialize nor relate the model to the empirical evidence. Recently, Aghion, Howitt and Mayer-Foulkes (2005) have modeled technology transfers with imperfect financial markets in a Schumpeterian growth model. Their model is different than ours in the sense that they focus on credit constraints impeding international technology transfers (and hence international convergence) while we focus on the role of credit constraints in allowing linkages between multinational firms and local suppliers in the host country to materialize and are thus more concerned with linkages within an economy once FDI has taken place.

The importance of well-functioning financial institutions in augmenting technological innovation

[9]This increase in foreign presence is either exogenously imposed or endogenously created, depending on the production function specifications, as will be made clear in the below discussions.

[10]Rodriguez-Clare (1996) assumes perfect competition in the final good; Markusen and Venables (1999) allows for competition effects between local and foreign firms in the final good sector. Lin and Saggi (2006) study the role of contractual relationships between foreign firms and local suppliers.

and capital accumulation, fostering entrepreneurial activity and economic development has been recognized and extensively discussed in the literature.[11] Furthermore, as McKinnon (1973) stated, the development of capital markets is “necessary and sufficient” to foster the “adoption of best-practice technologies and learning by doing.” In other words, limited access to credit markets restricts entrepreneurial development. In this paper, we extend this view and argue that the lack of development of local financial markets can limit the economy’s ability to take advantage of potential FDI spillovers.[12] Our results on the importance of the financial markets can also be interpreted more generally as the importance of the local policies and institutions in limiting the potential benefits that FDI can provide to the host country. For example, lack of adequate contract and property rights enforcement can limit the interaction between foreign and local firms. A foreign firm can decide instead of buying inputs in the host country to produce them within the boundaries of the firm or import them restricting their local activities to hiring labor.[13] Furthermore, our paper relates to the much broader literature that studies the role played by financial markets in allowing the benefits of globalization to materialize.[14]

The rest of the paper is organized as follows. Section 2 presents the model. Section 3 performs a calibration exercise using estimated values for the parameter values from the empirical literature. Section 4 discusses possible extensions and alternative frameworks. Section 5 concludes.

2 The Model

2.1 Households

Consider a small open economy. The economy is populated by a continuum of infinitely lived agents of total mass 1. Households maximize utility over their consumption of the final good,

$$U = \int_0^\infty e^{-\rho s} \log u(C_s) ds \tag{1}$$

where $u(.)$ is a continuously differentiable strictly concave utility function, ρ is the time preference parameter, and C_s denotes consumption of the final good at time s. The final good is a numeraire and is freely traded in world markets at a price p_t normalized at 1. The total expenditure on consumption is thus given by $E_t = p_t C_t$. Households maximize utility subject to the following intertemporal budget constraint.

[11] Goldsmith (1969), McKinnon (1973), Shaw (1973), followed by Boyd and Prescott (1986), Greenwood and Jovanovic (1990), and King and Levine (1993b), among others, have shown that well-functioning financial markets, by lowering the costs of conducting transactions, ensure capital is allocated to the projects that yield the highest returns, and therefore enhance growth rates.

[12] Following Intel’s construction of a semiconductor assembly plant in Costa Rica in 1996, local software production in Costa Rica increased dramatically. However, producers and potential entrepreneurs in the software sector continuously complain that a lack of funds resources and/or the high cost of available financing hinder the growth of the sector and its ability to compete in the international arena. See Spar (1998), Hanson (2001), Larrain, Lopez-Calva and Rodriguez-Clare (2000), and Perez (2000).

[13] See Antras (2003), and Lin and Saggi (2006).

[14] See for example Aghion, Bacchetta and Ranciere (2006) and Chang, Kaltani and Loayza (2005).

$$\int_0^\infty e^{-rs} E_s ds \leq \int_0^\infty e^{-rs} w_s ds + A_0 \tag{2}$$

where A_0 denotes the value of the assets held by the household at $s = 0$, and w_s is the wage income. The intertemporal budget constraint requires that the present value of the expenditures, E_t not exceed the present value of labor income plus the value of asset holdings in the initial period. The solution of this standard problem implies that the value of the expenditures must grow at a rate equal to the difference between the interest rate and the discount rate.[15] However if this rate of growth of expenditure is different from the endogenous rate of growth of the economy then either the transversality condition is violated or the economy no longer remains a small open economy. To rule out these possibilities, we assume that households are credit constrained and can borrow at most a fixed fraction of their current income. Further, we assume that this constraint is binding, and therefore the actual rate of growth of expenditures is proportional to the rate of growth of income:

$$\frac{\dot{E}}{E} \propto \frac{\dot{Y}}{Y}$$

This is only an assumption of convenience since as we will see later the entrepreneurs are also credit-constrained and we'd rather treat both the same. Also this assumption ensures that the consumption side of the economy has no implications for the production side. Hence there is no difference between assuming a household cannot borrow forever and a household cannot borrow over a certain fraction.

2.2 Production

2.2.1 The Final Good Sector

Final good production combines the production processes of domestic and foreign firms denoted respectively by Y_d and Y_f . The foreign and domestic goods themselves are not traded. Let p_d and p_f denote the prices for Y_d and Y_f.

The aggregate production function for the composite good Y is given by

$$Y = [Y_d^\rho + \mu Y_f^\rho]^{1/\rho} \tag{3}$$

where $\rho \leq 1$ and $\varepsilon = 1/(1-\rho)$ represents the elasticity of substitution between Y_d and Y_f. We do not model the decision of foreign firms to enter the market, i.e., we abstract from the determinants of FDI. The aggregator of foreign and domestic firm production therefore serves as an artifact that will allow us to capture several features related to the composition and interaction of foreign

[15] Since the economy has access to the international capital markets, equilibrium conditions require that rather than the trade balance prevailing each period, the present value of the trade balance, $\int_0^\infty e^{-rt} P_t C_t dt$, prevail. This condition is automatically guaranteed by the restriction imposed by the intertemporal budget constraint. Note that our economy is a one good economy and hence the discussion of trade balance is arguably immaterial.

and domestic firms in an economy.[16] In addition, this simple setup, allows us to emulate different interaction between domestic and foreign firms (as complements or substitutes for example) via competition in the local markets or different consumer preferences.[17] If $\varepsilon = 1/(1-\rho) = \infty$, foreign and domestic firms produce perfect substitutes; $\varepsilon = 1/(1-\rho) = -\infty$, both sectors would be complements. If $\varepsilon = 1/(1-\rho) = 1$, we proxy a Cobb Douglas production function.

Profit maximization gives the demand for intermediate goods and price relationships as,

$$\frac{p_f}{p_d} = \mu \left[\frac{Y_d}{Y_f}\right]^{1-\rho} \tag{4}$$

The cost function is given by

$$C(Y, p_f, p_d) = Y \left[p_d^{1-\varepsilon} + \mu^{\varepsilon} p_f^{1-\varepsilon}\right]^{\frac{1}{1-\varepsilon}}$$

Setting the price equal to marginal cost for final good producers,

$$1 = \left[p_d^{1-\varepsilon} + \mu^{\varepsilon} p_f^{1-\varepsilon}\right]^{\frac{1}{1-\varepsilon}}$$

which allows us to derive an expression between the price of the domestic firm and foreign firm goods $p_d = p(p_f)$,

$$p_d = \left(1 - \mu^{\varepsilon} p_f^{1-\varepsilon}\right)^{\frac{1}{1-\varepsilon}} \tag{5}$$

2.2.2 Foreign and Domestic Firms Production Processes in the Final Good Sector

Both foreign and domestic firms production processes combine unskilled labor and skilled labor (human capital) together with a composite intermediate good. The intermediate good is assembled from a continuum of horizontally differentiated goods. Labor, unskilled and skilled (human capital), are not traded and available in a fixed quantity L and H, correspondingly. Competition in the labor market ensures that unskilled and skilled wages, w_u and w_s, are equal to their respective

[16] Our preferred view is one where foreign and domestic firms are producing different goods in the final good sector which could be complements or substitutes. However, as we do not model the foreign firm's decision to enter the domestic market, we prefer the above assumption since this setup allows us to vary μ and relative productivities to capture realistic shares of foreign and domestic productions in GDP. For example, the share of Y_f is: $s_{Y_f} = \mu / \left(\left(\frac{Y_d}{Y_f}\right)^{\rho} + \mu\right)$. Therefore the share is endogenous and will approach $\mu/(1+\mu)$ in the limit as $\rho \to 0$ (the Cobb Douglas case). In addition, different assumptions regarding the elasticity of substitution allows us to model foreign and domestic sectors as complements or substitutes. For different applications of a similar setup see Acemoglu (1998) and Devereux and Engel (2005).

[17] More generally, we could model different preferences for domestic and foreign produced goods. However our setup has the further advantage of dissociating the production side of the economy from preferences. Since there is no systematic evidence of whether consumers preferences should be biased towards the domestic firm's good or the MNC's good, we'd rather abstract from this issue. In section 4 we explore the case of both goods being perfect substitutes. Also, explicitly modelling different market interaction between domestic and foreign firms would complicate the model without adding further insights to the results.

marginal products. To capture the importance of proximity between suppliers and users of inputs, we assume that all varieties of intermediate goods are non-traded.[18]

The domestic production is given by,

$$Y_{t,d} = A_d L_{t,d}^{\beta_d} H_{t,d}^{\gamma_d} I_{t,d}^{\lambda} \tag{6}$$

with $0 < \beta_d < 1$, $0 < \gamma_d < 1$, $0 < \lambda < 1$ and $\beta_d + \gamma_d + \lambda = 1$. $L_{t,d}$ denotes the amount of unskilled labor used in the domestic production in period t, $H_{t,d}$ is the skilled labor used in the domestic production in period t, $I_{t,d}$ is the amount of composite intermediate goods used in the domestic production in period t and A_d represents the time invariant productivity parameter.

Foreigners directly produce in the country rather than license the technology. The industrial organization literature suggests that firms engage in FDI not because of differences in the cost of capital but because certain assets are worth more under foreign than local control. If lower cost of capital were the only advantage a foreign firm had over domestic firms, it would still remain unexplained why a foreign investor would endure the troubles and headaches of operating a firm in a different political, legal, and cultural environment instead of simply making a portfolio investment. In addition, evidence shows that investors often fail to bring all the capital with them when they take control of a foreign company; instead, they tend to finance an important share of their investment in the local market.[19]

An investor's decision to acquire a foreign company or build a plant instead of simply exporting or engaging in other forms of contractual arrangements with foreign firms involves two interrelated aspects: ownership of an asset and the location to produce.[20] First, a firm can possess some ownership advantage – a firm-specific asset such as a patent, technology, process, or managerial or organizational know-how – that enables it to outperform local firms. And this is one of the reasons why researchers fail to find evidence of horizontal spillovers since this means that a foreign firm will seek to use this special asset to its advantage and prevent leakages of its technology. Hence, we model potential benefits from FDI as occurring via linkages and not through technology spillovers. Second, locational factors, such as opportunities to tap into local resources, providing access to low-cost inputs or low-wage labor, or bypass tariffs that protect a market from imported goods can also lead to the decision to invest in a country rather than serve the foreign market through exports.[21] Since our objective in this paper is to understand the effects of foreign production on local output and the role of financial markets, and not the decision to invest abroad, we model these frictions of doing business in the domestic economy with the function ϕ.[22]

[18]Non-tradability of inputs is only an extreme way to capture transportation costs in the model. This is a standard assumption in these models. See Markusen and Venables (1999), Javorcik (2004), Overman, Redding and Venables (2001) and Alfaro and Rodriguez-Clare (2004) for a discussion and the empirical relevance of this assumption.

[19]See Graham and Krugman (1991), Kindleberger (1969), and Lipsey (2003).

[20]This approach to the theory of the multinational firm is also known as the OLI framework (ownership advantage, localization, internalization. See Dunning (1981).

[21]For models that endogenize the FDI decision see Helpman (1984), Markusen (1984) and Helpman, Melitz and Yeaple (2004).

[22]Burnstein and Monge-Naranjo (2005) assume taxes on foreign firms to be the policy barrier in each country. We follow a broader interpretation, as foreign firms need to compensate for a wide range of costs/risks of doing business

Foreign firms use the following Cobb-Douglas constant returns to scale production function,

$$Y_{t,f} = \frac{A_f}{\phi} L_{t,f}^{\beta_f} H_{t,f}^{\gamma_f} I_{t,f}^{\lambda} \tag{7}$$

with $0 < \beta_f < 1$, $0 < \gamma_f < 1$, and $\beta_d + \gamma_d + \lambda = 1$. Like before, $L_{t,f}$ denotes the domestic labor useed in the foreign production in period t, $H_{t,f}$ is the domestic skilled labor used in the foreign production in period t, $I_{t,f}$ is the amount of composite intermediate goods used in the foreign production in period t, A_f represents the productivity parameter. Finally we allow for unskilled and skilled labor to have different shares within the domestic and foreign production though the total labor share is the same across both. This reflects the common observation that the share of labor tends to be around one third of total factor payments while still allowing us to have different skill intensities within domestic and foreign production. A corollary of assuming the same total labor share is,

$$\gamma_f - \gamma_d = \beta_d - \beta_f. \tag{8}$$

Lastly, the composite intermediate good is assembled from differentiated intermediate inputs. Following Ethier (1982), we assume that, for a given aggregate quantity of intermediate inputs used in the final good production, output is higher when the diversity in the set of inputs used is greater.[23] This specification captures the productivity gains from increasing degrees of specialization in the production of final goods.

$$I_{t,d} = I_{t,f} = I_t = \left[\int_0^n x_{t,i}^{\alpha} di\right]^{1/\alpha} \tag{9}$$

where $x_{t,i}$ is the amount of each intermediate good i used in the production of the final good at time t, and n is the number of varieties available. Let p_i denote the price of a variety i of the intermediate good x. The CES specification imposes constant and equal elasticity of substitution between a pair of goods.[24] Since the use of each intermediate good does not affect the productivity of the others and since there is decreasing marginal productivity of each intermediate good, the firm will use all the intermediate goods in the same quantity, thus $x_{t,i} = x_t$. Let $X_t = nx_t$ be the total input of intermediate goods employed in the production of the final good at time t, then we can rewrite $I_t = n_t^{\frac{1-\alpha}{\alpha}} X_t$. Then domestic production is given by (omitting the time subscripts for now):

$$Y_d = A_d L_d^{\beta_d} H_d^{\gamma_d} X_d^{\lambda} n^{\frac{\lambda(1-\alpha)}{\alpha}} \tag{10}$$

and foreign production by,

$$Y_f = \frac{A_f}{\phi} L_f^{\beta_f} H_d^{\gamma_f} X_f^{\lambda} n^{\frac{\lambda(1-\alpha)}{\alpha}}. \tag{11}$$

abroad including institutions, sovereign risk, taxes, infrastructure in the country, etc.

[23]The intermediate goods sector uses the functional form introduced by Dixit and Stiglitz (1978), which is proposed as a specification for a utility function and later applied to production theory by Ethier (1982).

[24]The elasticity of substitution is given by $\varepsilon = 1/(1-\alpha)$.

Thus raising the varieties of intermediate inputs n, holding the quantity of intermediate goods constant, raises output productivity. The reason is that bigger n allows the firm to use less of each one since inputs are imperfect substitutes, and this raises the average product for the part of the production that uses the intermediate good. This property of the production function is commonly referred to as love of variety for inputs.[25]

Equilibrium conditions require the unit cost to be equal to the price. Using the cost function and the fact that in a symmetric equilibrium all intermediate goods are priced similarly, $p_i = p_x$, we can write the equilibrium conditions for the domestic and foreign firms respectively as,

$$p_d = \frac{A_d^{-1}\beta_d^{-\beta_d}\gamma_d^{-\gamma_d}}{\lambda^{\lambda}} w_u^{\beta_d} w_s^{\gamma_d} p_x^{\lambda} n^{\frac{\lambda(\alpha-1)}{\alpha}}, \tag{12}$$

$$p_f = \frac{\phi A_f^{-1}\beta_f^{-\beta_f}\gamma_f^{-\gamma_f}}{\lambda^{\lambda}} w_u^{\beta_f} w_s^{\gamma_f} p_x^{\lambda} n^{\frac{\lambda(\alpha-1)}{\alpha}} \tag{13}$$

2.2.3 The Intermediate Goods Sector

The intermediate goods sector is characterized by monopolistic competition.[26] There exists an infinite set of potential varieties of these goods, but only a subset of varieties is produced at any point in time as entrepreneurs are required to develop a new variety. Since the set of potential intermediate goods is unbounded and all such products are symmetric, an entrepreneur will never choose to develop an already existing variety. Therefore, variety i of x is produced by a single firm which then chooses the price p_i to maximize profits. Firms take as given the price of competing intermediate inputs, the price of the final good and the price of the factors of production. In a symmetric equilibrium all intermediate goods are priced similarly, $p_i = p_x$. Hence, profit maximization in every time period for each supplier of variety i implies:

$$\max \ \pi_i = p_x x_i - c_x(w_u, w_s, x_i)x_i \tag{14}$$

where $c_x(w_u, w_s, x_i)$ represents the cost function and $x_i = x_d + x_f$, is the sum of the demand for the intermediate product i by domestic and foreign firms respectively.

