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# Host-country financial development and multinational activity☆

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ABSTRACT

This paper evaluates the influence of host-country financial conditions on the global operations of multinational firms. Using detailed U.S. data, we establish that financial development in a country is associated with relatively more entry by multinational affiliates, as well as with higher aggregate affiliate sales to the local market, back to the U.S. and to third destinations, with these effects being more pronounced in financially more vulnerable sectors. At the level of individual affiliates, by contrast, these forces are associated with relatively lower local sales and higher return and third-country sales. Yet at both aggregate and affiliate levels, the share of local sales in total sales is smaller, while the shares of U.S. and third-country sales are both bigger. These empirical regularities hold when using fixed effects to account for unobserved differences across country-years, sectors, and parent firms. We show theoretically that these patterns are consistent with host-country financial development affecting multinationals' incentives for FDI through two channels: a *financing effect* that induces affiliate entry and expansion by improving their access to external finance, and a *competition effect* that reorients affiliate sales away from the local market due to increased entry by credit-constrained domestic firms.



## 1. Introduction

Multinational firms (MNCs) account for two-thirds of international trade and provide a key channel through which capital and technology flow across borders. They manage increasingly complex operations, basing offshore affiliates in multiple countries and serving multiple markets from each location through a combination of horizontal, vertical and export-platform FDI. However, these firms face exceptionally high fixed and sunk costs of foreign establishments. While MNCs could finance

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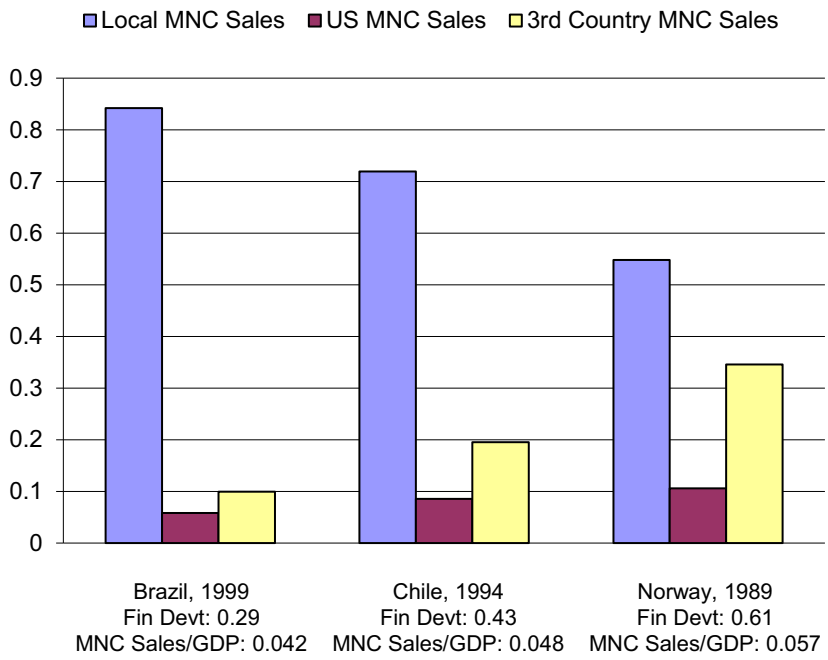


**Fig. 1.** An Example: MNC Sales Shares in Host Countries at Different Levels of Financial Development. *Notes:* This figure illustrates how the level and composition of aggregate MNC affiliate sales vary across three host countries at the 50th, 60th and 75th percentiles of the distribution of financial development. Financial Development is measured by the ratio of private credit to GDP.

these costs through both internal and global capital markets, in practice they receive significant funding for their affiliate activities in a given country from local sources external to the firm: Among the affiliates of U.S.-based multinationals, for example, nearly two-thirds of affiliate debt is raised in the host country, while U.S. headquarters hold only one-sixth. In fact, anecdotal evidence indicates that weak local capital markets can pose significant obstacles to firms seeking to establish an affiliate, while countries have engaged in financial reforms in part to stimulate the inflow of FDI.[1]

These observations suggest that multinational firms may be responsive to financial conditions in host economies, and raise the important question of how policy-makers can expect financial market reforms to influence inbound FDI. Two motivating facts indicate that host-country financial development might indeed shape the level and composition of MNC activity, and that the latter might in turn have implications for aggregate growth. First, looking at the pattern of U.S. multinational operations across three illustrative host countries and adjusting for market size, local financial development is associated with higher aggregate affiliate sales (see Fig. 1). At the same time, it is accompanied by a decline in the share of sales to the local economy and a rise in sales back to the U.S. and to third countries. Second, consistent with the idea that MNCs can stimulate growth, host countries that saw a bigger increase in U.S. MNC affiliate sales during 1989–2009 experienced faster GDP per capita growth over that period (see Appendix Fig. 1 and Appendix Table 1).[2] Host-country growth was also stronger when the share of affiliate sales to the local market expanded faster. While we view these relationships as suggestive correlations, they nevertheless indicate that the nature of FDI – whether it is horizontal, vertical and/or export-platform – can matter for the host economy; this could be due for example to the differential productivity spillovers from MNC subsidiaries to domestic firms in the same industry versus upstream or downstream industries, that has been documented in the literature.[3]

Motivated by these stylized facts, we provide evidence that the financial development of individual host countries is strongly associated with observable differences in the global operations of multinational affiliates. Using detailed data from the Bureau of Economic Analysis (BEA) on U.S.-based multinational firms during 1989–2009, we establish three sets of empirical regularities. First, countries with high levels of financial development attract more subsidiaries from the United States in sectors that require more external capital. Second, the distribution of affiliate sales across destination markets varies systematically with financial development. Stronger financial institutions in the host country are associated with higher

[1] The summary statistics on the breakdown of affiliate debt of U.S. multinationals is based on Feinberg and Phillips (2004), which we have corroborated in our own calculations. See also Section 4.2 for more motivating examples of the importance of host-country sources of financing for facilitating inward FDI.

[2] These patterns are documented using the public aggregate statistics from the BEA survey of U.S. multinational activity abroad. Appendix Table 1 documents that they hold when controlling for initial GDP per capita, or when instead considering non-overlapping five-year intervals.

[3] See for example (Javorcik, 2004) and (Javorcik and Spatareanu, 2009).

aggregate affiliate sales to the local market, the United States, and third destinations in financially more vulnerable sectors. At the level of the individual affiliate, by contrast, exports to the United States and to other markets increase, but local sales decline. Third, the share of affiliates' local sales in total sales falls faster with host-country financial development in financially more dependent sectors, while the shares of return and platform sales rise; these patterns hold at both the aggregate and the affiliate level.

