

Host Country Financial Development and MNC Activity*

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Abstract

Multinational corporations (MNCs) manage complex operations, often blending features of three modes of FDI that are well understood in isolation but not in tandem, namely: horizontal, vertical and export-platform FDI. We develop a three-country model with heterogeneous firms, in order to analyze how financing constraints in the FDI host country affect the relative strength of these three motives for FDI. In our model, financial development in the host country fosters entry by domestic firms, making the local market more competitive for MNC products. This leads MNCs to orient their affiliate sales away from the local market toward other markets instead. These predictions find strong confirmation in detailed data on the activities of U.S. multinationals abroad. We find that MNC affiliates in hosts with more mature financial markets: (i) channel a smaller share of their sales to the local market; (ii) send a bigger share of their sales back to the U.S., as well as to third-country destinations; and that (iii) these effects of host country financial development appear to be mediated through the entry of establishments in the local economy.

Keywords: Credit constraints, horizontal FDI, vertical FDI, export-platform FDI, heterogeneous firms.

JEL Classification: F12, F23, G20

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1 Introduction

Multinational corporations (MNCs) today manage complex global operations that serve multiple markets. Understanding what factors shape the location of MNC production and the patterns of MNC sales is important for a number of reasons. It sheds light on market conditions that affect the competitiveness of domestic firms vis-à-vis MNC affiliates, both at home and abroad. It speaks to a potential channel for the transmission of shocks across borders. Finally, it raises policy implications for countries that seek to attract FDI in order to generate capital inflows, jobs and technology spillovers.

The prior literature has identified three main motives for multinational activity that are well understood in isolation but not in tandem, namely: horizontal, vertical and export-platform FDI. Horizontal FDI occurs when MNCs set up full-fledged production facilities abroad for the purpose of selling to the local market, instead of exporting directly from home.¹ Vertical FDI arises when firms relocate some production stages to take advantage of cross-country differences in factor prices, while their final customers remain in the parent country.² Export-platform FDI describes a hybrid activity, where a foreign affiliate is set up as a production base for servicing third-country destinations.³ In practice, however, MNC operations do not conform neatly to this categorization and instead display features of all three FDI motives: The average U.S. affiliate abroad sells about 75% of its output in the host country, ships just under 10% back to the U.S., and exports the remainder to other markets (see Table 1).⁴

This paper shows that the level of financial development in the FDI host country affects the tradeoffs that MNCs make between these different modes of FDI. Using detailed data collected by the Bureau of Economic Analysis (BEA) on the activities of U.S. multinationals from 1989-2009, we establish three empirical regularities in the spatial composition of MNC affiliate sales. First, affiliates in countries with more mature financial markets channel a smaller share of their sales to the local market. Second, they send a bigger share of their sales back to the U.S. Third, they also direct a greater share of their sales to third-country destinations, with this effect on platform sales being stronger than that on return sales to the U.S. Taken together, we view this as evidence that stronger financial institutions in the host nation are associated with a reduced incentive to pursue horizontal FDI; these conditions instead favor vertical and especially export-platform activity.⁵

¹See Markusen (1984), Brainard (1997), Markusen and Venables (2000), and Helpman et al. (2004) for theory and evidence on the proximity-concentration tradeoff. This posits that horizontal FDI should be more attractive than direct exporting when transport costs are high, but plant economies of scale are low relative to firm economies of scale.

²See Helpman (1984), Hummels et al. (2001), Hanson et al. (2001, 2005), and Yeaple (2003a) for related work on the vertical fragmentation of production. Vertical FDI is thought to be more likely when factor price differences across countries are large, but the cost of shipping components is low.

³See Hanson et al. (2001) and Ekholm et al. (2007) for theory and evidence on export-platform FDI. Platform FDI is seen as more likely when the host country offers low wages and good access to other markets.

⁴Baldwin and Okubo (2012) report a similar breakdown for Japanese MNCs, although export-platform motives appear to be slightly more important, making up about 25% of the sales of Japanese affiliates.

⁵The share of affiliate sales to the U.S. market captures the extent of vertical FDI, in the sense that production has been fragmented with headquarter services based in the home country, while plant production and assembly are conducted in the FDI host country. See also Hanson et al. (2005) and Ramondo et al. (2012) who interpret this variable in a similar manner.

We rationalize these empirical facts by developing a three-country model of heterogeneous firms in the spirit of Melitz (2003) and Grossman et al. (2006). In the model, the world comprises two identical large economies in the North (called “West” and “East”) and a lower-wage third country (“South”). Upon entry, firms in each economy draw a productivity level that uniquely determines in equilibrium where they locate their production, which markets they sell to, and whether they service those markets via exports or FDI. Exporting incurs an iceberg transport cost, but requires a lower fixed cost than FDI. In our setup, Northern firms that are sufficiently productive are able to sell both at home and export abroad. The most efficient Northern firms, however, undertake FDI in South and will use their Southern plant in equilibrium as a global production center for servicing all three markets.

Financial intermediation matters because firms require external finance for their fixed costs of production. For the purposes of our analysis, we assume that Southern suppliers have limited access to capital due to imperfect credit markets, but that Northern firms do not face such constraints. Some prospective Southern producers are thus unable to operate, even though they would make positive profits in the absence of financial frictions. As a result, an improvement in financial development in the South fosters entry by domestic firms and increases competition in the local market. This induces MNCs to orient their sales away from the host country, toward servicing the third-country and home markets instead. Moreover, the share of platform affiliate sales increases more than the share of vertical sales. This arises in our model because MNCs headquartered in “West” face an additional margin of competition in their home market, from Western firms that only serve the domestic market and which produce close substitutes from the point of view of domestic consumers. These predictions from the model dovetail with the evidence we find on the spatial composition of U.S. MNC sales.

We use this theoretical framework to guide and discipline our empirical analysis. Consistent with the model’s predictions, we find robust and significant effects of host country financial development on the respective sales shares when using: (i) aggregate MNC sales at the host-country level; (ii) affiliate-level sales; and (iii) affiliate-level sales conditioning on unobserved MNC characteristics with parent-firm fixed effects. We also control for other traditional determinants of multinational activity that are also present in our model. These include the host’s market size (GDP), factor costs (GDP per capita and factor endowments), and trade costs (bilateral distance to the U.S. and membership in regional trade agreements). We further absorb systematic variation across sectors with industry fixed effects in all our regressions. Finally, we account for cross-country differences in corporate tax rates and overall rule of law to isolate the role of financial development from that of other institutional conditions.⁶

We employ two standard proxies for financial development in the FDI host country, namely: private credit and stock market capitalization, each scaled by GDP. These measures capture the ease with

⁶See Desai et al. (2004a), Branstetter et al. (2006), and Bénassy-Quéré et al. (2007) for evidence that low taxes and strong host country institutions (such as secure property rights and lack of corruption) increase FDI. Navaretti and Venables (2004, Chapter 6) and Blonigen (2005) review the literature on other country characteristics that affect FDI. These studies typically focus on FDI levels as opposed to its composition.

which local businesses can secure debt and equity financing, respectively. They are moreover arguably exogenous from the perspective of each MNC affiliate, which gives us cause to believe that our empirical results are picking up an effect running from financial development to the sales patterns of affiliates. To bolster the case for this interpretation, we further show that the affiliate sales shares are more sensitive to financial conditions in the host economy in sectors that require more external capital. It is precisely in such sectors that better access to finance should raise competition from domestic firms the most. Last but not least, we present direct evidence that better host country financial development is associated with a larger number of establishments, as reported in the UNIDO Industrial Statistics, and that the number of establishments predicted by this regression in turn exhibits the same partial correlations with the spatial dimension of MNC affiliate sales that we have been highlighting. This is consistent with the effects of financial development operating through the entry that it induces in the host economy.

This paper brings together and extends several different strands in the literature. A large and growing body of work has shown that credit constraints severely impede economic activity along many dimensions. The evidence here clearly indicates that financial development improves aggregate growth by boosting firm entry, expansion along the intensive margin, and technology adoption. It also raises export participation and aggregate export volumes. These effects are especially pronounced among small firms and in sectors that are inherently more reliant on external capital.⁷ We incorporate these insights into our model of financial market imperfections in the South, and examine their equilibrium implications for the competitive environment there.

We address directly a separate line of research on the impact of host country financial conditions on FDI. While frictions in external capital markets can limit the expansion of foreign affiliates to a certain degree, it is known that MNCs can mitigate these constraints by employing internal capital markets opportunistically (Feinberg and Phillips, 2004, Desai et al., 2004b). As a result, MNC subsidiaries are less credit constrained than local firms and respond more to profitable growth opportunities.⁸ When transacting with a supplier in a financially less developed country, firms may in fact choose to vertically integrate the supplier in order to incentivize local investors to fund her operations (see for example, Antràs et al., 2007, Bustos, 2007, and Carluccio and Fally, 2012). While consistent with the findings in this literature, our analysis shifts the focus away from the financing decisions of MNC affiliates to their production and sales decisions.⁹

On this note, our paper contributes to a growing body of work that has sought to model the complex global strategies available to MNCs. A key feature of this recent work has been its efforts to accommodate

⁷For example, see Rajan and Zingales (1998), Aghion et al. (2007), and Beck et al. (2005) on economic growth and investment, and Beck (2003), Amiti and Weinstein (2009), and Manova (2013) on international trade.

⁸Desai et al. (2008) find that following large real exchange rate devaluations, U.S. affiliates abroad receive more financing from their parent company which allows them to increase sales, while local producers contract or do not expand. Manova et al. (2009) show that MNCs export disproportionately more than domestic firms in financially dependent sectors in China.

⁹See also Buch et al. (2009) who show that financially constrained firms are less likely to choose horizontal FDI over direct exporting because of the higher associated fixed costs. They however do not consider other modes of FDI.

hybrid motives behind FDI, instead of examining horizontal, vertical and platform FDI in isolation, in order to obtain predictions for trade flows and multinational production that are rich enough to take to the data (Markusen and Venables, 2007, Irarrazabal et al., 2012, Ramondo and Rodriguez-Clare, 2012, Arkolakis et al., 2012, Tintelnot, 2012). Our approach in this paper is more closely related to Yeaple (2003a) and Grossman et al. (2006), in that we derive analytical results on how conditions in the FDI recipient country affect the equilibrium behavior of prospective MNCs that are faced with a rich array of operational options.

Finally, the mechanism we emphasize in our framework speaks to the literature on the interaction between foreign affiliates and domestic firms in FDI host countries. On the one hand, MNC subsidiaries could crowd out local producers if they raise competition levels and gain in local market share (Aitken and Harrison, 1999, De Backer and Sleuwaegen, 2003). On the other hand, MNCs can generate productivity spillovers in the host country and nudge indigenous companies to remove X-inefficiencies (Javorcik and Spatareanu, 2009, Arnold et al., 2011). These beneficial effects appear stronger in nations with advanced financial markets because of their greater capacity to allocate capital resources (Alfaro et al., 2004). While these papers study the impact of FDI on the host economy, we instead explore the effects that local financial development and increased competitive pressures can have on foreign multinationals.

The rest of the paper proceeds as follows. Section 2 sets up the three-country model with heterogeneous firms, while Section 3 derives the comparative statics on the effect of host country financial development on the spatial composition of MNC affiliate sales. Section 4 describes the data used in our empirical analysis, and Section 5 presents these results. The last section concludes. Detailed proofs have been relegated to the Appendix.

2 A Model of FDI with Host Country Credit Constraints

We develop a three-country model with heterogeneous firms to analyze how conditions in the FDI recipient country systematically affect the sales decisions of MNC affiliates located there. We specifically focus on the role of financial development and MNCs' incentives to service the host market versus the home- or third-country markets.

Consider a world of two identical countries in the developed North ("West" and "East") and a low-wage country in the developing "South". Each economy features two sectors: a homogeneous good sector ("agriculture"), and a differentiated goods sector ("manufacturing"). The homogeneous good is produced using a constant returns to scale technology. This good is freely tradable across borders, and thus serves as the global numeraire. In each country, the labor force is sufficiently large to ensure that agricultural output is strictly positive in equilibrium. In what follows, we set our model up so that the two Northern countries are symmetric in structure, as this will simplify the system of equations that describes the equilibrium in the manufacturing sector.

Labor is the sole factor of production, with the nominal wage pinned down by the constant marginal product of labor in the respective domestic agriculture sectors. Southern labor is less productive in agriculture than Northern labor: While $1/\omega$ workers are needed to make each unit of the homogeneous good in the South, only one worker is required in the North. We thus normalize the nominal wage in the two developed countries (West and East) to 1, so that the wage in South is $\omega < 1$.

Utility: The utility function of a representative consumer from the developed North (subscript $n = e, w$, for East and West respectively) is given by:

$$U_n = y_n^{1-\mu} \left[\sum_{j \in \{e, w\}} \left(\int_{\Omega_{nj}} x_{nj}(a)^\alpha dG_j(a) \right)^\alpha \right]^{\frac{\mu}{\beta}}, \quad (2.1)$$

while the corresponding utility function for Southern consumers (subscript s) is:

$$U_s = y_s^{1-\mu} \left[\sum_{j \in \{e, w, s\}} \left(\int_{\Omega_{sj}} x_{sj}(a)^\alpha dG_j(a) \right)^\alpha \right]^{\frac{\mu}{\beta}}. \quad (2.2)$$

Utility in country i ($i \in \{e, w, s\}$) is thus a Cobb-Douglas aggregate over consumption of the homogeneous good (y_i) and differentiated varieties of manufactures, where the share of expenditure spent on manufactures is equal to the constant $\mu \in (0, 1)$. Here, $x_{ij}(a)$ denotes the quantity of a country j manufactured variety (indexed by a) that is consumed in country i . (As a rule of thumb, the first subscript identifies the country of consumption, while the second subscript refers to the country of origin of the producing firm.) We define Ω_{ij} to be the set of differentiated varieties from country j available in i . When $i \neq j$, this set consists of all varieties exported from j to i , as well as varieties produced locally in i by country j 's multinational affiliates if FDI takes place. Similarly, when $i = j$, Ω_{ii} is the union of all indigenous varieties produced domestically, and all varieties produced by country i multinationals abroad that are then re-exported back to the home market.

The sub-utility derived from manufactures is a two-layered Dixit-Stiglitz aggregate over the consumption of varieties. We stipulate that $0 < \beta < \alpha < 1$, which translates into a home-bias assumption: Manufactured varieties from the same country are closer substitutes than varieties drawn from different countries. We further specify that South demands varieties from all three countries.¹⁰ By contrast, Southern manufactures do not enter the utility function of Northern consumers. One could argue for example that Southern goods do not cater to developed country tastes, or alternatively that the fixed costs of exporting to the North are prohibitively high for all Southern firms. This simplifying assumption allows us to examine the Southern industry without having to worry about feedback effects from Northern demand for Southern goods.¹¹

¹⁰Prior three-country models, such as Ekholm et al. (2003), Yeaple (2003a), and Grossman et al. (2006), have often assumed that the size of the Southern market is negligible, in order to focus on the MNC's decision over how to service the two large Northern markets. In our model, however, Southern demand for Northern varieties is crucial for changes in the level of competitiveness in the Southern market to affect the Northern industry equilibrium and MNCs' behavior.

¹¹This simplification does not alter our qualitative predictions: If Northern consumers also demand Southern goods, this

Each differentiated variety is produced by a separate firm. Varieties are indexed by a , the labor requirement per unit output. Upon paying the fixed cost of entry into the industry, every firm draws its a from a distribution $G_j(a)$ that represents the existing slate of technological possibilities in country j . $1/a$ is thus the firm's labor productivity and the key dimension along which firms in the manufacturing sector are heterogeneous.

Maximizing (2.1) and (2.2) respectively subject to the standard budget constraints implies the familiar iso-elastic demand functions for each variety: $x_{ij} = A_{ij}p_{ij}(a)^{-\varepsilon}$, where $p_{ij}(a)$ denotes the price of the country j variety in country i , and $\varepsilon = \frac{1}{1-\alpha} > 1$ is the elasticity of substitution between different varieties from the same country. Given the symmetry between West and East, the expressions for aggregate demand, A_{ij} , in country i for manufactured varieties from j are:

$$A_{ww} = A_{ee} = \frac{\mu E_n P_{ww}^{\varepsilon-\phi}}{P_{ww}^{1-\phi} + P_{ew}^{1-\phi}}, \quad (2.3)$$

$$A_{ew} = A_{we} = \frac{\mu E_n P_{ew}^{\varepsilon-\phi}}{P_{ww}^{1-\phi} + P_{ew}^{1-\phi}}, \quad (2.4)$$

$$A_{sw} = A_{se} = \frac{\mu E_s P_{sw}^{\varepsilon-\phi}}{P_{ss}^{1-\phi} + 2P_{sw}^{1-\phi}}, \quad \text{and} \quad (2.5)$$

$$A_{ss} = \frac{\mu E_s P_{ss}^{\varepsilon-\phi}}{P_{ss}^{1-\phi} + 2P_{sw}^{1-\phi}}, \quad (2.6)$$

where $P_{ij}^{1-\varepsilon} = \int_{\Omega_{ij}} p_{ij}(a)^{1-\varepsilon} dG_j(a)$ is the ideal price index of varieties from country j faced by country i . (Note that the above equations make use of the fact that $P_{ww}^{1-\varepsilon} = P_{ee}^{1-\varepsilon}$, $P_{ew}^{1-\varepsilon} = P_{we}^{1-\varepsilon}$ and $P_{sw}^{1-\varepsilon} = P_{se}^{1-\varepsilon}$, since West and East are symmetric.) Here, E_i is the total expenditure by consumers in i , and $E_w = E_e = E_n$.¹² These aggregate expenditure levels are exogenous and equal to the nominal wage times the size of the workforce in each country. Note also that $\phi = \frac{1}{1-\beta} > 1$ is the cross-country elasticity of substitution between manufactured varieties, and $\varepsilon > \phi$ because $\alpha > \beta$. This is precisely the statement that manufactured varieties from the same country are closer substitutes in consumption than varieties drawn from different countries. In particular, from (2.3) and (2.4), the fact that Western goods are not equally substitutable for manufactured varieties from East ($\varepsilon \neq \phi$) explains why demand for Western goods differs in the two developed countries ($A_{ww} \neq A_{ew}$). As we will show below, the condition $\varepsilon > \phi$ will play a role in signing various comparative statics related to the effect of Southern financial development.

2.1 Industry setup in the Northern countries

The structure of the Northern manufacturing sector builds on Helpman et al. (2004) and Grossman et al. (2006). We describe the environment in West, with the situation in East being entirely symmetric.¹³

would further spur the entry of Southern firms following an improvement in Southern financial development. This would serve to reinforce the competition effect in South between Northern and Southern manufacturing firms.

¹²While it may be natural to further assume that $E_n > E_s$, namely that each Northern country is a larger consumer market than South, this will not be necessary for our results.

¹³The corresponding equations for East can be obtained by interchanging the subscripts 'w' and 'e'.

Upon entering the industry, each firm in West obtains a unit cost draw, a , from the distribution $G_n(a)$. The firm then decides whether to engage in production or to exit entirely (which it does if it receives a very low productivity draw). Should the firm choose to stay in, production for the home economy incurs a per-period fixed cost of f_D units of Western labor. One can interpret these fixed costs as headquarter services such as managerial expertise or the recurring cost of maintaining equipment. At the start of each period, firms require external financing to pay f_D upfront. For simplicity, we assume that firms cannot use retained earnings from previous periods because management has no control rights over these revenues and must transfer them as dividends or profits to the firm's owners. Firms thus borrow for each period's fixed costs at a (gross) interest rate of $R > 1$, set exogenously in an international capital market that we do not model explicitly.

Firms charge a constant markup over marginal costs, so that the home price for a Western variety is $p_{ww}(a) = \frac{a}{\alpha}$. Individual producers take the aggregate demand levels in each country as given. Profits from sales in the domestic market are thus equal to:

$$\pi_D(a) = (1 - \alpha)A_{ww} \left(\frac{a}{\alpha}\right)^{1-\varepsilon} - Rf_D. \quad (2.7)$$

In addition, firms that are sufficiently productive will contemplate exporting to East or South (or both). Exporting to each foreign market incurs a per-period fixed cost of f_X units of Western labor, which capture for example the cost of maintaining an overseas distribution network. Exporting also incurs an iceberg transport cost that raises prices by a multiplicative factor, $\tau > 1$. The Western firm's profits from exporting to East and South are thus respectively:

$$\pi_{XN}(a) = (1 - \alpha)A_{ew} \left(\frac{\tau a}{\alpha}\right)^{1-\varepsilon} - Rf_X, \quad \text{and} \quad (2.8)$$

$$\pi_{XS}(a) = (1 - \alpha)A_{sw} \left(\frac{\tau a}{\alpha}\right)^{1-\varepsilon} - Rf_X. \quad (2.9)$$

The FDI decision: Alternatively, Northern firms that are sufficiently productive can choose to go multinational. Establishing an overseas plant confers several advantages. It allows the MNC to move closer to its foreign markets (saving on shipping costs), as well as to lower its wage bill if it locates in the South. However, setting up a production facility abroad requires a high per-period fixed cost equal to f_I units of Northern labor. A Western MNC thus faces a wide array of options: Apart from servicing the host country market, the Western headquarters may also want to use the foreign affiliate as an export platform to a third country or even back to its home (Western) market. We assume that such re-exporting incurs both the above-mentioned per-period fixed cost, f_X , of maintaining a distribution network, as well as the same iceberg transport cost, τ .

To keep the analysis tractable (and to economize on the number of relevant productivity cutoffs), we focus on the case in which: (i) Western firms that are sufficiently productive conduct FDI only in the low-wage South and not in East; and (ii) if a Southern affiliate is established, it automatically becomes the Western firm's global production center servicing all three countries. Below, we show that two

conditions, namely $\tau\omega < 1$ and $f_X < f_D < f_I$, suffice to ensure that this will be the optimal strategy for Western MNCs. Intuitively, the Southern wage ω must be lower than the Northern wage after adjusting for transport costs for MNCs to use South as an export platform to the Northern markets. The second assumption captures the idea that the fixed cost of an export distribution network is typically smaller than the fixed cost of running a domestic plant, which in turn is smaller than the fixed cost of running an overseas production facility.

Consider then a Western firm that is sufficiently productive to contemplate FDI. If this firm already operates an affiliate in South, it is more profitable to use it as an export platform to East, rather than servicing East via direct exports from West or via FDI in East. This follows from the inequality:

$$(1 - \alpha)A_{ew} \left(\frac{\tau a \omega}{\alpha}\right)^{1-\varepsilon} - Rf_X > \max \left\{ (1 - \alpha)A_{ew} \left(\frac{\tau a}{\alpha}\right)^{1-\varepsilon} - Rf_X, (1 - \alpha)A_{ew} \left(\frac{a}{\alpha}\right)^{1-\varepsilon} - Rf_I \right\},$$

which holds since $\tau\omega < 1 < \tau$ and $f_X < f_I$ (bearing in mind that $1 - \varepsilon < 0$). In particular, this rules out the possibility of the MNC establishing production plants in both South and East.