Production of intermediate goods require both skilled and unskilled labor according to the following specification:

$$x = L_x^{\delta} H_x^{1-\delta} \tag{15}$$

Hence, the cost function for the monopolist is given by:

$$c\,(w_u, w_s, x_i) = \delta^{-\delta}(1-\delta)^{-(1-\delta)} w_u^{\delta} w_s^{(1-\delta)} x \tag{16}$$

[25] Ethier (1982) ascribes this property of the technology to the gains from increasing degrees of specialization in production.

[26] In our model, intermediate suppliers can exist with a large domestic sector but little or no FDI. In later stages of development this can be beneficial since the MNE's might seek out countries where it is easier to find all the inputs locally. See Blomstrom (1986) for related evidence that countries with large domestic sectors attract more FDI.

Profit maximization yields the result that each variety is priced at a constant markup $(1/\alpha)$ over the marginal cost. Hence, the price of each intermediate good is given by,[27]

$$p_x = \delta^{-\delta}(1-\delta)^{-(1-\delta)}\frac{w_u^{\delta} w_s^{(1-\delta)}}{\alpha} \tag{17}$$

The fraction that domestic firms spends on all intermediate goods is given by the corresponding share in the production function, $\lambda p_d Y_d$. This implies that for each intermediate good, the amount spent by domestic firms is given by,

$$\frac{\lambda p_d Y_d}{n} \tag{18}$$

and the amount that foreign firms spend on these goods is given by

$$\frac{\lambda p_f Y_f}{n} \tag{19}$$

The sum of (18) and (19) must be the revenue of the intermediate producer:

$$p_x x_i = \frac{\lambda p_d Y_d}{n} + \frac{\lambda p_f Y_f}{n} \tag{20}$$

Therefore another way to write the *operating* profits per firm is:

$$\pi_i = \frac{(1-\alpha)}{n}\left[\lambda p_d Y_d + \lambda p_f Y_f\right] \tag{21}$$

What is the value of introducing new intermediate goods and thus the value of the monopolistic firm? Let v_t denote the value of a claim to the infinite stream of profits at time t. The present discounted value of an infinite stream of profits for a firm that supplies intermediate goods at time t is given by,

$$v_t = \int_t^{\infty} e^{-r(s-t)}\pi_s ds$$

Equity holders of the firm are entitled to the stream of future profits of the firm. They make an instantaneous return of $(\pi_t + \dot{v})$, (profits and capital gain). They can also invest the same amount in a risk free bond and receive return rv_t (the prevailing market interest rate). Arbitrage in capital markets ensures that,

$$\pi + \dot{v} = rv \Rightarrow \frac{\pi + \dot{v}}{v} = r. \tag{22}$$

Thus the rate of return of holding ownership shares is equal to the interest rate.[28]

[27]See Helpman and Krugman (1985), chapter 6.

[28]Note that the arbitrage condition does not contradict our assumption of credit-constrained households since they can choose to lend to firms or invest in a risk free bond.

2.2.4 Introduction of New Varieties and Financial Markets

In order to run a firm in the intermediate good sector, entrepreneurs must first develop a new variety of intermediate goods. Since this is a small open economy, innovative activities do not affect conditions abroad. The development of each new variety requires the use of capital according to the following specification,

$$\dot{n} = \frac{K}{a} n^{\theta} \tag{23}$$

In contrast to Grossman and Helpman (1991), who assume that new varieties are developed with two inputs, labor and general knowledge, we opt for one input only, capital, to simplify the analysis.[29] Our main results do not depend on this simplifying assumption. The main implication of this simplification is that our results are less dependent on the production parameters of the innovation sector. This has important advantages for our calibration exercise as the stylized facts of the innovation and imitation process are not well documented, limiting our range of parameters. Our central argument is that entrepreneurs in developing economies face difficulties in obtaining loans to set up firms and this chokes the creation of backward linkages even under the presence of FDI. Assuming only capital is used for these setup costs then allows us to focus better on this issue.

The introduction of a new variety depends on the existing stock of varieties. We introduce the parameter θ since this will help us to introduce the growth in capital stock in terms of the efficiency units and also let us have a more general production structure as argued by Jones (1995). At this point, we only postulate that θ is greater than zero. As we shall see later, whether it is actually less than one (increasing complexity in introducing new varieties) or greater than one ("standing on the shoulder of giants") will be pinned down by the balanced growth path requirements.[30] Finally, a can be viewed as the level of efficiency in the innovative sector.

Innovation in the intermediate good sector requires capital costs which must be financed by borrowing from the domestic financial institutions. Entrepreneurs will engage in the production of intermediate goods only if the present value of the stream of monopoly profits of operating a firm in the intermediate good sector are greater than the capital costs of innovating. The domestic financial system intermediates resources at an additional cost.[31] This cost reflects the level of development of the domestic financial markets where lower levels of development are associated with higher costs. The cost manifests itself in a higher borrowing rate, i which is greater than the lending rate, r. As King and Levine (1991) mention, this wedge could reflect taxes, interest ceilings, required reserve policies, or high intermediation costs due to labor regulation, high administration costs, etc.[32] This simplification allows us to focus on the main theme of the paper: the role of financial markets in

[29] Grossman and Helpman (1991) assume that the greater the stock of general knowledge among the scientific community, the smaller the input of human capital needed to invent a new product. They assume $\dot{n} = KL/a$, where K represents the stock of general knowledge capital, and not physical capital like in our model. Hence, in our model the R&D sector does not compete for labor inputs against the final good sector.

[30] In equilibrium θ must be different than one to get a balanced growth path.

[31] See Edwards and Vegh (1997) for a similar setup.

[32] Galor and Zeira (1993) adopt a similar strategy to allow for capital market imperfections.

allowing FDI benefits to materialize. Thus, this assumption should be regarded as a shortcut to more complex modelling of the financial sector.[33] The reader is referred to the appendix for a cost verification approach following King and Levine (1993b) that yields the similar implications. Our qualitative results will be the same under this framework.

Given n^{θ} and a, if an entrepreneur wants to introduce one variety at any instant in time, the amount of capital needed will be $K = a/n^{\theta}$, so that $\dot{n} = 1$.[34] Therefore the cost of one variety is

$$\frac{ia}{n^{\theta}} \tag{24}$$

There is free entry into the R&D sector. Entrepreneurs will have an incentive to enter if $\frac{ia}{n^{\theta}} < v$. However this condition implies that the demand for capital will be infinite, which cannot be an equilibrium solution. Hence, we can rule out this condition ex ante. If on the other hand $\frac{ia}{n^{\theta}} > v$, entrepreneurs will have no incentive to engage in innovation. This possibility cannot be ruled out ex ante but would lead to zero growth. Therefore, in equilibrium, if there is growth in the number of varieties it must be the case that,

$$\frac{ia}{n^{\theta}} = v \text{ iff } \dot{n} > 0 \tag{25}$$

This also implies,

$$\frac{\dot{v}}{v} = -\theta \frac{\dot{n}}{n}$$

i.e., more innovation reduces the value of each firm. Using this expression and the arbitrage condition in the capital markets, $\frac{\pi}{v} + \frac{\dot{v}}{v} = r$, we can rewrite equation (22) as,

$$\frac{\pi}{v} - \theta \frac{\dot{n}}{n} = r \tag{26}$$

Using firm profit equation (21), equation (25), and equation (26) we obtain,

$$\frac{(1-\alpha)\lambda}{ia}\left[\frac{p_d Y_d}{n^{1-\theta}} + \frac{p_f Y_f}{n^{1-\theta}}\right] - \theta \frac{\dot{n}}{n} = r \tag{27}$$

Notice that in the previous equation, *ceteris paribus*, higher foreign firm production, Y_f increases the growth rate of $\frac{\dot{n}}{n}$. On the other hand if intermediation costs increase (i goes up), the growth rate would be lower. In order to simplify, we define $\frac{Y_d}{n^{1-\theta}} = \tilde{Y}_d$ and $\frac{Y_f}{n^{1-\theta}} = \tilde{Y}_f$ as efficiency units of outputs and get,

$$\frac{(1-\alpha)\lambda}{ia}\left[p_d \tilde{Y}_d + p_f \tilde{Y}_f\right] - \theta \frac{\dot{n}}{n} = r \tag{28}$$

This means we can also rewrite equation (4) as,

[33] There is a broad literature modelling how information and transaction costs can explain the emergence of financial intermediaries. Financial institutions can economize on trading costs (Townsend, 1978); pool liquidity risk (Diamond and Dybig, 1983); acquire information on investment projects (Boyd and Prescott, 1986); and reduce the cost of monitoring entrepreneurs (Diamond, 1984).

[34] More generally we can think the cost as $\frac{\Psi a}{n^{\theta}}$, were Ψ represents the higher cost of intermediation faced in the domestic market.

$$\frac{p_f}{p_d} = \mu \left[\frac{\tilde{Y}_d}{\tilde{Y}_f} \right]^{1-\rho} \tag{29}$$

And we can rewrite equation (23) as

$$\frac{\dot{n}}{n} = \frac{1}{a}\frac{K}{n^{1-\theta}} = \frac{1}{a}\tilde{K}$$

where $\tilde{K}$ is the capital stock per efficiency unit.

2.3 General Equilibrium and the Balanced Growth Path

Substituting the price for intermediate inputs (17) into the equilibrium conditions for the domestic (12) and foreign production (13), and defining efficiency wages for both skilled and unskilled labor as $\tilde{w}_s = w_s / \left(n^{\frac{(1-\alpha)\lambda}{\alpha}}\right)$and $\tilde{w}_u = w_u / \left(n^{\frac{(1-\alpha)\lambda}{\alpha}}\right)$, for the domestic and foreign sector, respectively, we obtain the following expressions,

$$p_d = \frac{A_d^{-1} \beta_d^{-\beta_d} \gamma_d^{-\gamma d}}{\lambda^\lambda} \left(\frac{\delta^{-\delta}(1-\delta)^{-(1-\delta)}}{\alpha} \right)^\lambda \tilde{w}_u^{\beta_d + \delta\lambda} \tilde{w}_s^{\gamma_d + (1-\delta)\lambda} \tag{30}$$

$$p_f = \frac{\phi(\tau) A_f^{-1} \beta_f^{-\beta_f} \gamma_f^{-\gamma_f}}{\lambda^\lambda} \left(\frac{\delta^{-\delta}(1-\delta)^{-(1-\delta)}}{\alpha} \right)^\lambda \tilde{w}_u^{\beta_f + \delta\lambda} \tilde{w}_s^{\gamma_f + (1-\delta)\lambda} \tag{31}$$

Equilibrium conditions in the labor market imply that the labor employed by the domestic, the foreign and the intermediate good production processes add up to the total labor supply in the economy. This implies, for the skilled and unskilled labor, respectively,

$$L_d + L_f + nL_x = L \tag{32}$$

$$H_d + H_f + nH_x = H \tag{33}$$

Using the cost functions for the domestic, foreign and intermediate goods sector and Shepard's Lemma, we can rewrite these two constraints as

$$\frac{(\beta_d + \delta\alpha\lambda)\, p_d Y_d}{w_u} + \frac{(\beta_f + \delta\alpha\lambda)\, p_f Y_f}{w_u} = L$$

$$\frac{(\gamma_d + (1-\delta)\alpha\lambda)\, p_d Y_d}{w_s} + \frac{(\gamma_f + (1-\delta)\alpha\lambda)\, p_f Y_f}{w_s} = H$$

Using our output and wage equations in terms of efficiency units, we can rewrite both constraints as:

$$\frac{(\beta_d + \delta\alpha\lambda)\, p_d \tilde{Y}_d n^{1-\theta}}{\tilde{w}_u n^{\frac{(1-\alpha)\lambda}{\alpha}}} + \frac{(\beta_f + \delta\alpha\lambda)\, p_f \tilde{Y}_f n^{1-\theta}}{\tilde{w}_u n^{\frac{(1-\alpha)\lambda}{\alpha}}} = L$$

$$\frac{(\gamma_d + (1-\delta)\alpha\lambda)\, p_d \tilde{Y}_d n^{1-\theta}}{\tilde{w}_s n^{\frac{(1-\alpha)\lambda}{\alpha}}} + \frac{(\gamma_f + (1-\delta)\alpha\lambda)\, p_f \tilde{Y}_f n^{1-\theta}}{\tilde{w}_s n^{\frac{(1-\alpha)\lambda}{\alpha}}} = H$$

Along the balanced growth path, labor shares must be constant. This means that $\left(p_i\tilde{Y}_i n^{1-\theta}\right)/\tilde{w}_j n^{\frac{(1-\alpha)\lambda}{\alpha}}$ $(i = d, f; j = u, s)$ should be constant. There are two ways to achieve this. The first is to assume that prices, p_i, grow at the rate $\left(\frac{(1-\alpha)\lambda}{\alpha} - (1-\theta)\right)\frac{\dot{n}}{n}$. This would still mean that p_d/p_f would be constant since none of these parameters reflect sectoral differences and the relative price would thus be driven by other factors (mainly ρ and μ). An alternative would be to impose $\frac{(1-\alpha)\lambda}{\alpha} = 1-\theta$. This has the disadvantage of being a knife-edge condition but on the other hand it does offer a big advantage. It allows us to back out θ which may be impossible to get measures of (measures for λ and α on the other hand are easily available from the literature). This condition still implies that p_d/p_f would be constant. Therefore we assume that this condition holds. Thus, we can rewrite the above as

$$\frac{(\beta_d + \delta\alpha\lambda)\, p_d\tilde{Y}_d}{\tilde{w}_u} + \frac{(\beta_f + \delta\alpha\lambda)\, p_f\tilde{Y}_f}{\tilde{w}_u} = L \tag{34}$$

$$\frac{(\gamma_d + (1-\delta)\alpha\lambda)\, p_d\tilde{Y}_d}{\tilde{w}_s} + \frac{(\gamma_f + (1-\delta)\alpha\lambda)\, p_f\tilde{Y}_f}{\tilde{w}_s} = H \tag{35}$$

Now we can solve for all the endogenous variables completely and derive the equilibrium balanced growth. In order to be able to solve the equilibrium growth rate of varieties, $\frac{\dot{n}}{n}$ we need to solve the set of prices $\{p_d, p_f, \tilde{w}_u, \tilde{w}_s\}$ and the outputs of the domestic and foreign sectors, $\left\{\tilde{Y}_d, \tilde{Y}_f\right\}$. To solve for the prices and the outputs we use equations (4), (5), (30), (31), (34) and (35). These equations can be solved in a sequential order. The details are presented in appendix. While we can solve for the FOC's and derive implicit relationships, because of equation (5) we cannot derive explicit solutions for the endogenous variables in terms of the parameters. If we restrict ourselves to the special case of where the aggregator is a Cobb Douglas function, we can solve explicitly for all the endogenous variables. We turn to this next to get a sense of the qualitative implication of the model.

2.3.1 The Aggregator as a Cobb Douglas Function

The Cobb Douglas case is CES with $\rho \longrightarrow 0$. We can rewrite the aggregator for the domestic and foreign output as,

$$\begin{aligned} Y &= Y_d^{\frac{1}{1+\mu}} Y_f^{\frac{\mu}{1+\mu}} \\ Y &= Y_d^{\eta} Y_f^{1-\eta} \end{aligned} \tag{36}$$

where $\mu = (1-\eta)/\eta$ for simpler notation. Note that profit maximization here implies that

$$\frac{p_d}{p_f} = \frac{\eta}{1-\eta}\frac{Y_f}{Y_d} \tag{37}$$

As for the cost function and equilibrium conditions,

$$C(y, p_d, p_f) = \eta^{-\eta}(1-\eta)^{-(1-\eta)}\, p_d^{\eta} p_f^{(1-\eta)} Y = 1$$

$$\Rightarrow p_d = \eta\left(1-\eta\right)^{\frac{(1-\eta)}{\eta}} p_f^{\frac{-(1-\eta)}{\eta}} \tag{38}$$

Recalling the arbitrage condition,

$$\frac{(1-\alpha)\,\lambda}{ia}\left[p_d\tilde{Y}_d + p_f\tilde{Y}_f\right] - \theta\frac{\dot{n}}{n} = r$$

Using (37), the previous expression as,

$$\Rightarrow \frac{(1-\alpha)\,\lambda}{ia\,(1-\eta)} p_f\tilde{Y}_f - \theta\frac{\dot{n}}{n} = r \tag{39}$$

We can solve the model completely, using equations (30), (31), (34), (35), (37), and (38). The details are worked out in appendix. The main equations of interest are (77) and (85), renumbered here as (40)

$$\left(\frac{(1-\alpha)\,\lambda}{ia}\right)\left(\frac{\tilde{w}_s H}{\eta\left(\gamma_d + (1-\delta)\alpha\lambda\right) + (1-\eta)\left(\gamma_f + (1-\delta)\alpha\lambda\right)}\right) - \theta\frac{\dot{n}}{n} = r \tag{40}$$

$$\tilde{w}_s H = \Delta\Upsilon\Lambda_d^{\eta}\Lambda_f^{1-\eta}\left(\Phi L\right)^{\Psi_\beta} H^{\Psi_\gamma}$$

where $\Upsilon = \eta^{\eta}\left(1-\eta\right)^{(1-\eta)}$; $\Lambda_d = \left(A_d\beta_d^{\beta_d}\gamma_d^{\gamma d}\right)$; $\Lambda_f = \left(A_f\beta_f^{\beta_f}\gamma_f^{\gamma_f}\right)/\phi$;
$\Phi = \frac{\eta(\gamma_d+(1-\delta)\alpha\lambda)+(1-\eta)\left(\gamma_f+(1-\delta)\alpha\lambda\right)}{\eta(\beta_d+\delta\alpha\lambda)+(1-\eta)\left(\beta_f+\delta\alpha\lambda\right)}$;
$\Psi_\beta = \eta\left(\beta_d+\delta\lambda\right) + (1-\eta)\left(\beta_f+\delta\lambda\right)$;
$\Psi_\gamma = \eta\left(\gamma_d+(1-\delta)\lambda\right) + (1-\eta)\left(\gamma_f+(1-\delta)\lambda\right)$.