To rationalize these empirical regularities, we present a stylized three-country model with heterogeneous firms, imperfect capital markets in the host country, and variation in external finance dependence across sectors. The model shows how host-country financial development can influence MNC activity through two channels. The first is the *competition effect*: In the presence of credit market frictions, an improvement in host-country financial conditions stimulates entry by credit-constrained domestic firms and thereby intensifies competition in the local product market. This discourages multinational affiliate presence, and conditional on survival, induces affiliates to sell less in the local market and to instead export more to the home and third-country markets. The second is the *financing effect*: Host-country financial development facilitates affiliates' use of host-country external finance and thus reduces their cost of operating there, even accounting for their access to global capital markets. This induces more affiliate entry and raises affiliate sales in the aggregate. Together, these two effects jointly explain why aggregate measures of affiliate activity can rise with host-country financial development, even while surviving affiliates decrease sales to the host market. Importantly, financial conditions exert stronger competition and financing effects on MNC activity in sectors that require more external finance.

Our model makes specific assumptions about the nature of capital market imperfections in order to transparently illustrate the competition and financing effects. In particular, we consider credit rationing in the host country that arises from endogenous default risk. We also switch the financing effect on and off, to compare the case where multinationals can perfectly arbitrage capital markets across borders to the case where they cannot due to cross-border frictions in international lending. As we note in Section 2, however, the same mechanisms will remain active and generate similar predictions for MNC activity under alternative micro-foundations for the source or type of credit frictions and in settings where MNCs can more flexibly choose how much host-country financing to use.

The U.S. BEA data reveal that the relationship between host-country financial development and multinational activity is of an economically significant magnitude. Comparing two industries at the $10^{th}$ and $90^{th}$ percentile by external finance dependence, improving a country's financial conditions from the $10^{th}$ to $90^{th}$ percentile is associated with 7.8% more MNC subsidiaries and 18.6% higher aggregate affiliate sales in the financially more vulnerable industry. Sales adjust differentially across markets, however, so that the share of affiliate sales to the host market falls by 2.8 percentage points more in the financially more sensitive sector, while the shares of exports to the United States and to third-country destinations rise by 2.1 and 0.7 percentage points more, respectively.

Our primary measure of financial development is the amount of bank credit to the private sector relative to host-country GDP. This is a standard measure in the literature which captures the actual availability of external finance and reflects the strength of underlying financial institutions and their ability to support financial contracting. This measure is moreover consistent with our stylized model, as we can show that it moves monotonically with the key model parameter that governs financial frictions. Our empirical results are robust nevertheless to using alternative measures of financial development related to institutional reforms of the financial sector, or to equity instead of debt financing (i.e., stock market capitalization).

We pursue several estimation strategies to establish the causal effect of host-country financial conditions on multinational activity. First, we exploit the variation in external finance dependence across sectors, in the spirit of Rajan and Zingales (1998). The premise of this approach is that sectors' technologically-determined reliance on outside capital defines firms' sensitivity to credit availability, but less so to general institutional or economic conditions. We thus identify the differential effects that financial development exerts in financially more sensitive sectors, an approach that is more immune to endogeneity concerns that may bias its level effects. Second, we condition on a full set of country-year pair fixed effects, as well as sector fixed effects in specifications for aggregate FDI patterns and parent-firm fixed effects in regressions for individual affiliate outcomes. These fixed effects absorb various observed and unobserved supply- and demand-side factors other than financial conditions that may influence MNC behavior, as well as differences in firm characteristics. Third, we provide a series of sensitivity analyses that establish the robustness of the results. We find consistent patterns when using alternative measures of host-country financial development and sector financial dependence, when controlling for potentially differential effects of financial development based on sector or firm characteristics that are not directly related to financial frictions, and when performing checks on various subsamples. Finally, we present complementary evidence from affiliates' observed financing practices and for the level effects of host-country financial conditions in an average sector that further support our main conclusions.

This paper contributes to several active literatures. It advances a large body of work on the impact of financial frictions on firm operations. Evidence indicates that financial development improves aggregate growth by increasing entry by credit-constrained firms, as well as by encouraging technology adoption and expansion along the intensive margin (Aghion et al., 2007; Beck, 2003; Beck et al., 2005; Hsu et al., 2014; King and Levine, 1993; Rajan and Zingales, 1998). Financial reforms also raise firms' export participation and aggregate export volumes, with effects concentrated among small firms and in sectors relatively reliant on external capital (Manova, 2008; 2013). Financial crises distort trade by tightening credit by affected banks, while international bank linkages increase bilateral trade (Amiti and Weinstein, 2011; Caballero et al., 2018). We incorporate these insights into our analysis, and consider their implications for multinational firms' activity across countries at different levels of financial development.

We also extend a related line of research on the role of home- and host-country financial conditions for FDI.[4] Overall, multinational affiliates tend to be less constrained and thus more responsive to growth opportunities than domestic firms (Desai et al., 2008; Manova et al., 2015). Although MNCs have been shown to use internal and external capital markets opportunistically to minimize their overall cost of capital, they nevertheless face frictions that prevent them from perfectly arbitraging differences in the cost of external capital across countries. In particular, MNCs raise outside finance in the host economy when possible, and access capital markets abroad or obtain direct financing from the parent company otherwise.

However, parent funding does not fully compensate for the shortfall in local financing in hosts with weak financial systems, such that local financial conditions do influence the scale of MNC operations. For example, Feinberg and Phillips (2004) report that during 1983–1996, close to two-thirds of the debt of U.S. MNC subsidiaries abroad was raised locally, while funding from the parent company accounted for an additional 16%. Moreover, Desai et al. (2004) and Antràs et al. (2009) find that U.S. MNC affiliates use less external debt in host economies with lower levels of private credit and weaker creditor rights protection. Conversely, in such environments, U.S. MNC parents finance a bigger share of affiliate assets and hold a higher share of affiliate equity. Nevertheless, Desai et al. (2004) estimate that parent debt substituted for only three-quarters of the reduction in external borrowing induced by weak local credit markets. In addition, Feinberg and Phillips (2004) argue that MNCs operating in countries with weaker financial markets and more restrictions on FDI are less able to reallocate activity across their affiliates in response to differential growth shocks. More broadly, there is good evidence that deeper financial markets and more international banks from the home country support more outward FDI activity, but also host-country bank financing and bank deregulation encourage inward FDI (Kandilov et al., 2017; Klein et al., 2002; Poelhekke, 2015; Raff et al., 2018); that host-country financing conditions can affect the incidence of affiliate entry or acquisition in turn suggests that some component of local financing needs is associated with fixed FDI costs. We build on this earlier work by exploring how financial conditions in a host economy can shape the global operations of multinational firms by influencing their access to local capital, as well as where they produce and sell their goods. We thus consider not only MNCs' financing practices, but also their entry and sales decisions. Our findings suggest that credit market frictions in a host country can forestall the entry of less productive prospective multinationals and affect the sales composition of active multinationals.[5,6]

Our paper is also related to recent studies of multinational firms' complex global strategies. For example, Ramondo et al. (2016) analyze the importance of horizontal, vertical and export-platform motives for U.S. multinationals. This literature has developed models that accommodate hybrid activities and deliver empirically testable predictions for trade flows and multinational operations (Arkolakis et al., 2018; Irarrazabal et al., 2013; Markusen and Venables, 2007; Ramondo and Rodríguez-Clare, 2013; Tintelnot, 2017; Yeaple, 2003a; 2003b).[7] Our work speaks to the relative importance of these three FDI motives: One interpretation of our findings is that stronger financial institutions in the host nation reduce the incentives to pursue FDI for horizontal motives, and instead favor vertical and export-platform motives.[8]

Finally, the competition effect we highlight relates to prior work on the interaction between foreign affiliates and domestic firms in FDI host countries. Multinationals may crowd out local producers by raising competition (Aitken and Harrison, 1999; De Backer and Sleuwaegen, 2003), but they can also generate productivity spillovers and nudge indigenous companies to remove X-inefficiencies, especially when local financial markets are strong (Alfaro et al., 2004; Haskel et al., 2007).[9] This literature has identified knowledge spillovers through labor turnover, improvements in the provision of intermediate inputs, and productivity spillovers to domestic firms in the same industry or upstream/downstream from foreign affiliates (Arnold et al., 2011; Javorcik, 2004; Javorcik and Spatareanu, 2009; Poole, 2013).[10] While this line of research has primarily emphasized the implications of FDI for the host economy, we also point out how local financial development and increased competition by domestic firms can affect the activity of foreign multinationals.