Conditional on setting up a Southern affiliate, it is also optimal to use it to supply even the firm's home market. This follows from:

$$(1 - \alpha)A_{ww} \left(\frac{\tau a \omega}{\alpha}\right)^{1-\varepsilon} - Rf_X > (1 - \alpha)A_{ww} \left(\frac{a}{\alpha}\right)^{1-\varepsilon} - Rf_D,$$

which holds since $\tau\omega < 1$ and $f_X < f_D$. Thus, it is more profitable to produce in South and export to West than to incur the fixed costs and higher wages of production at home.

It remains to check that the optimal decision for the Western MNC is to locate its overseas affiliate in South, rather than in East. This requires that total profits from servicing all three countries out of a production plant in South must exceed the profits from setting up a plant in East instead:

$$\begin{aligned} & (1 - \alpha)A_{ww} \left(\frac{\tau a \omega}{\alpha}\right)^{1-\varepsilon} - Rf_X + (1 - \alpha)A_{ew} \left(\frac{\tau a \omega}{\alpha}\right)^{1-\varepsilon} - Rf_X + (1 - \alpha)A_{sw} \left(\frac{a \omega}{\alpha}\right)^{1-\varepsilon} - Rf_I \\ & > \max \left\{ (1 - \alpha)A_{ww} \left(\frac{a}{\alpha}\right)^{1-\varepsilon} - Rf_D, (1 - \alpha)A_{ww} \left(\frac{\tau a}{\alpha}\right)^{1-\varepsilon} - Rf_X \right\} \\ & \dots + (1 - \alpha)A_{ew} \left(\frac{a}{\alpha}\right)^{1-\varepsilon} - Rf_I + (1 - \alpha)A_{sw} \left(\frac{\tau a}{\alpha}\right)^{1-\varepsilon} - Rf_X. \end{aligned}$$

Note that if FDI is undertaken in East, the home market (West) can be supplied either through domestic production or re-exports from East, while South would be serviced by exports from the developed North. The expression on the right-hand side of the above inequality captures total profits from this alternative production mode. Once again, it is easy to check that this inequality holds since $\tau\omega < 1$, $\omega < 1$, $\omega < \tau$ and $f_X < f_D$. It is thus not optimal to conduct FDI in the high-wage East.

In sum, the conditions $\tau\omega < 1$ and $f_X < f_D < f_I$ guarantee that the FDI decision is in effect a decision over whether to relocate the firm's global production center to South, with only headquarter activities being retained in West. Under these parameter assumptions, and taking into account revenues from all three markets, profits from FDI in South for a firm with productivity $1/a$ are therefore:

$$\pi_I(a) = (1 - \alpha)A_{sw} \left(\frac{a \omega}{\alpha}\right)^{1-\varepsilon} + (1 - \alpha)(A_{ww} + A_{ew}) \left(\frac{\tau a \omega}{\alpha}\right)^{1-\varepsilon} - R(f_I + 2f_X). \quad (2.10)$$

Patterns of production: Each firm's productivity level determines where it manufactures and sells its goods. Firms produce at home for the local market if profits from (2.7) are positive. Solving $\pi_D(a) = 0$, this pins down a zero-profit value, a_D , which is the maximum labor input coefficient at which domestic production is sustainable. Similarly, setting $\pi_{XN}(a) = 0$ yields a cutoff level, a_{XN} , below which exporting to East is profitable. Solving $\pi_{XS}(a) = 0$ delivers the analogous cutoff, a_{XS} , for exporting to South. These three thresholds are given by:

$$a_D^{1-\varepsilon} = \frac{Rf_D}{(1-\alpha)A_{ww}(1/\alpha)^{1-\varepsilon}}, \quad (2.11)$$

$$a_{XN}^{1-\varepsilon} = \frac{Rf_X}{(1-\alpha)A_{ew}(\tau/\alpha)^{1-\varepsilon}}, \quad \text{and} \quad (2.12)$$

$$a_{XS}^{1-\varepsilon} = \frac{Rf_X}{(1-\alpha)A_{sw}(\tau/\alpha)^{1-\varepsilon}}. \quad (2.13)$$

There is a fourth cutoff, a_I , that identifies when FDI becomes feasible. Going multinational is more profitable than basing production in West when $\pi_I(a) > \pi_D(a) + \pi_{XN}(a) + \pi_{XS}(a)$. Solving this as an equality delivers the following expression for a_I :

$$a_I^{1-\varepsilon} = \frac{R(f_I - f_D)}{(1-\alpha)[A_{ww}((\frac{\tau\omega}{\alpha})^{1-\varepsilon} - (\frac{1}{\alpha})^{1-\varepsilon}) + A_{ew}((\frac{\tau\omega}{\alpha})^{1-\varepsilon} - (\frac{\tau}{\alpha})^{1-\varepsilon}) + A_{sw}((\frac{\omega}{\alpha})^{1-\varepsilon} - (\frac{\tau}{\alpha})^{1-\varepsilon})]}. \quad (2.14)$$

Note that the conditions $f_I > f_D$, $\tau\omega < 1$, $\omega < 1 < \tau$, and $\varepsilon > 1$ ensure that $a_I > 0$.

To lend some realistic structure to the industry equilibrium, we stipulate that $0 < a_D^{1-\varepsilon} < a_{XN}^{1-\varepsilon} < a_{XS}^{1-\varepsilon} < a_I^{1-\varepsilon}$. This describes a natural sorting of West's firms to the various production modes. The upper panel of Figure 1 illustrates this sorting pattern using $a^{1-\varepsilon}$ as a proxy for firm productivity. The least efficient firms with $a^{1-\varepsilon} < a_D^{1-\varepsilon}$ have labor input requirements that are too high and exit the industry upon observing their productivity draw. Firms with productivity levels between $a_D^{1-\varepsilon}$ and $a_{XN}^{1-\varepsilon}$ supply only the domestic West market. Using the cutoff expressions in (2.11) and (2.12), the assumption that $a_D^{1-\varepsilon} < a_{XN}^{1-\varepsilon}$ reduces to $\tau^{\varepsilon-1}(\frac{f_X}{A_{ew}}) > \frac{f_D}{A_{ww}}$, so that export costs (normalized by the level of demand in East) must be sufficiently bigger than the fixed cost of domestic production.¹⁴ Next, those firms that are even more productive, with $a_{XN}^{1-\varepsilon} < a^{1-\varepsilon} < a_{XS}^{1-\varepsilon}$, are able to overcome the additional costs of exporting to East, but not to South. Based on (2.12) and (2.13), the ranking $a_{XN}^{1-\varepsilon} < a_{XS}^{1-\varepsilon}$ holds if market demand for Western varieties is greater in East than in South, $A_{ew} > A_{sw}$. Firms with $a_{XS}^{1-\varepsilon} < a^{1-\varepsilon} < a_I^{1-\varepsilon}$ can further export to the smaller Southern market.¹⁵ Finally, the most productive firms with $a^{1-\varepsilon} > a_I^{1-\varepsilon}$ successfully conduct FDI in South.

Figure 2 provides an alternative illustration of the structure of the Western industry that focuses on the economic relations in our three-country world. Firms with $a^{1-\varepsilon} < a_I^{1-\varepsilon}$ base their production

¹⁴To be precise, one needs to substitute the values of A_{ww} and A_{ew} in general equilibrium into this inequality for the full restriction. Note also that this condition is not inconsistent with the earlier requirement that $f_X < f_D$.

¹⁵The parameter restriction that guarantees that $a_{XS}^{1-\varepsilon} < a_I^{1-\varepsilon}$ does not simplify neatly. Intuitively, it requires that the fixed cost of FDI, f_I , be sufficiently large so that FDI is only considered by the most productive firms.

activities in West, and undertake exports to East and even to South if they are sufficiently productive (Figure 2a). On the other hand, the most productive firms with $a^{1-\varepsilon} > a_I^{1-\varepsilon}$ become multinationals. While these firms are still headquartered in West, their production activities are located in South, from which they service all three markets (Figure 2b).

2.2 Industry setup in the Southern country

The structure of the Southern manufacturing industry is simpler, with Southern firms producing only for domestic consumption. (Recall from (2.1) that Southern manufactures do not enter the utility function of Northern countries.) The per-period fixed cost of domestic production is f_S units of Southern labor, and we assume once again that Southern firms need to borrow at the start of each period to finance these fixed costs.

However, Southern firms face credit constraints, arising from institutional weaknesses that lead to imperfect protection for lenders against default risk. Following Aghion, Howitt and Mayer-Foulkes (2004), we model this moral hazard problem by assuming that firms lose a fraction $\eta \in [0, 1]$ of their revenues if they choose to default. Thus, while it is tempting to default to avoid loan repayment, it is a costly option. The fraction η can be thought of as the pecuniary cost of actions taken to hide the firm's full financial resources from lenders. A Southern firm with input coefficient a would therefore default if and only if the associated revenue loss is smaller than the cost of servicing the loan:

$$\eta(1 - \alpha)A_{ss} \left(\frac{a\omega}{\alpha} \right)^{1-\varepsilon} < Rf_S\omega,$$

We interpret the parameter η as capturing the degree of financial development in South: When credit institutions are stronger, η is higher and it is more difficult for firms to hide their revenues and assets.

The default condition yields a productivity threshold above which firms have access to credit:

$$a_S^{1-\varepsilon} = \frac{1}{\eta} \frac{Rf_S\omega}{(1 - \alpha)A_{ss}(\omega/\alpha)^{1-\varepsilon}}. \quad (2.15)$$

We assume that lenders can observe a , and hence only Southern firms with $a^{1-\varepsilon} > a_S^{1-\varepsilon}$ will be able to commence production. When $\eta = 1$, $a_S^{1-\varepsilon}$ equals the cutoff for domestic entry that would prevail in the absence of credit market imperfections. When $\eta < 1$, however, the productivity bar is higher, as illustrated in the lower panel of Figure 1. This is because firms with productivity levels slightly lower than $a_S^{1-\varepsilon}$ would earn positive profits, but cannot credibly commit to repay their loans. As η increases toward 1, this distortion from credit constraints vanishes.¹⁶

2.3 Industry equilibrium

We now close the model by specifying the conditions that govern firm entry in each country. For this, it is convenient to define $V_i(a) = \int_0^a \tilde{a}^{1-\varepsilon} dG_i(\tilde{a})$, as this expression will show up repeatedly.

¹⁶We have also considered an extension (available on request) in which Northern multinationals need to borrow in the host country's financial markets for some portion of their Southern affiliate's activities. Our results continue to hold so long as the extent of these credit frictions is not too large.

Free entry: Prospective entrants in country i 's manufacturing sector incur an upfront entry cost equal to f_{Ei} units of country i labor. This is a once-off cost that firms pay *ex ante* before they can obtain their productivity draw $1/a$.¹⁷ On the exit side, firms face an exogenous probability, δ , of “dying” and leaving the industry in each period. For an equilibrium with a constant measure of firms in each country, the cost of entry must equal expected profits. Using the profit functions (2.7)-(2.10) and the cutoffs (2.11)-(2.14), and integrating the expressions for expected profits over the distribution $G_i(a)$, one can write down the free-entry conditions for Western and Southern firms as:

$$f_{En} = \frac{1}{1-\delta} \left[(1-\alpha)A_{ww} \left(\frac{1}{\alpha}\right)^{1-\varepsilon} (V_n(a_D) - V_n(a_I)) - Rf_D(G_n(a_D) - G_n(a_I)) \right. \\ \dots + (1-\alpha)A_{ew} \left(\frac{\tau}{\alpha}\right)^{1-\varepsilon} (V_n(a_{XN}) - V_n(a_I)) - Rf_X(G_n(a_{XN}) - G_n(a_I)) \\ \dots + (1-\alpha)A_{sw} \left(\frac{\tau}{\alpha}\right)^{1-\varepsilon} (V_n(a_{XS}) - V_n(a_I)) - Rf_X(G_n(a_{XS}) - G_n(a_I)) \\ \left. \dots + (1-\alpha) \left(A_{ww} \left(\frac{\tau\omega}{\alpha}\right)^{1-\varepsilon} + A_{ew} \left(\frac{\tau\omega}{\alpha}\right)^{1-\varepsilon} + A_{sw} \left(\frac{\omega}{\alpha}\right)^{1-\varepsilon} \right) V_n(a_I) - R(f_I + 2f_X)G_n(a_I) \right], \quad \text{and} \quad (2.16)$$

$$f_{Es}\omega = \frac{1}{1-\delta} \left[(1-\alpha)A_{ss} \left(\frac{\omega}{\alpha}\right)^{1-\varepsilon} V_s(a_S) - Rf_S\omega G_s(a_S) \right]. \quad (2.17)$$

Finally, we denote the measure of firms in country i 's manufacturing sector by N_i .¹⁸ The definition of the ideal price index ($P_{ij}^{1-\varepsilon} = \int_{\Omega_{ij}} p_{ij}(a)^{1-\varepsilon} dG_j(a)$) then implies:

$$P_{ww}^{1-\varepsilon} = N_n \left[\left(\frac{1}{\alpha}\right)^{1-\varepsilon} (V_n(a_D) - V_n(a_I)) + \left(\frac{\tau\omega}{\alpha}\right)^{1-\varepsilon} V_n(a_I) \right], \quad (2.18)$$

$$P_{ew}^{1-\varepsilon} = N_n \left[\left(\frac{\tau}{\alpha}\right)^{1-\varepsilon} (V_n(a_{XN}) - V_n(a_I)) + \left(\frac{\tau\omega}{\alpha}\right)^{1-\varepsilon} V_n(a_I) \right], \quad (2.19)$$

$$P_{sw}^{1-\varepsilon} = N_n \left[\left(\frac{\tau}{\alpha}\right)^{1-\varepsilon} (V_n(a_{XS}) - V_n(a_I)) + \left(\frac{\omega}{\alpha}\right)^{1-\varepsilon} V_n(a_I) \right], \quad \text{and} \quad (2.20)$$

$$P_{ss}^{1-\varepsilon} = N_s \left[\left(\frac{\omega}{\alpha}\right)^{1-\varepsilon} V_s(a_S) \right]. \quad (2.21)$$

The equilibrium of the model is thus defined by the system of equations (2.3)-(2.6) and (2.11)-(2.21) in the 15 unknowns, A_{ww} , A_{ew} , A_{sw} , A_{ss} , a_D , a_{XN} , a_{XS} , a_I , a_S , N_n , N_s , P_{ww} , P_{ew} , P_{sw} and P_{ss} . While we cannot solve for all of these variables in closed form, we can nevertheless derive precise results for some key comparative statics.

¹⁷One can show that our results are robust to subjecting the fixed cost of entry in the South, f_{Es} , to borrowing constraints too. Intuitively, an improvement in financial development in the South would spur more entry by Southern firms, which would work in the same direction as the effects in our baseline model.

¹⁸Following Melitz (2003), for N_i to be constant in steady state, the expected mass of successful entrants needs to equal the mass of firms that dies exogenously in each period. The mass of firms that attempts entry in each period in country i , N_i^{ent} , is thus pinned down by the equations $N_n^{ent}G_n(a_D) = \delta N_n$ and $N_s^{ent}G_s(a_S) = \delta N_s$.

3 Host country financial development and the industry equilibrium

How does financial development in the FDI host country affect multinational activity there? Using our model, we now determine how changes in η affect the spatial distribution of Western MNC affiliate sales emanating from South. This will in turn depend on the effect of η on the various productivity cutoffs. To foreshadow our key results, we will show that a rise in η increases both $a_{XS}^{1-\varepsilon}$ and $a_I^{1-\varepsilon}$, while at the same time reducing $a_D^{1-\varepsilon}$ and $a_{XN}^{1-\varepsilon}$. Intuitively, a stronger credit market in South induces more Southern firms to enter its manufacturing sector, thereby raising the productivity bar for Western firms to enter the Southern market. The new equilibrium thus features a smaller Western manufacturing presence in South, and tilts West's firms toward serving the developed markets instead.

To facilitate the derivations, we explicitly parameterize the set of technological possibilities in the manufacturing sector. As is common in this literature, we assume that productivity $1/a$ is distributed Pareto with shape parameter k and support $[1/\bar{a}_i, \infty)$ for each country i .¹⁹ (Recall that a lower k corresponds to a thicker right-tail in the productivity distribution.) This distributional assumption yields convenient expressions for G_i and V_i :

$$G_i(a) = \left(\frac{a}{\bar{a}_i}\right)^k, \quad \text{and} \quad (3.1)$$

$$V_i(a) = \frac{k}{k - \varepsilon + 1} \left(\frac{a^{k-\varepsilon+1}}{\bar{a}_i^k}\right). \quad (3.2)$$

Helpman et al. (2004) show that if the underlying productivity distribution is Pareto with shape parameter k , then the distribution of observed firm sales will be Pareto with shape parameter $k - \varepsilon + 1$. We therefore assume that $k > \varepsilon - 1$, which is necessary to deliver a finite variance for the distribution of firm sales. In essence, this requires that the distribution of firm productivities not place too large a mass on obtaining high productivity draws.²⁰

3.1 Impact on industry cutoffs and market demand levels

We first establish how an improvement in Southern financial development systematically shifts the productivity cutoffs that sort firms, as well as the aggregate demand levels in each market. Note that equations (2.15) and (2.17) precisely pin down A_{ss} and a_S for the equilibrium in South. Totally differentiating these two equations, we obtain:

Lemma 1: $\frac{da_S}{d\eta} > 0$ and $\frac{dA_{ss}}{d\eta} < 0$.

Proof. See Appendix 8.1. ■

¹⁹One might presume that $1/\bar{a}_s < 1/\bar{a}_n$, so that Southern manufacturing is on average less productive, but we will not need this assumption for the proofs. We will however require that \bar{a}_s and \bar{a}_n both be sufficiently large, so that all relevant cutoffs lie within the interior of the support of the distributions that they are drawn from. Similarly, our proofs do not require the same shape parameter in West and South, but we have assumed this to simplify notation.

²⁰Helpman et al. (2004) also use European firm-level data to quantify the goodness of fit of the Pareto distribution in describing firm sales. They typically find that $k > \varepsilon - 1$.

Intuitively, a rising cost of default in the South alleviates the moral hazard problem, and hence more Southern firms gain access to financial credit. This lowers the productivity cutoff $a_S^{1-\varepsilon}$ for entry into the local market, as illustrated in the bottom panel of Figure 3. However, the free-entry condition (2.17) requires the expected profitability of a Southern firm to remain constant. Average demand for each Southern product, A_{ss} , must subsequently fall.

Since Northern and Southern varieties are substitutes in consumption in the South, financial development there also affects each developed country's manufacturing sector. Specifically, the effects on the productivity cutoffs and demand levels relevant to Western firms are described in the following lemma; by symmetry, these comparative statics also apply to Eastern firms:

Lemma 2: (i) $\frac{1}{a_{XN}} \frac{da_{XN}}{d\eta} > \frac{1}{a_D} \frac{da_D}{d\eta} > 0$; (ii) $\frac{1}{a_{XS}} \frac{da_{XS}}{d\eta} < \frac{1}{a_I} \frac{da_I}{d\eta} < 0$; (iii) $\frac{1}{A_{ew}} \frac{dA_{ew}}{d\eta} > \frac{1}{A_{ww}} \frac{dA_{ww}}{d\eta} > 0$; and (iv) $\frac{dA_{sw}}{d\eta} < 0$.

Proof. See Appendix 8.2. ■

While the formal proof of Lemma 2 is fairly extended, the key shifts are very intuitive and are illustrated in the upper panel of Figure 3. Tougher competition in the Southern market decreases South's demand for each Western differentiated variety. This lowers A_{sw} , and correspondingly raises the productivity bars $a_{XS}^{1-\varepsilon}$ and $a_I^{1-\varepsilon}$ for Western firms seeking to penetrate the Southern market either through exporting or horizontal FDI. However, since the fixed cost of entry, f_{En} , remains constant, the free-entry condition (2.16) implies that total profits from sales in the Northern markets (West and East) must increase. The improvement in Southern financial development thus tilts West's firms toward serving the developed country markets: The productivity cutoffs $a_D^{1-\varepsilon}$ and $a_{XN}^{1-\varepsilon}$ both fall, while aggregate demand levels in West and East, A_{ww} and A_{ew} , both rise. The parameter assumption $\varepsilon > \phi$ plays a subtle role in this logic: The output of a given Southern firm must be a closer substitute for other Southern varieties than are varieties from the North, so that Northern goods are more easily displaced from South's consumption basket with the entry of more competing Southern firms.

We can moreover show that the proportional shift of the $a_{XN}^{1-\varepsilon}$ cutoff is larger than that of the $a_D^{1-\varepsilon}$ cutoff. Being closer to the $a_{XS}^{1-\varepsilon}$ and $a_I^{1-\varepsilon}$ thresholds, Western firms with productivity levels around $a_{XN}^{1-\varepsilon}$ are more directly affected by the contraction in Southern demand. Similarly, the $a_{XS}^{1-\varepsilon}$ cutoff increases proportionally more than $a_I^{1-\varepsilon}$ because the most productive Western firms (with $a^{1-\varepsilon} > a_I^{1-\varepsilon}$) are insulated to some extent from the negative demand shock in South. Compared to firms with $a_{XS}^{1-\varepsilon} < a^{1-\varepsilon} < a_I^{1-\varepsilon}$, they too benefit from higher demand in the Northern markets, but enjoy the lower wage costs in South.

3.2 The spatial distribution of sales: Firm-level predictions

These shifts in the productivity cutoffs and market demand levels allow us to sign the impact of Southern financial development on MNC sales. We define several quantities of interest that characterize the spatial

distribution of these sales. For a given affiliate in South with productivity $1/a$, sales to the local market amount to $HORI(a) \equiv (1 - \alpha)A_{sw} \left(\frac{a\omega}{\alpha}\right)^{1-\varepsilon}$. We refer to these as horizontal sales, since they allow the multinational to avoid transport costs while servicing the Southern market. Export-platform sales to third-country destinations (in our case, East) are defined as $PLAT(a) \equiv (1 - \alpha)A_{ew} \left(\frac{\tau a\omega}{\alpha}\right)^{1-\varepsilon}$. Finally, sales back to the Western home market equal $VERT(a) \equiv (1 - \alpha)A_{ww} \left(\frac{\tau a\omega}{\alpha}\right)^{1-\varepsilon}$. These capture the extent of vertical FDI in the sense that production has been fragmented across borders: While headquarter inputs (embodied in f_I) are provided in the Western headquarters, production and assembly occur in the South, taking advantage of lower factor costs there. Naturally, the affiliate's total sales are $TOT(a) = HORI(a) + PLAT(a) + VERT(a)$.