There are a couple of conclusions one can draw from the Cobb-Douglas case: 1) Higher productivity of either domestic or foreign firms raises the growth rate in the economy since all else being equal a higher A_f and a higher A_d both tend to raise growth. Note that the prototype of our model is a standard product variety endogenous growth model with scale effects. The equation for $\tilde{w}_s H$ above, is increasing in both L and H and also A_f and A_d. Essentially an increase in any of these exogenous parameters increases the profits from introducing new intermediate goods and thus causes the growth rate to rise. 2) The effect of a higher share of foreign production in the economy on aggregate growth is ambiguous. This happens because of the Cobb-Douglas aggregator, which keeps the share of domestic and foreign production constant. Thus even if A_f increases relative to A_d (i.e. a higher productivity gap between the domestic and the foreign producer) this will not increase the share of the foreign producer in the market. This is the clear drawback of using a Cobb Douglas specification. However we can ask the question of what happens as the share of the foreign producers is increased exogenously, i.e. a decrease in η. This turns out to be ambiguous since $\Upsilon = \eta^{\eta}\left(1-\eta\right)^{(1-\eta)}$ is a U-shaped function of η which is minimized at $\eta = 0.5$. For almost all countries in the world $\eta > 0.5$ and for most developed economies it would be near to 1. Therefore, even if there is a productivity gap between the domestic and the foreign produces, the term Υ, which is independent of this gap could drive down the growth rates.

The qualitative effect of financial markets on economic growth is unchanged irrespective of whether we look at Cobb-Douglas or the CES case. In both cases (will be shown later), an increase in FDI (either through a higher A_f (better technology) or through an increase in the exogenous parameter μ) in the CES case, raises the overall growth rate of the economy. Note that both CES and Cobb-Douglas specifications guarantee the co-existence of both firms in the long-run. And in the Cobb-Douglas case their relative shares in the economy is fixed. However in the CES case an increase in A_f (if the elasticity of substitution is greater than 1), or a rise in μ, will lead to a reallocation of resources away from the domestic firm to the foreign firm. Therefore the instantaneous effect will be a decline in domestic firms' share in output. In the long run, both domestic and foreign firms will benefit from the higher growth rate. However this implies that at least in the short-run the horizontal spillovers in the final good sector, which indirectly result from the backward linkages between the foreign firm and the intermediate good sector, exists only for the surviving domestic firms as opposed to all domestic firms in the Cobb-Douglas case. This is an additional contribution of our setup, which can shed light on why empirical studies fail to find evidence of positive horizontal spillovers for developing countries and even find negative spillovers in some cases.

We will turn into the calibration exercise now where by using micro estimates of our parameters we quantitatively study the comparative static effects we have discussed so far.

3 Calibration Exercise

In order to illustrate the qualitative properties of the model, we undertake a calibration exercise using values for the parameters from micro-econometric studies. Then we compute the growth rates implied by our model. The purpose of this exercise is to study the quantitative growth effects of FDI, focusing on different levels of financial market development. In the below discussion the main equations used for the numerical exercise are (4), (5), (30), (31), (28), and (35).

We group countries based on their financial market development levels. Different measures have been used in the literature to proxy for financial market development.[35] The broader financial market development measures such as the monetary-aggregates as a share of GDP and the private sector credit extended by financial institutions as a share of GDP capture the extent of financial intermediation; interest rate spreads, on the other hand, capture the cost of intermediation. Given that the spread between the lending and borrowing rates better captures the spirit of our model, we prefer it as the measure for the development of the financial markets.[36] We find that the alternative measures of financial market development, including the size of the financial market, the share of private sector credit in total banking activity, the overhead costs and the interest rate spreads, are all highly correlated, allowing for using these measures interchangeably.[37] The average spread

[35] See Levine et al. (2000), Erosa (2001).

[36] Erosa (2001) defines the financial intermediation cost as the resources used up per unit of value that is intermediated, which is the total value of financial assets owned by the financial institutions. He measures the financial intermediation cost as the spread between the lending and borrowing rates.

[37] The development of the financial markets could alternatively be proxied using broad measures of banking sector development such as private credit to GDP as in Levine et al. (2000) or stock market variables such as capitalization to GDP as in Levine and Zervos (1998); or as the overhead costs as a share of total loans, following Imrohoroglu and Kumar (2003).

for the low financially developed (poor) countries, medium financially developed (middle income) countries and the high financially developed (rich) countries between 2000 and 2003 are 14.5%, 8.5%, and 4.5%, respectively.[38]

The remaining parameters that are used in the benchmark analysis are taken from the literature. We start by discussing the production parameters. The parameters are chosen such that those for the domestic firm capture the characteristics of the production technologies available in the developing countries; whereas, those for the foreign firm capture the characteristics of the production technologies available in the industrial countries. The share of intermediate goods in the production of the final good (λ) is assumed to be same across the two production technologies. The formulation of the production technology allows setting the share of the intermediate goods equal to the share of physical capital in final production. Following many studies in the literature we set this share equal to 1/3.[39] The remaining 2/3 of final production is accounted by skilled and unskilled labor.

Following Weil (2004) the share of wages paid to human capital (skilled labor) is taken as 49% for the developing countries, suggesting that of labor's 2/3rd share in final production 49% is due to the skilled labor. Therefore, we set the share of skilled labor in final production, γ_d, at 32%. In parallel the share of unskilled labor in final production, β_d, is set at 35%. As a benchmark assumption we set the total factor productivity A_d equal to 1.

The share of skilled and unskilled labor in the final production by the foreign firm are calculated in similar fashion. Following Weil (2004), the share of wages paid to human capital (skilled labor) is taken as 65% in industrial countries. Accordingly, the share of skilled labor in the final production of the foreign firm, γ_f, is set equal to 40%; imputed as 65% of 2/3, the share of labor in final production. Similarly, the share of unskilled labor in the final production by the foreign firm, β_f, is set equal to 0.27. Thus we assume that $\gamma_f > \gamma_d$.[40] The productivity of the foreign firm, A_f, is initially set to be twice that of the domestic firm following Hall and Jones (1999), who show the productivity parameter for a very large sample of non-industrial countries is around 45% of the productivity parameter of the U.S. With respect to the institutional barriers the foreign firms face, ϕ, we consider a range of parameters from ranging between 1 and 2. Given $A_f = 2A_d$, the overall advantage foreign firms have in terms of TFP translates into varying between the range of 2 and 1, corresponding to the range of values set for the cost of doing business, ϕ. Therefore our best case scenario is one where the foreign firm is twice as productive than domestic firms even –after considering the cost to foreign firms of doing business in a foreign country– and the worst case is where the foreign firm,

[38]We also looked into a breakdown into 5 groups, which gives us the same qualitative results.

[39]See Gollin (2002).

[40]As Barba Navaretti and Venables (2004) note, there is ample evidence that foreign firms employ more skilled personnel than domestic firms. They also tend to be larger, more efficient, and pay higher wages. This could be both because MNEs bring to host countries a knowledge that may not necessarily be available in the domestic economy (technologies, management skills, market access and others) or because foreign firms cherry pick the best firm or sectors. When adopting stringent econometric techniques, the differences between foreign and domestic firms are small and not always significant. But foreign firms are still found to perform better in some cases and never worse than local firms. Foreign firms are also found to pay higher wages than local firms, even after controlling for skill differences and for firm-specific factors.

–once additional costs of doing business abroad are considered– has no apparent overall advantage. The latter scenario may be unrealistic but is a useful benchmark. Finally, given the lack of any estimate, the share of unskilled labor in the production of the intermediate good δ is taken as 0.5 as benchmark.

The stock of skilled and unskilled labor, H and L respectively, are set to follow Duffy, Papageorgiou, and Perez-Sebastian (2004). Duffy et al. (2004) discuss the possible aggregation bias that could be caused by differences in the contribution to the production in terms of efficiency units of the different types of labor. To overcome this bias, they weigh the length of education by the returns to schooling, and compute what they call "weighted" labor stock data. Taking the workers that have completed secondary schooling as skilled labor we calculate averages for a sample of countries in each category of income level according to data availability. Accordingly, we set the ratio of unskilled labor to skilled labor equal to 12 for the poor countries, 9 for the middle income countries, and 5 for the rich countries.[41] To rule out the possibility of scale effects driving differences in growth rates, we assume that $H + L = 1$ and the shares of the two factors are allocated according to these three ratios so that they sum to 1 (e.g. for poor countries $H = 0.077$ and $L = 0.923$).

The remaining parameters are $\alpha = 0.91, r = 0.05$. Based on the work of Basu (1996), the mark-up is assumed to be 10%, and hence the value of the reciprocal of (1+mark-up) is given by $\alpha = 0.91$. The risk free interest rate is assumed to be 5%. The price of the final good is taken as the numeraire. Finally, the parameter capturing the ease of developing new variety of products, θ, is limited by other parameter choices given the following formulation: $\theta = 1 - (\lambda * (1 - \alpha)/\alpha)$. These above discussed parameters are used in both the Cobb-Douglas and the CES exercises, for which the results are discussed respectively in sections 3.2 and 3.1.

The cost of introducing a new variety of product, a, is taken as the free parameter. In both cases the model is calibrated to allow for the financially well-developed country growth rates to match the U.S. growth rate. Given the fact that the U.S. is often considered to be the technological leader one can assume that the productivity of foreign firms in the U.S. is no different than the productivity of the domestic U.S. firms, allowing us to assume that $A_f/(\phi A_d) = 1$ to back out a. [42]

In particular, the U.S. growth rate of real GDP was approximately 3.5% for the 70 years of data available from the Bureau of Labor Statistics (1930-2000), which is the approximate value we try to achieve in the benchmark case for the financially well developed group. This condition and the other parameters above, pins down $a = 15$ for the CES production function case, and $a = 60$ for the Cobb-Douglas production function case. We use these respective values for the entire analysis

[41] On average for the Latin American countries, the ratio between the unskilled and skilled workers (L/H) is equal to 10; for a group of countries that include Latin America, Central America, and the East Asia and Pacific region the average increases to 12. The ratio for a sample of developed countries, including the US, European Union economies, Canada and Japan, is found to be 5.

[42] Note that we are not assuming that U.S. firms investing abroad have the same productivity as U.S. firms that do not. The work by Helpman, Melitz and Yeaple (2004) finds U.S. Multinational be more productive than U.S. domestic firms.

of the CES case and the Cobb-Douglas case, respectively.[43] As benchmark, in the Cobb-Douglas production function case, we assume that the share of the foreign firms in total output is only 5% (i.e. $\eta = 0.95$). Again this varies considerably by country. Lipsey (2001) estimates that in 1995 the share of world production due to FDI flows was at best 8%. More specifically at individual country levels, we find for example, that foreign owned companies were responsible for 12% of GDP in Australia, 5% in Italy, 7% in Finland, 19% in Hungary and 22% in the Czech Republic.[44] We will later consider how our results change when we assume a lower $\eta = 0.75$. The share of foreign production, η is no longer exogenous in the CES production function case; however, the choice of μ implicitly determines the relative foreign and domestic production. As such, the benchmark value for μ is determined to allow for the matching of the relative output values to the real data. This implies that the benchmark value be $\mu = 0.1$.

In our model, ρ relates to the elasticity of substitution between goods produced by foreign and domestic firms. Evidence regarding the appropriate choice of the elasticity of substitution parameter ρ is sparse, given that such depiction of final goods production has not been used in previous models as an artifact to capture the interaction (production/preferences) between foreign and domestic firms. The closest evidence is from the literature that depicts the consumption behavior using a constant elasticity of substitution utility function between varieties of domestic and foreign goods, or between tradables and nontradables. Ruhl (2005) provides a detailed overview of the Armingtom elasticity, i.e. the elasticity of substitution between the foreign and home goods, and finds that an appropriate value for ρ is around 0.2 and 0.3.[45] While the benchmark analysis below is based on $\rho = 0.2$ the robustness of the results to different values of the elasticity of substitution is also tested for by allowing the ρ value to range between -0.9 and 0.9. Table 1 summarizes all the parameter values.

We consider two scenarios that reflect the benefits of FDI. One scenario is where advances in innovation in the parent country are transmitted through FDI to the host country. These technological benefits of FDI are captured through the productivity parameter of the foreign firm (i.e, an increase in A_f). In considering reasonable increases in A_f, we refer to Coe, Helpman and Hoffmaister (1997). Analyzing the spillovers from foreign R&D activity on the Southern total factor productivities (TFP) Coe, Helpman and Hoffmaister (1997) regress the domestic TFP of the Southern economies on foreign R&D stock, among several other variables. This regression allows identification of the foreign R&D elasticity of TFPs. In the benchmark regression, Coe, Helpman and Hoffmaister (1997) report this elasticity to be at the range of 0.73-0.75.[46] We consider the

[43] Conceivably, since a reflects the barriers for entrepreneurs in introducing new blueprints, it may also be a function of development. However in the absence of any estimates we do not experiment along this line.

[44] This data comes from Mataloni, Jr. (2005)

[45] Ruhl (2005) argues that a model that captures both the temporary and permanent shocks, in the case of Ruhl (2005) these are trade shocks, then one can replicate both the low elasticity of substitution figures used by the international real business cycle studies and the high elasticity of substitution values found by the empirical trade studies. The real elasticity of substitution value depends on which of these shock dominate the system. A wide range of estimates are available in the literature, the value f or ρ ranging from between 0 and 0.5 (see Obstfeld and Rogoff, 2005, and Backus, Kehoe and Kydland, 1994 among others) to values higher than 0.5 (see Head and Reis, 2001, Hummels and Klenow, 2002, and Romalis, 2005, among others).

[46] Hejazi and Safarian (1999) adds FDI to Coe, Helpman and Hoffmaister's framework and measures international

implications of an increase in A_f that is 25% (i.e. A_f/A_d rises to 2.5). Implicitly this would reflect a $25/0.75 = 33.3\%$ increase in R&D stock of the technological leaders. At first glance this may seem like assuming a rather large increase. On the other hand note that A_f in our model is a constant and therefore this one time jump captures what might realistically happen, perhaps, over a decade. Alternative measures for the extent of spillovers are obtained from the micro-level econometric studies. Javorcik (2004) finds that an approximately 23% increase in foreign direct investment corresponds to a 15% spillover, which in our framework corresponds to a 15% increase the relative productivity of foreign firms.[47] In the exercises below we undertake the numerical calibration of the Cobb-Douglas as well as the CES production function cases following Javorcik's findings(2004), however in the below representation we report the Cobb-Douglas exercise where there is a 25% increase in A_f, and the CES exercise where there is a 15% increase in A_f.[48]

The second scenario is an exogenous increase in FDI share (lower η). Under both of these scenarios H/L ratios are held fixed for each country, so the resulting differences in the growth rates do not reflect human capital differences, rather they reflect variations in FDI. Both scenarios are studied separately for the CES and the Cobb-Douglas production function cases, in sections 3.1 and 3.2, respectively.

3.1 CES Production Function

The benchmark results for the CES production function are reported in table 2. In the case of CES, the choice of the parameter μ, *ceteris paribus*, has a positive effect on the share of MNE production. Given all other parameter values, it turns out that the reasonable choice is μ=0.1, based on the relative output its value implies. As table 2 suggests, in this case foreign production equals around 6.5% of domestic production, while when $\mu = 0.2$ the same ratio increases to around 15.5%. These two values correspond to the share of foreign production in total production to be 6% and 13%, respectively.[49] Following Mattaloni (2005) most of our analysis is restricted around these two values. However, for the sake of completeness, the tables also list results for increments

spillovers both for trade and FDI. They find that much of the measured spillover effect on productivity is through FDI rather than trade.

[47] Javorcik (2004) finds that a one-standard deviation increase in foreign presence, which in her model corresponds to a 23% increase in FDI, increases domestic production by 15%. A better representation of this correspondence in our model would be allowing for an increase in the productivity of intermediate goods production, as the Javorcik (2004) study measures the extent of backward linkages. Given that the mechanics of our model works such that an increase in the foreign presence, via an improvement in the relative productivity of foreign firms, increases the demand for locally produced intermediate goods using the findings from Javorcik (2004) seems to be a good approximation. Futhermore, the analysis is repeated for a wide-range of possible spillover magnitudes, not limiting the below discussion to the choice of the extent of spillovers at neither 25% nor 15%.

[48] The qualitative results remain unchanged. Due to space limitations and to allow for a wide ranging representation of the results we report the two alternative spillover magnitudes for the two alternative production function representations.