The rest of the paper proceeds as follows. Section 2 develops the theoretical framework and introduces the competition and financing effects of host-country financial development on multinational activity. Sections 3 and 4 outline the estimation

[4] See Foley and Manova (2015) for a detailed review.

[5] Firms that offshore production abroad may also have an incentive to integrate their foreign supplier (and thus become multinational) if the latter faces credit constraints due to weak local financial markets (Antràs et al., 2009; Bustos, 2007; Carluccio and Fally, 2012). Conversely, financially constrained firms are less likely to choose horizontal FDI over direct exporting because of the higher associated fixed costs (Buch et al., 2009).

[6] Our analysis also contributes to research on the impact of broader institutional frictions on FDI. While we focus on financial institutions, other recent studies have emphasized the effects of contractual imperfections, investor protection laws, and intellectual property rights on multinational activity (Antràs, 2003; Antràs and Chor, 2013; Bénassy-Quéré et al., 2007; Bernard et al., 2010; Bilir, 2014; Branstetter et al., 2006). Similar to Antràs and Caballero (2009), our approach emphasizes the equilibrium interaction between FDI and trade flows in the presence of financial frictions.

[7] Yeaple (2013), Chapter 3, reviews the growing literature on hybrid models of FDI. It is conceptually challenging to write down a tractable multi-country model that simultaneously accommodates horizontal, vertical and export-platform FDI, due to the large number of combinatorial possibilities that a multinational firm faces in such a general setting.

[8] See also Fillat et al. (2015) who demonstrate that the spatial dimension of U.S. MNC affiliate activity is consistent with risk diversification motives.

[9] By X-inefficiencies, we mean any deviations in firm behavior from what would be optimal under profit maximization. These may arise due to rational or irrational factors such as principal-agent problems or behavioral bias, respectively.

[10] See also Alvarez (2019), who indicates that multinational entry can directly increase aggregate productivity even in the absence of technological spillovers to domestic firms, as the former are on average more productive than the latter.

strategy and the data used. Sections 5 and 6 report the main empirical findings and a series of sensitivity analyses. The last section concludes.

## 2. Model: two effects of host-country financial development

We develop a model of FDI with heterogeneous firms which demonstrates how financial market frictions in the FDI host country affect the entry and sales decisions of multinational affiliates. The model builds on Helpman et al. (2004) and Grossman et al. (2006), so we will be succinct when presenting the set-up, while also relegating all proofs and extensions to an Online Appendix. We focus instead on the model's novel predictions for the competition and financing effects of host-country financial development.

### 2.1. Economic environment

Consider a world comprised of three countries, West, East, and South. This provides a parsimonious baseline setting to examine key features of affiliate activity and specifically the composition of affiliate sales – to the local market, back to the home country, and to third-country markets.

There are $K+1$ industries, indexed by $k = 0, 1, \ldots, K$, active in each country. Labor is the only factor of production. Sector 0 is a constant returns-to-scale, homogeneous-good sector; this good is freely tradable across borders, and thus serves as the global numeraire. On the other hand, the industries indexed by $k = 1, \ldots, K$ each feature a continuum of differentiated varieties manufactured by heterogeneous firms, as in Melitz (2003). These $K$ industries differ in their underlying fixed costs of production, as well as the degree to which these fixed costs need to be financed externally.

To facilitate analytical derivations, we assume that West and East are symmetric in their economic structure. However, South is less productive in the homogeneous-good sector than West and East: While $1/\omega$ workers are needed to make each unit of the numeraire in South (where $\omega < 1$), only 1 worker is required in West and East. The labor force in each country is sufficiently large, so that a strictly positive amount of the homogeneous good is produced in equilibrium. The nominal wage in West and East is thus 1, while the wage in South is $\omega$, so firms manufacturing in South face lower production costs.[11]

The utility function of the representative consumer in each country is two-tiered, with the upper tier being Cobb-Douglas over consumption from the $K+1$ industries. The sub-utility for each heterogeneous-firms industry ($k \in \{1, \ldots, K\}$) is in turn a CES aggregate over varieties. We denote by $x_{ij}^k(a)$ the quantity of an industry-$k$ variety (indexed by $a$) consumed in country $i$ that originates from a country-$j$ firm. The demand in country $i$ for this variety is thus: $x_{ij}^k(a) = A_{ij}^k (p_{ij}^k(a))^{-\varepsilon^k}$, where $p_{ij}^k(a)$ is its price, and $\varepsilon^k > 1$ is the constant elasticity of substitution in the industry.[12] We further assume that Southern varieties do not enter into utility in West and East, so that $A_{es} = A_{ws} = 0$; this simplifies the analysis, but does not detract from the general nature of our main effects.[13]

Consider the heterogeneous-firms industry $k$ in country $j$. Upon paying a fixed entry cost, each entrant draws a unit labor requirement $a$ for producing its distinct variety, from a technology distribution $G_j^k(a)$. After observing its productivity $1/a$, each firm chooses whether to incur additional fixed operating costs in order to: (i) commence production for its home market; (ii) export to foreign markets; and/or (iii) pursue FDI. We assume that all firms require external capital to cover a fraction $\phi^k \in [0, 1]$ of each of these fixed operating costs upfront. Such a need may arise for example when management has limited control rights over revenues, must instead distribute them as dividends or profits to stakeholders, and hence cannot retain sufficient earnings to fund future outlays. Following Rajan and Zingales (1998), we view $\phi^k$ as a parameter that is pinned down by the nature of the production technology in the industry, which gives rise to variation in the demand for external financing across sectors.

To highlight the role of credit market imperfections in the FDI host country, we assume that financial frictions affect external financing in South, but not in West and East.[14] Southern firms are therefore more credit constrained than Western and Eastern producers; this generates the competition effect when financial development in South improves. Although Western and Eastern firms are not credit constrained in their home-country operations, they may or may not be able to fund their multinational affiliates abroad in full; the financing effect will emerge precisely under the latter scenario.

### 2.2. Firm decisions and industry equilibrium

*West and East*: We consider the decisions made by an industry-$k$ firm with unit cost draw $a$ that is headquartered in West; the decision problem for firms from East is symmetric. We drop the superscript $k$ below to ease the notation, but all key parameters, including the various fixed costs, are allowed to vary across industries. If the firm commences production

[11] We consider the case of endogenous wages in South in an extension in the Online Appendix.