Applying these definitions, the following three expressions describe the breakdown of affiliate sales by destination:

$$\frac{HORI(a)}{TOT(a)} = \left(1 + \tau^{1-\varepsilon} \frac{A_{ew}}{A_{sw}} + \tau^{1-\varepsilon} \frac{A_{ww}}{A_{sw}}\right)^{-1}, \quad (3.3)$$

$$\frac{PLAT(a)}{TOT(a)} = \left(1 + \tau^{\varepsilon-1} \frac{A_{sw}}{A_{ew}} + \frac{A_{ww}}{A_{ew}}\right)^{-1}, \quad \text{and} \quad (3.4)$$

$$\frac{VERT(a)}{TOT(a)} = \left(1 + \tau^{\varepsilon-1} \frac{A_{sw}}{A_{ww}} + \frac{A_{ew}}{A_{ww}}\right)^{-1}. \quad (3.5)$$

We can now state the following result regarding the spatial distribution of MNC sales:

Proposition 1 *Consider a Western multinational with a production affiliate in the South. Suppose that the South undergoes a small improvement in financial development, after which this firm remains a multinational. In response to this increase in η :*

(i) *$HORI(a)$ decreases, while both $PLAT(a)$ and $VERT(a)$ increase; and*

(ii) *$\frac{HORI(a)}{TOT(a)}$ decreases, while both $\frac{PLAT(a)}{TOT(a)}$ and $\frac{VERT(a)}{TOT(a)}$ increase.*

Proof. See Appendix 8.3. ■

The intuition behind this proposition builds on the logic of Lemma 2. The changes in sales levels, $HORI(a)$, $PLAT(a)$, and $VERT(a)$, are driven by changes in demand levels, A_{sw} , A_{ew} , and A_{ww} , in the markets that the multinational serves. When credit constraints in South are eased, the demand in South for Western goods drops due to the increased competition from local firms. Hence, horizontal sales into South, as well as their share in total sales, both decline. At the same time, demand levels in East and West rise in equilibrium, which impels the multinational toward servicing the developed Northern markets. This prompts an increase in platform and vertical sales both in absolute levels and relative to total sales.

In fact, the model delivers the further prediction that the increase in the MNC's export-platform sales exceeds that in its sales back to West, in both absolute and relative terms:

Lemma 3: (i) $\frac{d}{d\eta} PLAT(a) > \frac{d}{d\eta} VERT(a) > 0$; and (ii) $\frac{d}{d\eta} \frac{PLAT(a)}{TOT(a)} > \frac{d}{d\eta} \frac{VERT(a)}{TOT(a)} > 0$.

Proof. See Appendix 8.4. ■

Platform sales rise more than vertical sales for a simple reason: The multinational faces tougher competition in its own home market than in East. This occurs because Western varieties are closer substitutes in consumption for the MNC's goods than Eastern varieties (since $\varepsilon > \phi$), and a margin of Western firms (with productivity $a_D^{1-\varepsilon} < a^{1-\varepsilon} < a_{XN}^{1-\varepsilon}$) sell only at home but not in East.

3.3 The spatial distribution of sales: Aggregate predictions

Apart from firm-level predictions, our model also allows us to deduce the effects of host country financial development on sales volumes at the industry level. For this, we define the aggregate horizontal, platform and vertical sales of Western MNCs as:

$$HORI \equiv N_n \int_0^{a_I} HORI(a) dG_n(a) = N_n(1-\alpha)A_{sw} \left(\frac{\omega}{\alpha}\right)^{1-\varepsilon} V_n(a_I), \quad (3.6)$$

$$PLAT \equiv N_n \int_0^{a_I} PLAT(a) dG_n(a) = N_n(1-\alpha)A_{ew} \left(\frac{\tau\omega}{\alpha}\right)^{1-\varepsilon} V_n(a_I), \quad \text{and} \quad (3.7)$$

$$VERT \equiv N_n \int_0^{a_I} VERT(a) dG_n(a) = N_n(1-\alpha)A_{ww} \left(\frac{\tau\omega}{\alpha}\right)^{1-\varepsilon} V_n(a_I), \quad (3.8)$$

where we have integrated over the measure of Western firms with $a^{1-\varepsilon} > a_I^{1-\varepsilon}$ that are productive enough to go multinational. Changes in η affect these industry outcomes as follows:

Proposition 2 *Consider sales aggregated over all Western multinationals with an affiliate in the South. In response to an improvement in financial development η in South:*

(i) N_n , $HORI$, $PLAT$, and $VERT$ all decrease; and

(ii) $\frac{HORI}{TOT}$ decreases, while both $\frac{PLAT}{TOT}$ and $\frac{VERT}{TOT}$ increase.

Proof. See Appendix 8.5. ■

It is useful to discuss part (ii) of this proposition first. Observe that the shares of horizontal, platform and vertical sales for an individual firm in (3.3)-(3.5) are all independent of its productivity level, $1/a$. It follows immediately that these sales shares also describe the industry as a whole, namely: $\frac{HORI}{TOT} = \frac{HORI(a)}{TOT(a)}$, $\frac{PLAT}{TOT} = \frac{PLAT(a)}{TOT(a)}$, and $\frac{VERT}{TOT} = \frac{VERT(a)}{TOT(a)}$, so that our model carries the same implications for these aggregate shares as it does at the affiliate level. Once again, an improvement in financial development in the South intensifies competition locally. This leads Western firms to re-direct their sales away from the South toward the developed North instead, and this effect manifests itself in the aggregate sales shares.

This competition effect also explains part (i) of the proposition. The easing of financial constraints in the South induces more entry by local competitors and reduces the *ex ante* expected profits of Western firms. This leads to a decrease in the measure of Western firms. As for the effect of η on the aggregate sales levels, this works through three channels as seen from equations (3.6)-(3.8): (i) the productivity cutoff for FDI, $a_I^{1-\varepsilon}$; (ii) the measure of Western firms, N_n ; and (iii) the demand levels in each market, A_{sw} , A_{ew} , and A_{ww} . The first two channels capture the extensive margin of FDI sales, since they operate through the entry or exit of Western MNCs, while the third channel reflects the intensive margin of existing affiliates' sales. It is clear that the effect of a higher η on the extensive margin is to lower *HORI*, *PLAT*, and *VERT*, as it raises the productivity bar for FDI in South, so that $V_N(a_I)$ drops (Lemma 2), and it also decreases N_n (as we have just seen). In the case of horizontal sales, this negative effect on the extensive margin is reinforced by a reduction in A_{sw} , and *HORI* clearly falls. It turns out that the decline on the extensive margin also dominates the increases on the intensive margin from A_{ew} and A_{ww} , so that both *PLAT* and *VERT* fall unambiguously as well.

4 Data Description

4.1 U.S. Multinational Activity

We turn next to test the empirical predictions of the model using confidential data from the Bureau of Economic Analysis (BEA) Survey of U.S. Direct Investment Abroad. This dataset provides detailed financial and operational data for all U.S. multinational firms and their affiliates abroad for the 1989-2009 period. All foreign business enterprises in which a U.S. national holds at least a 10% ownership stake are required by law to respond to the survey in benchmark years. Our empirical analysis focuses on the subset of non-bank affiliates of non-bank U.S. parents.

The BEA conducts benchmark surveys every five years covering the universe of U.S. foreign affiliates; our sample includes benchmark surveys in 1989, 1994, 1999, 2004, and 2009. By contrast, survey participation in non-benchmark year is subject to size thresholds, as only affiliates with sales greater than a predetermined threshold are required to report. To mitigate issues related to sample selection, we therefore focus only on benchmark years for our aggregate analysis. However, in affiliate-level regressions to follow, we incorporate the full panel of observations from the annual survey, simply omitting any missing observations or imputed values. Although we face an unbalanced panel of affiliates using this approach, we have separately confirmed that all of our results hold when using affiliate-level data solely from the comprehensive benchmark years (results available on request).

The BEA data contain information detailing the spatial distribution of multinationals' affiliate sales. In addition to recording the total sales ("gross operating revenues, excluding sales taxes") of each affiliate abroad ($TOT(a)$), the survey captures sales according the following categories: (i) local sales in the host country market, (ii) sales to the U.S., and (iii) sales to other destinations. We use these to form our

baseline measures of horizontal ($HORI(a)$), vertical ($VERT(a)$) and export-platform ($PLAT(a)$) sales respectively. Dividing by $TOT(a)$, we obtain the share of each activity in total affiliate sales. Within each category, the BEA data further distinguish between sales to other company affiliates and sales to unaffiliated customers. We will make use of this additional detail to construct alternative proxies for horizontal, vertical, and platform FDI in robustness checks.

Table 1 summarizes the variation in these MNC sales shares for the first and last benchmark years in our panel. In 1989, there were 14,042 U.S.-owned affiliates in 132 countries which belonged to 2,119 parent firms. By 2009, these numbers had changed slightly to 16,478, 142 and 1,892 respectively. The spatial distribution of MNC sales remained fairly stable over this period, with a slight rise in third-country sales at the expense of local sales. In 2009, horizontal sales contributed by far the most to affiliate revenues at 73%. Platform sales accounted for 19%, with sales back to the U.S. taking up the remaining 8%. These averages however mask substantial variation in MNC activity across firms and host countries; the standard deviations around these three means reached 38%, 33% and 22% respectively.

4.2 Host Country Characteristics

We use two standard measures in the literature to capture the degree of financial development in FDI recipient countries. The amount of credit extended by banks and other financial intermediaries to the private sector summarizes access to debt financing. Stock market capitalization, on the other hand, represents the total value of publicly traded companies and thus indicates access to equity financing. Both measures are normalized by national GDP to make them comparable across countries; these variables are drawn from Beck et al. (2009). While these are outcome-based measures that capture the actual availability of external capital in an economy, they also reflect on the ability of local institutions to support formal lending activity and enforce financial contracts.

Financial development varies significantly across the 95 host countries and 21 years in our sample, as reported in Appendix Table 1. The mean levels of private credit and stock market capitalization are 0.51 and 0.56 in the panel, with standard deviations of 0.44 and 0.68 respectively. While the time-series variation in these measures is important, the cross-sectional dispersion is much greater. For example, the standard deviation of private credit across countries was 0.62 in 2009. By contrast, the standard deviation of private credit over the 1989-2009 period was only 0.15 for the average economy.

Our empirical analysis conditions on a number of control variables, which we proceed to describe. Real GDP and GDP per capita are taken from the Penn World Tables, Version 7.0. We calculate measures of physical capital per worker from this same source using the perpetual inventory method.²¹ Similarly, we use the updated country schooling data from Barro and Lee (2010) to construct measures of human capital per worker, using the methodology of Hall and Jones (1999). We also include several commonly-

²¹We set the initial capital stock equal to $I_0/(g + \delta)$, where I_0 is investment in the initial year, g is the average growth rate of investment over the first ten years, and $\delta = 0.06$ is the assumed depreciation rate.

used controls that capture trade costs. The CEPII provides data on bilateral distance to the U.S., based on the great circle formula distance between the major population centers of the U.S. and each host country. Information on trade agreements was taken from Rose (2004), updated by direct reference to the WTO website. We created 11 regional trade agreement (RTA) dummies indicating whether a given host country was a RTA partner of the U.S. (for example, through NAFTA), as well as 8 separate dummies for whether the country was a member of a major multilateral agreement (namely, GATT/WTO, EU, EFTA, CARICOM, CACM, ASEAN, ASEAN-China, and Mercosur).²² We also control for a general rule of law index, taken from La Porta et al. (1998). Finally, we use BEA data on the actual taxes paid by U.S. multinationals abroad to infer the average tax rate they face in each host country. All of these country measures are collected annually, with the exception of bilateral distance and rule of law, which do not vary over time.

5 Empirical Evidence

The patterns of U.S. multinational activity abroad are in fact strongly supportive of the predictions of our model, specifically those related to the influence of host country financial development on the spatial dimension of affiliate sales. In what follows, we aim to explain affiliate sales destined for the local market, the U.S., and third-country markets, expressed respectively as a fraction of total affiliate sales, focusing on these shares for two reasons. First, dividing by total sales helps to make the data more comparable across affiliates and across countries, this being a convenient way to account for effects that might be related to firm or country scale. Second, the affiliate-level data on horizontal, vertical and export-platform sales contains a fair number of zeros in practice, so this approach will allow us to avoid dropping these observations (had we used log sales instead as the dependent variable).

Before proceeding to a rigorous empirical analysis, we offer a motivating example of the systematic patterns in the data. Figure 4 illustrates the sales composition of MNC affiliates based in three host countries: Brazil (in 1999), Chile (in 1994), and Norway (in 1989). These economies were chosen as they are comparable in terms of GDP, GDP per capita and distance to the U.S., but have dramatically different levels of financial development. Private credit as a share of GDP was 0.29 in Brazil, 0.43 in Chile, and 0.61 in Norway, which correspond roughly to the 40th, 55th, and 70th percentiles of the distribution of private credit in our panel.

For each recipient country, Figure 4 shows the share of aggregate MNC sales (summed across all affiliates) destined for the local market, shipped back to the U.S., or exported to other destinations. The striking pattern that emerges is that the share of horizontal sales decreases monotonically with the

²²The 11 RTAs that the U.S. was a signatory to in our sample are: US-Israel, NAFTA, US-Jordan, US-Singapore, US-Chile, US-Australia, US-Morocco, CAFTA-DR (Dominican Republic-Central America), US-Bahrain, US-Peru, and US-Oman. The abbreviations for the multilateral trade agreements are: EU = European Union, EFTA = European Free Trade Area, NAFTA = North American Free Trade Agreement, CARICOM = Caribbean Community, CACM = Central American Common Market, ASEAN = Association of Southeast Asian Nations.

host's financial development. By contrast, export-platform FDI grows quickly with private credit. While the share of vertical sales also rises as local credit conditions improve, this effect is more moderate. Although only suggestive, these regularities are consistent with our theoretical predictions and anticipate our econometric results below.

5.1 Baseline Results

We formally test our model's implications with the following specifications:

$$\left(\frac{HORI}{TOT}\right)_{ikt} = \alpha_H + \beta_{HORI}FinDevt_{it} + \Gamma_H X_{it} + \delta_{k,H}\varphi_k + \delta_{t,H}\varphi_t + \varepsilon_{ikt,H}, \quad (5.1)$$

$$\left(\frac{PLAT}{TOT}\right)_{ikt} = \alpha_P + \beta_{PLAT}FinDevt_{it} + \Gamma_P X_{it} + \delta_{k,P}\varphi_k + \delta_{t,P}\varphi_t + \varepsilon_{ikt,P}, \text{ and} \quad (5.2)$$

$$\left(\frac{VERT}{TOT}\right)_{ikt} = \alpha_V + \beta_{VERT}FinDevt_{it} + \Gamma_V X_{it} + \delta_{k,V}\varphi_k + \delta_{t,V}\varphi_t + \varepsilon_{ikt,V}. \quad (5.3)$$

The dependent variables in these three regressions summarize the spatial distribution of multinational sales aggregated across all U.S.-owned affiliates in host country i that operate in sector k .²³ $\left(\frac{HORI}{TOT}\right)_{ikt}$ denotes the share of total affiliate sales that remain in the local market, in year t . Similarly, $\left(\frac{PLAT}{TOT}\right)_{ikt}$ and $\left(\frac{VERT}{TOT}\right)_{ikt}$ reflect the share of total affiliate sales destined for the U.S. and for third-country markets respectively. Since we are interested in aggregates at the level of the host country, we base this initial analysis on the five benchmark years in our panel which comprehensively cover the universe of U.S. multinational affiliates abroad (1989, 1994, 1999, 2004, 2009).

Importantly, we include industry fixed effects, φ_k , to control for any unobserved industry characteristics that might affect firms' incentives to pursue horizontal, vertical or export-platform FDI. In the context of our model, these capture in particular the role of economies of scale (the fixed costs) in production or exporting, which could affect the attractiveness of FDI (relative to exporting) as the means for a firm to service a given market. In addition, the φ_k 's flexibly account for other sector-specific determinants of MNC activity that are outside the scope of our model. Similarly, the composition of MNC sales might vary over time for reasons unrelated to the core mechanisms of our model. For example, broad reductions in transportation or communication costs might make vertical and platform FDI more profitable across all host countries and sectors. We therefore absorb such changes over time with year fixed effects, φ_t .

Our main explanatory variable of interest is $FinDevt_{it}$, the level of financial development in host country i in year t . In most of the regression tables that follow, we report results using the ratio of private credit to GDP to capture $FinDevt_{it}$ in Columns 1-3, while using the ratio of stock market capitalization to GDP in Columns 4-6. To isolate the effects of financial development from those of other country characteristics that might be correlated with it, we include a large set of country-level

²³The BEA surveys report the primary industry affiliation for each multinational affiliate in the NAICS 4-digit industry classification. This allows us to construct the relevant sales shares at that level of disaggregation.

controls X_{it} , which we describe below. Finally, we cluster our standard errors by host country, to allow for unobserved correlated shocks to the sales shares across years.

From Proposition 2, we expect that $\beta_{HORI} < 0 < \beta_{VERT} < \beta_{PLAT}$. In other words, host country financial development should be negatively correlated with the share of local in total sales. In contrast, it should be positively correlated with the share of platform sales and, to a lesser degree, with sales back to the MNC's home market. Table 2 runs the specifications in equations (5.1)-(5.3), and confirms that these three predictions are strongly supported in the aggregate data. *Ceteris paribus*, affiliates sell a lower fraction of their output in the local economy when the host country boasts more mature credit and stock markets ($\beta_{HORI} = -0.080$ in Column 1, and $\beta_{HORI} = -0.051$ in Column 4, both significant at the 1% level). Conversely, they direct more of their sales to third-country destinations and back to the U.S. in such environments (Columns 2-3 and 5-6).²⁴ Moreover, our point estimates suggest that export-platform FDI is indeed more sensitive to $FinDevt_{it}$ than vertical FDI. In particular, $\beta_{VERT} = 0.025 < 0.036 = \beta_{PLAT}$ for the private credit measure of $FinDevt_{it}$, while $\beta_{VERT} = 0.015 < 0.026 = \beta_{PLAT}$ for the stock market capitalization measure.²⁵

To gauge the economic significance of these effects, consider a host nation where access to private credit improves from the level of the 10th percentile country to that of the 90th percentile country in our sample. Based on the Table 2 point estimates, this improvement in financial development would be associated with a decrease in the share of horizontal sales by $0.080 \times (1.05 - 0.11) = 0.075$ in the typical sector; the corresponding increases in the share of platform sales and in the share of return sales to the U.S. would respectively be 0.034 and 0.024. This represents a fairly sizeable reorientation in MNC activity, particularly when viewed from the perspective of platform and vertical sales, given that these latter two shares average 0.18 and 0.07 across our entire panel.²⁶

We next exploit the full dimensionality in the data and evaluate the predictions of our model at the level of the affiliate. We now calculate the $(\frac{HORI}{TOT})_{fikt}$, $(\frac{PLAT}{TOT})_{fikt}$, and $(\frac{VERT}{TOT})_{fikt}$ ratios for each affiliate f in host country i and sector k at time t . Using these shares as the outcome variables instead, we re-estimate equations (5.1)-(5.3), reporting these results in Table 3. Since we are no longer interested in economy-wide aggregates, we now use the affiliate-level records for all 21 years in the 1989-2009 sample. As a result, the sample size in the regression increases from 15,028 in Table 2 to 211,829.

Consistent with Proposition 1, we find that financial development in the host country strongly influences the operations of multinational affiliates. Subsidiaries based in countries with better financial institutions sell a significantly lower share of their output to local consumers. On the other hand, they

²⁴Note that we do not restrict β_{HORI} , β_{VERT} and β_{PLAT} to sum to 1, since we do not impose that the control variables enter with the same coefficients across the three regressions.

²⁵However, we cannot reject the null hypothesis that $\beta_{VERT} = \beta_{PLAT}$ when formally comparing the magnitudes of these coefficients.

²⁶The analogous exercise for the stock market capitalization measure of financial development yields a reduction in the horizontal sales share of $0.051 \times (1.06 - 0.08) = 0.050$, and increases in the third-country and U.S. sales shares of 0.025 and 0.015 respectively.

re-export a higher fraction of their sales to third-country markets and back to the U.S. In line with Lemma 3, vertical FDI responds less to credit conditions in the host country than platform FDI. The patterns seen here with the affiliate-level regressions thus continue to be similar to those in Table 2, albeit being slightly smaller in magnitude. That said, the point estimates continue to corroborate the $\beta_{HORI} < 0 < \beta_{VERT} < \beta_{PLAT}$ prediction from our model.

Our baseline results in Tables 2 and 3 obtain in the presence of a large vector of controls, X_{it} , for known determinants of multinational activity. First, we have included the host country's log real GDP as an explanatory variable in all our regressions. Not surprisingly, we find here that bigger host economies capture a larger share of the sales of MNC affiliates. We interpret this as a market size effect that raises the propensity toward horizontal FDI, while steering affiliates away from servicing third-country markets or the home economy (the U.S.).

Second, we have sought to account for the variation in factor costs across FDI host countries through the use of three proxies, namely: the stock of physical capital per worker, the stock of human capital per worker, and real GDP per capita. While high manufacturing costs in the host country may deter multinational activity in general, it is less clear-cut from a theoretical perspective what effects this has on the destination mix of affiliate sales. Empirically, we obtain no significant coefficients on these variables in our baseline regressions in Tables 2 and 3. Nevertheless, controlling for income per capita in particular remains useful, since it ensures that we estimate the impact of financial development separately from that of overall economic development.

Third, we have controlled for various measures of trade and FDI costs. The findings here indicate that distance to the U.S. and the local corporate tax rates faced by U.S. affiliates tend not to be significant determinants of the destination sales shares. Separately, we have also examined the role of membership in trade agreements. Countries providing preferential access to nearby markets are likely to be more attractive export platform locations. We have therefore included a set of dummy variables corresponding to several large multilateral agreements, including the GATT/WTO and the European Union (EU) in our regressions. Regional trade agreements (RTAs) signed with the U.S. may similarly affect the production decisions of U.S. multinationals by lowering trade barriers between home and host countries. For this reason, we also include variables capturing whether the host country was an RTA partner of the U.S. While we do not report the full list of trade agreement coefficients, these generally conform to expected patterns. For example, we find a positive and significant effect of EU membership on the export-platform share of affiliate sales, with a consequent decrease in the share of both horizontal and vertical sales. In addition, affiliates located in North American Free Trade Agreement (NAFTA) member countries report a significantly higher share of return sales to the U.S.

Finally, we have used overall rule of law to capture host country conditions that could affect the security of MNCs' inward foreign direct investment. Environments with unstable legal practices cast doubt on the reliability of property rights protection, reducing firms' incentives to undertake all three

forms of investment. Conditional on producing in a given country, however, multinationals may be more likely to divert sales to other countries if expropriation risk primarily concerns final goods aimed for distribution within the local consumer market. This suggests that rule of law may be positively correlated with the share of horizontal sales, but negatively correlated with the shares of vertical and platform sales. Where significant, our point estimates broadly suggest that this is indeed the case.