[49] The tables report the ratio of foreign production to domestic production, i.e. $\frac{P_f Y_f}{P_d Y_d}$. Using these share values it is possible to impute the share of foreign production in total production, i.e. $\frac{P_f Y_f}{P_d Y_d + P_f Y_F}$. For example, if foreign production is 10% of domestic production this corresponds to the share of foreing production in total production being $9\% = 1/(1 + 0.10)$.

of 0.1 for μ until $\mu = 0.6$ and as the benchmark value we use $\mu = 0.1$.[50]

The first scenario capturing an increase in the foreign presence is an exogenous increase in FDI share (higher μ). Results in table 3 show that an increase in μ from 0.1 to 0.2 corresponds to a tripling of the foreign output level, and an increase in foreign production relative to domestic production from 6% to 16%, corresponding to an increase of share of foreign production in total production from 6% to 13%. Such intensive increase in the extent of foreign presence in the domestic economy generates additional growth rates that are quantitatively much larger than those discussed below for the case of improvements in the relative productivity of the foreign firm. Such an increase in FDI, due to an increase in μ from 0.1 to 0.2, creates a 1.25 percentage point increase in the average growth rate of the financially well-developed countries, a 0.88 percentage point increase in the average growth rate of the financially medium-developed countries, and a 0.61 percentage point increase in the average growth rate of the financially poorly-developed countries. This finding is supportive of the main hypothesis of this paper, that for the same amount of increase in FDI the additional growth rates that are made possible in financially well-developed countries is almost double that of additional growth rates made possible in financially poorly-developed countries.

The results in table 4 are supportive of the hypothesis as well, suggesting that regardless of the *source* of the increase in the extent of foreign presence in the local economy, for the same magnitude of increase in the foreign presence the additional growth effects generated in the local economy are higher for the financially well-developed countries than those generated in the financially medium developed countries, and these are higher than those generated in the financially poorly developed countries. In this case the increase in the extent of foreign presence is captured through an increase in the relative productivity, $A^f/(\phi A^d)$. For the benchmark case, numerically a 15% increase in the relative productivity of the foreign firms increases the growth rate of the financially well-developed countries by 0.03 percentage points, increases the growth rate of the financially medium-developed countries by 0.02 percentage points, and increases the growth rate of the financially poorly-developed countries by 0.01 percentage points. The higher relative productivity of the foreign firm corresponds to a 4.2% increase in the foreign production, $P_f Y_f$, and a marginal increase in the share of foreign production in total production from around 6.1% to 6.3%. These results hold qualitatively across alternative η assumptions. For example, if $\eta = 0.6$ or $\mu = 0.4$, in other words if foreign production is about 37%, a 15% increase in the relative productivity of the foreign firm generates a 0.35 percentage point increase in the average growth rate of the financially well-developed countries, a 0.24 percentage point increase in the average growth rate of the financially medium developed countries, and a 0.17 percentage point increase in the average growth rate of the financially poorly-developed countries. The corresponding increase in the extent of foreign presence in the local economy is reflected in an 6.6% increase in foreign production, $P_f Y_f$, and an increase in foreign production relative to domestic production from 37% to 38%. This finding is suggestive of a nonlinearity in the growth effects of FDI, where the additional growth effects increase by a larger

[50] The results reported in the benchmark case provides evidence that the results hold regardless of the choice of the μ value. We have replicated tables 2 through 9 using $\mu = 0.2$ both the qualitative and quantitative results prevail. These results are available from the authors upon request.

magnitude when the initial level of FDI is higher, suggestive of a convex relationship between the level of FDI and the additional growth rate generated across each level of financial development.

While the relative *net* productivity between foreign and domestic firms can change due to the changes in the foreign and the domestic firms' gross productivity, an alternative source of change could be alterations in the cost of doing business, ϕ. In table 5, keeping $\mu = 0.1$ and the remaining parameters as in the benchmark case, we allow for ϕ to change. We observe that, regardless of the net relative productivity levels, in this case on account of different ϕ values, an increase in FDI always creates higher additional growth rates for financially more developed countries than in financially less developed countries. The extent of increased foreign presence in table 5 corresponds to a 19% increase in foreign production and an increase in the share of foreign production in the economy from around 11% to 12%. These results are evidence that the benchmark findings are robust to the choice of the cost of doing business parameter, ϕ. Therefore, in the remainder of the exercise the choice of keeping $\phi = 1$ has no effect on the qualitative results. In fact, results in table 5 is further suggestive that the quantitative results do not differ significantly across different ϕ assumptions; for the financially well-developed countries, when the net productivity of the foreign firm is twice that of the domestic firm the additional growth rate increased FDI creates is 0.03 percentage point while when the net productivity of the foreign firm is equal to the domestic firm the the same increase in FDI creates 0.02 percentage point additional growth. The difference is even smaller for the financially medium- and poorly-developed countries.

The above exercise kept the relative labor endowments constant across the three groups of countries in order to observe the differences solely on account of financial market development differences. The three groups however also differ in their relative labor endowments, as reflected in table 1. As such, in table 6 and table 7 we allow for the relative labor endowments to differ among the three groups, alongside the financial market depth. The differences in the additional growth rates the same level of FDI generates in the three groups of countries is even larger, with the main hypothesis of the model holding even stronger. While the additional growth the same level of FDI creates in the financially well-developed countries is twice of that created in the financially poorly-developed countries when the relative labor endowments do not differ across the three groups, its is triple of that when the relative labor endowments reflect the real world figures for the respective country groups.[51] This table also allows comparison of results with alternative absorptive capacity measures, such as the labor skills as suggested by Borenzstein et al. (1998) and Xu (2002). Comparing the results in tables 4 and 6 one observes that when $\mu = 0.2$ for example, the additional growth rate generated is 0.06 for the financially medium developed countries. When the labor endowments of these countries decrease to the actual level then this additional growth rate decreases to 0.05, suggesting that the 0.01 percentage points additional growth was due to the better labor endowments. This result suggests that countries with more skill-intensive labor endowments benefit more in terms of growth effects from FDI.

So far in the analysis in setting the parameters regarding the relative productivity of the foreign

[51] As in the Cobb-Douglas case the robustness of the results are ensured by using alternative labor endowment figures from Barro and Lee (1992), and Caselli and Coleman (2005). The qualitative results remain unchanged.

and domestic firms, $\frac{A_f}{\phi A_d}$, we made use of the information from macro level studies showing that the productivity difference between the industrialized and developing countries is approximately 2. Micro level studies provide further information regarding the productivity differences between foreign owned and domestic owned firms. For example, Davies and Lyons (1991) show that foreign firms are 30% more productive than their domestic counterparts, and 18% of this is attributable to the multinational firm characteristics of the firm. Therefore, one could argue that $\frac{A_f}{\phi A_d} = 1.18$. In similar vein, Aitken and Harrison (1998) find that as a plant goes from being domestically owned to fully foreign owned then its total productivity increases by between 10% and 16%. So, one could easily envisage $\frac{A_f}{\phi A_d} = 1.15$. Conyon et.al. (2002) on the other hand, show that the foreign firms in the U.K. are between 30% and 50% more productive than the domestic firms. Finally, micro level evidence provided from Japan by Kimura and Kiyota (2004) suggests that foreign firms are 67% to 100% more productive than domestic firms, suggesting a relative productivity value close to that suggested by macro level studies. Given the wide range of estimates available for the relative productivity we next allow for alternative relative productivity values. Results reported in tables 8 and 9 start with the lowest value from the micro evidence, namely 1.15 and allows for increments of approximately 15% change in this value. This exercise allows us to cover a wide range of possible relative productivity measures, and not only is a robustness check but also allows us to discuss alternative magnitudes of increased foreign presence and alternative spillover magnitudes.

Table 8 shows the additional growth rates observed in the three groups of countries when the technology gap among the foreign and domestic firms change. While the first three columns reports the results for the benchmark value for μ the robustness of the results to alternative values of μ are also tested for in the remainder of the table. The results for the benchmark case suggest that increments of 15% increases in the technology gap between the foreign and domestic firms creates additional growth rates of 0.020 percentage points in the financially well-developed countries, 0.011 percentage points in the financially medium developed countries, and 0.06 percentage points in the financially poorly developed countries. For example, when the technology gap measure increases from 1.15 to 1.32, by approximately 15%, the additional growth rates in the three countries are as reported in the previous sentence. Alternatively if the technology gap measure increases by 100%, to 2.3, one has to look at the cumulative of the additional growth values reported in table 8. For the financially well-developed countries this doubling of the relative productivity measure creates an additional 0.1 percentage point growth, while creating around 0.05 percentage point growth in the financially medium developed, and around 0.03 percentage point growth in the financially poorly-developed countries. The exercise reported in table 8 allows for replicating this exercise for a very wide range of initial technology gap measures, as well as alternative values of *extent of spillovers*. Table 9 alternatively looks into the additional growth rates due to increased foreign presence measured through changes in μ, rather than through changes in the technology gap. The same results prevail, where the additional growth rates are almost triple for the financially well-developed countries than for the financially poorly-developed countries.

Finally, given the lack of strong evidence for the appropriate measure of the elasticity of substitution parameter the above exercise is replicated for values of ρ ranging from -0.9 to 0.9. Figures 1 through 6 show the nonmonotonic relationship between ρ and the additional growth rates created by increased FDI across the three groups of countries. Figures 1, 2, and 3 show the results for the financially well-, medium-, and poorly-developed countries, respectively, for positive values of ρ. Similarly, figures 4, 5, and 6 show the results for the financially well-, medium-, and poorly-developed countries, respectively, for negative values of ρ. An interpretation of the elasticity of substitution values suggests that as ρ increases the domestic and foreign produced goods become more substitutes, and in such cases we observe higher additional growth effects of FDI across the board and the main hypothesis of the model remains fully supported. The figures furthermore show that these results remain unchanged across alternative initial values of foreign presence in the market, i.e. for alternative values of μ.

3.2 Cobb-douglas production function

This section discusses the results for the Cobb-Douglas production function ($\varepsilon = 1/(1-\rho) = 1$). As seen in table 10, there are large differences in growth rates across groups only because of financial markets. Though all groups have the same FDI shares and technological gaps between the two sectors, the countries with high levels of financial development grow 1 percentage point faster then the ones with medium levels of financial development and the medium ones grow 0.8 percentage point faster than the countries with low levels of financial development. High financially developed countries grow twice as fast as the low financially developed countries. This result holds for all levels of ϕ. As institutional barriers for business fall (a decrease in ϕ), we see very small increases in growth for the given level of financial development. When barriers completely disappear, i.e. ϕ goes from 2 to 1, leads to only a 0.1% increase in the growth rate. This suggest that $\frac{A_f}{\phi A_d}$ increases do not matter much.

Next, we consider the effect of increasing A_f by 25% as shown in table 11. Comparing table 11 to table 10 shows very little change in growth rates. The growth rates are slightly higher for the high and medium financially developed countries (i.e. 2.49 vs. 2.53; 3.61 vs. 3.65). Thus it seems the marginal effect of raising A_f is very small. One reason why this might be the case is our assumption of $\eta = 0.95$. With foreign firms producing only 5% of the total output, it would be unreasonable to expect improvements in their productivity to have large measurable effect on the growth rate of the economy.[52]

In table 12, we allow human capital ratios to vary across country groups. Everything else is as in table 10. Comparing to table 10, we see that the growth rates for medium and low financially developed countries decrease, whereas the rates for the high financially developed country is the same since the ratio for the latter is unchanged. In table 10 the countries with high levels of financial development grow twice as fast as the countries with low levels of financial development. Now this gap increased another 0.5%, which is considerable but not as big as the one caused by financial markets alone. Table 13 repeats the exercise of table 12 by exogenously increasing A_f by 25%. Again as in the case of comparing table 10 and 11 the differences are negligible.

[52] Recall that in line with the micro- empirical evidence, our model captures externality effect via linkages and not through other form of spillovers.

In tables 14, we decrease the share of the domestic firm to 75% and increase that of the foreign firm to 25%. This probably represents an upper bound in terms of foreign ownership. Everything else is as in table 12. Growth rates are lower for all the levels of financial development but the qualitative results are the same. Low financially developed countries grow at less than third the speed of high financially developed countries. Also note that as ϕ (barriers) increase, the growth rates are even lower within each group. In fact there is a 0.16% drop for the countries with low levels of financial development. This indicates that $\frac{A_f}{\phi A_d}$ ratio is more important here than it was before. This is not surprising given that the foreign sector now has a larger share. Table 15 repeats the same exercise with the exogenous increase in FDI. The growth rates are higher again, though more so than the previous cases, where the increase was negligible. These findings are parallel to the findings reported for the CES case, where the magnitude of effects are much larger when the implicit share of foreign production is higher in the domestic economy. The bottomline is that the role of financial market is extremely important in realizing the growth effects of higher FDI. [53]

4 Extensions

4.1 Domestic and Foreign Production as Perfect Substitutes

CES aggregators allow for finite elasticities of substitution. But what if the two outputs were perfect substitutes? First of all, given the different intensities in labor usage, perfect substitution does not necessarily mean that either domestic or foreign firms will exist on their own. Ultimately co-existence will be determined by the relative productivity gap and the aggregate factor endowments, and differences in the magnitudes of production function parameters.

Perfect substitutes, is of course a special case of the CES with $\rho \to 1$ (and for simplicity assume that $\mu = 1$ too). In this situation it easier to bypass the aggregator (since both products will have the same price and are indistinguishable) and simply assume that they both trade in the international market with the world price normalized to 1.

In this case, we obtain the following expression for foreign production,

$$P\tilde{Y}_f = \frac{(\beta_d + \lambda\delta\alpha)\,\tilde{w}_s H - (\gamma_d + \lambda\,(1-\delta)\,\alpha)\,\tilde{w}_u L}{(1-\lambda+\alpha\lambda)\,(\beta_d - \beta_f)} \tag{41}$$

and the following expression for the domestic production,

$$P\tilde{Y}_d = \frac{(\gamma_f + \alpha\lambda\,(1-\delta))\,\tilde{w}_u L - (\beta_f + \lambda\delta\alpha)\,\tilde{w}_s H}{(1-\lambda+\alpha\lambda)\,(\beta_d - \beta_f)} \tag{42}$$

[53] We also did the same exercises using two other measures of financial development. We use overhead costs and the net interest margin. Overhead costs are defined as the accounting value of a bank's overhead costs as a share of its total costs and net interest margin is defined as the accounting value of bank's net interest revenue as a share of its interest- bearing (total earning) assets. The qualitative results remain unchanged. The results are also robust to alternative measures of relative labor endowments, for which we used relative labor endowments suggested by Barro and Lee, 1992 and Caselli and Coleman, 2005. Finally, the results are also robust to alternative values of the free parameter, a.

While we do not go into the details, observe that for both equations to be positive, the parameters must satisfy certain conditions. Summing these two equations, (41) and (42), and using the fact that $(\gamma_f - \gamma_d) = (\beta_d - \beta_f)$, we can rewrite total final good production in the economy as,

$$P\tilde{Y}_d + P\tilde{Y}_f = \frac{(\gamma_f - \gamma_d)\,\tilde{w}_u L + (\beta_d - \beta_f)\,\tilde{w}_s H}{(1-\lambda+\alpha\lambda)\,(\beta_d - \beta_f)} = \frac{\tilde{w}_u L + \tilde{w}_s H}{(1-\lambda+\alpha\lambda)} \tag{43}$$

Substituting equation (43) into the arbitrage condition (28) gives us the equilibrium growth rate for varieties,

$$\frac{\dot{n}}{n} = \frac{\lambda}{\theta}\frac{(1-\alpha)}{ia}\left[\frac{(\tilde{w}_u L + \tilde{w}_s H)}{(1-\lambda+\alpha\lambda)}\right] - \frac{r}{\theta} \tag{44}$$

Improvements in the level of financial market development (i.e. reductions in i) have clear positive effects on the growth rate. How does a change in ϕ, which in our setup corresponds to changes in the presence of multinational firms in the economy, affect the growth rate of the economy? In order to perform this exercise, we need to solve for the effect of changes in ϕ on $\tilde{w}_u$ and $\tilde{w}_s$. Looking at the reduced form factor price equations, we know that the effect of ϕ is opposite of that of A_f. An increase in A_f raises the skilled wage per efficiency unit and reduces the unskilled wage per efficiency unit as long as multinationals use skills more intensively, that is $\gamma_f > \gamma_d$. This is because a rise in the technology of the skill intensive sector, raises the demand for skills more than it raises the demand for raw labor. As a result this creates an upward pressure on skilled labor wages. This suggests that the overall effect can be ambiguous. Moreover, the effect of changes in ϕ depends also upon the relative stocks of L and H in the economy. If the increase in skilled labor wage bill more than compensates the reduction in unskilled labor wage bill then the growth rate of the economy will go up. Thus even the skill intensive nature of FDI is not sufficient to ensure that more FDI leads to higher growth rates in the economy. If it does raise the growth rate then clearly both sectors experience increases in growth rates. This would then be the case of a beneficial spillover effect. On the other hand, if the increase in skilled wages does not compensate the reduction in unskilled wages, then the growth rates will diminish. In this case FDI would have a negative impact in the economy.[54] Of course the opposite happens if A_d increases.