[12] The full expressions for the utility functions and the aggregate demand terms $A_{ij}^k$ are presented in the Online Appendix. In particular, the $A_{ij}^k$'s are familiar functions of country expenditure on industry-$k$ varieties and a CES price index.

[13] We consider the case where South can export its varieties to West and East in the Online Appendix.

[14] The key feature here is the presence of financial frictions in the FDI host country; whether or not such frictions are also present but weaker in West and East is not essential for the results.

for the home economy, it would incur a per-period fixed cost of $f_D$ units of Western labor. The firm also considers whether to export to East, South, or both markets. Exporting to each of these foreign markets entails an upfront, per-period fixed cost of $f_X$ units of Western labor and an iceberg transport cost, $\tau > 1$. Under CES utility, firms charge a constant markup over marginal cost, so that the home price for a Western variety is $p_{ww}(a) = a/\alpha$, and its price when exported is $p_{ew}(a) = p_{sw}(a) = \tau a/\alpha$.

While a fraction $\phi$ of the fixed costs, $f_D$ and $f_X$, need to be covered using external sources of finance, the cost of this borrowing for firms in West is low, in line with the assumption that credit markets in West are frictionless. To ease the exposition, we set the cost of external financing equal to the internal cost of financing, and normalize this interest rate to 1. It should be emphasized that all results below hold so long as the cost of outside capital in West is sufficiently low and close to 1, even if it does not exactly equal the cost of internal funds. When we turn to Southern firms later, we will instead assume that their external financing cost is strictly greater than 1 as credit markets are under-developed there. With this structure, one can show that the profits of a Western firm from domestic sales in West, from exporting to East, and from exporting to South are respectively: $\pi_D(a) = (1-\alpha)A_{ww}(a/\alpha)^{1-\varepsilon} - f_D$, $\pi_{XN}(a) = (1-\alpha)A_{ew}(\tau a/\alpha)^{1-\varepsilon} - f_X$, and $\pi_{XS}(a) = (1-\alpha)A_{sw}(\tau a/\alpha)^{1-\varepsilon} - f_X$.

Each Western firm can further consider whether to become a multinational by locating its production abroad. This would allow the firm to save on shipping costs on sales to the FDI host country, and would moreover lower its wage costs if it sets up an affiliate in South. An affiliate can be used not only to supply the host country, but also to export back to West or to the third-country market; we refer to these as local, return, and export platform sales, respectively. Affiliate exporting incurs the same fixed and variable trade costs to each market as above, $f_X$ and $\tau$. Each foreign affiliate also bears a per-period fixed cost of $f_I$ units of Western labor, of which a fraction $\phi$ needs to be financed externally.

The presence of financial frictions in South implies that the cost of obtaining capital there exceeds that in West. A Western multinational would thus have no incentive to raise capital in South as long as Western financiers are willing to fully fund $\phi f_I$. We assume first that Western firms are able to fund all affiliate operations with credit obtained in West, and relax this later in Section 2.4.

Western firms face a wide array of options for their export-versus-FDI decision over the three markets; for this reason, multi-country models of FDI with export platforms are analytically complex (Arkolakis et al., 2018; Yeaple, 2003a; 2003b; 2013). To illustrate the effects of interest as transparently as possible, we focus on the case where Western multinationals: (i) locate affiliates only in South; and (ii) use the Southern plant as a production center for serving all three markets. We show in the Online Appendix that two conditions are sufficient to guarantee that this will in fact be the optimal FDI strategy: $\tau\omega < 1$ and $f_X < f_D < f_I$. Intuitively, fixed export costs, Southern wages, and trade costs must be low enough for MNCs to use South as their global production and export center. The fixed cost of FDI also needs to be sufficiently high so that the Western firm would not set up affiliates in both East and South.[15] Under these parameter conditions, and taking into account the revenues and fixed costs in all three markets, profits from FDI in South by a Western firm are:

$$\pi_I(a) = (1-\alpha)A_{sw}\left(\frac{a\omega}{\alpha}\right)^{1-\varepsilon} + (1-\alpha)(A_{ww}+A_{ew})\left(\frac{\tau a\omega}{\alpha}\right)^{1-\varepsilon} - (f_I + 2f_X). \tag{2.1}$$

Firms in the industry sort into different modes of activity depending on their productivity draw. By setting profits in $\pi_D(a)$, $\pi_{XN}(a)$, and $\pi_{XS}(a)$ to zero, we obtain the cut-offs above which production for the home market, exporting to East, and exporting to South would respectively be pursued:

$$a_D^{1-\varepsilon} = \frac{f_D}{(1-\alpha)A_{ww}(1/\alpha)^{1-\varepsilon}}, \quad a_{XN}^{1-\varepsilon} = \frac{f_X}{(1-\alpha)A_{ew}(\tau/\alpha)^{1-\varepsilon}}, \text{ and } \quad a_{XS}^{1-\varepsilon} = \frac{f_X}{(1-\alpha)A_{sw}(\tau/\alpha)^{1-\varepsilon}}.$$

A fourth cut-off, $a_I$, delineates when FDI is feasible. Becoming a multinational is more profitable than basing production in West when $\pi_I(a) > \pi_D(a) + \pi_{XN}(a) + \pi_{XS}(a)$. The FDI cut-off is thus:

$$a_I^{1-\varepsilon} = \frac{f_I - f_D}{(1-\alpha)[A_{ww}((\frac{\tau\omega}{\alpha})^{1-\varepsilon} - (\frac{1}{\alpha})^{1-\varepsilon}) + A_{ew}((\frac{\tau\omega}{\alpha})^{1-\varepsilon} - (\frac{\tau}{\alpha})^{1-\varepsilon}) + A_{sw}((\frac{\omega}{\alpha})^{1-\varepsilon} - (\frac{\tau}{\alpha})^{1-\varepsilon})]}, \tag{2.2}$$

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

We focus on an industry equilibrium in which $0 < a_D^{1-\varepsilon} < a_{XN}^{1-\varepsilon} < a_{XS}^{1-\varepsilon} < a_I^{1-\varepsilon}$, where $a^{1-\varepsilon}$ acts as a proxy for firm productivity.[16] This sorting of Western firms across production modes is in line with prior evidence that exporters tend to be more productive than non-exporters, while multinationals are on average more productive than either (e.g., Helpman et al., 2004). Firms with $a^{1-\varepsilon} < a_I^{1-\varepsilon}$ base their production activity in West, and export to East and possibly also to South if they are productive enough. The most efficient firms with $a^{1-\varepsilon} > a_I^{1-\varepsilon}$ instead become multinationals; while still headquartered in West, these firms locate production in South and serve all three markets from there.

*Credit constraints in South*: Southern firms in each differentiated-varieties industry produce only for domestic consumption. Each Southern firm needs to engage $f_S$ units of Southern labor in order to commence production in a given period; as in West and East, the firm requires external capital to cover a fraction $\phi$ of this fixed cost. Its per-period expense on fixed

[15] The Online Appendix also shows how our insights can extend to a setting with multiple potential FDI host countries.