To summarize, our baseline results indicate that host country financial development is an important determinant of the nature of MNC activity. It influences in particular the spatial distribution of affiliate sales in a manner consistent with the predictions of our model. These effects are robust to controlling for an extensive set of alternative factors known to influence multinational activity, mitigating concerns about omitted variable bias.

5.2 Sensitivity Analysis

We next establish that our findings survive a series of sensitivity analyses. To exploit the richness of the data and to economize on space, we report all tests at the affiliate level using the full unbalanced panel for 1989-2009; the results based on the aggregate sales share are largely consistent and we discuss these only in passing.

We first consider alternative measures of horizontal, vertical, and platform FDI sales that draw on the distinction between sales to affiliated and unaffiliated customers. Since sales from one MNC affiliate to another affiliate of the same company represent transactions within the boundaries of the firm, we use sales to affiliated entities in the U.S. as a narrower measure of vertical FDI. This may implicitly capture fragmentation of the production process within the firm aimed, for example, at exploiting factor price differences across countries. On the other hand, sales to unrelated parties in the host country and in third destinations serve as alternative proxies for horizontal and platform sales, respectively. By excluding intra-firm transactions, these variables may more precisely capture sales to final consumers in these markets. Table 4 reports our findings from using these alternative measures of the relative importance of the different modes of FDI. We obtain qualitatively and quantitatively similar results, with the exception of one coefficient (β_{PLAT} in Column 2) that is now only significant at the 15% level of confidence. Even stronger results hold when we aggregate the data across affiliates to the host country level (available on request).

We next explore the sensitivity of our results to the choice of estimation technique. In Table 5, we address the concern that many affiliates report no activity in one of the three FDI categories. Out of the 211,829 affiliate-country-year observations in the sample, the share of horizontal, vertical, and export platform sales is 0 in 22,321, 147,041, and 114,997 cases respectively. We therefore check that our findings hold when we relax the linearity assumption of OLS and instead use Tobit. The point estimates remain of the same sign, magnitude and significance for all but one coefficient (β_{PLAT} in Column 2), which is less precisely pinned down. On the other hand, when using the aggregate sales shares, all point estimates

remain highly statistically significant (available on request).

A potentially important category of omitted variables pertains to unobserved parent firm characteristics. Through the lens of our model, this heterogeneity arises solely from differences in firm productivity (the $1/a$ draws). In reality, multinationals might further differ along other dimensions (such as managerial practices, labor skill composition, R&D intensity, financial health) that could affect their production and sales decisions. Such omitted firm characteristics could also shape the composition of FDI; for instance, firms that enjoy particular familiarity with or product appeal in specific markets could well tilt their sales toward these destinations.

In Table 6, we therefore control for such unobserved firm characteristics with parent fixed effects. Note that the role of financial development is now identified primarily from the variation in credit conditions across the affiliates of the same multinational that are based in different countries. We therefore restrict the sample to U.S. multinationals with production facilities in at least two countries. (The median MNC operated in 12 host countries in 1989 and 14 in 2009.) Combined with the fact that we condition on a wide range of country-level variables, this reduces somewhat the relevant variation in the data underlying our estimates of β_{HORI} , β_{PLAT} and β_{VERT} . Even in this stringent specification, we continue to obtain coefficients that line up as our theory would predict (i.e., $\beta_{HORI} < 0 < \beta_{VERT} < \beta_{PLAT}$). While these results appear stronger when using stock market capitalization as our measure of financial development, the relevant coefficients remain significant for private credit as well, except for β_{VERT} which is marginally insignificant at the 10% level. In other words, the evidence suggests that when multinationals optimize their production and sales operations, their affiliates in more financially advanced economies are oriented more toward vertical and export-platform motives. By contrast, affiliates in less financially developed host countries tend to divert a greater share of sales to the local market.

While reverse causality is often a challenge in empirical studies of the impact of financial development, this is arguably less of a concern in our context. It is less clear how the composition of FDI activity (the respective destination sales shares) would affect the level of private credit or stock market capitalization, even if it were the case that financial markets responded to the aggregate level of MNC sales. Moreover, financial development is more plausibly exogenous from the perspective of individual firms, making our affiliate-level findings less exposed to such endogeneity concerns.

We nevertheless explore the variation in financial dependence across sectors to help establish a clearer case for a causal effect from credit conditions to MNC operations. The premise of this strategy is the idea that some industries tend to be more dependent on external sources of financing for largely technological reasons related to the nature of their manufacturing processes. For example, such industries may feature substantially higher upfront costs, which impose liquidity constraints on firms with limited cash flow, raising their need for external capital. Host country financial development should thus be expected to stimulate relatively more local firm entry and expansion in sectors that are financially more dependent. Since this would increase competition differentially across industries, we would expect our

model’s predictions to be more salient in sectors with a high reliance on outside finance.

Table 7 confirms that this is indeed the case. We now include $FinDevt_{it}$ and its interaction with a measure of industry k ’s external capital dependence, this being the commonly-used measure of the share of capital expenditures not financed from internal cash flow developed by Rajan and Zingales (1998).²⁷ (Note that the main effect of financial dependence is subsumed by the sector fixed effects in the regressions.) Reassuringly, we find that the main effect of $FinDevt_{it}$ and its interaction with external finance dependence both enter with the same sign in each column, implying that the effect of financial development is reinforced in sectors that are particularly reliant on external sources of capital. The latter interaction effect is moreover statistically significant in all but one specification (β_{VERT} in Column 6).²⁸ In other words, in financially developed host countries, U.S. multinationals pursue relatively less horizontal FDI in sectors that are more financially dependent. Appendix Table 2 shows that similar results obtain when we repeat this interaction analysis using the data on aggregate sales shares instead.

Finally, we examine the extent to which the above relationships between local financial development and MNC activity are also manifest in the within-country time series variation. Conceptually, our model should have implications for both the cross-country and within-country dimensions of the data: At any given point, countries with weaker financial systems should attract relatively more local affiliate sales and exhibit relatively lower shares of shipments to third-country destinations or to the U.S. Analogously, as a country undergoes financial development over time, one should see a weakening of horizontal sales motives in favor of vertical and export-platform activity. Our empirical approach so far has used the combined variation in $FinDevt_{it}$ across host countries and over time to estimate β_{HORI} , β_{VERT} , and β_{PLAT} , although the presence of year fixed effects limits the role played here by the time-series variation.

We explore the relative importance of the cross- versus within-country variation for FDI patterns as follows. In unreported regressions, we have verified that our baseline results in Tables 2 and 3 hold in the pure cross-sections of data in each of the benchmark years. On the other hand, including country fixed effects in (5.1)-(5.3) without the time dummies often leads to insignificant point estimates, although the key coefficients of $FinDevt_{it}$ often retain their sign (also available on request). This suggests that the cross-country variation in financial development is particularly important for picking up the effects of MNC sales activity that we have documented. This should not be too surprising, given the much larger variance in $FinDevt_{it}$ across countries, compared to the typical within-country experience, that we reported earlier. Notwithstanding this, when we further consider differences across sectors in their inherent dependence on external finance – using the interaction between $FinDevt_{it}$ and the industry measure of financial dependence – we recover the differential effect of financial development on MNC

²⁷We computed this as an industry median value, using all publicly listed U.S. firms in the Compustat dataset between 1996-2005.

²⁸That said, the magnitudes of the effects here are fairly moderate. The decrease in the horizontal sales share between a country at the 10th and 90th percentiles of the private credit to GDP ratio for an industry at the 10th relative to 90th percentiles of external capital dependence stands at: $0.010 \times (1.05 - 0.11) \times (0.496 - (-1.019)) = 0.014$, based on the Column 1 estimates in Table 7.

activity, even if we control additionally for country fixed effects (together with sector and year dummies). These results are reported in Table 8 for the affiliate-level sales patterns, and in Appendix Table 3 using the aggregate sales shares. Together, these findings imply that credit market imperfections strongly predict the pattern of multinational activity across countries and sectors, as well as across sectors within a country over time. Improvements in credit conditions thus appear to trigger reallocations in the composition of affiliate sales across industries.

5.3 Underlying Mechanism

The results above suggest that host country financial development shapes the spatial dimension of affiliate sales in a manner consistent with our theoretical predictions. We conclude with some corroborating evidence that the mechanism driving these effects works through the entry of more potential competitors in the local market.

Our model implies that stronger financial markets allow more domestic firms to operate in the South. In Table 9, we confirm that this is indeed borne out in the data: Countries with higher levels of private credit access or stock market capitalization support a significantly larger number of local establishments (Columns 1 and 5). We measure the latter with the log number of establishments by country as reported in the UNIDO Industrial Statistics database. In these regressions, we have included the full set of control variables, X_{it} , and year fixed effects, in order to highlight the independent role of country financial development in influencing the thickness of domestic markets on the production side. Several caveats related to the UNIDO data are in order, chief among which is the fact that the underlying coverage is inherently uneven across countries and over time, resulting in an unbalanced panel. We are also unable to distinguish between establishments that are purely domestic and those that may have a foreign parent. That said, the UNIDO data do represent the best available information to our knowledge on industrial activity around the world, which is why we exploit them for this exercise.

To test the mechanism proposed in our model, we obtained the fitted value for the number of establishments in each country from these “first-stage” regressions. This provides us with a proxy for the extent of competition that MNC affiliates may encounter in these production locations, as predicted by the the local credit environment (among other variables). In the rest of Table 9, we then re-ran the specifications in (5.1)-(5.3), but replacing $FinDevt_{it}$ with the predicted number of establishments from this “first-stage”. We indeed find that MNC affiliates keep a smaller fraction of their sales in their host country when more establishments are present there. In such circumstances, affiliates instead direct more of their sales back home to the U.S. or to other markets. Once again, exports to third-country destinations respond more than return shipments to the U.S. While these findings for the local and platform sales shares are statistically significant at the 1% level when we use private credit to predict the number of establishments, a similar but less precise pattern obtains when we employ stock market capitalization instead. These findings help to strengthen the link between our theory and the empirics, by lending

credence to our interpretation of a competition effect through which host country financial development affects MNC activity.

6 Conclusion

This paper contributes to the literature examining how conditions in FDI host countries affect the structure of multinational activity. We uncover several novel effects of financial development in the FDI-receiving country, using comprehensive data on U.S. multinational activity abroad. In host countries where secure sources of external credit are more accessible, MNC affiliates exhibit a lower share of sales to the local market, while channelling a larger share toward sales to third-country markets. There is a further positive effect on the share of return sales to the U.S. (the home market), but this tends to be smaller in magnitude than the corresponding effect of export platform sales. Better host country financial development thus appears to reduce the horizontal component of FDI, while raising the export-platform motive for multinational activity.

We posit and formalize a competition effect to explain this link between financial development and the spatial distribution of MNC sales. An improvement in credit conditions in the FDI host country (“South”) would facilitate the entry of more Southern manufacturing firms into the local market. Northern varieties thus face more competition in the Southern market, and this prompts Northern MNCs based in South to shift their sales away from the local market, toward the third-country and home country markets instead. In support of this mechanism, we presented evidence that the effect of host country financial development on the spatial composition of affiliate sales operates at least in part through the former’s effect on the entry of establishments in the local economy.

There remains much scope for further research on this topic. While we have focused in this paper on the effects of local credit conditions on MNC activity, there is clearly room to improve our understanding of how MNC affiliates and domestic firms interact in the host country’s financial market. Our findings also shed light on one possible mechanism through which local conditions might affect the nature of global supply chain activity, an issue that certainly deserves more attention and investigation.

7 References

- Aghion, Philippe, Peter Howitt, and David Mayer-Foulkes, (2004), “The Effect of Financial Development on Convergence: Theory and Evidence,” *Quarterly Journal of Economics* 120(1): 173-222.
- Aghion, Philippe, Thibault Fally, and Stefano Scarpetta, (2007), “Credit Constraints as a Barrier to the Entry and Post-Entry Growth of Firms: Theory and Evidence,” *Economic Policy* 22(52): 731-779.
- Aitken, Brian J., and Ann E. Harrison, (1999), “Do Domestic Firms Benefit from Foreign Direct Investment? Evidence from Venezuela,” *American Economic Review* 89(3): 605-618.
- Alfaro, Laura, Areendam Chanda, Sebnem Kalemli-Ozcan, and Selin Sayek, (2004), “FDI and Economic Growth: The Role of Local Financial Markets,” *Journal of International Economics* 64(1): 89-112.
- Amiti, Mary, and David Weinstein, (2009), “Exports and Financial Shocks,” *Quarterly Journal of Economics* 126(4): 1841-1877.
- Antràs, Pol, Mihir Desai, and C. Fritz Foley, (2007), “Multinational Firms, FDI Flows and Imperfect Capital Markets,” *Quarterly Journal of Economics* 124(3): 1171-1219.
- Arkolakis, Costas, Natalia Ramondo, Andrés Rodríguez-Clare, and Stephen Yeaple, (2012), “Innovation and Production in the Global Economy,” mimeo.
- Arnold, Jens M., Beata S. Javorcik, and Aaditya Mattoo, (2011), “Does Services Liberalization Benefit Manufacturing Firms? Evidence from the Czech Republic,” *Journal of International Economics* 85(1): 136-146.
- Baldwin, Richard, and Toshihiro Okubo, (2012), “Networked FDI: Sales and Sourcing Patterns of Japanese Foreign Affiliates,” NBER Working Paper #18083.
- Barro, Robert, and Lee Jong Wha, (2010), “A New Data Set of Educational Attainment in the World, 1950-2010,” NBER Working Paper #15902.
- Beck, Thorsten, (2003), “Financial Dependence and International Trade,” *Review of International Economics* 11(2): 296-316.
- Beck, Thorsten, Asli Demirgüç-Kunt, and Vojislav Maksimovic, (2005), “Financial and Legal Constraints to Firm Growth: Does Size Matter?” *Journal of Finance* 60(1): 137-177.
- Beck, Thorsten, Asli Demirgüç-Kunt, and Ross Levine, (2009), “Financial Institutions and Markets across Countries and over Time – Data and Analysis,” World Bank Policy Research Working Paper #4943.
- Bénassy-Quéré, Agnès, Maylis Coupet, Thierry Mayer, (2007), “Institutional Determinants of Foreign Direct Investment,” *World Economy* 30(5): 764-782.
- Blonigen, Bruce A., (2005), “A Review of the Empirical Literature on FDI Determinants,” *Atlantic Economic Journal* 33(4): 383-403.
- Brainard, S. Lael, (1997), “An Empirical Assessment of the Proximity-Concentration Trade-off Between Multinational Sales and Trade,” *American Economic Review* 87(4): 520-544.
- Branstetter, Lee, C. Fritz Foley, and Raymond Fisman, (2006), “Do Stronger Intellectual Property Rights Increase International Technology Transfer? Empirical Evidence from U.S. Firm-Level Panel Data,” *Quarterly Journal of Economics* 121(1): 321-349.

- Buch, Claudia, Iris Kesternich, Alexander Lipponer, and Monika Schnitzer, (2009), "Financial Constraints and the Margins of FDI," University of Munich mimeo.
- Bustos, Paula, (2007), "FDI as a Source of Finance in Imperfect Capital Markets: Firm-Level Evidence from Argentina," CREI mimeo.
- Carluccio, Juan, and Thibault Fally, (2012), "Global Sourcing under Imperfect Capital Markets," *Review of Economics and Statistics* 94(3): 740-763.
- De Backer, Koen, and Leo Sleuwaegen, (2003), "Does Foreign Direct Investment Crowd Out Domestic Entrepreneurship?" *Review of Industrial Organization* 22(1): 67-84.
- Desai, Mihir A., C. Fritz Foley, and Kirsten J. Forbes, (2008), "Financial Constraints and Growth: Multinational and Local Firm Responses to Currency Depreciations," *Review of Financial Studies* 21(6): 2857-2888.
- Desai, Mihir A., C. Fritz Foley, and James R. Hines Jr., (2004a), "Foreign Direct Investment in a World of Multiple Taxes," *Journal of Public Economics* 88(12): 2727-2744.
- Desai, Mihir A., C. Fritz Foley, and James R. Hines Jr., (2004b), "A Multinational Perspective on Capital Structure Choice and Internal Capital Markets," *Journal of Finance* 59(6): 2451-2487.
- Ekholm, Karolina, Rikard Forslid, and James R. Markusen, (2007), "Export-Platform Foreign Direct Investment," *Journal of the European Economic Association* 5(4): 776-795.
- Feinberg, Susan, and Gordon Phillips, (2004), "Growth, Capital Market Development and Competition for Resources within MNCs," NBER Working Paper #9252.
- Grossman, Gene, Elhanan Helpman, and Adam Szeidl, (2006), "Optimal Integration Strategies for the Multinational Firm," *Journal of International Economics* 70(1): 216-238.
- Hall, Robert, and Charles Jones, (1999), "Why Do Some Countries Produce So Much More Output Per Worker Than Others?" *Quarterly Journal of Economics* 114(1): 83-116.
- Hanson, Gordon, Raymond Mataloni, and Matthew Slaughter, (2001), "Expansion Strategies of U.S. Multinational Firms," in Dani Rodrik and Susan Collins, eds., *Brookings Trade Forum*, 2001: 245-282.
- Hanson, Gordon, Raymond Mataloni, and Matthew Slaughter, (2005), "Vertical Production Networks in Multinational Firms," *Review of Economics and Statistics* 87(4): 664-678.
- Helpman, Elhanan, (1984), "A Simple Theory of International Trade with Multinational Corporations," *Journal of Political Economy* 92(3): 451-471.
- Helpman, Elhanan, Marc J. Melitz, and Stephen R. Yeaple, (2004), "Exports Versus FDI with Heterogeneous Firms," *American Economic Review* 94(1): 300-316.
- Hummels, David, Jun Ishii, and Kei-Mu Yi, (2001), "The Nature and Growth of Vertical Specialization in World Trade," *Journal of International Economics* 54(1): 75-96.
- Irrazabal, Alfonso, Andreas Moxnes, and Luca David Opmolla, (2012), "The Margins of Multinational Production and the Role of Intra-firm Trade," conditionally accepted at the *Journal of Political Economy*.

- Javorcik, Beata S., and Mariana Spatareanu, (2009), "Tough Love: Do Czech Suppliers Learn from Their Relationships with Multinationals?" *Scandinavian Journal of Economics* 111(4): 811-833.
- La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert Vishny, (1998), "Law and Finance," *Journal of Political Economy* 106(6): 1113-1155.
- Lipsey, Robert E., (2003), "Foreign Direct Investment and the Operations of Multinational Firms: Concepts, History, and Data," in Winifred M. Aldrich, James Harrigan, Eun Kwan Choi, James C. Hartigan, eds., *Handbook of International Trade*, Blackwell Publishing, 287-319.
- Manova, Kalina, (2013), "Credit Constraints, Heterogeneous Firms, and International Trade", *Review of Economic Studies*, forthcoming.
- Manova, Kalina, Shang-Jin Wei, and Zhiwei Zhang (2009), "Firms Exports and Multinational Activity under Credit Constraints," NBER Working Paper #16905.
- Markusen, James R., (1984), "Multinationals, Multi-Plant Economies, and the Gains from Trade," *Journal of International Economics* 16(3-4): 205-226.
- Markusen, James R., and Anthony Venables, (1998), "Multinational Firms and the New Trade Theory," *Journal of International Economics* 46(2): 183-204.
- Markusen, James R., and Anthony Venables, (2000), "The Theory of Endowment, Intra-industry and Multi-national Trade," *Journal of International Economics* 52(2): 209-234.
- Markusen, James R., and Anthony Venables, (2007), "Interacting Factor Endowments and Trade Costs: A Multi-Country, Multi-Good Approach to Trade Theory," *Journal of International Economics* 73(2): 333-354.
- Navaretti, Giorgio Barba, and Anthony J. Venables, (2004), *Multinational Firms in the World Economy*, with Frank G. Barry, Karolina Ekholm, Anna M. Falzoni, Jan I. Haaland, Karen Helene Midelfart, & Alessandro Turrini, Princeton University Press.
- Rajan, Raghuram, and Luigi Zingales, (1998), "Financial Dependence and Growth," *American Economic Review* 88(3): 559-586.
- Ramondo, Natalia, Veronica Rappoport, and Kim Ruhl, (2011), "Horizontal versus Vertical FDI: Re-visiting Evidence about U.S. Multinationals," Arizona State University mimeo.
- Ramondo, Natalia, and Andrés Rodríguez-Clare, (2012), "Trade, Multinational Production, and the Gains from Openness," *Journal of Political Economy*, forthcoming.
- Rose, Andrew, (2004), "Do We Really Know that the WTO Increases Trade?" *American Economic Review* 94(1): 98-104.
- Tintelnot, Felix, (2012), "Global Production with Export Platforms," Penn State mimeo.
- Yeaple, Stephen R., (2003a), "The Role of Skill Endowments in the Structure of U.S. Outward Foreign Direct Investment," *Review of Economics and Statistics* 85(3): 726-734.
- Yeaple, Stephen R., (2003b), "The Complex Integration Strategies of Multinationals and Cross Country Dependencies in the Structure of Foreign Direct Investment," *Journal of International Economics* 60(2): 293-314.

8 Appendix (Details of Proofs)

8.1 Proof of Lemma 1

Proof. Log-differentiating (2.15) and (2.17), one obtains:

$$(\varepsilon - 1) \frac{da_S}{a_S} = \frac{d\eta}{\eta} + \frac{dA_{ss}}{A_{ss}}, \quad \text{and}$$

$$a_S^{\varepsilon-1} V_s(a_S) \frac{dA_{ss}}{A_{ss}} + [a_S^{\varepsilon-1} V'_s(a_S) - \eta G'_s(a_S)] da_S = 0.$$

Note that we have used the fact that $(1 - \alpha)A_{ss}(\omega/\alpha)^{1-\varepsilon} = (1/\eta)a_S^{\varepsilon-1} Rf_S\omega$, which holds from the cutoff expression for $a_S^{1-\varepsilon}$ from (2.15), in deriving the second equation above. Solving these two equations simultaneously yields:

$$\frac{da_S}{d\eta} = \frac{1}{\eta} \frac{a_S^{\varepsilon-1} V_s(a_S)}{(\varepsilon - 1)a_S^{\varepsilon-2} V_s(a_S) + [a_S^{\varepsilon-1} V'_s(a_S) - \eta G'_s(a_S)]} > 0, \quad \text{and}$$

$$\frac{dA_{ss}}{d\eta} = -\frac{A_{ss}}{\eta} \frac{a_S^{\varepsilon-1} V'_s(a_S) - \eta G'_s(a_S)}{(\varepsilon - 1)a_S^{\varepsilon-2} V_s(a_S) + [a_S^{\varepsilon-1} V'_s(a_S) - \eta G'_s(a_S)]} < 0.$$

To sign these last two expressions, observe that applying Liebnitz's rule to the definition of $V_s(a_S)$ implies that $a_S^{\varepsilon-1} V'_s(a_S) = G'_s(a_S)$. Hence, $a_S^{\varepsilon-1} V'_s(a_S) - \eta G'_s(a_S) = (1 - \eta)G'_s(a_S) > 0$, since $\eta \in (0, 1)$ and $G'_s(a) > 0$ for all $a \in (0, \bar{a}_s)$. (Bear in mind also that $\varepsilon > 1$.) ■

8.2 Proof of Lemma 2

Proof. The proof of this lemma is long, so it is useful to provide a heuristic roadmap of how it proceeds. We will take the remaining 13 equations that define the Western industry equilibrium – (2.3)-(2.6), (2.11)-(2.14), (2.16), and (2.18)-(2.21) – and log-differentiate them. We then reduce the resulting system to a set of 4 equations in the 4 unknowns, $\frac{da_D}{a_D}$, $\frac{da_{XN}}{a_{XN}}$, $\frac{da_{XS}}{a_{XS}}$, and $\frac{da_I}{a_I}$. From this, we can determine the comparative statics with respect to η for the Western industry cutoffs, and hence for the other endogenous variables as well.