Returning to the innovation in the economy, let $\tilde{K} = K/n^{1-\theta}$ be the capital stock adjusted for efficiency units. Using the equation (23), $\dot{n} = \frac{K}{a}n^{\theta}$, and equation (44), $g = \frac{K}{an^{1-\theta}}$, we can rewrite the previous expression as $\tilde{K} = ag$. Thus capital for innovation is given by,

$$\Rightarrow \tilde{K} = \frac{\lambda}{\theta}\frac{(1-\alpha)}{i}\left[\frac{(\tilde{w}_u L + \tilde{w}_s H)}{(1-\lambda+\alpha\lambda)}\right] - \frac{r}{a\theta} \tag{45}$$

And the capital stock to output ratio is given by,

$$\Rightarrow \frac{\tilde{K}}{P\tilde{Y}_d + P\tilde{Y}_f} = \frac{\lambda}{\theta}\frac{(1-\alpha)}{i} - \frac{r}{a\theta}\frac{(1-\lambda+\alpha\lambda)}{(\tilde{w}_u L + \tilde{w}_s H)} \tag{46}$$

[54] Rodriguez-Clare (1996) and Markusen and Venables (1999) also get ambiguous results in terms of the effects of multinationals in the domestic economy stemming from reduction in the demand for local inputs due as foreign firms may import inputs or competition in the labor market with local firms.

Therefore the world interest rate has two negative effects on this ratio. First of all, indirectly, by raising the borrowing rate (i), it raises the cost of the only input used in the innovation pricess and secondly, directly, it raises the opportunity cost (since entrepreneurs may now instead simply lend their resources rather than invest in the firm). However, the level of development of financial market intermediation affects only the first of these since it only alters i.

Notice also that solving for the relative shares of domestic and foreign output, $P\tilde{Y}_d$ and $P\tilde{Y}_f$, allows solving for the share of MNE in the economy,

$$\frac{P\tilde{Y}_f}{P\tilde{Y}_d} = \frac{(\beta_d + \lambda\delta\alpha)\,\tilde{w}_s H - (\gamma_d + \lambda\,(1-\delta)\,\alpha)\,\tilde{w}_u L}{(\gamma_f + \alpha\lambda\,(1-\delta))\,\tilde{w}_u L - (\beta_f + \lambda\delta\alpha)\,\tilde{w}_s H} \tag{47}$$

We can analyze the effect of a decrease in ϕ or an increase in A_f on these shares of output. Given the assumption ($\gamma_f > \gamma_d$), such changes will raise $\tilde{w}_s$ and reduce $\tilde{w}_u$. This will clearly raise the numerator and reduce the denominator in the previous expression leading to a higher share of foreign output. An increase in FDI (lower ϕ) lowers domestic output. In any case, even if domestic output level is lowered, this is not necessarily true in the long run. In the long run, both domestic and foreign output grow at the same rate which is $\frac{\dot{n}}{n}$.

5 Conclusions

Although there is a widespread belief among policymakers that foreign direct investment (FDI) generates positive productivity externalities for host countries, the empirical evidence on the existence of positive productivity externalities is sobering. Both macro and micro empirical literatures either find no effect of FDI on host countries firms productivity and/or aggregate growth or they find negative effects. The theoretical models of FDI, on the other hand implies that FDI is good for the host country's development.

In this paper we try to bridge this gap between the theoretical and the empirical literatures by proposing a novel mechanism through which foreign direct investment (FDI) leads to higher growth. We model a small open economy, where foreign and domestic firms both produce in the final good sector and compete for skilled labor, unskilled labor, and intermediate products. Production of intermediate goods is carried out by local entrepreneurs in a monopolistically competitive market. To operate a firm in the intermediate goods sector, entrepreneurs must first develop a new variety of intermediate good. Innovation requires capital costs, which must be financed through the domestic financial institutions. If the local financial markets are developed enough they can allow credit constrained entrepreneurs to start their own firms. Thus the number of varieties of intermediate goods increases, causing positive spillovers to the final goods sector. As a result the host country benefits from the backward linkages between the foreign and domestic firms since the local financial markets allow these linkages to turn into FDI spillovers. Our calibration exercise confirms our analytical results. For the same level of FDI, countries with more developed financial markets tend to have significantly higher growth rates and for sizeable increases in the productivity of FDI, the increase in the aggregate growth rate is higher for economies with more developed financial markets. In particular, the results show that the same amount of increase in FDI, regardless of the reason of the increase, generates three times more additional growth in financially well-developed countries than in financially poorly-developed countries.

We have focussed on only one kind of spillover. In practice, there are likely to be additional spillovers and technology transfers which would make the effects in our model only a lower bound. Besides, our results are based on a model that takes FDI as given. The decision of a firm to outsource or invest abroad (and the potential to generate linkages) may depend on the conditions of the country and on the characteristics of the firm.[55]

[55] See Antras and Helpman (2004); Antras (2005).

6 References

Aghion P., P. Bacchetta, R. Ranciere, and K. Rogoff 2006. "Productivity Growth and the Exchange Rate Regime: The Role of Financial Development," NBER Working Paper, 12117.

Aghion, P. and P. Howitt, 1999. *Endogenous Growth Theory*, MIT Press: Cambridge, Ma.

Aghion, P., P. Howitt, and D. Mayer-Foulkes, 2005. "The Effect of Financial Development on Convergence: Theory and Evidence," *Quarterly Journal of Economics*120, 173-222.

Aitken, B. J. and A. Harrison, 1999. "Do Domestic Firms Benefit from Direct Foreign Investment? Evidence from Venezuela," *American Economic Review* 89, 605-618.

Alfaro, L., A. Chanda, S. Kalemli-Ozcan and S. Sayek, 2004. "FDI and Economic Growth, The Role of Local Financial Markets," *Journal of International Economics* 64, 113-134.

Alfaro, L., S. McIntyre and V. Dev, 2005. "Foreign Direct Investment and Ireland's Tiger Economy," *Harvard Business School Case* 705-009.

Alfaro, L. and A. Rodriguez-Clare, 2004. "Multinationals and Linkages: Evidence from Latin America," *Economia* 4, 113-170.

Antras, P. 2003. "Firms, Contracts and Trade Structure," *Quarterly Journal of Economics* 118, 1374-1418.

Barba Navaretti, G. and A. Venables, 2004. *Multinational Firms in the World Economy.* Princeton University Press: Princeton, N.J.

Basu, S., 1996. "Procyclical Productivity: Increasing Returns or Cyclical Utilization," *Quarterly Journal of Economics* 111, 719-751.

Blomstrom, M., 1986. "Foreign Investment and Productivity Efficiency: The Case of Mexico," *Journal of International Economics* 15, 97-110.

Blomstrom, M. and A. Kokko, 1998. "Multinational Corporations and Spillovers," *Journal of Economic Surveys* 12, 247-277.

Borensztein, E., J. De Gregorio, and J-W. Lee, 1998. "How Does Foreign Direct Investment Affect Economic Growth?" *Journal of International Economics* 45, 115-135.

Boyd, J. H., E. C. Prescott, 1986. "Financial Intermediary Coalitions," *Journal of Economic Theory* 38, 211-232.

Burnstein, A. and A. Monge-Naranjo, 2005. "Aggregate Consequences of International Firms in Developing Countries," mimeo.

Carkovic, M. and R. Levine, 2002. "Does Foreign Direct Investment Accelerate Economic Growth?" University of Minnesota, Working Paper.

Caves, R., 1974, 2002. "Multinational Firms, Competition and Productivity in the Host Country," *Economica* 41, 176-193.

Chang, R., L. Kaltani and N. Loayza, 2005. "Openness Can be Good for Growth: The Role of Policy Complementarities," mimeo.

Coe, D. T. and E. Helpman, 1995. "International R&D Spillovers,"*European Economic Review* 39, 859-887.

Coe, D.T., E. Helpman and A. Hoffmaister, 1997. "North-South R&D Spillovers," *Economic Journal* 107, 134-149.

Diamond, D., 1984. "Financial Integration and Delegated Monitoring," *Review of Economic Studies* 51, 393-419.

Duffy, J., C. Papageorgiou and F. Perez-Sebastian, 2004. "Capital-Skill Complementarity? Evidence From a Panel of Countries," *The Review of Economics and Statistics* 86, 327-344.

Dunning, J.H., 1981. *International Production and the Multinational Enterprise.* London, U.K.: George Allen and Unwin.

Durham, K. B. J. B., 2004. "Absorptive Capacity and the Effects of Foreign Direct Investment and Equity Foreign Portfolio Investment on Economic Growth," *European Economic Review* 48, 285-306.

Edwards, S. and C. Vegh, 2004. "Banks and Macroeconomic Disturbances under Predetermined Exchange Rates," *Journal of Monetary Economics* 40, 239-278.

Erosa, A., 2001, "Financial Intermediation and Occupational Choice in Development," *Review of Economic Dynamics* 4, 303-334.

Gao, Ting, 2005, "Foreign Direct Investment and Growth Under Economic Integration," *Journal of International Economics* 67, 157-174.

Galor, O., and J. Zeira, 1993. "Income Distribution and Macroeconomics," *Review of Economic Studies* 60, 35-52.

Gollin, D. 2002. "Getting Income Shares Right," *Journal of Political Economy* 110, 458-474.

Goldsmith, R. W., 1969. *Financial Structure and Development,* New Haven, Connecticut: Yale University Press.

Gorg, H. and E. Strobl, 2002. "Multinational Companies and Indigenous Development: An Empirical Analysis," *European Economic Review* 46, 1305-1322

Graham, E. and Krugman, P. 1991 *Foreign Direct Investment in the United States.* Washington D.C.: Institute for International Economics.

Greenwood, J., B. Jovanovic, 1990. " Financial Development, Growth and the Distribution of Income," *Journal of Political Economy* 98, 1076–1107.

Grossman, G., and E. Helpman, 1991. "Comparative Advantage and Long-Run Growth," *American Economic Review* 80, 796-815.

Grossman, G., and E. Helpman, 1991. *Innovation and Growth in the Global Economy*. Cambridge: MIT Press.

Hanson, G. H., 2001. "Should Countries Promote Foreign Direct Investment?," G-24 Discussion Paper No. 9. New York: United Nations.

Hall, R. E. and C. Jones, 1999. "Why Do Some Countries Produce So Much More Output per Worker than Others?," *The Quarterly Journal of Economics* 114, 83-116.

Haskel, J. E., S. C. Pereira and M. J. Slaughter, 2002. "Does Inward Foreign Direct Investment Boost the Productivity of Local Firms?," NBER Working Paper 8433.

Helpman, E., 1984. "Simple theory of International Trade and Multinational Corporations," *Journal of Political Economy* 92, 451-471.

Helpman, E. and P. Krugman, 1985. *Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition, and the International Economy.* Cambridge: MIT Press.

Helpman, E., M. Melitz, and S. R. Yeaple, 2004. "Export versus FDI with Heterogeneous Firms," *American Economic Review* 94, 300-316.

Hobday, M. 1995. *Innovation in East Asia: The Challenge to Japan.* Cheltenham: Edward Elgar.

Hermes, N., Lensink, R., 2003. "Foreign Direct Investment, Financial Development and Economic Growth," *Journal of Development Studies* 40, 142-163.

Hirschman, A., 1958. it The Strategy of Economic Development. New Haven: Yale University Press.

Holmstrom, B. and J. Tirole, 1993. "Market Liquidity and Performance Monitoring," *Journal of Political Economy* 101, 678-709.

Imrohoroglu, A. and K. B. Kumar, 2004. "Intermediation Costs and Capital Flows," *Review of Economic Dynamics* 7, 586-612.

Javorcik, B. S., 2004. "Does Foreign Direct Investment Increase the Productivity of Domestic Firms? In Search of Spillovers Through Backward Linkages," *American Economic Review* 94, 605-627.

Jones, C. 2995. "R&D-Based Models of Economic Growth," *Journal of Political Economy*103, 759-84.

Keller and Yeaple, 2003. "Multinational Enterprises, International Trade, and Productivity Growth: Firm-Level Evidence from the United States," NBER Working Paper 9504.

Kindleberger, C. P., 1969. *American Business Abroad.* New Haven, CT: Yale University Press.

King, R., R. Levine, 1993a. "Finance and Growth: Schumpeter Might be Right," *Quarterly Journal of Economics* 108, 717-738.

King, R., R. Levine, 1993b. "Finance, Entrepreneurship and Growth: Theory and Evidence," *Journal of Monetary Economics* 32, 513-542.

Lall, S., 1980. "Vertical Inter-Firm Linkages in LDCs: An Empirical Study," *Oxford Bulletin of Economics and Statistics* 42, 203-206.

Larrain, F., L. Lopez-Calva, and A. Rodriguez-Clare, 2000. "Intel: A Case Study of Foreign Direct Investment in Central America," Center for International Development, Harvard University Working Paper No. 58.

Levine, R., N. Loayza, and T. Beck, 2000. "Financial Intermediation and Growth: Causality and Causes," *Journal of Monetary Economics* 46, 31-77.

Levine, R. and S. Zervos, 1998. "Stock Markets, Banks and Economic Growth," *American Economic Review* 88, 537-558.

Lin P, and K. Saggi, 2006. "Multinational Firms, Exclusivity, and Backward Linkages," *Journal of International Economics* forthcoming.

Lipsey, R. E., 2002. "Home and Host Country Effects of FDI," NBER Working Paper 9293.

Lipsey, Robert E. 2003. "Foreign Direct Investment and the Operations of Multinational Firms: Concepts, History, and Data," in E. Kwan Choi and James Harrigan (eds.), Handbook of International Trade, Blackwell: Oxford, UK.

Markusen. J. and A.J. Venables, 1999. "Foreign Direct Investment as a Catalyst for Industrial Development," *European Economic Review* 43, 335-338.

Markusen. J. 1984. "Multinationals, Multi-Plant Economies and the Gains from Trade," *Journal of International Economics* 16, 205-226.

Moran, T. H., 2001. *Foreign Direct Investment and Development: The New Agenda for Developing Countries and Economies in Transition*Institute of International Economics: Washington D.C.

Overman, H., S. Redding and A. Venables, 2001. "The Economic Geography of Trade, Production and Income: A Survey of Empirics," CEPR Discussion Paper No. 2978.

Parikh, K. S. (ed.), 1997. India Development Report. Delhi: Oxford University Press.

Perez, C., 2000. "Empresa de Technología con cautela en 2002," *El Financiero,* January 7-13.

Rodríguez-Clare, A., 1996. "Multinationals, Linkages and Economic Development," *American Economic Review* 86, 852-873.

Spar, D., 1998. " Attracting High Technology Investment: Intel's Costa Rica Plant," *World Bank Occasional Paper* 11.

Weil, David, 2004, *Economic Growth*, Addison-Wesley.

Xu, B., 2000. "Multinational Enterprises, Technology Diffusion, and Host Country Productivity Growth," *Journal of Development Economics* 62, 477-493.

A Modelling Financial Markets

We present a bare-bones model of imperfect financial markets using the costly state verification approach. The model is adapted from King and Levine (1993).[56] As in their model we assume individuals have equal financial wealth which is a claim on profits of a diversified portfolio of firms engaged in innovative activity. Some individuals do have the ability to manage innovation but this does not lead them to accumulate different levels of wealth from the rest of individuals in the economy. These potential entrepreneurs have the ability to successfully manage a project with probability α. These abilities are unobservable to both the entrepreneur and the financial intermediary. However, the actual capability of such an individual to manage a project can be ascertained at a cost, F.[57] The main two differences are the following. First, consistent with our setup, we use capital in the R&D sector instead of labor. The second difference is related to our assumption regarding the structure of verification costs. We assume these costs to be proportional to the set up costs for any project. The main advantage of this approach is that it allows us to retain the balanced growth properties of the model while allowing in principle to make total verification costs decreasing in the level of overall technology and hence in the level of development.[58] Therefore one could argue that our setup relates automatically more efficient financial markets to higher levels of development.[59]

We depart from the main text in that now innovation and imitation projects are potentially risky and there is a probability α of the project being run successfully. Which potential entrepreneur will manage a project successfully is unknown both to the entrepreneur and the intermediary. The intermediary can spend an amount F to reduce the uncertainty regarding the project's outcome. Further we postulate the following structure on F :

$$F = fr\frac{a}{n^{\theta}} \tag{48}$$

Therefore since setup costs require $\frac{a}{n^{\theta}}$ units of K then the cost of verification simply is proportional to total setup costs and f represents that factor of proportionality. While not necessary for our model, it seems intuitive that f should be less than 1—verification costs are likely to be lower than setup costs.

If the value of a successful project is q then, with a competitive intermediation sector, in equilibrium we must have,[60]

[56] See Aghion, Howitt and Mayer-Foulkes (2005) for an alternative modelling strategy for imperfect financial markets in an endogenous growth model. In their model, entrepreneurs can pay an upfront cost and defraud the lenders. Incentive compatibility constraints and arbitrage conditions then leads to an upper bound on how much is actually invested in new innovations which is lower than the optimal investment amount. The gap between the two is an inverse function of the degree of creditor protection. Their model seems more suited to "quality ladder" Schumpeterian models whereas the King and Levine structure is more easily incorporated into a product variety setup such as ours.

[57] Obviously entrepreneurs cannot evaluate themselves and credibly communicate the results to others.