[16] The Online Appendix discusses the parameter conditions that need to be satisfied for this ordering of cut-offs to hold.

costs is thus $(R\phi + (1-\phi))f_S\omega$, where $R$ is the gross interest rate of external finance in South. We assume $R > 1$, reflecting the higher cost of outside capital in South relative to the internal cost of funds (which has been normalized to 1).[17] Per-period operating profits are thus: $(1-\alpha)A_{ss}(a\omega/\alpha)^{1-\varepsilon} - (R\phi + (1-\phi))f_S\omega$.

Unlike in West and East, firms headquartered in South face credit constraints due to weak institutions that leave lenders exposed to unprotected default risk, as in Aghion et al. (2005).[18] Although lenders observe firms' productivity, borrowers could opt to default on repayment. Default, however, incurs a pecuniary cost equal to a fraction $\eta \in [0, 1]$ of the firm's appropriable profits, associated with actions taken to shield the firm's financial resources from creditors. The parameter $\eta$ therefore captures the degree of financial development in South: When credit institutions are stronger, $\eta$ is higher and it is more costly for firms to hide their profits. For simplicity, we take appropriable profits to be the firm's variable profits. A Southern firm with unit cost $a$ would thus default if and only if the implied profit loss is smaller than the cost of repayment: $\eta(1-\alpha)A_{ss}\left(\frac{a\omega}{\alpha}\right)^{1-\varepsilon} < R\phi f_S\omega$. Assuming that lenders can observe firms' productivity, this implies a threshold $(a_S^{credit})^{1-\varepsilon}$ above which Southern firms can credibly commit against default and raise the external finance they require, where:

$$(a_S^{credit})^{1-\varepsilon} = \frac{1}{\eta}\frac{R\phi f_S\omega}{(1-\alpha)A_{ss}(\omega/\alpha)^{1-\varepsilon}}. \tag{2.3}$$

At the same time, a Southern firm would not commence operations unless its per-period profits are positive. This would hold for firms whose productivity exceeds $(a_S^{profit})^{1-\varepsilon}$, where:

$$(a_S^{profit})^{1-\varepsilon} = \frac{(R\phi + (1-\phi))f_S\omega}{(1-\alpha)A_{ss}(\omega/\alpha)^{1-\varepsilon}}. \tag{2.4}$$

The relevant productivity cut-off for Southern firms to commence production is therefore:

$$(a_S)^{1-\varepsilon} = \max\left\{(a_S^{credit})^{1-\varepsilon}, (a_S^{profit})^{1-\varepsilon}\right\}. \tag{2.5}$$

In order for financial frictions to have a binding effect, we shall assume that $(a_S^{credit})^{1-\varepsilon} > (a_S^{profit})^{1-\varepsilon}$, so that $a_S = a_S^{credit}$. There is thus a margin of potential Southern firms – with productivity below $(a_S^{credit})^{1-\varepsilon}$ but above $(a_S^{profit})^{1-\varepsilon}$ – that would earn positive profits if granted credit, but are unable to given the risk of default.[19] From (2.3) and (2.4), the inequality $(a_S^{credit})^{1-\varepsilon} > (a_S^{profit})^{1-\varepsilon}$ simplifies to: $R\frac{\phi}{1-\phi} > \frac{\eta}{1-\eta}$. Credit constraints thus bind when external finance dependence $\phi$ is sufficiently high. In contrast, credit would not be rationed when $\eta = 1$ regardless of the industry's reliance on external finance, which corresponds to the situation in West and East.

We show in the Online Appendix that with the above formulation, the aggregate amount of credit extended to firms in the Southern economy as a share of total production is increasing in $\eta$. This validates our later use of an empirical measure of private credit to GDP to capture financial development.

*Industry equilibrium*: We close the model with free entry conditions in each industry $k$ for each country $j$. As is standard in the literature, we assume that productivity $1/a$ is Pareto distributed with shape parameter $\kappa$ and support $[1/\bar{a}_j, \infty)$.[20] To save space, we spell out the free-entry conditions and the full system of equations that pins down the industry equilibrium in the Online Appendix. Our main interest is in five dimensions of MNC activity: affiliate entry, affiliate-level sales and their breakdown by destination market, and aggregate MNC sales and their breakdown by destination market.

*Outcomes of interest*: Let $N_n$ denote the measure of firms and $G_n(a)$ the cdf of productivity draws in West. The measure of Western multinational firms (with $a^{1-\varepsilon} > a_I^{1-\varepsilon}$) then equals $N_n\int_0^{a_I} dG_n(a) = N_nG_n(a_I)$. For a given affiliate in South with productivity $1/a$, sales to the local market are $HOR(a) \equiv A_{sw}(a\omega/\alpha)^{1-\varepsilon}$. We refer to these as horizontal sales, since they allow the MNC to avoid transport costs while serving the Southern market. Export-platform sales to third-country destinations (here East) are defined as $PLA(a) \equiv A_{ew}(\tau a\omega/\alpha)^{1-\varepsilon}$. Finally, return sales back to the home market (here West) are $RET(a) \equiv A_{ww}(\tau a\omega/\alpha)^{1-\varepsilon}$. The affiliate's total sales are $TOT(a) \equiv HOR(a) + PLA(a) + RET(a)$. Integrating affiliate-level sales over all Western multinationals, the aggregate levels of horizontal, platform, and return sales are respectively: $HOR \equiv N_nA_{sw}(\omega/\alpha)^{1-\varepsilon}V_n(a_I)$, $PLA \equiv N_nA_{ew}(\tau\omega/\alpha)^{1-\varepsilon}V_n(a_I)$, and $RET \equiv N_nA_{ww}(\tau\omega/\alpha)^{1-\varepsilon}V_n(a_I)$, where $V_n(a_I) \equiv \int_0^{a_I} a^{1-\varepsilon}dG_n(a)$.

It follows that the affiliate sales shares across the three markets are given by:

$$\frac{HOR(a)}{TOT(a)} = \frac{HOR}{TOT} = \left(1 + \tau^{1-\varepsilon}\frac{A_{ew}}{A_{sw}} + \tau^{1-\varepsilon}\frac{A_{ww}}{A_{sw}}\right)^{-1}, \tag{2.6}$$

$$\frac{PLA(a)}{TOT(a)} = \frac{PLA}{TOT} = \left(1 + \tau^{\varepsilon-1}\frac{A_{sw}}{A_{ew}} + \frac{A_{ww}}{A_{ew}}\right)^{-1}, \quad \text{and} \tag{2.7}$$

[17] One can view $R$ as the gross interest rate set exogenously by financiers in a large international capital market, at which they are willing to provide capital to firms producing in South.

[18] We consider endogenous default risk that generates credit rationing, but similar results would obtain under other microfoundations for credit rationing such as imperfect contract enforcement or collateral constraints, or under financial frictions that inflate the cost of capital without credit rationing.

[19] This is consistent with evidence that smaller firms generally have less access to external finance (Guiso et al., 2004).