First, log-differentiating (2.11), (2.12) and (2.13) yields:

$$(\varepsilon - 1) \frac{da_D}{a_D} = \frac{dA_{ww}}{A_{ww}}, \tag{8.1}$$

$$(\varepsilon - 1) \frac{da_{XN}}{a_{XN}} = \frac{dA_{ew}}{A_{ew}}, \quad \text{and} \tag{8.2}$$

$$(\varepsilon - 1) \frac{da_{XS}}{a_{XS}} = \frac{dA_{sw}}{A_{sw}}. \tag{8.3}$$

Since $\varepsilon > 1$, this implies that: $\text{sign}(\frac{da_D}{d\eta}) = \text{sign}(\frac{dA_{ww}}{d\eta})$, $\text{sign}(\frac{da_{XN}}{d\eta}) = \text{sign}(\frac{dA_{ew}}{d\eta})$, and $\text{sign}(\frac{da_{XS}}{d\eta}) = \text{sign}(\frac{dA_{sw}}{d\eta})$.

Similarly, log-differentiating (2.14) yields:

$$(\varepsilon - 1) \frac{da_I}{a_I} = \frac{A_{ww} \left(\left(\frac{\tau\omega}{\alpha} \right)^{1-\varepsilon} - \left(\frac{1}{\alpha} \right)^{1-\varepsilon} \right) \frac{dA_{ww}}{A_{ww}} + A_{ew} \left(\left(\frac{\tau\omega}{\alpha} \right)^{1-\varepsilon} - \left(\frac{\tau}{\alpha} \right)^{1-\varepsilon} \right) \frac{dA_{ew}}{A_{ew}} + A_{sw} \left(\left(\frac{\omega}{\alpha} \right)^{1-\varepsilon} - \left(\frac{\tau}{\alpha} \right)^{1-\varepsilon} \right) \frac{dA_{sw}}{A_{sw}}}{A_{ww} \left(\left(\frac{\tau\omega}{\alpha} \right)^{1-\varepsilon} - \left(\frac{1}{\alpha} \right)^{1-\varepsilon} \right) + A_{ew} \left(\left(\frac{\tau\omega}{\alpha} \right)^{1-\varepsilon} - \left(\frac{\tau}{\alpha} \right)^{1-\varepsilon} \right) + A_{sw} \left(\left(\frac{\omega}{\alpha} \right)^{1-\varepsilon} - \left(\frac{\tau}{\alpha} \right)^{1-\varepsilon} \right)}.$$

We replace $\frac{dA_{ww}}{A_{ww}}$, $\frac{dA_{ew}}{A_{ew}}$, and $\frac{dA_{sw}}{A_{sw}}$ by the expressions in (8.1)-(8.3). Making use also of the expressions: (i) for A_{ww} , A_{ew} and A_{sw} from (2.3)-(2.5); and (ii) for $P_{ww}^{1-\varepsilon}$, $P_{ew}^{1-\varepsilon}$ and $P_{sw}^{1-\varepsilon}$ from (2.18)-(2.20); and simplifying extensively, one can show that:

$$\frac{da_I}{a_I} = \frac{\rho_1(1 - \Delta_1) \frac{da_D}{a_D} + (1 - \rho_1)(1 - \Delta_2) \frac{da_{XN}}{a_{XN}} + \frac{1-\rho_2}{2} \frac{E_s}{E_n} (1 - \Delta_3) \frac{da_{XS}}{a_{XS}}}{\rho_1(1 - \Delta_1) + (1 - \rho_1)(1 - \Delta_2) + \frac{1-\rho_2}{2} \frac{E_s}{E_n} (1 - \Delta_3)}, \quad (8.4)$$

where we define:

$$\rho_1 = \frac{P_{ww}^{1-\phi}}{P_{ww}^{1-\phi} + P_{ew}^{1-\phi}}, \quad (8.5)$$

$$\rho_2 = \frac{P_{ss}^{1-\phi}}{P_{ss}^{1-\phi} + 2P_{sw}^{1-\phi}}, \quad (8.6)$$

$$\Delta_1 = \frac{\left(\frac{1}{\alpha} \right)^{1-\varepsilon} V_n(a_D)}{\left(\frac{1}{\alpha} \right)^{1-\varepsilon} V_n(a_D) + \left(\left(\frac{\tau\omega}{\alpha} \right)^{1-\varepsilon} - \left(\frac{1}{\alpha} \right)^{1-\varepsilon} \right) V_n(a_I)}, \quad (8.7)$$

$$\Delta_2 = \frac{\left(\frac{\tau}{\alpha} \right)^{1-\varepsilon} V_n(a_{XN})}{\left(\frac{\tau}{\alpha} \right)^{1-\varepsilon} V_n(a_{XN}) + \left(\left(\frac{\tau\omega}{\alpha} \right)^{1-\varepsilon} - \left(\frac{\tau}{\alpha} \right)^{1-\varepsilon} \right) V_n(a_I)}, \quad \text{and} \quad (8.8)$$

$$\Delta_3 = \frac{\left(\frac{\tau}{\alpha} \right)^{1-\varepsilon} V_n(a_{XS})}{\left(\frac{\tau}{\alpha} \right)^{1-\varepsilon} V_n(a_{XS}) + \left(\left(\frac{\omega}{\alpha} \right)^{1-\varepsilon} - \left(\frac{\tau}{\alpha} \right)^{1-\varepsilon} \right) V_n(a_I)}. \quad (8.9)$$

Thus, $\frac{da_I}{a_I}$ is a weighted average of $\frac{da_D}{a_D}$, $\frac{da_{XN}}{a_{XN}}$, and $\frac{da_{XS}}{a_{XS}}$. Note that: $\rho_1, \rho_2, \Delta_1, \Delta_2, \Delta_3 \in (0, 1)$. Moreover, using the definitions of Δ_1 , Δ_2 , and Δ_3 , we have:

$$\text{sign}\{\Delta_1 - \Delta_2\} = \text{sign}\{(\omega^{1-\varepsilon} - 1)V_N(a_D) - ((\tau\omega)^{1-\varepsilon} - 1)V_N(a_{XN})\} > 0.$$

This inequality holds as: $V_N(a_D) > V_N(a_{XN}) > 0$ (since $a_D > a_{XN}$), and $\omega^{1-\varepsilon} - 1 > (\tau\omega)^{1-\varepsilon} - 1 > 0$. In an analogous fashion, we have:

$$\text{sign}\{\Delta_2 - \Delta_3\} = \text{sign}\{(\omega^{1-\varepsilon} - \tau^{1-\varepsilon})V_N(a_{XN}) - ((\tau\omega)^{1-\varepsilon} - \tau^{1-\varepsilon})V_N(a_{XS})\} > 0.$$

This is again positive since: $V_N(a_{XN}) > V_N(a_{XS}) > 0$ (because $a_{XN} > a_{XS}$), and $\omega^{1-\varepsilon} - \tau^{1-\varepsilon} > (\tau\omega)^{1-\varepsilon} - \tau^{1-\varepsilon} > 0$. It therefore follows that $1 > \Delta_1 > \Delta_2 > \Delta_3 > 0$. These are useful properties to bear in mind for what follows.

We now differentiate the free-entry condition for West, (2.16):

$$\begin{aligned}
0 = & \left[(1-\alpha)A_{ww} \left(\left(\frac{1}{\alpha} \right)^{1-\varepsilon} V_n(a_D) + \left(\left(\frac{\tau\omega}{\alpha} \right)^{1-\varepsilon} - \left(\frac{1}{\alpha} \right)^{1-\varepsilon} \right) V_n(a_I) \right) \right] \frac{dA_{ww}}{A_{ww}} \\
& \dots + \left[(1-\alpha)A_{ew} \left(\left(\frac{\tau}{\alpha} \right)^{1-\varepsilon} V_n(a_{XN}) + \left(\left(\frac{\tau\omega}{\alpha} \right)^{1-\varepsilon} - \left(\frac{\tau}{\alpha} \right)^{1-\varepsilon} \right) V_n(a_I) \right) \right] \frac{dA_{ew}}{A_{ew}} \\
& \dots + \left[(1-\alpha)A_{sw} \left(\left(\frac{\tau}{\alpha} \right)^{1-\varepsilon} V_n(a_{XS}) + \left(\left(\frac{\omega}{\alpha} \right)^{1-\varepsilon} - \left(\frac{\tau}{\alpha} \right)^{1-\varepsilon} \right) V_n(a_I) \right) \right] \frac{dA_{sw}}{A_{sw}} \\
& \dots + \left[(1-\alpha)A_{ww} \left(\frac{1}{\alpha} \right)^{1-\varepsilon} V'_n(a_D) - Rf_D G'_n(a_D) \right] da_D \\
& \dots + \left[(1-\alpha)A_{ew} \left(\frac{\tau}{\alpha} \right)^{1-\varepsilon} V'_n(a_{XN}) - Rf_X G'_n(a_{XN}) \right] da_{XN} \\
& \dots + \left[(1-\alpha)A_{sw} \left(\frac{\tau}{\alpha} \right)^{1-\varepsilon} V'_n(a_{XS}) - Rf_X G'_n(a_{XS}) \right] da_{XS} \\
& \dots + \left[(1-\alpha) \left(A_{ww} \left(\left(\frac{\tau\omega}{\alpha} \right)^{1-\varepsilon} - \left(\frac{1}{\alpha} \right)^{1-\varepsilon} \right) + A_{ew} \left(\left(\frac{\tau\omega}{\alpha} \right)^{1-\varepsilon} - \left(\frac{\tau}{\alpha} \right)^{1-\varepsilon} \right) \right. \right. \\
& \left. \left. \dots + A_{sw} \left(\left(\frac{\omega}{\alpha} \right)^{1-\varepsilon} - \left(\frac{\tau}{\alpha} \right)^{1-\varepsilon} \right) \right) V'_n(a_I) - R(f_I - f_D) G'_n(a_I) \right] da_I.
\end{aligned}$$

Focus first on the term involving da_D on the right-hand side. We make use of the fact that: (i) $(1-\alpha)A_{ww}(1/\alpha)^{1-\varepsilon} = a_D^{\varepsilon-1}Rf_D$, which holds from the expression for $a_D^{1-\varepsilon}$ from (2.11); and (ii) $a^{\varepsilon-1}V'_n(a) = G'_n(a)$ for all $a \in (0, \bar{a}_n)$, which holds from Leibnitz's Rule; one can show that the coefficient of da_D reduces to 0. An analogous argument implies that the coefficients of da_{XN} , da_{XS} , and da_I are all also equal to 0. Turning to the terms involving $\frac{dA_{ww}}{A_{ww}}$, $\frac{dA_{ew}}{A_{ew}}$, and $\frac{dA_{sw}}{A_{sw}}$, one can now apply the definitions in (8.5)-(8.6) to simplify the derivative of this free-entry equation to:

$$\rho_1 \frac{dA_{ww}}{A_{ww}} + (1-\rho_1) \frac{dA_{ew}}{A_{ew}} + \frac{1-\rho_2}{2} \frac{E_s}{E_n} \frac{dA_{sw}}{A_{sw}} = 0.$$

A quick substitution from (8.1)-(8.3) then implies:

$$\rho_1 \frac{da_D}{a_D} + (1-\rho_1) \frac{da_{XN}}{a_{XN}} + \frac{1-\rho_2}{2} \frac{E_s}{E_n} \frac{da_{XS}}{a_{XS}} = 0. \quad (8.10)$$

Intuitively, the free-entry condition requires that a rise in demand in any one market for the Western firm's goods must be balanced by a decline in demand from at least one other market. By implication, the three a_D , a_{XN} and a_{XS} cannot all move in the same direction.

We move on to log-differentiate the market demand expressions in (2.3)-(2.6):

$$\frac{dA_{ww}}{A_{ww}} = \left((1-\rho_1) \frac{\phi-1}{\varepsilon-1} - 1 \right) \frac{dP_{ww}^{1-\varepsilon}}{P_{ww}^{1-\varepsilon}} - (1-\rho_1) \frac{\phi-1}{\varepsilon-1} \frac{dP_{ew}^{1-\varepsilon}}{P_{ew}^{1-\varepsilon}}, \quad (8.11)$$

$$\frac{dA_{ew}}{A_{ew}} = \left(\rho_1 \frac{\phi-1}{\varepsilon-1} - 1 \right) \frac{dP_{ew}^{1-\varepsilon}}{P_{ew}^{1-\varepsilon}} - \rho_1 \frac{\phi-1}{\varepsilon-1} \frac{dP_{ww}^{1-\varepsilon}}{P_{ww}^{1-\varepsilon}}, \quad (8.12)$$

$$\frac{dA_{sw}}{A_{sw}} = \left(\rho_2 \frac{\phi-1}{\varepsilon-1} - 1 \right) \frac{dP_{sw}^{1-\varepsilon}}{P_{sw}^{1-\varepsilon}} - \rho_2 \frac{\phi-1}{\varepsilon-1} \frac{dP_{ss}^{1-\varepsilon}}{P_{ss}^{1-\varepsilon}}, \quad \text{and} \quad (8.13)$$

$$\frac{dA_{ss}}{A_{ss}} = \left((1-\rho_2) \frac{\phi-1}{\varepsilon-1} - 1 \right) \frac{dP_{ss}^{1-\varepsilon}}{P_{ss}^{1-\varepsilon}} - (1-\rho_2) \frac{\phi-1}{\varepsilon-1} \frac{dP_{sw}^{1-\varepsilon}}{P_{sw}^{1-\varepsilon}}. \quad (8.14)$$

Meanwhile, log-differentiating the ideal price indices (2.18)-(2.20) gives us:

$$\frac{dP_{ww}^{1-\varepsilon}}{P_{ww}^{1-\varepsilon}} = \frac{dN_n}{N_n} + (k - \varepsilon + 1) \left(\Delta_1 \frac{da_D}{a_D} + (1 - \Delta_1) \frac{da_I}{a_I} \right), \quad (8.15)$$

$$\frac{dP_{ew}^{1-\varepsilon}}{P_{ew}^{1-\varepsilon}} = \frac{dN_n}{N_n} + (k - \varepsilon + 1) \left(\Delta_2 \frac{da_{XN}}{a_{XN}} + (1 - \Delta_2) \frac{da_I}{a_I} \right), \quad \text{and} \quad (8.16)$$

$$\frac{dP_{sw}^{1-\varepsilon}}{P_{sw}^{1-\varepsilon}} = \frac{dN_n}{N_n} + (k - \varepsilon + 1) \left(\Delta_3 \frac{da_{XS}}{a_{XS}} + (1 - \Delta_3) \frac{da_I}{a_I} \right), \quad (8.17)$$

where we have applied the fact that: $\frac{aV'_n(a)}{V_n(a)} = k - \varepsilon + 1$, for the Pareto distribution to obtain these last three equations.²⁹

Using Cramer's Rule, we now invert (8.13) and (8.14) to obtain:

$$\frac{dP_{sw}^{1-\varepsilon}}{P_{sw}^{1-\varepsilon}} = \left(-\rho_2 \frac{\phi - 1}{\varepsilon - \phi} - 1 \right) \frac{dA_{sw}}{A_{sw}} + \rho_2 \frac{\phi - 1}{\varepsilon - \phi} \frac{dA_{ss}}{A_{ss}}, \quad \text{and} \quad (8.18)$$

$$\frac{dP_{ss}^{1-\varepsilon}}{P_{ss}^{1-\varepsilon}} = \left(-(1 - \rho_2) \frac{\phi - 1}{\varepsilon - \phi} - 1 \right) \frac{dA_{ss}}{A_{ss}} + (1 - \rho_2) \frac{\phi - 1}{\varepsilon - \phi} \frac{dA_{sw}}{A_{sw}}. \quad (8.19)$$

Setting (8.17) equal to (8.18) then implies that:

$$\frac{dN_n}{N_n} = \rho_2 \frac{\phi - 1}{\varepsilon - \phi} \frac{dA_{ss}}{A_{ss}} - \left[(\varepsilon - 1) \left(\rho_2 \frac{\phi - 1}{\varepsilon - \phi} + 1 \right) + (k - \varepsilon + 1) \Delta_3 \right] \frac{da_{XS}}{a_{XS}} - (k - \varepsilon + 1) (1 - \Delta_3) \frac{da_I}{a_I}. \quad (8.20)$$

We now plug this expression for $\frac{dN_n}{N_n}$ into (8.15) and (8.16), and substitute the subsequent expressions for $\frac{dP_{ww}^{1-\varepsilon}}{P_{ww}^{1-\varepsilon}}$ and $\frac{dP_{ew}^{1-\varepsilon}}{P_{ew}^{1-\varepsilon}}$ into (8.11) and (8.12). Finally, replacing $\frac{dA_{ww}}{A_{ww}}$ and $\frac{dA_{ew}}{A_{ew}}$ with the expressions in terms of $\frac{da_D}{a_D}$ and $\frac{da_{XN}}{a_{XN}}$ from (8.1) and (8.2) respectively, one obtains (after some rearrangement):

$$\begin{aligned} \frac{\rho_2}{k - \varepsilon + 1} \frac{\phi - 1}{\varepsilon - \phi} \frac{dA_{ss}}{A_{ss}} &= \left[\left((1 - \rho_1) \frac{\phi - 1}{\varepsilon - 1} - 1 \right) \Delta_1 - \frac{\varepsilon - 1}{k - \varepsilon + 1} \right] \frac{da_D}{a_D} - (1 - \rho_1) \frac{\phi - 1}{\varepsilon - 1} \Delta_2 \frac{da_{XN}}{a_{XN}} \\ &\quad \dots + \left[\frac{\varepsilon - 1}{k - \varepsilon + 1} \left(\rho_2 \frac{\phi - 1}{\varepsilon - \phi} + 1 \right) + \Delta_3 \right] \frac{da_{XS}}{a_{XS}} \\ &\quad \dots + \left[(\Delta_1 - \Delta_3) - (\Delta_1 - \Delta_2) (1 - \rho_1) \frac{\phi - 1}{\varepsilon - 1} \right] \frac{da_I}{a_I}, \quad \text{and} \end{aligned} \quad (8.21)$$

$$\begin{aligned} \frac{\rho_2}{k - \varepsilon + 1} \frac{\phi - 1}{\varepsilon - \phi} \frac{dA_{ss}}{A_{ss}} &= -\rho_1 \frac{\phi - 1}{\varepsilon - 1} \Delta_1 \frac{da_D}{a_D} + \left[\left(\rho_1 \frac{\phi - 1}{\varepsilon - 1} - 1 \right) \Delta_2 - \frac{\varepsilon - 1}{k - \varepsilon + 1} \right] \frac{da_{XN}}{a_{XN}} \\ &\quad \dots + \left[\frac{\varepsilon - 1}{k - \varepsilon + 1} \left(\rho_2 \frac{\phi - 1}{\varepsilon - \phi} + 1 \right) + \Delta_3 \right] \frac{da_{XS}}{a_{XS}} \\ &\quad \dots + \left[(\Delta_2 - \Delta_3) + (\Delta_1 - \Delta_2) \rho_1 \frac{\phi - 1}{\varepsilon - 1} \right] \frac{da_I}{a_I}. \end{aligned} \quad (8.22)$$

(8.4), (8.10), (8.21), and (8.22) give us four equations in the four unknowns, $\frac{da_D}{a_D}$, $\frac{da_{XN}}{a_{XN}}$, $\frac{da_{XS}}{a_{XS}}$, and $\frac{da_I}{a_I}$. To pin down the comparative statics explicitly, note that equating (8.22) and (8.21) implies:

$$\frac{da_I}{a_I} = \frac{1}{\Delta_1 - \Delta_2} \left[\left(\Delta_1 + \frac{\varepsilon - 1}{k - \varepsilon + 1} \frac{\varepsilon - 1}{\varepsilon - \phi} \right) \frac{da_D}{a_D} - \left(\Delta_2 + \frac{\varepsilon - 1}{k - \varepsilon + 1} \frac{\varepsilon - 1}{\varepsilon - \phi} \right) \frac{da_{XN}}{a_{XN}} \right]. \quad (8.23)$$

²⁹This is the key step where the Pareto distribution assumption leads to some helpful simplifications in the algebra. Note that most of our results would also hold if we were willing to make the more general assumption that $aV'_n(a)/V_n(a)$ is (weakly) increasing in a for all $a \in (0, \bar{a}_n)$; details are available on request. Note also that we have not explicitly differentiated (2.21) for $P_{ss}^{1-\varepsilon}$. This equation only plays a role in pinning down the sign of $\frac{dN_s}{N_s}$, which is of secondary interest to our exercise.

Meanwhile, using (8.10) to eliminate $\frac{da_{XS}}{a_{XS}}$ from (8.4) delivers:

$$\frac{da_I}{a_I} = -\frac{\rho_1(\Delta_1 - \Delta_3)\frac{da_D}{a_D} + (1 - \rho_1)(\Delta_2 - \Delta_3)\frac{da_{XN}}{a_{XN}}}{\rho_1(1 - \Delta_1) + (1 - \rho_1)(1 - \Delta_2) + \frac{1 - \rho_2}{2}\frac{E_s}{E_n}(1 - \Delta_3)}. \quad (8.24)$$

For convenience, let us define: $\Delta_d = \rho_1(1 - \Delta_1) + (1 - \rho_1)(1 - \Delta_2) + \frac{1 - \rho_2}{2}\frac{E_s}{E_n}(1 - \Delta_3)$, which is the denominator in (8.24). Note that $\Delta_d > 0$, since $\rho_1, \rho_2, \Delta_1, \Delta_2, \Delta_3 \in (0, 1)$.