[58] Indeed King and Levine (1993) suggest this modification as a potentially useful extension of their model (pp 518).

[59] The objective of our paper, as mentioned, is not to model the relation between financial markets and development but instead the role of financial markets in allowing an economy to reap the benefits of potential FDI spillovers.

[60] Of course in the background we assume that for an intermediary it is better to do this evaluation rather than

$$\alpha q = F$$

The value of a successful project is simply the present discounted value of profits (v) minus the set up costs (η). Therefore the above condition can be rewritten as,

$$a(v - \eta) = F$$

Further from our model we had setup costs for each blueprint to be $\frac{ra}{n^\theta}$

$$\Rightarrow \alpha \left(v - \frac{ra}{n^\theta} \right) = F \tag{49}$$

The standard arbitrage condition from equation (22) continues to hold,

$$\frac{\pi}{v} + \frac{\dot{v}}{v} = r \tag{50}$$

Substituting equation (48) in equation (49), we continue to get as in the main modell

$$\frac{\dot{v}}{v} = -\theta \frac{\dot{n}}{n}$$

Now we can combine this with the previous equation to get,

$$\frac{\pi}{v} - \theta \frac{\dot{n}}{n} = r$$

In our model the per intermediate firm operating profit was (see equation (21))

$$\pi_i = \frac{(1-\alpha)}{n} \left[\lambda p_d Y_d + \lambda p_f Y_f \right]$$

Therefore

$$\frac{1}{v} \left\{ \frac{(1-\alpha)}{n} \left[\lambda p_d Y_d + \lambda p_f Y_f \right] \right\} - \theta \frac{\dot{n}}{n} = r$$

Noting that

$$v = \frac{f}{\alpha} r \frac{a}{n^\theta} + \frac{ra}{n^\theta}$$

$$\Rightarrow \frac{1}{ra\left(\frac{f}{\alpha} + 1\right)} \left\{ (1-\alpha) \left[\lambda p_d \tilde{Y}_d + \lambda p_d \tilde{Y}_f \right] \right\} - \theta \frac{\dot{n}}{n} = r$$

where $\tilde{Y}_i = Y_i / n^{1-\theta}$.

Thus we have an expression for the growth rate similar to the one derived in the main text,

$$g = \frac{\dot{n}}{n} = \frac{\lambda}{\theta} \frac{(1-\tau)(1-\alpha)}{ra\left(\frac{f}{\alpha} + 1\right)} \left[\lambda p_d \tilde{Y}_d + \lambda p_d \tilde{Y}_f \right] - \frac{r}{\theta}$$

simply lending the money and not incurring the verification cost.

Of course, what was earlier represented in the main text by i can now be substituted by $r\left(\frac{f}{\alpha}+1\right)$. In practice $\frac{f}{\alpha}$ is likely to be unobservable across countries. Therefore in the numerical exercises, when we use the spread, theoretically, we are measuring $r\frac{f}{\alpha}$. Therefore a higher spread has the same effect as a higher verification costs. Further, for every unique f, given r and α, there is a unique value of the spread. Therefore using the spread between lending and borrowing rates serves as a convenient proxy for verification costs.

B Solving the Model with a CES Aggregator

As mentioned in the text we begin with six equations,

$$p_d = \frac{A_d^{-1}\beta_d^{-\beta_d}\gamma_d^{-\gamma d}}{\lambda^\lambda}\left(\frac{\delta^{-\delta}(1-\delta)^{-(1-\delta)}}{\alpha}\right)^\lambda \tilde{w}_u^{\beta_d+\delta\lambda}\tilde{w}_s^{\gamma_d+(1-\delta)\lambda} \tag{51}$$

$$p_f = \frac{\phi A_f^{-1}\beta_f^{-\beta_f}\gamma_f^{-\gamma_f}}{\lambda^\lambda}\left(\frac{\delta^{-\delta}(1-\delta)^{-(1-\delta)}}{\alpha}\right)^\lambda \tilde{w}_u^{\beta_f+\delta\lambda}\tilde{w}_s^{\gamma_f+(1-\delta)\lambda} \tag{52}$$

$$\frac{p_f}{p_d} = \mu\left[\frac{\tilde{Y}_d}{\tilde{Y}_f}\right]^{1-\rho} \tag{53}$$

$$p_d = \left(1-\mu^\varepsilon p_f^{1-\varepsilon}\right) \Rightarrow p_d = p_d\left(p_f\right) \tag{54}$$

$$\frac{\left(\beta_d+\delta\alpha\lambda\right)p_d\tilde{Y}_d}{\tilde{w}_u} + \frac{\left(\beta_f+\delta\alpha\lambda\right)p_f\tilde{Y}_f}{\tilde{w}_u} = L \tag{55}$$

$$\frac{\left(\gamma_d+(1-\delta)\alpha\lambda\right)p_d\tilde{Y}_d}{\tilde{w}_s} + \frac{\left(\gamma_f+(1-\delta)\alpha\lambda\right)p_f\tilde{Y}_f}{\tilde{w}_s} = H \tag{56}$$

Also, Recall that the growth rate of varieties is pinned down by equation (28),

$$\frac{(1-\alpha)\lambda}{ia}\left[p_d\tilde{Y}_d + p_f\tilde{Y}_f\right] - \theta\frac{\dot{n}}{n} = r \tag{57}$$

We next list the steps involved in arriving at a solution for this setup:

1) First of all note that we can use equations (51) and (52) to express efficiency wages as a function of the prices of foreign and domestic goods,

$$\tilde{w}_u = A_{du}\Delta A_{fu} p_d^{\frac{\left(\gamma_f+(1-\delta)\lambda\right)}{\left(\gamma_f-\gamma_d\right)}} p_f^{\frac{-\left(\gamma_d+(1-\delta)\lambda\right)}{\left(\gamma_f-\gamma_d\right)}} \tag{58}$$

$$\tilde{w}_s = A_{ds}\Delta A_{fs} p_d^{\frac{-\left(\beta_f+\delta\lambda\right)}{\left(\gamma_f-\gamma_d\right)}} p_f^{\frac{\beta_d+\delta\lambda}{\left(\gamma_f-\gamma_d\right)}} \tag{59}$$

From these two equations we get,

$$\frac{p_d}{p_f} = \frac{A_d^{-1}\beta_d^{-\beta_d}\gamma_d^{-\gamma d}}{\phi A_f^{-1}\beta_f^{-\beta_f}\gamma_{fs}^{-\gamma_f}}\left(\frac{\tilde{w}_u}{\tilde{w}_s}\right)^{\gamma_f-\gamma_d}$$

$$\frac{p_d}{p_f} = \frac{\Lambda_f}{\Lambda_d}\left(\frac{\tilde{w}_u}{\tilde{w}_s}\right)^{\gamma_f-\gamma_d} \tag{60}$$

where $\Lambda_d = \left(A_d\beta_d^{\beta_d}\gamma_d^{\gamma_d}\right), \Lambda_f = \left(A_f\beta_f^{\beta_f}\gamma_f^{\gamma_f}\right)/\phi$, like before.

Dividing equation (55) by (56):

$$\Rightarrow \frac{(\beta_d+\delta\alpha\lambda)+(\beta_f+\delta\alpha\lambda)\frac{p_f\tilde{Y}_f}{p_d\tilde{Y}_d}}{(\gamma_d+(1-\delta)\alpha\lambda)+(\gamma_f+(1-\delta)\alpha\lambda)\frac{p_f\tilde{Y}_f}{p_d\tilde{Y}_d}} = \frac{\tilde{w}_u L}{\tilde{w}_s H} \tag{61}$$

Now note, that the cost minimization equation (53) can be rewritten as,

$$\left[\frac{1}{\mu}\frac{p_f}{p_d}\right]^{\frac{-1}{1-\rho}} = \frac{\tilde{Y}_f}{\tilde{Y}_d} \tag{62}$$

Substituting this into equation(61):

$$\frac{(\beta_d+\delta\alpha\lambda)+(\beta_f+\delta\alpha\lambda)\left(\frac{p_f}{p_d}\right)^{1-\frac{1}{1-\rho}}\left[\frac{1}{\mu}\right]^{\frac{-1}{1-\rho}}}{(\gamma_d+(1-\delta)\alpha\lambda)+(\gamma_f+(1-\delta)\alpha\lambda)\left(\frac{p_f}{p_d}\right)^{1-\frac{1}{1-\rho}}\left[\frac{1}{\mu}\right]^{\frac{-1}{1-\rho}}} = \frac{\tilde{w}_u L}{\tilde{w}_s H}$$

Further using equation (60),

$$\frac{(\beta_d+\delta\alpha\lambda)+(\beta_f+\delta\alpha\lambda)\left(\frac{p_f}{p_d}\right)^{1-\frac{1}{1-\rho}}\left[\frac{1}{\mu}\right]^{\frac{-1}{1-\rho}}}{(\gamma_d+(1-\delta)\alpha\lambda)+(\gamma_f+(1-\delta)\alpha\lambda)\left(\frac{p_f}{p_d}\right)^{1-\frac{1}{1-\rho}}\left[\frac{1}{\mu}\right]^{\frac{-1}{1-\rho}}} = \left(\frac{\Lambda_d}{\Lambda_f}\frac{p_d}{p_f}\right)^{\frac{1}{\gamma_f-\gamma_d}}\frac{L}{H}$$

Finally using equation (5), $\left(1-\mu^{\varepsilon}p_f^{1-\varepsilon}\right)^{\frac{1}{1-\varepsilon}} = p_d$, we can rewrite the expression above to obtain,

$$\Rightarrow \frac{(\beta_d+\delta\alpha\lambda)+(\beta_f+\delta\alpha\lambda)\left(\frac{p_f}{\left(1-\mu^{\varepsilon}p_f^{1-\varepsilon}\right)^{\frac{1}{1-\varepsilon}}}\right)^{1-\frac{1}{1-\rho}}\left[\frac{1}{\mu}\right]^{\frac{-1}{1-\rho}}}{(\gamma_d+(1-\delta)\alpha\lambda)+(\gamma_f+(1-\delta)\alpha\lambda)\left(\frac{p_f}{\left(1-\mu^{\varepsilon}p_f^{1-\varepsilon}\right)^{\frac{1}{1-\varepsilon}}}\right)^{1-\frac{1}{1-\rho}}\left[\frac{1}{\mu}\right]^{\frac{-1}{1-\rho}}} = \left(\frac{1}{\Lambda}\frac{\left(1-\mu^{\varepsilon}p_f^{1-\varepsilon}\right)^{\frac{1}{1-\varepsilon}}}{p_f}\right)^{\frac{1}{\gamma_f-\gamma_d}}\frac{L}{H}$$

Thus solving for $p_f = p_f^*$ where * denotes the solved value

2) As soon as we have solved for p_f we can again use $p_d^* = \left(1-\mu^{\varepsilon}p_f^{1-\varepsilon}\right)^{\frac{1}{1-\varepsilon}}$ to back out p_d

3) Since we now have both p_d^* and p_f^*, we can also derive the efficiency wages, and also the relative outputs.

To derive the efficiency wages substitute prices into equations (58) and (59), as to rewrite them such that we have $\tilde{w}_u^* = \tilde{w}_u^*(p_d, p_f)$ and $\tilde{w}_s^* = \tilde{w}_s^*(p_d, p_f)$. More explicitly, after some tedious rearrangements, we get,

$$\tilde{w}_u^* = A_{du}\Delta A_{fu}\left(p_d^*\right)^{\frac{\left(\gamma_f+(1-\delta)\lambda\right)}{\left(\gamma_f-\gamma_d\right)}}\left(p_f^*\right)^{\frac{-\left(\gamma_d+(1-\delta)\lambda\right)}{\left(\gamma_f-\gamma_d\right)}} \tag{63}$$

$$\tilde{w}_s^* = A_{ds}\Delta A_{fs}\left(p_d^*\right)^{\frac{-\left(\beta_f+\delta\lambda\right)}{\left(\gamma_f-\gamma_d\right)}}\left(p_f^*\right)^{\frac{\beta_d+\delta\lambda}{\left(\gamma_f-\gamma_d\right)}} \tag{64}$$

where

$$A_{du} = \left(A_d\beta_d^{\beta_d}\gamma_d^{\gamma_d}\right)^{\frac{\left(\gamma_f+(1-\delta)\lambda\right)}{\left(\gamma_f-\gamma_d\right)}}; \quad A_{fu} = \left(\frac{A_f\beta_f^{\beta_f}\gamma_f^{\gamma_f}}{\phi}\right)^{\frac{-\left(\gamma_d+(1-\delta)\lambda\right)}{\left(\gamma_f-\gamma_d\right)}}$$

$$A_{ds} = \left(A_d\beta_d^{\beta_d}\gamma_d^{\gamma_d}\right)^{\frac{-\left(\beta_f+\delta\lambda\right)}{\left(\gamma_f-\gamma_d\right)}}; \qquad A_{fs} = \left(\frac{A_f\beta_f^{\beta_f}\gamma_f^{\gamma_f}}{\phi}\right)^{\frac{\beta_d+\delta\lambda}{\left(\gamma_f-\gamma_d\right)}}$$

$$\Delta = \left(\frac{\delta^{-\delta}(1-\delta)^{-(1-\delta)}}{\alpha}\right)^{-\lambda}$$

Of course this allows us also to derive the relative wages,

$$\frac{\tilde{w}_u}{\tilde{w}_s} = \left(\frac{\Lambda_d}{\Lambda_f}\frac{p_d^*}{p_f^*}\right)^{\frac{1}{\gamma_f-\gamma_d}}$$

From equation (62) we now also have a value for

$$\Rightarrow \frac{\tilde{Y}_f}{\tilde{Y}_d} = \left[\frac{1}{\mu}\frac{p_f^*}{p_d^*}\right]^{\frac{-1}{1-\rho}} \tag{65}$$

4) So we can write now $\tilde{Y}_f = Y\left(\tilde{Y}_d\right)$

5) Now take either of the two labor market constraint equations. Let's take the unskilled labor market equation (55)

$$\left(\beta_d + \delta\alpha\lambda\right)p_d^*\tilde{Y}_d + \left(\beta_f + \delta\alpha\lambda\right)p_f^*\tilde{Y}_f = \tilde{w}_u^* L$$

$$\Rightarrow \left(\beta_d + \delta\alpha\lambda\right)p_d^*\tilde{Y}_d + \left(\beta_f + \delta\alpha\lambda\right)p_f^* Y\left(\tilde{Y}_d\right) = \tilde{w}_u^* L$$

$$\Rightarrow \tilde{Y}_d = \tilde{Y}_d^*$$

6) We can now use substitute this into equation (65) and get
$\tilde{Y}_f^*$.

7) Thus we have everything we need to derive the growth rate from equation (57):

$$\frac{\dot{n}}{n} = \frac{1}{\theta}\left(\frac{(1-\alpha)\lambda}{ia}\left[p_d^*\tilde{Y}_d^* + p_f^*\tilde{Y}_f^*\right] - r\right)$$

C Solving for the Cobb Douglas Case

Similar to the CES case, we begin with an analogous set of six equations,

$$p_d = \frac{A_d^{-1}\beta_d^{-\beta_d}\gamma_d^{-\gamma d}}{\lambda^\lambda}\left(\frac{\delta^{-\delta}(1-\delta)^{-(1-\delta)}}{\alpha}\right)^\lambda \tilde{w}_u^{\beta_d+\delta\lambda}\tilde{w}_s^{\gamma_d+(1-\delta)\lambda} \tag{66}$$

$$p_f = \frac{\phi(\tau)A_f^{-1}\beta_f^{-\beta_f}\gamma_f^{-\gamma_f}}{\lambda^\lambda}\left(\frac{\delta^{-\delta}(1-\delta)^{-(1-\delta)}}{\alpha}\right)^\lambda \tilde{w}_u^{\beta_f+\delta\lambda}\tilde{w}_s^{\gamma_f+(1-\delta)\lambda} \tag{67}$$

$$\frac{p_d}{p_f} = \frac{\eta}{1-\eta}\frac{\tilde{Y}_f}{\tilde{Y}_d} \tag{68}$$

$$p_d = \eta\left(1-\eta\right)^{\frac{(1-\eta)}{\eta}} p_f^{\frac{-(1-\eta)}{\eta}} \tag{69}$$

$$\frac{\left(\beta_d+\delta\alpha\lambda\right)p_d\tilde{Y}_d}{\tilde{w}_u} + \frac{\left(\beta_f+\delta\alpha\lambda\right)p_f\tilde{Y}_f}{\tilde{w}_u} = L \tag{70}$$

$$\frac{\left(\gamma_d+(1-\delta)\alpha\lambda\right)p_d\tilde{Y}_d}{\tilde{w}_s} + \frac{\left(\gamma_f+(1-\delta)\alpha\lambda\right)p_f\tilde{Y}_f}{\tilde{w}_s} = H \tag{71}$$

We have six equations and six unknowns. Rearranging equation (68) we have,

$$p_d\tilde{Y}_d = \frac{\eta}{(1-\eta)}p_f\tilde{Y}_f$$

Substituting this into equations (70) and (71) and further rearrangment gives us:

$$\left(\frac{\eta\left(\beta_d+\delta\alpha\lambda\right)+\left(\beta_f+\delta\alpha\lambda\right)}{(1-\eta)}\right)p_f\tilde{Y}_f = \tilde{w}_u L \tag{72}$$

$$\left(\frac{\eta\left(\gamma_d+(1-\delta)\alpha\lambda\right)+(1-\eta)\left(\gamma_f+(1-\delta)\alpha\lambda\right)}{(1-\eta)}\right)p_f\tilde{Y}_f = \tilde{w}_s H \tag{73}$$