[20] Note that the model can accommodate differences in $\kappa$ and $\bar{a}_j$ across industries $k$.

$$\frac{RET(a)}{TOT(a)} = \frac{RET}{TOT} = \left(1 + \tau^{\varepsilon-1}\frac{A_{sw}}{A_{ww}} + \frac{A_{ew}}{A_{ww}}\right)^{-1}. \tag{2.8}$$

### 2.3. The competition effect

We now study how MNC activity responds to host-country financial development (as captured by an increase in $\eta$), as well as how this response varies across industries that differ in their dependence on external finance (as reflected in $\phi$). In this subsection, we first establish a *competition effect*, under the baseline assumption that foreign subsidiaries do not require financing from host-country sources.

Improvements in financial institutions in South have a direct effect on the industry equilibrium in that country. When $\eta$ rises, the higher cost of default alleviates the moral hazard problem, and hence more Southern firms gain access to credit. This lowers the productivity cut-off for commencing production, $a_S^{1-\varepsilon}$, as illustrated in the bottom panel of Fig. 2. However, the free-entry condition requires that the expected profitability of a Southern firm remain constant. Average demand for each Southern product, $A_{ss}$, must subsequently fall. In sum, we have:

**Lemma 1.** *(i)* $\frac{da_S}{d\eta} > 0$; *and (ii)* $\frac{dA_{ss}}{d\eta} < 0$.

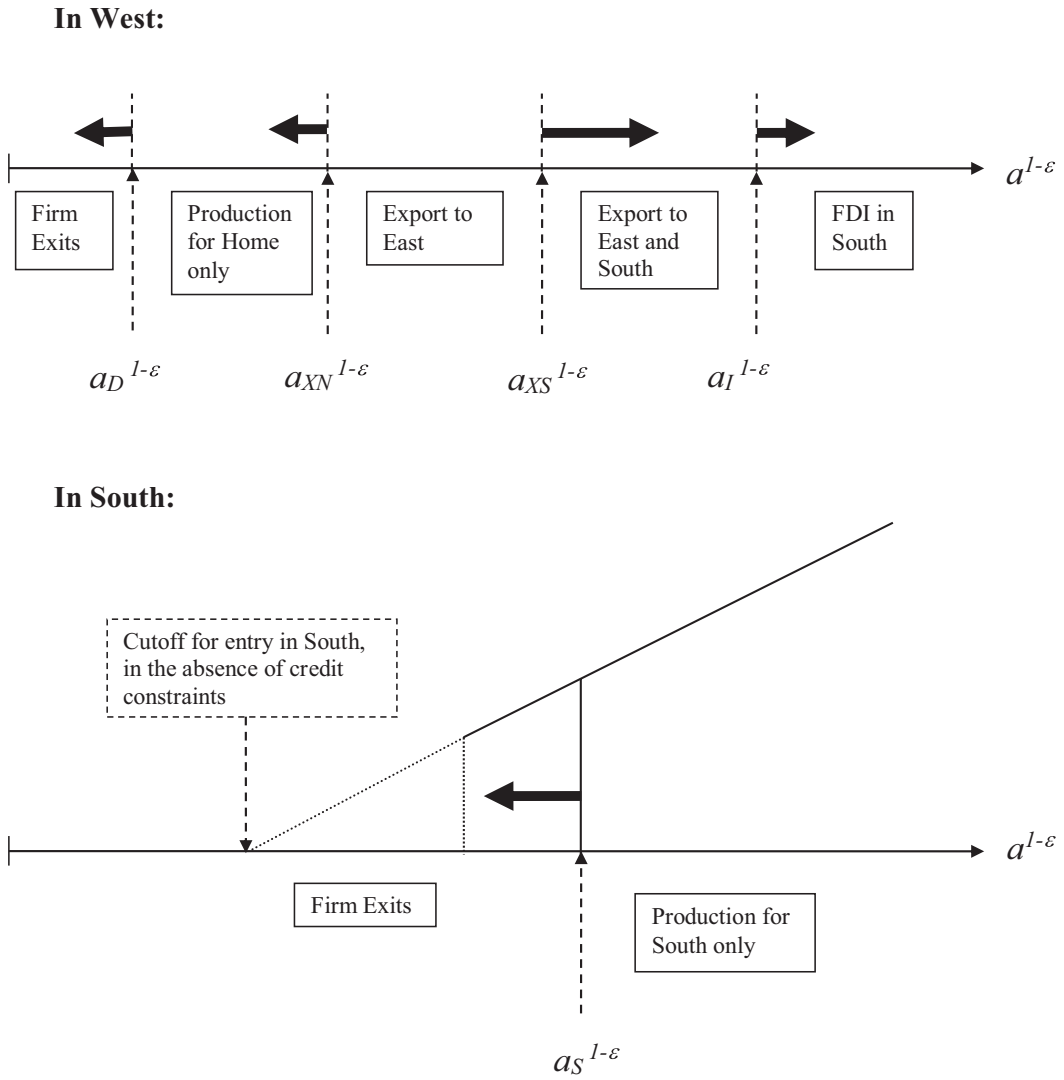


**Fig. 2.** Response of cutoffs to an improvement in Southern financial development: competition effect and weak or no financing effect.

**Table 1**
Empirical hypotheses and results overview.

| | Competition Effect + No/Weak Financing Effect (1) | Competition Effect + Strong Financing Effect (2) | Data (3) |
|---|---|---|---|
| **Aggregate affiliate activity** | | | |
| Number of MNC Affiliates, N | −, − | +, ? | + |
| Total sales, TOT | −, − | +, ? | + |
| Local sales, HOR | −, − | +, ? | + |
| US sales, RET | −, − | +, ? | + |
| 3rd country sales, PLA | −, − | +, ? | + |
| Local sales / Total sales, HOR/TOT | −, − | −, − | − |
| US sales / Total sales, RET/TOT | +, + | +, + | + |
| 3rd country sales / Total sales, PLA/TOT | +, + | +, + | + |
| **Individual affiliates** | | | |
| Total sales, TOT(a) | ?, ? | ?, ? | 0 |
| Local sales, HOR(a) | −, − | −, − | − |
| US sales, RET(a) | +, + | ?, ? | + |
| 3rd country sales, PLA(a) | +, + | ?, ? | + |
| Local sales / Total sales, HOR(a)/TOT(a) | −, − | −, − | − |
| US sales / Total sales, RET(a)/TOT(a) | +, + | +, + | + |
| 3rd country sales / Total sales, PLA(a)/TOT(a) | +, + | +, + | + |

*Notes:* This table summarizes the hypothesized and observed effects of host-country financial development on multinational activity there. Column 1 presents the empirical hypotheses for the case where the financing effect is either absent or weak (so that the competition effect dominates), while Column 2 presents the analogous hypotheses for the case where the financing effect is sufficiently strong. In each of Columns 1 and 2, the first sign indicates the model prediction for the level effect of host-country financial development, while the second sign indicates the prediction for the cross-partial effect with respect to external finance dependence. Predictions are derived under the assumption that initial host-country financial development in South is sufficiently high; as discussed in the Online Appendix, this is a mild condition in practice. For comparison, Column 3 reports the sign of the effects actually obtained in our empirical analysis.