Then, setting (8.23) equal to (8.24) and rearranging, one obtains:

$$0 = \left[\rho_1(\Delta_1 - \Delta_3)(\Delta_1 - \Delta_2) + \Delta_d \left(\Delta_1 + \frac{\varepsilon - 1}{k - \varepsilon + 1} \frac{\varepsilon - 1}{\varepsilon - \phi} \right) \right] \frac{da_D}{a_D} \\ \dots + \left[(1 - \rho_1)(\Delta_2 - \Delta_3)(\Delta_1 - \Delta_2) - \Delta_d \left(\Delta_2 + \frac{\varepsilon - 1}{k - \varepsilon + 1} \frac{\varepsilon - 1}{\varepsilon - \phi} \right) \right] \frac{da_{XN}}{a_{XN}}. \quad (8.25)$$

Since $\Delta_1 - \Delta_2, \Delta_1 - \Delta_3 > 0$, it follows that the coefficient of $\frac{da_D}{a_D}$ in (8.25) is positive. Moreover, using the definition of Δ_d , one can see that the coefficient of $\frac{da_{XN}}{a_{XN}}$ is strictly smaller than: $(1 - \rho_1)(\Delta_2 - \Delta_3)(\Delta_1 - \Delta_2) - (1 - \rho_1)(1 - \Delta_2)\Delta_2$, which itself is already negative, since: $1 - \Delta_2 > \Delta_1 - \Delta_2 > 0$, and $\Delta_2 > \Delta_2 - \Delta_3 > 0$. Thus, the coefficient of $\frac{da_{XN}}{a_{XN}}$ in (8.25) is negative. Since the linear combination in (8.25) is equal to 0, it follows that $\text{sign}(\frac{da_D}{d\eta}) = \text{sign}(\frac{da_{XN}}{d\eta})$.

We require one more equation in $\frac{da_D}{a_D}$ and $\frac{da_{XN}}{a_{XN}}$ in order to pin down their common sign. For this, substitute the expression for $\frac{da_I}{a_I}$ from (8.24) and that for $\frac{da_{XS}}{a_{XS}}$ from (8.10) into (8.21) to obtain:

$$\frac{\rho_2}{k - \varepsilon + 1} \frac{\phi - 1}{\varepsilon - \phi} \frac{dA_{ss}}{A_{ss}} = \left[\left((1 - \rho_1) \frac{\phi - 1}{\varepsilon - 1} - 1 \right) \Delta_1 - \frac{2\rho_1}{1 - \rho_2} \frac{E_n}{E_s} \left(\frac{\varepsilon - 1}{k - \varepsilon + 1} \left(\rho_2 \frac{\phi - 1}{\varepsilon - \phi} + 1 \right) + \Delta_3 \right) \right. \\ \dots - \frac{\varepsilon - 1}{k - \varepsilon + 1} - \left. \left((\Delta_1 - \Delta_3) - (\Delta_1 - \Delta_2)(1 - \rho_1) \frac{\phi - 1}{\varepsilon - 1} \right) \frac{\rho_1(\Delta_1 - \Delta_3)}{\Delta_d} \right] \frac{da_D}{a_D} \\ \dots + \left[-(1 - \rho_1) \frac{\phi - 1}{\varepsilon - 1} \Delta_2 - \frac{2(1 - \rho_1)}{1 - \rho_2} \frac{E_n}{E_s} \left(\frac{\varepsilon - 1}{k - \varepsilon + 1} \left(\rho_2 \frac{\phi - 1}{\varepsilon - \phi} + 1 \right) + \Delta_3 \right) \right. \\ \dots - \left. \left((\Delta_1 - \Delta_3) - (\Delta_1 - \Delta_2)(1 - \rho_1) \frac{\phi - 1}{\varepsilon - 1} \right) \frac{(1 - \rho_1)(\Delta_2 - \Delta_3)}{\Delta_d} \right] \frac{da_{XN}}{a_{XN}}. \quad (8.26)$$

Note that $(\Delta_1 - \Delta_3) - (\Delta_1 - \Delta_2)(1 - \rho_1) \frac{\phi - 1}{\varepsilon - 1} > 0$, since: $\Delta_1 - \Delta_3 > \Delta_1 - \Delta_2 > 0$, $1 - \rho_1 \in (0, 1)$, and $\frac{\phi - 1}{\varepsilon - 1} \in (0, 1)$ (because $\varepsilon > \phi > 1$). These conditions also imply that: $(1 - \rho_1) \frac{\phi - 1}{\varepsilon - 1} - 1 < 0$. It is then straightforward to see that the coefficients of both $\frac{da_D}{a_D}$ and $\frac{da_{XN}}{a_{XN}}$ in (8.26) are negative. From Lemma 1, recall that $\frac{dA_{ss}}{d\eta} < 0$. It follows then from (8.26) that $\text{sign}(\frac{da_D}{d\eta}) = \text{sign}(\frac{da_{XN}}{d\eta}) > 0$.

Rearranging (8.25) now implies that:

$$\frac{\frac{1}{a_D} \frac{da_D}{d\eta}}{\frac{1}{a_{XN}} \frac{da_{XN}}{d\eta}} = \frac{-(1 - \rho_1)(\Delta_2 - \Delta_3)(\Delta_1 - \Delta_2) + \Delta_d \left(\Delta_2 + \frac{\varepsilon - 1}{k - \varepsilon + 1} \frac{\varepsilon - 1}{\varepsilon - \phi} \right)}{\rho_1(\Delta_1 - \Delta_3)(\Delta_1 - \Delta_2) + \Delta_d \left(\Delta_1 + \frac{\varepsilon - 1}{k - \varepsilon + 1} \frac{\varepsilon - 1}{\varepsilon - \phi} \right)}. \quad (8.27)$$

It is easy to verify that the numerator of (8.27) is positive but smaller than the denominator; in particular, this follows as a consequence of $\Delta_1 > \Delta_2$. It follows that $\frac{1}{a_D} \frac{da_D}{d\eta} / \frac{1}{a_{XN}} \frac{da_{XN}}{d\eta} \in (0, 1)$, so that: $\frac{1}{a_{XN}} \frac{da_{XN}}{d\eta} > \frac{1}{a_D} \frac{da_D}{d\eta} > 0$, as stated in part (i) of Lemma 2. Part (iii) of the lemma then holds immediately from (8.1)

and (8.2), since the percentage changes in a_D and a_{XN} are respectively proportional to the percentage changes in A_{ww} and A_{ew} (by a multiplicative factor equal to $\varepsilon - 1 > 0$).

As for part (ii) of the lemma, observe that (8.10) implies:

$$\frac{da_{XS}}{a_{XS}} = -\frac{2}{1-\rho_2} \frac{E_n}{E_s} \left(\rho_1 \frac{da_D}{a_D} + (1-\rho_1) \frac{da_{XN}}{a_{XN}} \right) < 0. \quad (8.28)$$

At the same time, it is clear from (8.24) that $\frac{da_I}{a_I} < 0$. Now, subtracting (8.28) from (8.24) yields:

$$\frac{da_I}{a_I} - \frac{da_{XS}}{a_{XS}} = \left(-\frac{\Delta_1 - \Delta_3}{\Delta_d} + \frac{2}{1-\rho_2} \frac{E_n}{E_s} \right) \rho_1 \frac{da_D}{a_D} + \left(-\frac{\Delta_2 - \Delta_3}{\Delta_d} + \frac{2}{1-\rho_2} \frac{E_n}{E_s} \right) (1-\rho_1) \frac{da_{XN}}{a_{XN}}.$$

One can check directly that: $\frac{2}{1-\rho_2} \frac{E_n}{E_s} \Delta_d > 1 - \Delta_3 > \Delta_1 - \Delta_3, \Delta_2 - \Delta_3$. The coefficients of $\frac{da_D}{a_D}$ and $\frac{da_{XN}}{a_{XN}}$ from this last equation are thus both positive, from which we can conclude that: $\frac{1}{a_{XS}} \frac{da_{XS}}{d\eta} < \frac{1}{a_I} \frac{da_I}{d\eta} < 0$. Finally, part (iv) follows from the fact that $\frac{da_{XS}}{a_{XS}}$ and $\frac{dA_{sw}}{A_{sw}}$ share the same sign (from (8.3)). ■

8.3 Proof of Proposition 1

Proof. For a given level of firm productivity $1/a$, the definitions of $HORI(a)$, $PLAT(a)$, and $VERT(a)$ imply that the effects of Southern financial development on these sales volumes are pinned down respectively by the derivative of A_{sw} , A_{ew} , and A_{ww} with respect to η . Lemma 2 then implies that when Southern financial development improves, $HORI(a)$ falls (since $\frac{dA_{sw}}{d\eta} < 0$), $PLAT(a)$ increases (since $\frac{dA_{ew}}{d\eta} > 0$), and $VERT(a)$ increases (since $\frac{dA_{ww}}{d\eta} > 0$).

Moreover, from (3.3), one can see that $\frac{d}{d\eta} \frac{HORI(a)}{TOT(a)} < 0$, since both $\frac{A_{ww}}{A_{sw}}$ and $\frac{A_{ew}}{A_{sw}}$ increase with η . On the other hand, from (3.4), we have $\frac{d}{d\eta} \frac{PLAT(a)}{TOT(a)} > 0$, since both $\frac{A_{sw}}{A_{ew}}$ and $\frac{A_{ww}}{A_{ew}}$ are decreasing in η . (That $\frac{d}{d\eta} \frac{A_{ww}}{A_{ew}} < 0$ follows from $\frac{1}{A_{ew}} \frac{dA_{ew}}{d\eta} > \frac{1}{A_{ww}} \frac{dA_{ww}}{d\eta} > 0$.)

It remains to show that $\frac{d}{d\eta} \frac{VERT(a)}{TOT(a)} > 0$ as well. From (3.5), it suffices to show that $\tau^{\varepsilon-1} \frac{A_{sw}}{A_{ww}} + \frac{A_{ew}}{A_{ww}}$ decreases with η . Note that:

$$\begin{aligned} \frac{d}{d\eta} \left(\tau^{\varepsilon-1} \frac{A_{sw}}{A_{ww}} + \frac{A_{ew}}{A_{ww}} \right) &\propto \tau^{\varepsilon-1} A_{sw} \left(\frac{1}{A_{sw}} \frac{dA_{sw}}{d\eta} - \frac{1}{A_{ww}} \frac{dA_{ww}}{d\eta} \right) + A_{ew} \left(\frac{1}{A_{ew}} \frac{dA_{ew}}{d\eta} - \frac{1}{A_{ww}} \frac{dA_{ww}}{d\eta} \right) \\ &\propto \tau^{\varepsilon-1} \frac{A_{sw}}{A_{ew}} \left(\frac{1}{a_{XS}} \frac{da_{XS}}{d\eta} - \frac{1}{a_D} \frac{da_D}{d\eta} \right) + \left(\frac{1}{a_{XN}} \frac{da_{XN}}{d\eta} - \frac{1}{a_D} \frac{da_D}{d\eta} \right), \end{aligned}$$

where ‘ \propto ’ denotes equality up to a positive multiplicative term. (In the last step above, we have used (8.1)-(8.3) to replace the derivatives of the aggregate demand levels with the derivatives of the industry cutoffs.) We now replace $\frac{da_{XS}}{d\eta}$ using the expression in (8.28). Also, based on the definitions from (2.4), (2.3), (8.5) and (8.6), one can show that: $\frac{A_{sw}}{A_{ew}} = \frac{E_s}{E_n} \frac{1-\rho_2}{2(1-\rho_1)} \frac{P_{ew}^{1-\varepsilon}}{P_{sw}^{1-\varepsilon}}$. Performing these substitutions and rearranging, one obtains:

$$\begin{aligned} \frac{d}{d\eta} \left(\tau^{\varepsilon-1} \frac{A_{sw}}{A_{ww}} + \frac{A_{ew}}{A_{ww}} \right) &\propto - \left[1 + \tau^{\varepsilon-1} \frac{A_{sw}}{A_{ew}} \left(\frac{E_n}{E_s} \frac{2\rho_1}{1-\rho_2} + 1 \right) \right] \frac{1}{a_D} \frac{da_D}{d\eta} + \\ &\quad \dots + \left[1 - \tau^{\varepsilon-1} \frac{P_{ew}^{1-\varepsilon}}{P_{sw}^{1-\varepsilon}} \right] \frac{1}{a_{XN}} \frac{da_{XN}}{d\eta}. \end{aligned} \quad (8.29)$$

In this last equation, the coefficient of $\frac{1}{a_D} \frac{da_D}{d\eta}$ is clearly negative. As for the coefficient of $\frac{1}{a_{XN}} \frac{da_{XN}}{d\eta}$, using the expressions for $P_{ew}^{1-\varepsilon}$ and $P_{sw}^{1-\varepsilon}$ from (2.19) and (2.20), we have:

$$\begin{aligned} 1 - \tau^{\varepsilon-1} \frac{P_{ew}^{1-\varepsilon}}{P_{sw}^{1-\varepsilon}} &= 1 - \tau^{\varepsilon-1} \left[\frac{\tau^{1-\varepsilon} V_N(a_{XN}) + ((\tau\omega)^{1-\varepsilon} - \tau^{1-\varepsilon}) V_N(a_I)}{\tau^{1-\varepsilon} V_N(a_{XS}) + (\omega^{1-\varepsilon} - \tau^{1-\varepsilon}) V_N(a_I)} \right] \\ &= \frac{\tau^{1-\varepsilon} (V_N(a_{XS}) - V_N(a_I)) - (V_N(a_{XN}) - V_N(a_I))}{\tau^{1-\varepsilon} V_N(a_{XS}) + (\omega^{1-\varepsilon} - \tau^{1-\varepsilon}) V_N(a_I)} \\ &< \frac{(\tau^{1-\varepsilon} - 1) (V_N(a_{XN}) - V_N(a_I))}{\tau^{1-\varepsilon} V_N(a_{XS}) + (\omega^{1-\varepsilon} - \tau^{1-\varepsilon}) V_N(a_I)} \\ &< 0. \end{aligned}$$

The second-to-last step relies on the fact that $V_N(a_{XN}) > V_N(a_{XS})$ (since $a_{XN} > a_{XS}$), while the last step follows from $\tau^{1-\varepsilon} < 1$ and $V_N(a_{XN}) > V_N(a_I)$ (since $a_{XN} > a_I$). The coefficient of $\frac{1}{a_{XN}} \frac{da_{XN}}{d\eta}$ is thus negative as well. Since $\frac{da_D}{d\eta}, \frac{da_{XN}}{d\eta} > 0$, it follows from (8.29) that $\frac{d}{d\eta} \left(\tau^{\varepsilon-1} \frac{A_{sw}}{A_{ww}} + \frac{A_{ew}}{A_{ww}} \right) < 0$. Hence, $\frac{VERT(a)}{TOT(a)}$ increases with η . ■

8.4 Proof of Lemma 3

Proof. For part (i) of the lemma, based on the definitions of $PLAT(a)$ and $VERT(a)$, we have:

$$\frac{d}{d\eta} (PLAT(a) - VERT(a)) = (1 - \alpha) \left(\frac{\tau a \omega}{\alpha} \right)^{1-\varepsilon} A_{ww} \left(\frac{A_{ew}}{A_{ww}} \frac{1}{A_{ew}} \frac{dA_{ew}}{d\eta} - \frac{1}{A_{ww}} \frac{dA_{ww}}{d\eta} \right).$$

We show first that $\frac{A_{ew}}{A_{ww}} > 1$. From the definitions of A_{ww} and A_{ew} in (2.3) and (2.4), we have:

$$\frac{A_{ew}}{A_{ww}} = \left[\frac{V_N(a_D) + ((\tau\omega)^{1-\varepsilon} - 1) V_N(a_I)}{\tau^{1-\varepsilon} V_N(a_{XN}) + ((\tau\omega)^{1-\varepsilon} - \tau^{1-\varepsilon}) V_N(a_I)} \right]^{\frac{\varepsilon-\phi}{\varepsilon-1}}. \quad (8.30)$$

Observe now that:

$$\begin{aligned} &V_N(a_D) + ((\tau\omega)^{1-\varepsilon} - 1) V_N(a_I) - (\tau^{1-\varepsilon} V_N(a_{XN}) + ((\tau\omega)^{1-\varepsilon} - \tau^{1-\varepsilon}) V_N(a_I)) \\ &= V_N(a_D) - V_N(a_I) - \tau^{1-\varepsilon} (V_N(a_{XN}) - V_N(a_I)) \\ &> (1 - \tau^{1-\varepsilon}) (V_N(a_{XN}) - V_N(a_I)) \\ &> 0. \end{aligned}$$

Note that the second-to-last step above uses the fact that $V_N(a_D) > V_N(a_{XN})$ (since $a_D > a_{XN}$), while the final step holds because $\tau^{1-\varepsilon} < 1$. Since the exponent, $\frac{\varepsilon-\phi}{\varepsilon-1}$, in (8.30) is positive (as $\varepsilon > \phi > 1$), it follows that $\frac{A_{ew}}{A_{ww}} > 1$, as claimed.

We thus have:

$$\begin{aligned} \frac{d}{d\eta} (PLAT(a) - VERT(a)) &> (1 - \alpha) \left(\frac{\tau a \omega}{\alpha} \right)^{1-\varepsilon} A_{ww} \left(\frac{1}{A_{ew}} \frac{dA_{ew}}{d\eta} - \frac{1}{A_{ww}} \frac{dA_{ww}}{d\eta} \right) \\ &> 0, \end{aligned}$$

since $\frac{1}{A_{ew}} \frac{dA_{ew}}{d\eta} > \frac{1}{A_{ww}} \frac{dA_{ww}}{d\eta}$ from Lemma 2.

As for part (ii) of the lemma, applying the quotient rule to the expressions for $\frac{PLAT(a)}{TOT(a)}$ and $\frac{VERT(a)}{TOT(a)}$ from (3.4) and (3.5) respectively, one obtains after some simplification that:

$$\begin{aligned} \frac{d}{d\eta} \left[\frac{PLAT(a)}{TOT(a)} - \frac{VERT(a)}{TOT(a)} \right] &\propto \tau^{\varepsilon-1} \frac{A_{sw}}{A_{ew}} \left(1 - \frac{A_{ew}}{A_{ww}} \right) \frac{1}{A_{sw}} \frac{dA_{sw}}{d\eta} + 2 \left(\frac{1}{A_{ew}} \frac{dA_{ew}}{d\eta} - \frac{1}{A_{ww}} \frac{dA_{ww}}{d\eta} \right) \\ &\quad \dots + \tau^{\varepsilon-1} \frac{A_{sw}}{A_{ew}} \left(\frac{A_{ew}}{A_{ww}} \frac{1}{A_{ew}} \frac{dA_{ew}}{d\eta} - \frac{1}{A_{ww}} \frac{dA_{ww}}{d\eta} \right) \\ &> 0, \end{aligned}$$

where this last inequality hinges on: $\frac{1}{A_{ew}} \frac{dA_{ew}}{d\eta} > \frac{1}{A_{ww}} \frac{dA_{ww}}{d\eta} > 0 > \frac{1}{A_{sw}} \frac{dA_{sw}}{d\eta}$ (from Lemma 2), and $\frac{A_{ew}}{A_{ww}} > 1$ (as shown above for part (i) of this lemma). ■

8.5 Proof of Proposition 2

Proof. To show that $\frac{dN_n}{d\eta} < 0$ for part (i), we solve for $\frac{dN_n}{N_n}$ from (8.16). First, note that applying Cramer's Rule to (8.11) and (8.12), we have:

$$\begin{aligned} \frac{dP_{ew}^{1-\varepsilon}}{P_{ew}^{1-\varepsilon}} &= \rho_1 \frac{\phi - 1}{\varepsilon - \phi} \left(\frac{dA_{ww}}{A_{ww}} - \frac{dA_{ew}}{A_{ew}} \right) - \frac{dA_{ew}}{A_{ew}} \\ &= (\varepsilon - 1) \left[\rho_1 \frac{\phi - 1}{\varepsilon - \phi} \left(\frac{da_D}{a_D} - \frac{da_{XN}}{a_{XN}} \right) - \frac{da_{XN}}{a_{XN}} \right]. \end{aligned} \quad (8.31)$$

(In particular, this means that $\frac{1}{P_{ew}^{1-\varepsilon}} \frac{dP_{ew}^{1-\varepsilon}}{d\eta} < 0$, since $\frac{1}{a_{XN}} \frac{da_{XN}}{d\eta} > \frac{1}{a_D} \frac{da_D}{d\eta} > 0$ by Lemma 2.) Substituting from (8.31) into (8.16), replacing $\frac{da_I}{a_I}$ with the expression from (8.23), and rearranging yields:

$$\begin{aligned} \frac{1}{k - \varepsilon + 1} \frac{dN_n}{N_n} &= \left[\rho_1 \frac{\phi - 1}{\varepsilon - \phi} \frac{\varepsilon - 1}{k - \varepsilon + 1} - \frac{1 - \Delta_2}{\Delta_1 - \Delta_2} \left(\Delta_1 + \frac{\varepsilon - 1}{k - \varepsilon + 1} \frac{\varepsilon - 1}{\varepsilon - \phi} \right) \right] \frac{da_D}{a_D} \\ &\quad \dots + \left[- \left(\rho_1 \frac{\phi - 1}{\varepsilon - \phi} + 1 \right) \frac{\varepsilon - 1}{k - \varepsilon + 1} - \Delta_2 + \frac{1 - \Delta_2}{\Delta_1 - \Delta_2} \left(\Delta_2 + \frac{\varepsilon - 1}{k - \varepsilon + 1} \frac{\varepsilon - 1}{\varepsilon - \phi} \right) \right] \frac{da_{XN}}{a_{XN}}. \end{aligned} \quad (8.32)$$

To determine the sign of $\frac{dN_n}{N_n}$, divide the right-hand side of (8.32) by $\frac{da_{XN}}{a_{XN}}$, and substitute in the expression for $\frac{da_D}{a_D} / \frac{da_{XN}}{a_{XN}}$ from (8.27). After simplifying and collecting terms, one can show that the sign of $\frac{dN_n}{d\eta}$ is given by the sign of:

$$\begin{aligned} &- \left(\Delta_2 + \frac{\varepsilon - 1}{k - \varepsilon + 1} \right) \left[\Delta_d \left(\Delta_1 + \frac{\varepsilon - 1}{k - \varepsilon + 1} \frac{\varepsilon - 1}{\varepsilon - \phi} \right) + \rho_1 (\Delta_1 - \Delta_2) (\Delta_1 - \Delta_3) \right] \\ &\quad \dots - \rho_1 \frac{\varepsilon - 1}{k - \varepsilon + 1} \frac{\phi - 1}{\varepsilon - \phi} (\Delta_1 - \Delta_2) [\rho_1 (\Delta_1 - \Delta_3) + (1 - \rho_1) (\Delta_2 - \Delta_3) + \Delta_d] \\ &\quad \dots + (1 - \Delta_2) \left[\left(\Delta_2 + \frac{\varepsilon - 1}{k - \varepsilon + 1} \frac{\varepsilon - 1}{\varepsilon - \phi} \right) \rho_1 (\Delta_1 - \Delta_3) + \left(\Delta_1 + \frac{\varepsilon - 1}{k - \varepsilon + 1} \frac{\varepsilon - 1}{\varepsilon - \phi} \right) (1 - \rho_1) (\Delta_2 - \Delta_3) \right] \\ < &- \left(\Delta_2 + \frac{\varepsilon - 1}{k - \varepsilon + 1} \right) \left[(\rho_1 (1 - \Delta_1) + (1 - \rho_1) (1 - \Delta_2)) \left(\Delta_1 + \frac{\varepsilon - 1}{k - \varepsilon + 1} \frac{\varepsilon - 1}{\varepsilon - \phi} \right) + \rho_1 (\Delta_1 - \Delta_2) (\Delta_1 - \Delta_3) \right] \\ &\quad \dots - \rho_1 \frac{\varepsilon - 1}{k - \varepsilon + 1} \frac{\phi - 1}{\varepsilon - \phi} (\Delta_1 - \Delta_2) (1 - \Delta_3) \\ &\quad \dots + (1 - \Delta_2) \left[\left(\Delta_2 + \frac{\varepsilon - 1}{k - \varepsilon + 1} \frac{\varepsilon - 1}{\varepsilon - \phi} \right) \rho_1 (\Delta_1 - \Delta_3) + \left(\Delta_1 + \frac{\varepsilon - 1}{k - \varepsilon + 1} \frac{\varepsilon - 1}{\varepsilon - \phi} \right) (1 - \rho_1) (\Delta_2 - \Delta_3) \right], \end{aligned} \quad (8.33)$$

where the inequality comes from applying: $\Delta_d > \rho_1(1 - \Delta_1) + (1 - \rho_1)(1 - \Delta_2)$.