Therefore we can easilly figure out the wage premium in this setup,

$$\Rightarrow \frac{\tilde{w}_s}{\tilde{w}_u} = \frac{\eta\left(\gamma_d+(1-\delta)\alpha\lambda\right)+(1-\eta)\left(\gamma_f+(1-\delta)\alpha\lambda\right)}{\eta\left(\beta_d+\delta\alpha\lambda\right)+(1-\eta)\left(\beta_f+\delta\alpha\lambda\right)}\frac{L}{H} \tag{74}$$

At the same time note that the growth equation,

$$\frac{(1-\alpha)\lambda}{ia}\left[p_d\tilde{Y}_d+p_f\tilde{Y}_f\right]-\theta\frac{\dot{n}}{n}=r$$

$$\Rightarrow \frac{(1-\alpha)\lambda}{ia}\left[\frac{\eta}{1-\eta}p_f\tilde{Y}_f+p_f\tilde{Y}_f\right]-\theta\frac{\dot{n}}{n}=r \tag{75}$$

$$\Rightarrow \left(\frac{(1-\alpha)\lambda}{ia\left(1-\eta\right)}\right)p_f\tilde{Y}_f-\theta\frac{\dot{n}}{n}=r \tag{76}$$

Therefore to solve for the endogenous rate of growth of varieties we simply need to figure out $p_f \tilde{Y}_f$. This in turn requires us to figure out either $\tilde{w}_s H$(equation (73)) or $\tilde{w}_u L$(equation (72))[61]. If we proceed with the former, we have

$$\left(\frac{(1-\alpha)\lambda}{ia}\right)\left(\frac{\tilde{w}_s H}{\eta\left(\gamma_d+(1-\delta)\alpha\lambda\right)+(1-\eta)\left(\gamma_f+(1-\delta)\alpha\lambda\right)}\right)-\theta\frac{\dot{n}}{n}=r \tag{77}$$

Similarly, to solve for $\tilde{w}_s$ and $\tilde{w}_u$, equations (66), (66) can be rewritten such that we have $\tilde{w}_u = \tilde{w}_u(p_d, p_f)$ and $\tilde{w}_s = \tilde{w}_s(p_d, p_f)$. More explicitly, after some tedious rearrangements, we get,

$$\tilde{w}_u = A_{du}\Delta A_{fu} p_d^{\frac{\left(\gamma_f+(1-\delta)\lambda\right)}{\left(\gamma_f-\gamma_d\right)}} p_f^{\frac{-\left(\gamma_d+(1-\delta)\lambda\right)}{\left(\gamma_f-\gamma_d\right)}} \tag{78}$$

$$\tilde{w}_s = A_{ds}\Delta A_{fs} p_d^{\frac{-\left(\beta_f+\delta\lambda\right)}{\left(\gamma_f-\gamma_d\right)}} p_f^{\frac{\beta_d+\delta\lambda}{\left(\gamma_f-\gamma_d\right)}} \tag{79}$$

Note that these are exactly the same as the corresponding CES equations (63) and (64),

We can use these expressions for efficiency wages and substitute them into equation (74) and write prices as a function of L/H. Again this involves some tedious algebra but ultimately gives us,

$$\frac{p_f}{p_d}=\frac{\phi A_d \beta_d^{\beta_d}\gamma_d^{\gamma d}}{A_f \beta_f^{\beta_f}\gamma_f^{\gamma_f}}\left(\frac{\eta\left(\gamma_d+(1-\delta)\alpha\lambda\right)+(1-\eta)\left(\gamma_f+(1-\delta)\alpha\lambda\right)}{\eta\left(\beta_d+\delta\alpha\lambda\right)+(1-\eta)\left(\beta_f+\delta\alpha\lambda\right)}\frac{L}{H}\right)^{\gamma_f-\gamma_d} \tag{80}$$

Therefore we have the relative prices completely in terms of exogenous variables. As expected, the prices are inversely related to the relative TFP's of the sectors. Further as long as $\gamma_f > \gamma_d$ (share of H is greater in the foreign sector), an decrease in the L/H ratio leads to a decrease in relative prices. As human capital becomes relatively more abundant, the sector that uses this more intensively benefits more from the lower cost and therefore charges a lower price. Finally we can use equation (69) in conjunction with (80) to solve explicity for p_f and p_d. Once we have these two solutions, we can substitute them back into equation (78) and (79) and derive the explicit values for $\tilde{w}_u$ and $\tilde{w}_s$. All of this involves another round of tedious algebra and we get the following solutions:

$$p_f = \Upsilon\left(\frac{\Lambda_d}{\Lambda_f}\right)^{\eta}\left(\Phi\frac{L}{H}\right)^{\eta\left(\gamma_f-\gamma_d\right)} \tag{81}$$

$$p_d = \Upsilon\left(\frac{\Lambda_d}{\Lambda_f}\right)^{-(1-\eta)}\left(\Phi\frac{L}{H}\right)^{-\left(\gamma_f-\gamma_d\right)(1-\eta)} \tag{82}$$

$$\tilde{w}_u = \Delta\Upsilon\Lambda_d^{\eta}\Lambda_f^{1-\eta}\left(\Phi^{-1}\frac{H}{L}\right)^{\Psi_\gamma} \tag{83}$$

$$\tilde{w}_s = \Delta\Upsilon\Lambda_d^{\eta}\Lambda_f^{1-\eta}\left(\Phi\frac{L}{H}\right)^{\Psi_\beta} \tag{84}$$

[61] Given the symmetric nature of Cobb Douglas Production functions, ultimately it does not matter which one we proceed with.

where
$\Upsilon = \eta^{\eta} (1-\eta)^{(1-\eta)}$,
$\Lambda_d = \left(A_d \beta_d^{\beta_d} \gamma_d^{\gamma d} \right)$,
$\Lambda_f = \left(A_f \beta_f^{\beta_f} \gamma_f^{\gamma_f} \right) / \phi$,
$\Phi = \frac{\eta(\gamma_d + (1-\delta)\alpha\lambda) + (1-\eta)\left(\gamma_f + (1-\delta)\alpha\lambda\right)}{\eta(\beta_d + \delta\alpha\lambda) + (1-\eta)\left(\beta_f + \delta\alpha\lambda\right)}$
$\Psi_\beta = \eta (\beta_d + \delta\lambda) + (1-\eta) (\beta_f + \delta\lambda)$
$\Psi_\gamma = \eta (\gamma_d + (1-\delta)\lambda) + (1-\eta) (\gamma_f + (1-\delta)\lambda)$
(Note that $\Psi_\beta + \Psi_\gamma = 1$)
To derive the growth rate we need $\tilde{w}_s H$,

$$\begin{aligned} \tilde{w}_s H &= \Delta \Upsilon \Lambda_d^{\eta} \Lambda_f^{1-\eta} (\Phi L)^{\Psi_\beta} H^{1-\Psi_{\beta\beta}} \\ \Rightarrow \tilde{w}_s H &= \Delta \Upsilon \Lambda_d^{\eta} \Lambda_f^{1-\eta} (\Phi L)^{\Psi_\beta} H^{\Psi_\gamma} \end{aligned} \tag{85}$$

and this can be substituted back into equation (77) to derive $\frac{\dot{n}}{n}$.

Table 1: Benchmark Parameters

Common parameters for three groups		
$\alpha = 0.91$	$r = 0.05$	$\phi = 1$
Production Function Parameters		
$\beta^d = 0.34$	$\beta^f = 0.27$	$\gamma = 0.5$
$\gamma^d = 0.33$	$\gamma^f = 0.40$	$A^f/A^d = 2$
$\mu = 0.1$	$\rho = 0.2$	
Group Specific Parameters		
	Financial Dev.	L/H
High (rich)	0.045	5
Medium (middle)	0.085	9
Low (poor)	0.145	12

Notes: We group countries based on their financial market development levels, using the interest rate spreads. The average spread for the low financially developed (poor) countries, medium financially developed (middle income) countries and the high financially developed (rich) countries between 2000 and 2003 are 14.5%, 8.5%, and 4.5%, respectively. Following Duffy et al. (2004), we set the ratio of unskilled labor to skilled labor equal to 12 for the poor countries, 9 for the middle income countries, and 5 for the rich countries.

Table 2: Benchmark Results

μ	Growth Rate High Financial Development	Growth Rate Medium Financial Development	Growth Rate Low Financial Development	Relative Output (Y^f/Y^d)	Relative Wage (w^u/w^s)
0.1	3.10	2.13	1.42	0.065	0.201
0.2	4.35	3.01	2.03	0.155	0.196
0.3	6.17	4.29	2.92	0.257	0.192
0.4	8.74	6.10	4.17	0.369	0.189
0.5	12.25	8.57	5.88	0.487	0.186
0.6	16.97	11.89	8.18	0.612	0.183

Notes: See table 1 for the parameter values. Growth rates are in percent. Relative outputs are valued at their respective price. The relative labor endowments are constant at the level of rich (high financial development) countries.

Table 3: Increasing Foreign Presence, Changing μ

$\Delta\mu$	Change in Growth High Financial Development	Change in Growth Medium Financial Development	Change in Growth Low Financial Development	Change in Relative Output $\Delta(Y^f/Y^d)$	Percent Change in Y^f
0.1 to 0.2	1.25	0.88	0.61	0.09	203.2
0.2 to 0.3	1.83	1.29	0.89	0.10	114.1
0.3 to 0.4	2.56	1.80	1.25	0.11	84.8
0.4 to 0.5	3.51	2.47	1.71	0.12	69.6
0.5 to 0.6	4.72	3.32	2.30	0.12	59.9

Notes: See table 1 for the parameter values. All changes are in percentage points unless reported otherwise. Relative outputs are valued at their respective price. The relative labor endowments are constant at the level of rich (high financial development) countries.

Table 4: Increasing Foreign Presence via Increasing MNE Productivity, $\Delta A^f/A^d = 15\%$

μ	Change in Growth High Financial Development	Change in Growth Medium Financial Development	Change in Growth Low Financial Development	Change in Relative Output $\Delta(Y^f/Y^d)$	Percent Change in Y^f
0.1	0.03	0.02	0.01	0.002	4.2
0.2	0.09	0.06	0.04	0.006	5.0
0.3	0.19	0.13	0.09	0.009	5.8
0.4	0.35	0.24	0.17	0.013	6.6
0.5	0.59	0.41	0.29	0.017	7.2
0.6	0.94	0.66	0.46	0.022	7.8

Notes: See table 1 for the parameter values. All changes are in percentage points unless reported otherwise. Relative outputs are valued at their respective price. The relative labor endowments are constant at the level of rich (high financial development) countries.

Table 5: Increasing Foreign Activity via Increasing MNE Prodcutivity, $\Delta A^f/A^d = 15\%$ and Changing the Cost of Doing Business

ϕ	Change in Growth High Financial Development	Change in Growth Medium Financial Development	Change in Growth Low Financial Development	Change in Relative Output $\Delta(Y^f/Y^d)$	Percent Change in Y^f
1	0.029	0.020	0.014	0.002	104
1.1	0.028	0.020	0.014	0.002	104
1.2	0.027	0.019	0.013	0.002	104
1.3	0.026	0.019	0.013	0.002	104
1.4	0.026	0.018	0.013	0.002	104
1.5	0.025	0.018	0.012	0.002	104
1.6	0.025	0.017	0.012	0.002	104
1.7	0.024	0.017	0.012	0.002	104
1.8	0.024	0.017	0.012	0.002	104
1.9	0.024	0.017	0.012	0.002	104
2	0.023	0.016	0.011	0.002	104

Notes: See table 1 for the parameter values. All changes are in percentage points unless reported otherwise. Relative outputs are valued at their respective price. The relative labor endowments are constant at the level of rich (high financial development) countries.

Table 6: Increasing Foreign Activity via Increasing MNE Productivity $\Delta A^f/A^d = 15\%$, and L/H varies by Group

μ	Δ Growth High	Δ Growth Medium	Δ Growth Low	Δ Y^f/Y^d High	Δ Y^f/Y^d Medium	Δ Y^f/Y^d Low	% Δ Y^f High	% Δ Y^f Medium	% Δ Y^f Low
0.1	0.03	0.02	0.01	0.002	0.002	0.002	4.23	4.23	4.22
0.2	0.09	0.05	0.03	0.006	0.005	0.005	5.04	5.03	5.02
0.3	0.19	0.10	0.06	0.009	0.009	0.009	5.83	5.81	5.80
0.4	0.35	0.19	0.12	0.013	0.013	0.013	6.56	6.56	6.52
0.5	0.59	0.33	0.20	0.017	0.017	0.017	7.21	7.19	7.18

Notes: See table 1 for the parameter values. All changes are in percentage points unless reported otherwise. Relative outputs are valued at their respective price. The relative labor endowments change together with financial development as high, medium, low.

Table 7: Increasing Foreign Presence via Increasing MNE Productivity $\Delta A^f/A^d = 15\%$, , and L/H varies by Group

$\Delta\mu$	Δ Growth High	Δ Growth Medium	Δ Growth Low	Δ Y^f/Y^d High	Δ Y^f/Y^d Medium	Δ Y^f/Y^d Low	% Δ Y^f High	% Δ Y^f Medium	% Δ Y^f Low
0.1 to 0.2	1.25	0.70	0.43	0.09	0.09	0.09	203.2	202.5	202.2
0.2 to 0.3	1.83	1.02	0.62	0.10	0.10	0.10	114.1	113.6	113.4
0.3 to 0.4	2.56	1.43	0.87	0.11	0.19	0.11	84.8	84.4	84.2
0.4 to 0.5	3.51	1.96	1.19	0.12	0.12	0.12	69.6	69.2	69.1

Notes: See table 1 for the parameter values. All changes are in percentage points unless reported otherwise. Relative outputs are valued at their respective price. The relative labor endowments change together with financial development as high, medium, low.

Table 8: Increasing Foreign Activity for different levels of Foreign Presence

Δ A^f/A^d	Δ Growth High $\mu = 0.1$	Δ Growth Medium $\mu = 0.1$	Δ Growth Low $\mu = 0.1$	Δ Growth High $\mu = 0.2$	Δ Growth Medium $\mu = 0.2$	Δ Growth Low $\mu = 0.2$	Δ Growth High $\mu = 0.3$	Δ Growth Medium $\mu = 0.3$	Δ Growth Low $\mu = 0.3$
1.15 to									
1.32	0.02	0.010	0.006	0.05	0.03	0.02	0.11	0.06	0.04
1.52	0.02	0.003	0.002	0.05	0.01	0.00	0.11	0.02	0.01
1.75	0.02	0.002	0.001	0.06	0.01	0.00	0.12	0.01	0.01
2.0	0.02	0.011	0.006	0.06	0.03	0.02	0.12	0.07	0.04
2.3	0.02	0.011	0.007	0.06	0.03	0.02	0.13	0.07	0.05
2.6	0.02	0.010	0.006	0.06	0.03	0.02	0.12	0.07	0.04

Notes: See table 1 for the parameter values. All changes are in percentage points unless reported otherwise. The relative labor endowments change together with financial development as high, medium, low.

Table 9: Increasing Foreign Presence for different levels of Foreign Activity

A^f/A^d	Δ Growth High $\Delta\mu$ 0.1 to 0.2	Δ Growth Medium $\Delta\mu$ 0.1 to 0.2	Δ Growth Low $\Delta\mu$ 0.1 to 0.2	Δ Growth High $\Delta\mu$ 0.2 to 0.3	Δ Growth Medium $\Delta\mu$ 0.2 to 0.3	Δ Growth Low $\Delta\mu$ 0.2 to 0.3	Δ Growth High $\Delta\mu$ 0.3 to 0.4	Δ Growth Medium $\Delta\mu$ 0.3 to 0.4	Δ Growth Low $\Delta\mu$ 0.3 to 0.4
1.15	1.05	0.59	0.36	1.49	0.83	0.51	2.03	1.14	0.69
1.32	1.09	0.61	0.38	1.56	0.88	0.54	2.15	1.20	0.73
1.52	1.14	0.64	0.39	1.65	0.92	0.56	2.28	1.27	0.78
1.75	1.20	0.67	0.41	1.74	0.97	0.59	2.42	1.35	0.83
2.00	1.25	0.70	0.43	1.83	1.02	0.62	2.56	1.43	0.87
2.30	1.31	0.73	0.45	1.93	1.08	0.66	2.72	1.52	0.93
2.60	1.36	0.76	0.47	2.02	1.13	0.69	2.87	1.60	0.98

Notes: See table 1 for the parameter values. All changes are in percentage points unless reported otherwise. The relative labor endowments change together with financial development as high, medium, low.