Financial development in South in turn affects industry outcomes in West and East. As more Southern firms enter, the local market becomes more competitive, and Southern demand for each Western variety, $A_{sw}$, declines. This raises the productivity cut-offs for Western firms seeking to penetrate the Southern market through exports or FDI, $a_{XS}^{1-\varepsilon}$ and $a_I^{1-\varepsilon}$. To ensure that the free-entry condition in West holds even while expected profits from the Southern market decline, total profits from sales to West and East must increase. This tilts Western firms toward serving those latter markets: The cut-offs, $a_D^{1-\varepsilon}$ and $a_{XN}^{1-\varepsilon}$, both fall, while aggregate demand for Western varieties in West and East, $A_{ww}$ and $A_{ew}$, rises. These comparative statics are illustrated in the upper panel of Fig. 2, and stated below as:

**Lemma 2.** *When MNCs do not require host-country financing, (i)* $\frac{1}{a_{XS}}\frac{da_{XS}}{d\eta} < \frac{1}{a_I}\frac{da_I}{d\eta} < 0$*; (ii)* $\frac{1}{a_{XN}}\frac{da_{XN}}{d\eta} = \frac{1}{a_D}\frac{da_D}{d\eta} > 0$*; (iii)* $\frac{1}{A_{sw}}\frac{dA_{sw}}{d\eta} < 0$*; and (iv)* $\frac{1}{A_{ew}}\frac{dA_{ew}}{d\eta} = \frac{1}{A_{ww}}\frac{dA_{ww}}{d\eta} > 0$.

The above shifts in the productivity cut-offs and aggregate demand levels govern how host-country financial development affects affiliate entry and sales. Proposition 1 states the rich set of predictions stemming from this competition effect; we also summarize them in the first column of Table 1.

**Proposition 1.** *When MNC affiliates do not require host-country financing, in response to a small improvement in financial development, $\eta$, in South:*

(i) *HOR(a) decreases, while both PLA(a) and RET(a) increase;*
(ii) $\frac{HOR(a)}{TOT(a)} = \frac{HOR}{TOT}$ *decreases, while both* $\frac{PLA(a)}{TOT(a)} = \frac{PLA}{TOT}$ *and* $\frac{RET(a)}{TOT(a)} = \frac{RET}{TOT}$ *increase; and*
(iii) $N_n$, $N_n G_n(a_I)$, *HOR, PLA, RET and TOT all decrease.*

*These effects are stronger in industries with higher external finance dependence, $\phi$, if the initial level of $\eta$ is sufficiently high.*

Proposition 1 builds directly on the logic of Lemma 2. For each surviving MNC affiliate, the competition effect leads to a reduction in horizontal sales to South, as well as their share in total sales. At the same time, demand rises in East and West, inducing each affiliate to re-direct its sales toward those markets. Platform and return sales thus rise, both in absolute levels and relative to total sales. At the aggregate level, the competition effect depresses the *ex ante* expected profits of Western firms, which leads to a decrease in the measure of these firms, $N_n$, the measure of multinationals, $N_n G_n(a_I)$, and consequently the aggregate volume of horizontal, platform and return sales.[21] All of these changes are intuitively stronger

[21] In particular, for *RET* and *PLA*, the decline in $N_n$ and $V_n(a_I)$ can be shown to dominate the expansion along the intensive margin of $A_{ew}$ and $A_{ww}$; see the Online Appendix for the proof.

in industries where firms are innately more reliant on external financing: A given increase in $\eta$ would have a greater impact on improving access to credit in a high-$\phi$ industry, and hence the resulting competition effect would be more intense. As we show in the Online Appendix, the condition that $\eta$ be sufficiently high for the cross-partial results is a mild requirement in practice.[22]

### 2.4. The financing effect

We next incorporate into the model a direct *financing effect* of host-country financial development on MNC activity. We introduce a role for local financial institutions in meeting the credit needs of MNC subsidiaries, motivated by the broad evidence that such financing shapes affiliate operations in practice. Our premise is that multinational firms use internal and external capital markets opportunistically to minimize their overall cost of capital in the face of financial frictions. We posit that Western financiers are willing to fund all domestic and export activities of Western firms, but only a portion of their fixed FDI costs, up to what would be provided for commencing domestic production.[23] Since a fraction $1-\phi$ of $f_I$ is funded internally and interest rates are lower in West than South, MNCs thus optimally raise the maximum possible amount of external finance $\phi f_D$ in West, and borrow the shortfall $\phi(f_I - f_D)$ in South's imperfect capital market. These assumptions grant tractability, but all that our predictions require is that MNCs cannot perfectly arbitrage cross-country differences in the cost of capital, so that affiliate activity will be responsive to financial development in South.[24]

Affiliates can obtain financing in South only if they can credibly commit to repayment. As above, defaulting on Southern loans costs a fraction $\eta \in [0,1]$ of appropriable profits. Since the firm's outside option is to move production back to West, we assume appropriable profits from the perspective of Southern creditors are operating profits from FDI less operating profits from producing in West.[25] A multinational with productivity $a^{1-\varepsilon}$ would therefore default on its Southern loan if:

$$\eta(1-\alpha)\left[A_{ww}\left(\left(\frac{\tau a\omega}{\alpha}\right)^{1-\varepsilon}-\left(\frac{a}{\alpha}\right)^{1-\varepsilon}\right)+A_{ew}\left(\left(\frac{\tau a\omega}{\alpha}\right)^{1-\varepsilon}-\left(\frac{\tau a}{\alpha}\right)^{1-\varepsilon}\right)+A_{sw}\left(\left(\frac{a\omega}{\alpha}\right)^{1-\varepsilon}-\left(\frac{\tau a}{\alpha}\right)^{1-\varepsilon}\right)\right] < R\phi(f_I-f_D),$$

namely if it is less costly to default than to repay its creditors. This implies a modified FDI cut-off:

$$\tilde{a}_I^{1-\varepsilon} = \frac{R\phi}{\eta} a_I^{1-\varepsilon}, \tag{2.9}$$

where $a_I^{1-\varepsilon}$ is the cut-off from (2.2) when MNCs do not need host-country financing. Capital market imperfections in South now directly affect MNC entry: The productivity cut-off $\tilde{a}_I^{1-\varepsilon}$ for setting up an affiliate is higher the greater the cost of external finance in South $R$, the weaker Southern financial development $\eta$, and the higher the degree of external finance dependence $\phi$.[26]

Hence, an improvement in host-country financial institutions facilitates entry by more Southern firms *and* by more foreign subsidiaries. This affects the industry equilibrium in West as follows:

**Lemma 3.** *When MNC affiliates require host-country financing, (i)* $\frac{1}{\tilde{a}_I}\frac{d\tilde{a}_I}{d\eta} > 0$*; (ii)* $\frac{1}{a_{XS}}\frac{da_{XS}}{d\eta} < 0$*; (iii)* $\frac{1}{a_{XN}}\frac{da_{XN}}{d\eta} = \frac{1}{a_D}\frac{da_D}{d\eta} > \frac{1}{a_{XS}}\frac{da_{XS}}{d\eta}$*; (iv)* $\frac{1}{A_{sw}}\frac{dA_{sw}}{d\eta} < 0$*; and (v)* $\frac{1}{A_{ew}}\frac{dA_{ew}}{d\eta} = \frac{1}{A_{ww}}\frac{dA_{ww}}{d\eta} > \frac{1}{A_{sw}}\frac{dA_{sw}}{d\eta}$.