We now collect all the terms in (8.33) in which $\frac{\varepsilon-1}{k-\varepsilon+1}$ does not appear. These are:

$$\begin{aligned} & -\Delta_2 [(\rho_1(1 - \Delta_1) + (1 - \rho_1)(1 - \Delta_2))\Delta_1 + \rho_1(\Delta_1 - \Delta_2)(\Delta_1 - \Delta_3)] \\ & \quad \dots + (1 - \Delta_2) [\Delta_2\rho_1(\Delta_1 - \Delta_3) + \Delta_1(1 - \rho_1)(\Delta_2 - \Delta_3)] \\ = & -\Delta_3 [\rho_1\Delta_2(1 - \Delta_1) + (1 - \rho_1)\Delta_1(1 - \Delta_2)] \\ < & 0. \end{aligned}$$

This term is negative, since $\rho_1, \Delta_1, \Delta_2, \Delta_3 \in (0, 1)$.

Similarly, we collect the remaining terms in (8.33), all of which involve $\frac{\varepsilon-1}{k-\varepsilon+1}$, as follows:

$$\begin{aligned} & -\frac{\varepsilon-1}{k-\varepsilon+1} \left[(\rho_1(1 - \Delta_1) + (1 - \rho_1)(1 - \Delta_2)) \left(\Delta_1 + \frac{\varepsilon-1}{k-\varepsilon+1} \frac{\varepsilon-1}{\varepsilon-\phi} \right) + \rho_1(\Delta_1 - \Delta_2)(\Delta_1 - \Delta_3) \right. \\ & \quad \dots + \Delta_2(\rho_1(1 - \Delta_1) + (1 - \rho_1)(1 - \Delta_2)) \frac{\varepsilon-1}{\varepsilon-\phi} \\ & \quad \left. \dots + \rho_1 \frac{\phi-1}{\varepsilon-\phi} (\Delta_1 - \Delta_2)(1 - \Delta_3) - \frac{\varepsilon-1}{\varepsilon-\phi} (1 - \Delta_2)(\rho_1(\Delta_1 - \Delta_3) + (1 - \rho_1)(\Delta_2 - \Delta_3)) \right] \\ < & -\frac{\varepsilon-1}{k-\varepsilon+1} \left[(\rho_1(1 - \Delta_1) + (1 - \rho_1)(1 - \Delta_2))\Delta_1 + \rho_1(\Delta_1 - \Delta_2)(\Delta_1 - \Delta_3) + \frac{\phi-1}{\varepsilon-\phi} \rho_1(\Delta_1 - \Delta_2)(1 - \Delta_3) \right. \\ & \quad \left. \dots + \Delta_2(\rho_1(1 - \Delta_1) + (1 - \rho_1)(1 - \Delta_2)) \frac{\varepsilon-1}{\varepsilon-\phi} - \frac{\varepsilon-1}{\varepsilon-\phi} (1 - \Delta_2)(\rho_1(\Delta_1 - \Delta_3) + (1 - \rho_1)(\Delta_2 - \Delta_3)) \right] \\ = & -\frac{\varepsilon-1}{k-\varepsilon+1} \left[\rho_1(1 - \Delta_1)\Delta_2 + (1 - \rho_1)\Delta_1(1 - \Delta_2) + \frac{\varepsilon-1}{\varepsilon-\phi} \Delta_3(\rho_1(1 - \Delta_1) + (1 - \rho_1)(1 - \Delta_2)) \right] \\ < & 0, \end{aligned}$$

since $\frac{\varepsilon-1}{k-\varepsilon+1} > 0$. This completes the proof that $\frac{dN_n}{d\eta} < 0$ for part (i) of the proposition.

For part (ii), since $V_n(a)$ is an increasing function for all $a \in (0, \bar{a}_n)$, an improvement in η leads to a decrease in a_I and hence in $V_n(a_I)$ also. Lemma 4 has also established that N_n decreases in η . Therefore, to show that *HORI*, *PLAT*, and *VERT* all decline in η , it suffices to prove that *PLAT* is declining in η , since $\frac{1}{A_{ew}} \frac{dA_{ew}}{d\eta} > \frac{1}{A_{ww}} \frac{dA_{ww}}{d\eta}, \frac{1}{A_{sw}} \frac{dA_{sw}}{d\eta}$.

From the expression for *PLAT* in (3.7), we have:

$$\begin{aligned} \frac{d}{d\eta} \ln(PLAT) &= \frac{1}{N_n} \frac{dN_n}{d\eta} + \frac{1}{A_{ew}} \frac{dA_{ew}}{d\eta} + \frac{V'_N(a_I)a_I}{V_N(a_I)} \frac{1}{a_I} \frac{da_I}{d\eta} \\ &= (\varepsilon-1) \left[\rho_1 \frac{\phi-1}{\varepsilon-\phi} \left(\frac{1}{a_{XN}} \frac{da_{XN}}{d\eta} - \frac{1}{a_D} \frac{da_D}{d\eta} \right) - \frac{1}{a_{XN}} \frac{da_{XN}}{d\eta} \right] \\ & \quad \dots - (k-\varepsilon+1) \left(\Delta_2 \frac{1}{a_{XN}} \frac{da_{XN}}{d\eta} + (1-\Delta_2) \frac{1}{a_I} \frac{da_I}{d\eta} \right) + (\varepsilon-1) \frac{1}{a_{XN}} \frac{da_{XN}}{d\eta} + (k-\varepsilon+1) \frac{1}{a_I} \frac{da_I}{d\eta} \\ &= -(\varepsilon-1)\rho_1 \frac{\phi-1}{\varepsilon-\phi} \left(\frac{1}{a_{XN}} \frac{da_{XN}}{d\eta} - \frac{1}{a_D} \frac{da_D}{d\eta} \right) - (k-\varepsilon+1)\Delta_2 \left(\frac{1}{a_{XN}} \frac{da_{XN}}{d\eta} - \frac{1}{a_I} \frac{da_I}{d\eta} \right) \\ &< & 0. \end{aligned}$$

To get from the first line above to the second line, we have used the expression for $\frac{dN_n}{d\eta}$ from (8.16), and substituted for $\frac{dP_{ew}^{1-\varepsilon}}{P_{ew}^{1-\varepsilon}}$ using (8.31). We have also used (8.1) and (8.2) to substitute for $\frac{1}{A_{ww}} \frac{dA_{ww}}{d\eta}$ and $\frac{1}{A_{ew}} \frac{dA_{ew}}{d\eta}$ wherever these terms appear. Finally, we have relied on the fact that $\frac{V'_N(a_I)a_I}{V_N(a_I)} = k - \varepsilon + 1$ for the

Pareto distribution. The last step establishing that $\frac{d}{d\eta} \ln(PLAT) < 0$ follows from $\frac{1}{a_{XN}} \frac{da_{XN}}{d\eta} > \frac{1}{a_D} \frac{da_D}{d\eta} > \frac{1}{a_I} \frac{da_I}{d\eta}$, bearing in mind that $\phi - 1 > 0$ and $k - \varepsilon + 1 > 0$. Thus, when η increases, the contraction in the extensive margin captured by the fall in N_n and $V_N(a_I)$ is larger in magnitude than the increase in sales on the intensive margin due to the rise in the demand level, A_{ew} .³⁰

Turning to part (iii) of the proposition, note from (3.6)-(3.8) that the expressions for the aggregate horizontal, platform and vertical shares are identical to (3.3)-(3.5), the corresponding expressions for individual MNCs. From the proof of Proposition 1, this means that $\frac{HORI}{TOT}$ falls, while both $\frac{PLAT}{TOT}$ and $\frac{VERT}{TOT}$ rise, when η increases. ■

³⁰Note that these results in part (ii) of the proposition hinge on the use of the Pareto distribution. More generally, we can always conclude that $\frac{d}{d\eta} VERT < 0$, since $\frac{dA_{ew}}{d\eta} < 0$ reinforces the decrease in N_n and $V_n(a_I)$. However, the signs of $\frac{d}{d\eta} PLAT$ and $\frac{d}{d\eta} HORI$ will depend on the specific distributional assumption adopted.

Table 1
Summary Statistics: MNC Sales
(Affiliate-level variables, benchmark survey years)

	Mean	St Dev
Year: 1989		
Number of obs. = 14,042		
Local / Total sales	0.771	0.351
3rd country / Total sales	0.156	0.290
US / Total sales	0.072	0.216
Unaffiliated local / Total sales	0.726	0.381
Unaffiliated 3rd country / Total sales	0.098	0.231
Affiliated US / Total sales	0.054	0.187
Year: 2009		
Number of obs. = 16,478		
Local / Total sales	0.733	0.382
3rd country / Total sales	0.191	0.326
US / Total sales	0.076	0.220
Unaffiliated local / Total sales	0.655	0.420
Unaffiliated 3rd country / Total sales	0.098	0.238
Affiliated US / Total sales	0.055	0.189

Notes: Based on the BEA Survey of US Direct Investment Abroad.

Table 2
Host Country Financial Development and the Spatial Distribution of MNC Sales
(Aggregate evidence, benchmark years only)

Fin Devt Measure:	Private Credit / GDP			Stock Market Cap / GDP		
	<i>Local</i> <i>Total Sales</i>	<i>3rd – ctry</i> <i>Total Sales</i>	<i>US</i> <i>Total Sales</i>	<i>Local</i> <i>Total Sales</i>	<i>3rd – ctry</i> <i>Total Sales</i>	<i>US</i> <i>Total Sales</i>
Dep Variable:	(1)	(2)	(3)	(4)	(5)	(6)
Financial Devt	-0.080 (-3.27)***	0.036 (1.67)*	0.025 (3.68)***	-0.051 (-3.01)***	0.026 (2.00)*	0.015 (2.82)***
Log GDP	0.026 (2.91)***	-0.030 (-4.52)***	-0.008 (-2.94)***	0.018 (1.95)*	-0.026 (-3.91)***	-0.006 (-2.63)**
Log GDP per capita	-0.006 (-0.13)	0.034 (0.93)	-0.005 (-0.42)	0.021 (0.42)	0.017 (0.43)	-0.012 (-0.90)
Log Distance	-0.022 (-1.10)	0.015 (1.27)	-0.000 (-0.07)	-0.011 (-0.59)	0.009 (0.78)	-0.004 (-0.75)
Log K per worker	-0.011 (-0.24)	-0.005 (-0.15)	0.009 (0.81)	-0.026 (-0.54)	0.003 (0.08)	0.013 (1.14)
Log H per worker	0.112 (1.44)	-0.024 (-0.39)	-0.017 (-0.78)	0.083 (1.13)	-0.006 (-0.10)	-0.009 (-0.43)
Rule of Law	0.008 (0.80)	-0.003 (-0.40)	-0.005 (-1.63)	-0.000 (-0.04)	0.001 (0.24)	-0.002 (-0.76)
Tax Rate	-0.000 (-1.35)	0.000 (1.27)	0.000 (0.16)	-0.000 (-1.56)	0.000 (1.44)	0.000 (0.64)
Trade Agreements	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
# observations	15,028	15,028	15,028	15,028	15,028	15,028
R-squared	0.19	0.23	0.13	0.20	0.23	0.13

Notes: All regressions include year and industry fixed effects, as well as a full set of multilateral and regional trade agreement dummies. T-statistics based on robust standard errors clustered by host country reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level.

Table 3
Host Country Financial Development and the Spatial Distribution of MNC Sales
(Affiliate-level evidence, 1989-2009)

Fin Devt Measure:	Private Credit / GDP			Stock Market Cap / GDP		
	<i>Local</i> <i>Total Sales</i>	<i>3rd – ctry</i> <i>Total Sales</i>	<i>US</i> <i>Total Sales</i>	<i>Local</i> <i>Total Sales</i>	<i>3rd – ctry</i> <i>Total Sales</i>	<i>US</i> <i>Total Sales</i>
Dep Variable:	(1)	(2)	(3)	(4)	(5)	(6)
Financial Devt	-0.072 (-3.05)***	0.033 (1.84)*	0.019 (2.09)**	-0.039 (-2.76)***	0.020 (2.17)**	0.014 (3.04)***
Log GDP	0.045 (4.69)***	-0.043 (-6.03)***	-0.009 (-2.87)***	0.037 (3.53)***	-0.039 (-5.43)***	-0.007 (-2.38)**
Log GDP per capita	-0.039 (-0.84)	0.016 (0.43)	0.023 (1.70)*	-0.026 (-0.52)	0.007 (0.17)	0.013 (1.00)
Log Distance	-0.017 (-0.98)	0.017 (1.53)	0.010 (1.04)	-0.010 (-0.56)	0.013 (1.07)	0.007 (0.94)
Log K per worker	0.002 (0.05)	0.006 (0.17)	-0.007 (-0.58)	-0.007 (-0.16)	0.012 (0.34)	-0.001 (-0.12)
Log H per worker	0.043 (0.48)	0.024 (0.38)	-0.078 (-2.29)**	0.016 (0.18)	0.040 (0.62)	-0.065 (-1.99)**
Rule of Law	0.021 (1.73)*	-0.002 (-0.31)	-0.009 (-2.12)**	0.014 (1.22)	0.001 (0.17)	-0.007 (-1.66)
Tax Rate	-0.000 (-1.07)	-0.000 (-0.44)	0.000 (2.93)***	-0.000 (-2.13)**	0.000 (0.71)	0.000 (3.33)***
Trade Agreements	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
# observations	211,829	211,829	211,829	211,829	211,829	211,829
R-squared	0.10	0.16	0.09	0.10	0.16	0.09

Notes: All regressions include year and industry fixed effects, as well as a full set of multilateral and regional trade agreement dummies. T-statistics based on robust standard errors clustered by host country reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level.

Table 4
Alternative Measures of the Spatial Distribution of MNC Sales
(Affiliate-level evidence, 1989-2009)

Fin Devt Measure:	Private Credit / GDP			Stock Market Cap / GDP		
	<i>UnaffLocal</i>	<i>Unaff 3rd – ctry</i>	<i>AffUS</i>	<i>UnaffLocal</i>	<i>Unaff 3rd – ctry</i>	<i>AffUS</i>
Dep Variable:	<i>Total Sales</i>	<i>Total Sales</i>	<i>Total Sales</i>	<i>Total Sales</i>	<i>Total Sales</i>	<i>Total Sales</i>
	(1)	(2)	(3)	(4)	(5)	(6)
Financial Devt	-0.078 (-3.07)***	0.018 (1.48)	0.013 (1.82)*	-0.048 (-3.26)***	0.016 (3.01)***	0.009 (2.32)**
Controls	GDP, GDP per capita, Distance, K/L, H/L, Rule of Law, Tax Rate, Trade Agreement Dummies					
Industry FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
# observations	211,829	211,829	211,829	211,829	211,829	211,829
R-squared	0.13	0.11	0.06	0.13	0.11	0.06

Notes: All regressions include year and industry fixed effects, as well as all country-level controls from Table 2. T-statistics based on robust standard errors clustered by host country reported in parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% level.

Table 5
Alternative Specification: Tobit Estimation
(Affiliate-level evidence, 1989-2009)

Fin Devt Measure:	Private Credit / GDP			Stock Market Cap / GDP		
	<i>Local</i>	<i>3rd – ctry</i>	<i>US</i>	<i>Local</i>	<i>3rd – ctry</i>	<i>US</i>
Dep Variable:	<i>Total Sales</i>	<i>Total Sales</i>	<i>Total Sales</i>	<i>Total Sales</i>	<i>Total Sales</i>	<i>Total Sales</i>
	(1)	(2)	(3)	(4)	(5)	(6)
Financial Devt	-0.084 (-3.19)***	0.038 (1.22)	0.055 (2.06)**	-0.043 (-2.72)***	0.036 (2.49)**	0.047 (3.85)***
Controls	GDP, GDP per capita, Distance, K/L, H/L, Rule of Law, Tax Rate, Trade Agreement Dummies					
Industry FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
# observations	211,829	211,829	211,829	211,829	211,829	211,829
Pseudo R-squared	0.10	0.17	0.10	0.13	0.17	0.13

Notes: All regressions include year and industry fixed effects, as well as all country-level controls from Table 2. T-statistics based on robust standard errors clustered by host country reported in parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% level.

Table 6
Alternative Specification: Parent Firm Fixed Effects
(Affiliate-level evidence, 1989-2009)

Fin Devt Measure:	Private Credit / GDP			Stock Market Cap / GDP		
	<i>Local</i> <i>Total Sales</i>	<i>3rd – ctry</i> <i>Total Sales</i>	<i>US</i> <i>Total Sales</i>	<i>Local</i> <i>Total Sales</i>	<i>3rd – ctry</i> <i>Total Sales</i>	<i>US</i> <i>Total Sales</i>
Dep Variable:	(1)	(2)	(3)	(4)	(5)	(6)
Financial Devt	-0.059 (-2.76)***	0.027 (1.67)*	0.011 (1.60)	-0.033 (-2.56)**	0.017 (2.06)**	0.010 (2.60)**
Controls	GDP, GDP per capita, Distance, K/L, H/L, Rule of Law, Tax Rate, Trade Agreement Dummies					
Parent Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
# observations	206,535	206,535	206,535	206,535	206,535	206,535
R-squared	0.19	0.25	0.20	0.19	0.25	0.20

Notes: All regressions include year and parent firm fixed effects, as well as all country-level controls from Table 2. Sample restricted to firms with affiliates in at least two countries. T-statistics based on robust standard errors clustered by host country reported in parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10%

Table 7
Cross-Sectoral Variation in External Finance Dependence
(Affiliate-level evidence, 1989-2009)

Fin Devt Measure:	Private Credit / GDP			Stock Market Cap / GDP		
	<i>Local</i> <i>Total Sales</i>	<i>3rd – ctry</i> <i>Total Sales</i>	<i>US</i> <i>Total Sales</i>	<i>Local</i> <i>Total Sales</i>	<i>3rd – ctry</i> <i>Total Sales</i>	<i>US</i> <i>Total Sales</i>
Dep Variable:	(1)	(2)	(3)	(4)	(5)	(6)
Financial Devt	-0.059 (-2.30)**	0.030 (1.53)	0.011 (1.14)	-0.034 (-2.22)**	0.020 (1.95)*	0.009 (2.00)**
Financial Devt x Ext Fin Depend	-0.010 (-3.51)***	0.005 (2.34)**	0.003 (1.84)*	-0.005 (-2.63)**	0.003 (2.23)**	0.001 (0.94)
Controls	GDP, GDP per capita, Distance, K/L, H/L, Rule of Law, Tax Rate, Trade Agreement Dummies					
Industry FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
# observations	159,185	159,185	159,185	159,185	159,185	159,185
R-squared	0.13	0.16	0.10	0.13	0.16	0.10

Notes: All regressions include year and industry fixed effects, as well as all country-level controls from Table 2. T-statistics based on robust standard errors clustered by host country reported in parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% level.

Table 8
Cross-Sectoral Variation in External Finance Dependence: Country Fixed Effects
(Affiliate-level evidence, 1989-2009)

Fin Devt Measure:	Private Credit / GDP			Stock Market Cap / GDP		
	<i>Local</i> <i>Total Sales</i>	<i>3rd – ctry</i> <i>Total Sales</i>	<i>US</i> <i>Total Sales</i>	<i>Local</i> <i>Total Sales</i>	<i>3rd – ctry</i> <i>Total Sales</i>	<i>US</i> <i>Total Sales</i>
Dep Variable:	(1)	(2)	(3)	(4)	(5)	(6)
Financial Devt	-0.016 (-0.67)	-0.021 (-1.77)*	0.001 (0.21)	-0.015 (-0.84)	-0.012 (-2.54)**	0.000 (0.01)
Financial Devt x Ext Fin Depend	-0.007 (-3.09)***	0.004 (1.91)*	0.002 (1.62)	-0.004 (-2.49)**	0.003 (1.96)*	0.001 (0.81)
Controls	GDP, GDP per capita, Distance, K/L, H/L, Rule of Law, Tax Rate, Trade Agreement Dummies					
Country FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
# observations	159,164	159,164	159,164	159,164	159,164	159,164
R-squared	0.16	0.19	0.12	0.16	0.19	0.12

Notes: All regressions include year and industry fixed effects, as well as all country-level controls from Table 2. T-statistics based on robust standard errors clustered by host country reported in parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% level.

Table 9
Uncovering the Mechanism: Number of Host Country Establishments
(Affiliate-level evidence, 1989-2009)

Fin Devt Measure:	Private Credit / GDP				Stock Market Cap / GDP			
Dep Variable:	<i>Log # Firms in Host Ctry</i>	<i>Local Total Sales</i>	<i>3rd – ctry Total Sales</i>	<i>US Total Sales</i>	<i>Log # Firms in Host Ctry</i>	<i>Local Total Sales</i>	<i>3rd – ctry Total Sales</i>	<i>US Total Sales</i>
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Financial Devt	0.792 (6.82) ^{***}				0.236 (3.56) ^{***}			
Fitted Log # Firms in Host Ctry		-0.117 (-2.74) ^{***}	0.074 (2.76) ^{***}	0.015 (0.89)		-0.124 (-1.26)	0.080 (1.43)	0.016 (0.56)
Controls	GDP, GDP per capita, Distance, K/L, H/L, Rule of Law, Tax Rate, Trade Agreement Dummies							
Industry FE	--	Y	Y	Y	--	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
# observations	584	145,456	145,456	145,456	585	145,456	145,456	145,456
R-squared	0.71	0.09	0.16	0.08	0.69	0.09	0.16	0.08

Notes: All regressions include year fixed effects, industry fixed effects, and all other controls in Table 2. T-statistics based on robust standard errors clustered by host country reported in parenthesis. ^{***}, ^{**}, and ^{*} denote significance at the 1%, 5%, and 10% level.