Table 10: Benchmark Growth Rates

Financial Development	$\phi = 1$	$\phi = 1.1$	$\phi = 1.2$	$\phi = 1.5$	$\phi = 2$
Low	1.67	1.66	1.65	1.63	1.61
Medium	2.49	2.47	2.46	2.43	2.40
High	3.61	3.59	3.57	3.53	3.48

Table 11: An Increase in MNE Productivity, $A^f = 2.5A^d$

Financial Development	$\phi = 1$	$\phi = 1.1$	$\phi = 1.2$	$\phi = 1.5$	$\phi = 2$
Low	1.69	1.68	1.67	1.65	1.63
Medium	2.52	2.50	2.49	2.46	2.43
High	3.65	3.63	3.61	3.57	3.52

Table 12: Changing the L/H Ratios

Financial Development	$\phi = 1$	$\phi = 1.1$	$\phi = 1.2$	$\phi = 1.5$	$\phi = 2$
Low	1.16	1.15	1.15	1.13	1.11
Medium	1.98	1.97	1.96	1.94	1.91
High	3.61	3.59	3.57	3.53	3.48

Table 13: An Increase in MNE Prdoctivity, $A^f = 2.5A^d$; L/H Ratios varies by Group

Financial Development	$\phi = 1$	$\phi = 1.1$	$\phi = 1.2$	$\phi = 1.5$	$\phi = 2$
Low	1.17	1.17	1.16	1.15	1.13
Medium	2.01	2.00	1.99	1.96	1.93
High	3.65	3.63	3.61	3.57	3.52

Table 14: Changing the MNE share to 25% from 5%; L/H Ratios varies by Group

Financial Development	$\phi = 1$	$\phi = 1.1$	$\phi = 1.2$	$\phi = 1.5$	$\phi = 2$
Low	0.85	0.83	0.81	0.75	0.69
Medium	1.49	1.46	1.42	1.33	1.23
High	2.78	2.71	2.64	2.49	2.31

Table 15: MNC share is 25%, An Increase in MNE Productivity, $A^f = 2.5A^d$, and L/H Ratios varies by Group

Financial Development	$\phi = 1$	$\phi = 1.1$	$\phi = 1.2$	$\phi = 1.5$	$\phi = 2$
Low	0.91	0.89	0.86	0.81	0.74
Medium	1.59	1.55	1.51	1.42	1.31
High	2.94	2.87	2.81	2.64	2.45

Figure 1: Financially well-developed, positive ρ

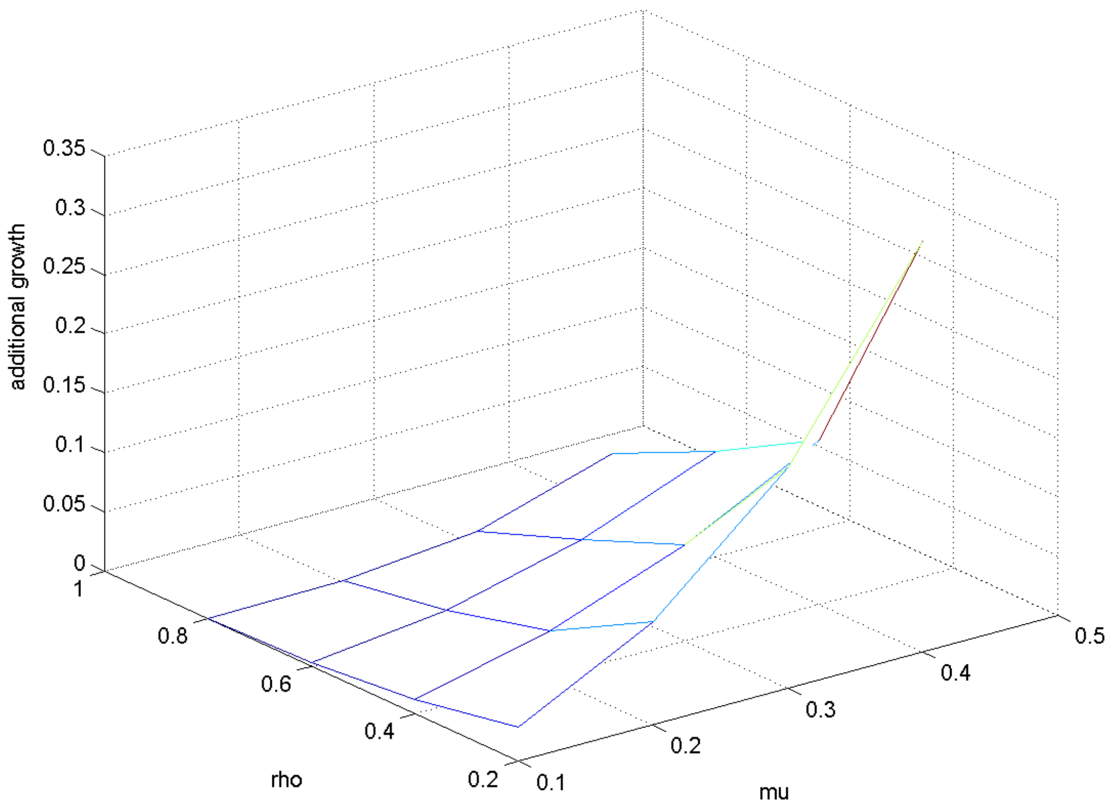

Figure 2: Financially medium-developed, positive ρ

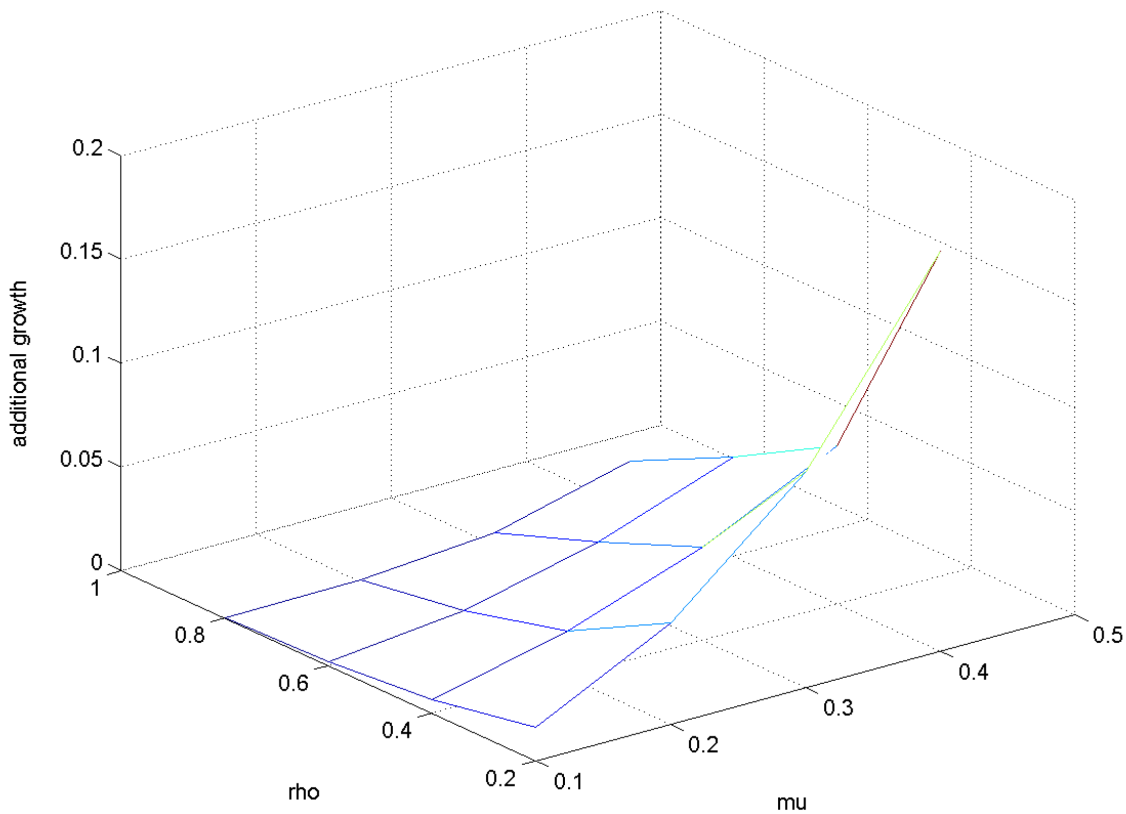

Figure 3: Financially poorly-developed, positive ρ

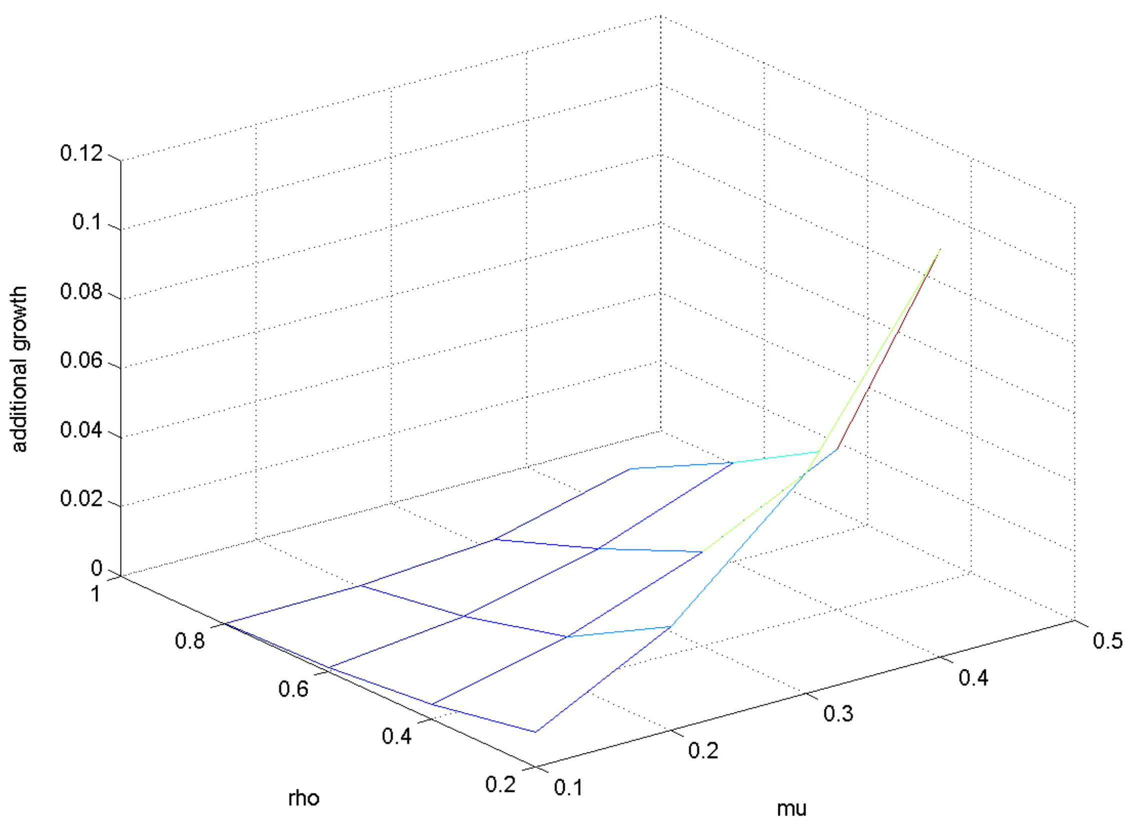

Figure 4: Financially well-developed, negative ρ

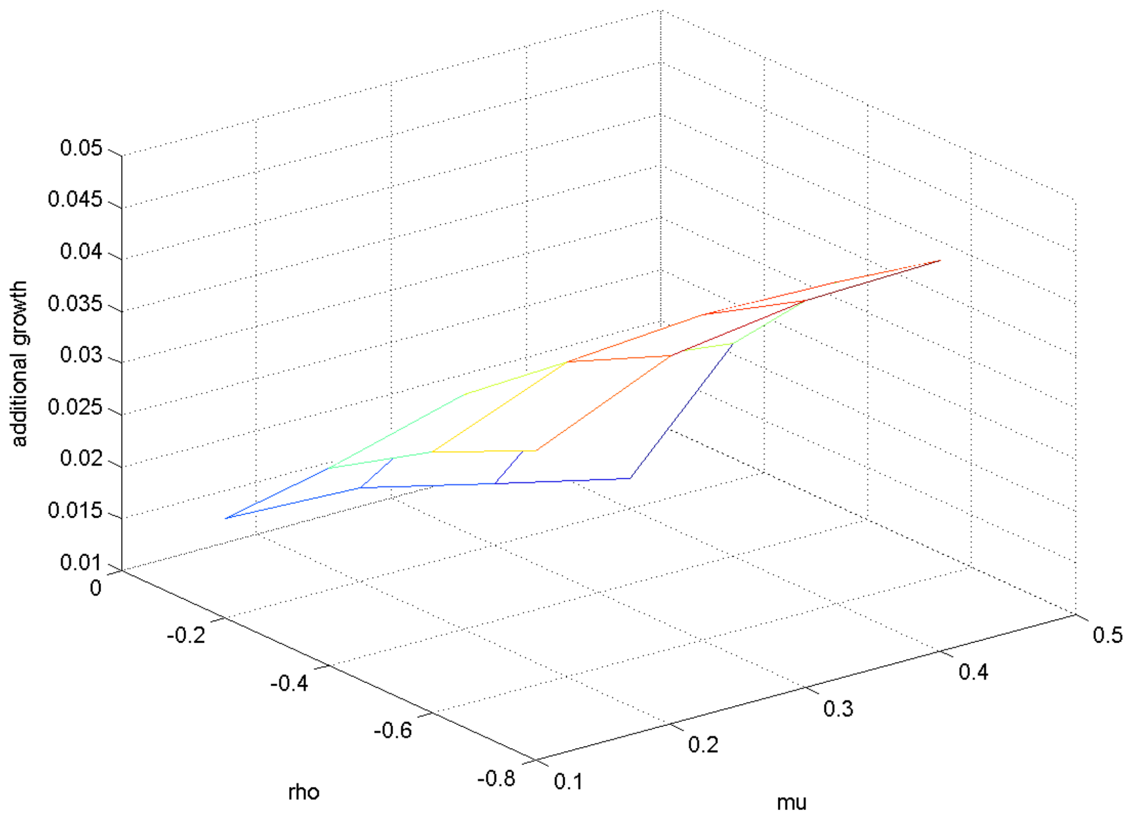

Figure 5: Financially medium-developed, positive ρ

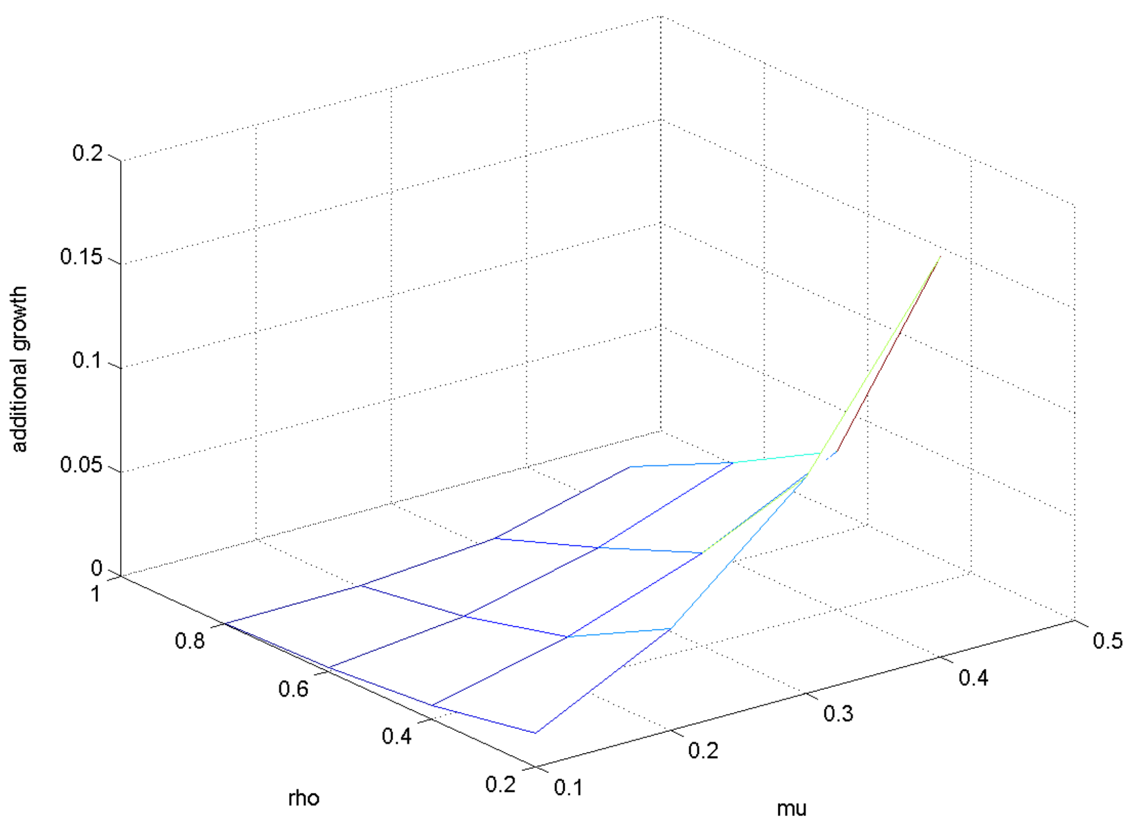

Figure 6: Financially poorly-developed, negative ρ