Appendix Table 1
Summary Statistics: Host Country Financial Development

Country	Private Credit		Stock Mkt Cap		Country	Private Credit		Stock Mkt Cap		Country	Private Credit		Stock Mkt Cap	
	Mean	St Dev	Mean	St Dev		Mean	St Dev	Mean	St Dev		Mean	St Dev	Mean	St Dev
Algeria	0.15	0.16			Guatemala	0.21	0.08	0.01	0.00	Paraguay	0.22	0.05	0.03	0.01
Argentina	0.16	0.05	0.30	0.31	Guyana	0.43	0.08	0.20	0.03	Peru	0.17	0.08	0.35	0.39
Australia	0.82	0.23	0.93	0.40	Haiti	0.13	0.02			Philippines	0.29	0.10	0.51	0.23
Austria	0.99	0.10	0.24	0.20	Honduras	0.35	0.10	0.08		Poland	0.25	0.09	0.19	0.18
Bahrain	0.41	0.07	0.92	0.10	Hong Kong	1.43	0.14	3.10	1.62	Portugal	1.05	0.45	0.34	0.20
Bangladesh	0.28	0.06	0.04	0.04	Hungary	0.38	0.14	0.21	0.12	Qatar	0.29	0.04	0.78	0.64
Belgium	0.71	0.18	0.59	0.23	Iceland	0.88	0.76	1.36	0.72	Russia	0.19	0.12	0.42	0.46
Bolivia	0.41	0.13	0.13	0.07	India	0.30	0.09	0.55	0.63	Saudi Arabia	0.26	0.07	0.60	0.39
Botswana	0.14	0.04	0.24	0.21	Indonesia	0.33	0.13	0.25	0.17	Senegal	0.20	0.04		
Brazil	0.35	0.08	0.40	0.39	Iran	0.21	0.04	0.16	0.07	Singapore	0.92	0.12	1.61	0.45
Bulgaria	0.34	0.22	0.22	0.34	Ireland	1.01	0.59	0.60	0.10	Slovakia	0.41	0.07	0.07	0.01
Cameroon	0.12	0.07			Israel	0.71	0.14	0.63	0.48	Slovenia	0.44	0.22	0.29	0.34
Canada	0.96	0.24	0.94	0.44	Italy	0.71	0.18	0.35	0.18	South Africa	0.63	0.10	1.76	0.66
Chile	0.55	0.12	0.89	0.28	Jamaica	0.22	0.05	0.61	0.42	Spain	1.05	0.42	0.63	0.38
Colombia	0.30	0.07	0.21	0.17	Japan	1.49	0.41	0.84	0.23	Sri Lanka	0.23	0.08	0.15	0.06
Congo	0.06	0.05			Jordan	0.71	0.12	1.06	0.67	Sudan	0.04	0.02		
Costa Rica	0.22	0.12	0.10	0.04	Kenya	0.22	0.02	0.20	0.14	Sweden	0.69	0.35	0.93	0.38
Cote D'Ivoire	0.20	0.09	0.17	0.22	Kuwait	0.47	0.19	0.75	0.28	Switzerland	1.61	0.07	1.98	0.93
Croatia	0.61	0.13	0.42	0.31	Lebanon			0.24	0.23	Syria	0.09	0.01		
Cyprus	1.42	0.36	0.40	0.24	Luxembourg	1.24	0.47	1.89	1.49	Tanzania	0.09	0.05	0.04	0.02
Czech Republic	0.49	0.14	0.27	0.11	Malawi	0.07	0.02	0.08	0.04	Thailand	1.03	0.28	0.54	0.22
Denmark	0.97	0.70	0.52	0.22	Malaysia	1.09	0.22	1.64	0.54	Trinidad & Tobago	0.30	0.03	0.49	0.34
Dominican Rep	0.21	0.05			Malta	0.97	0.15	0.34	0.20	Tunisia	0.54	0.04	0.12	0.05
Ecuador	0.23	0.06	0.08	0.03	Mexico	0.19	0.06	0.30	0.13	Turkey	0.17	0.07	0.20	0.12
Egypt	0.38	0.12	0.36	0.34	Morocco	0.43	0.17	0.39	0.44	Uganda	0.05	0.02	0.01	0.00
El Salvador	0.35	0.09	0.19	0.12	Netherlands	1.24	0.43	0.97	0.39	United Kingdom	1.31	0.30	1.30	0.29
Finland	0.69	0.14	0.94	0.71	New Zealand	1.05	0.25	0.39	0.09	Uruguay	0.32	0.15	0.01	0.00
France	0.91	0.09	0.65	0.33	Norway	0.64	0.09	0.44	0.28	Venezuela	0.13	0.07	0.09	0.05
Gabon	0.11	0.04			Oman	0.34	0.04	0.23	0.11	Vietnam	0.51	0.28	0.07	0.09
Germany	1.05	0.10	0.41	0.19	Pakistan	0.24	0.02	0.20	0.13	Yemen	0.06	0.01		
Ghana	0.08	0.04	0.16	0.07	Panama	0.69	0.18	0.22	0.09	Zambia	0.07	0.03	0.13	0.08
Greece	0.50	0.24	0.41	0.32	Papua New Guinea	0.18	0.05	0.64	0.15					
Panel Variation:	0.51	0.44	0.56	0.68										

Notes: Private credit and stock market capitalization are both normalized by GDP.

Appendix Table 2
Cross-Sectoral Variation in External Finance Dependence
(Aggregate evidence, benchmark years only)

Fin Devt Measure:	Private Credit / GDP			Stock Market Cap / GDP		
	<i>Local</i>	<i>3rd – ctry</i>	<i>US</i>	<i>Local</i>	<i>3rd – ctry</i>	<i>US</i>
Dep Variable:	<i>Total Sales</i>	<i>Total Sales</i>	<i>Total Sales</i>	<i>Total Sales</i>	<i>Total Sales</i>	<i>Total Sales</i>
	(1)	(2)	(3)	(4)	(5)	(6)
Financial Devt	-0.083 (-3.32)***	0.037 (1.67)*	0.021 (3.29)***	-0.049 (-2.87)***	0.028 (2.17)**	0.012 (2.50)**
Financial Devt x Ext Fin Depend	-0.019 (-4.18)***	0.010 (3.21)***	0.002 (1.30)	-0.012 (-6.86)***	0.007 (3.40)***	0.001 (1.82)*
Controls	GDP, GDP per capita, Distance, K/L, H/L, Rule of Law, Tax Rate, Trade Agreement Dummies					
Industry FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
# observations	10,149	10,149	10,149	10,149	10,149	10,149
R-squared	0.21	0.24	0.15	0.21	0.24	0.15

Notes: All regressions include year and industry fixed effects, as well as all country-level controls from Table 2. T-statistics based on robust standard errors clustered by host country reported in parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% level.

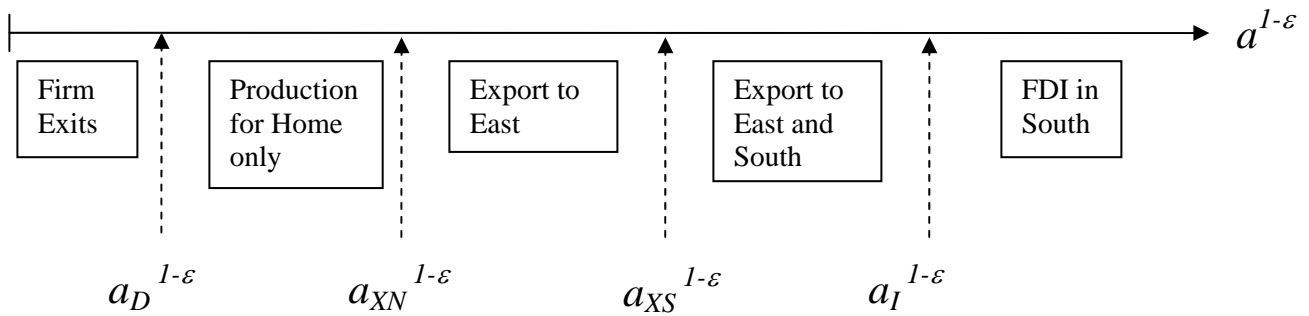
Appendix Table 3
Cross-Sectoral Variation in External Finance Dependence: Country Fixed Effects
(Aggregate evidence, benchmark years only)

Fin Devt Measure:	Private Credit / GDP			Stock Market Cap / GDP		
	<i>Local</i>	<i>3rd – ctry</i>	<i>US</i>	<i>Local</i>	<i>3rd – ctry</i>	<i>US</i>
Dep Variable:	<i>Total Sales</i>	<i>Total Sales</i>	<i>Total Sales</i>	<i>Total Sales</i>	<i>Total Sales</i>	<i>Total Sales</i>
	(1)	(2)	(3)	(4)	(5)	(6)
Financial Devt	-0.056 (-2.01)**	-0.016 (-1.44)	-0.001 (-0.19)	-0.030 (-1.20)	-0.011 (-1.98)*	0.008 (2.00)**
Financial Devt x Ext Fin Depend	-0.017 (-3.84)***	0.010 (3.14)***	0.001 (0.93)	-0.011 (-6.49)***	0.007 (3.32)***	0.001 (1.65)
Controls	GDP, GDP per capita, Distance, K/L, H/L, Rule of Law, Tax Rate, Trade Agreement Dummies					
Country FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
# observations	10,149	10,149	10,149	10,149	10,149	10,149
R-squared	0.27	0.30	0.18	0.27	0.30	0.18

Notes: All regressions include year and industry fixed effects, as well as all country-level controls from Table 2. T-statistics based on robust standard errors clustered by host country reported in parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% level.

Figure 1
Productivity Cutoffs and Industry Structure

In West:



In South:

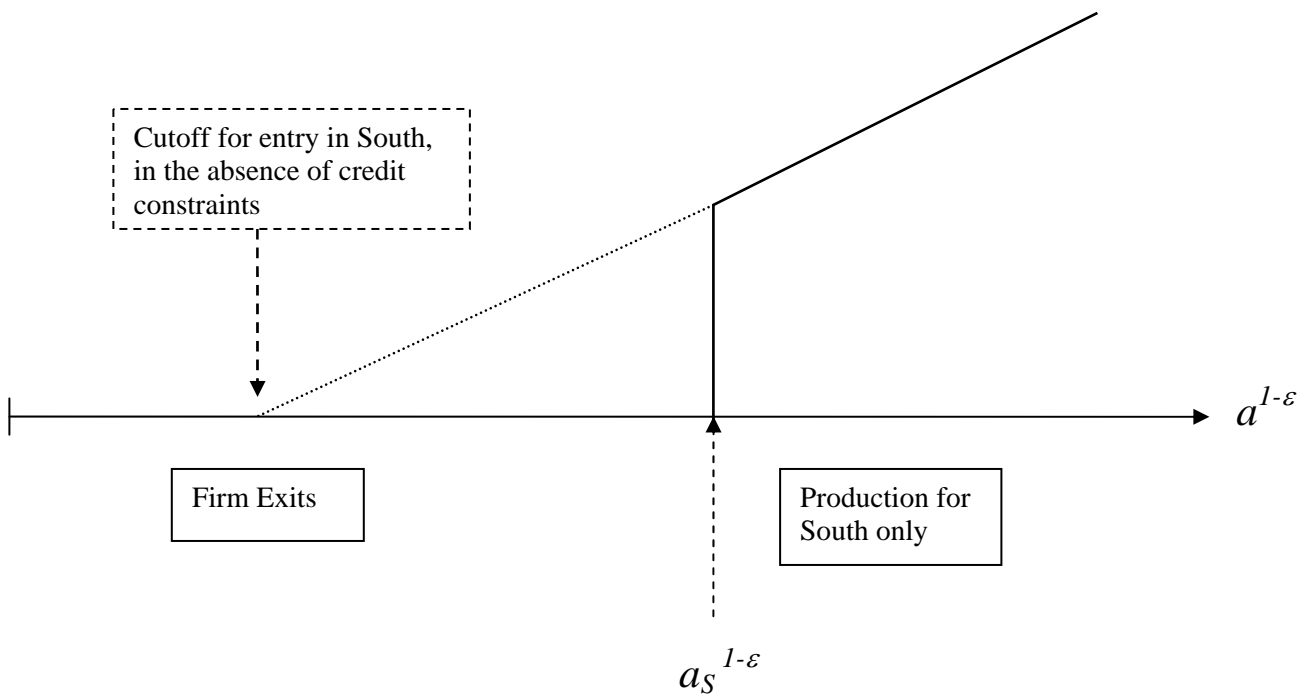


Figure 2a
Modes of Operation (illustrated for Western firms)

If $a^{1-\varepsilon} < a_I^{1-\varepsilon}$ (No FDI):

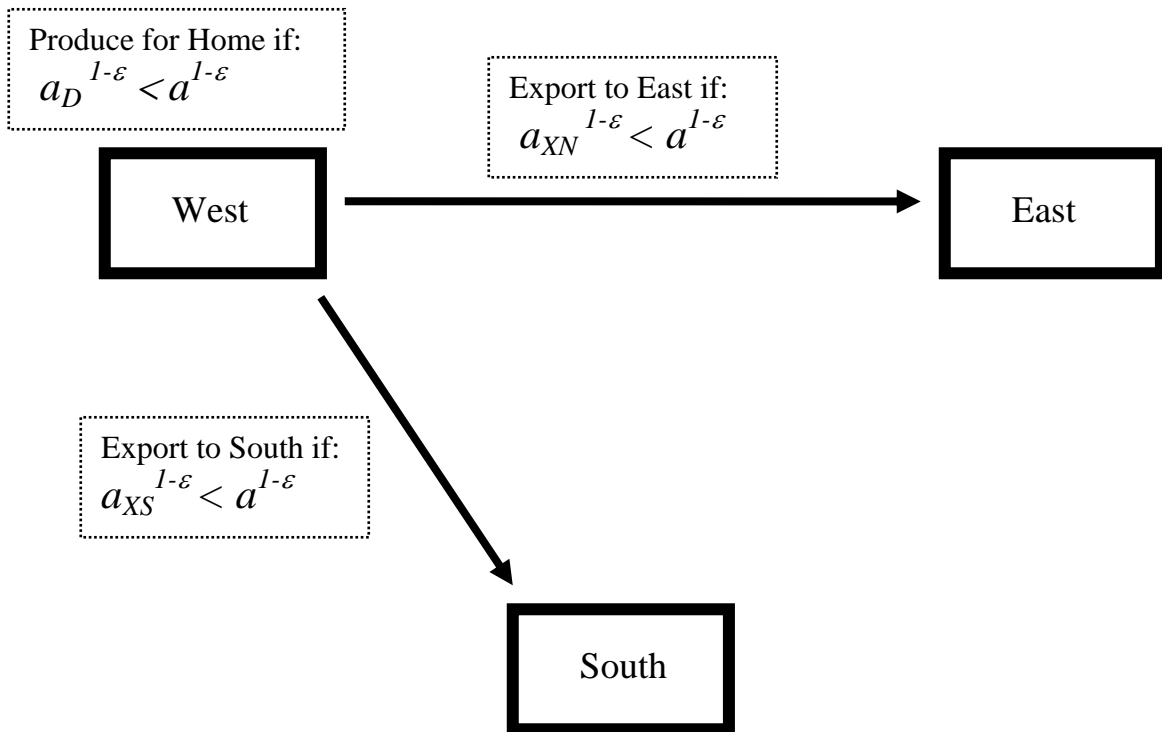


Figure 2b
Modes of Operation (illustrated for Western firms)

If $a^{1-\varepsilon} > a_I^{1-\varepsilon}$ (FDI in South):

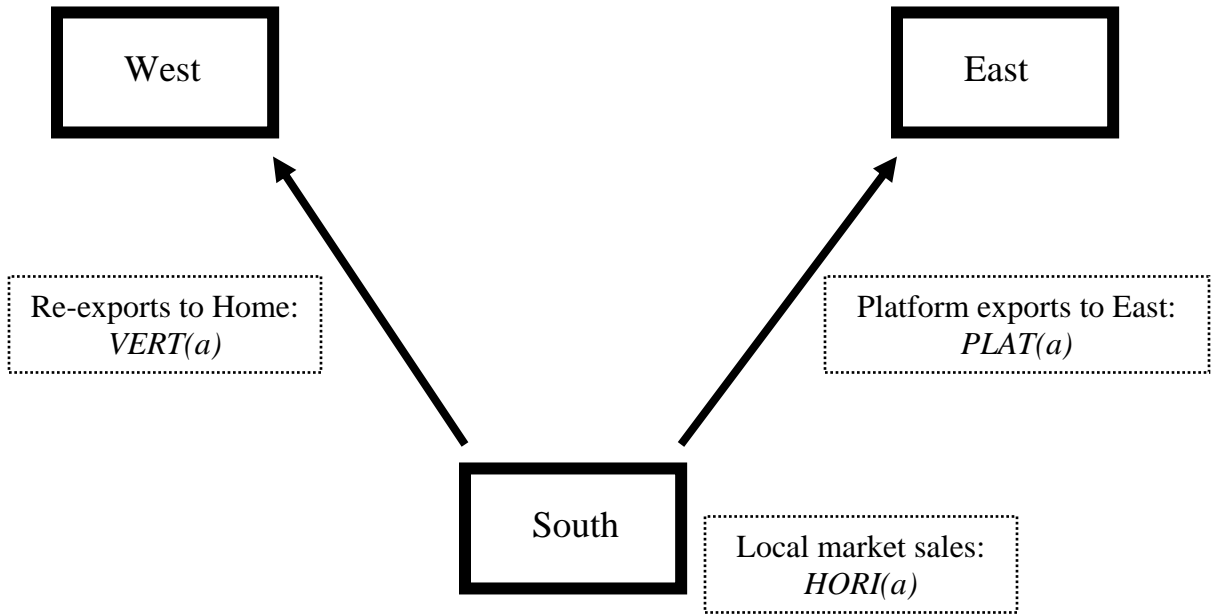
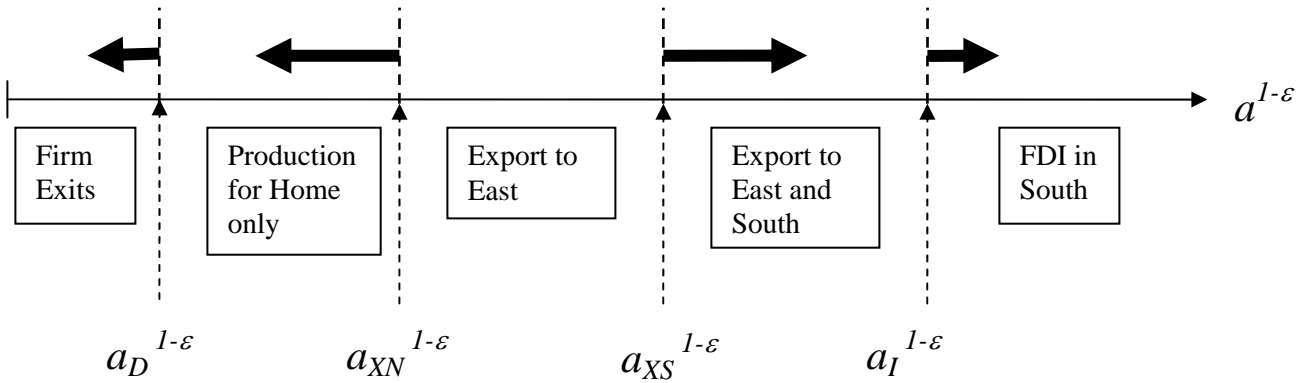


Figure 3
Response of Productivity Cutoffs and Industry Structure to
an Improvement in Southern Financial Development

In West:



In South:

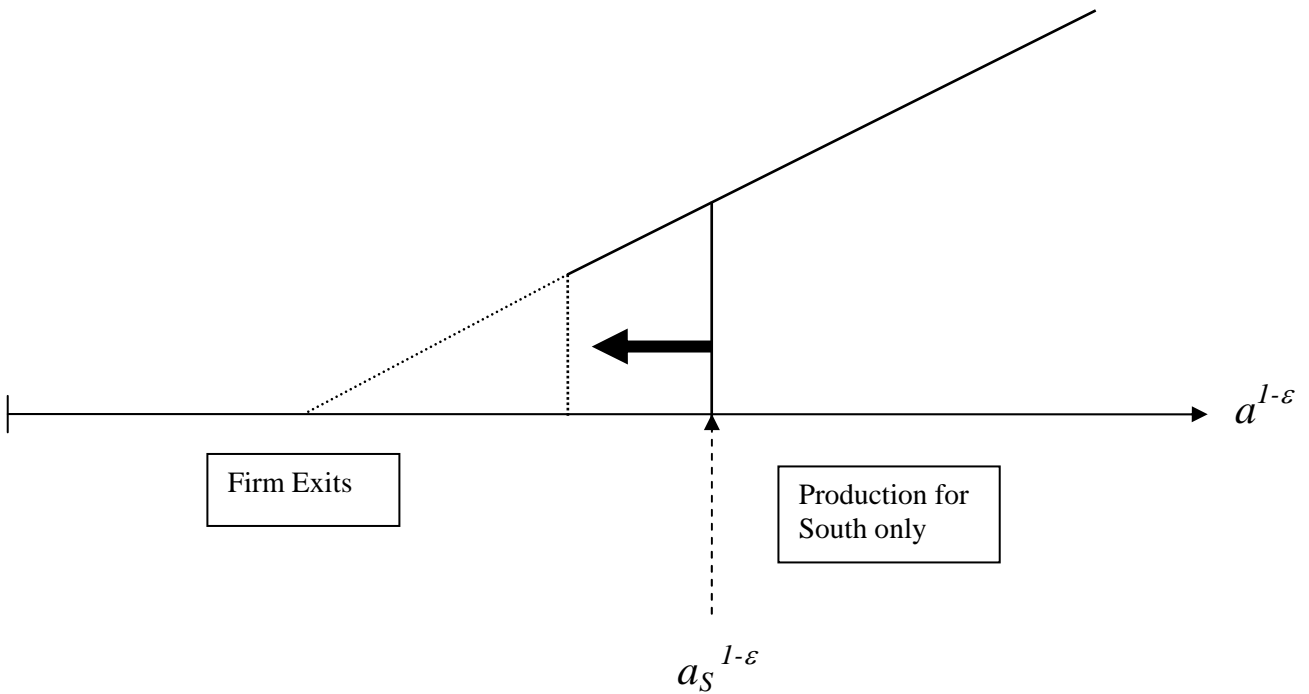


Figure 4
An Example: MNC Sales Shares in Host Countries with Different Levels of Financial Development