In contrast to Lemma 2, an increase in $\eta$ now triggers a financing effect that makes credit accessible and FDI feasible for a larger margin of Western firms. This leads to a leftward shift in the FDI cut-off, $\tilde{a}_I^{1-\varepsilon}$, as illustrated in Fig. 3. At the same time, the competition effect remains active: The Southern market becomes more competitive not only because of the entry of local firms, but also because more MNC affiliates are now present. The cut-off for Western firms exporting to South, $a_{XS}^{1-\varepsilon}$, thus shifts to the right. One can moreover show that even if $a_D^{1-\varepsilon}$ and $a_{XN}^{1-\varepsilon}$ were to also increase, they would do so to a smaller extent than $a_{XS}^{1-\varepsilon}$; intuitively, this is because firms near the $a_D^{1-\varepsilon}$ and $a_{XN}^{1-\varepsilon}$ thresholds are less directly affected by competition in South. This in turn allows us to compare the proportional changes in $A_{ww}$, $A_{ew}$ and $A_{sw}$, and hence derive the following:

**Proposition 2.** *Suppose that the initial level of Southern financial development $\eta$ is sufficiently high. When MNC affiliates require host-country financing, in response to a small improvement in $\eta$ in South:*

(i) *HOR($a$) decreases, while the effects on both PLA($a$) and RET($a$) are ambiguous;*

[22] The Online Appendix also makes clear that this condition is in fact not needed to sign the cross-partial effects for the variables in part (i) of the proposition. The proposition has been stated in its current form for the sake of brevity.

[23] This could be due to institutional frictions: Affiliate assets might not be fully collateralizable, due to expropriation risk or weak enforcement of cross-border claims; there might be asymmetric information when lenders do not observe how firms manage operations abroad; and remote financiers might face difficulties in monitoring debtors and claiming collateral.

[24] For example, our results would be reinforced if the share of $f_I$ that can be financed in South plausibly increased with $\eta$. Likewise, the financing effect would remain relevant if external funds were required to finance ongoing variable production costs rather than just fixed costs.

[25] While there are alternative ways of defining what constitutes appropriable profits, our general insights would hold so long as the productivity cutoff for FDI by Western firms is higher the more severe financial constraints in South are.

[26] We maintain the assumption that $R\frac{\phi}{1-\phi} > \frac{\eta}{1-\eta}$. This ensures that it is optimal for Western firms with productivity above $\tilde{a}_I^{1-\varepsilon}$ to pursue FDI, since their profits would then satisfy: $\pi_I(a) > \pi_D(a) + \pi_{XN}(a) + \pi_{XS}(a)$.

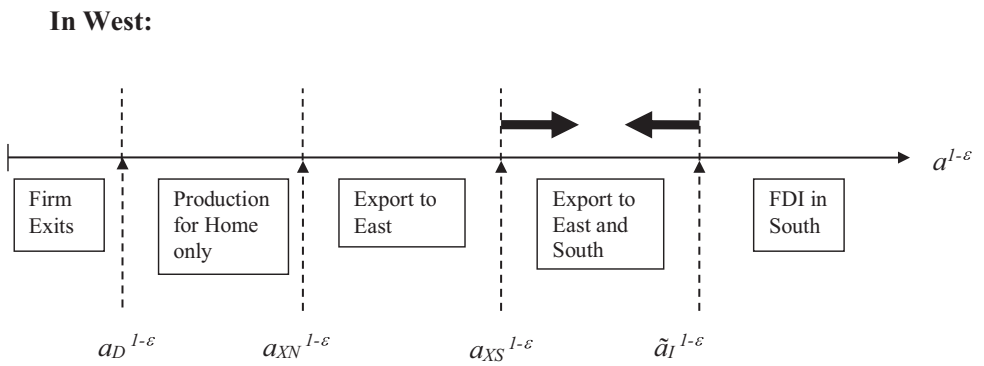


**Fig. 3.** Response of cutoffs to an improvement in Southern financial development: competition effect and strong financing effect.

(ii) $\frac{HOR(a)}{TOT(a)} = \frac{HOR}{TOT}$ *decreases, while both* $\frac{PLA(a)}{TOT(a)} = \frac{PLA}{TOT}$ *and* $\frac{RET(a)}{TOT(a)} = \frac{RET}{TOT}$ *increase; and*
(iii) $N_n G_n(\tilde{a}_I)$, *HOR, PLA, RET and TOT all increase.*

*The effects in (i) and (ii) are stronger in industries with higher external finance dependence,* $\phi$.

Parts (i) and (ii) of the proposition confirm that the breakdown of affiliate sales by destination continue to reflect the competition effect: With an improvement in $\eta$, the tendency to sell to the host market decreases, while rising instead for the shares of sales to the home and third-country markets.[27] Intuitively, these effects are once again stronger in financially more sensitive industries.

Importantly, part (iii) shows that the financing effect alters the behavior of aggregate MNC outcomes compared to the baseline case with only the competition effect. When $\eta$ increases, the expansion in MNC activity on the extensive margin can now be strong enough to dominate the contraction along the intensive margin of individual affiliate sales. Aggregate sales to any market, *HOR, PLA, RET* and *TOT*, can therefore rise. In particular, when the initial level of host-country financial development is relatively high, an increase in $\eta$ would generate only a modest amount of entry by Southern firms, so that the competition effect is muted relative to the financing effect on entry by MNC affiliates.[28] (While the cross-partial effects for part (iii) cannot be signed unambiguously, what is key is that the model with host-country financing has a more flexible set of predictions than the baseline model.)

We summarize the predictions of Proposition 2 in the second column of Table 1. This column shows the net impact of host-country financial development when the financing effect is sufficiently powerful to overturn the competition effect on the number of affiliates and aggregate affiliate sales. Should the financing effect be present but relatively weak, the patterns would revert to those in the first column.

In the Online Appendix, we develop several extensions to show that the competition and financing effects remain relevant when: (i) allowing Southern firms to export their varieties to West and East; and (ii) incorporating multiple FDI host countries. The latter extension implies that Propositions 1 and 2 also apply to the pattern of affiliate activity across countries that differ in their financial development.

## 3. Estimation strategy

The theoretical framework above delivers specific predictions for the effect of host-country financial development on multinational activity, including its differential effect across sectors with varying degrees of external finance dependence. This section describes the empirical strategy we use to evaluate these predictions in the data.

### 3.1. Empirical design

We estimate the differential impact of host-country financial conditions on aggregate and affiliate-level MNC outcomes across sectors with the following baseline specifications:

$$MNC_{ikt} = \beta\, FD_{it} \times EFD_k + \varphi_{it} + \varphi_k + \epsilon_{ikt}, \text{ and} \tag{3.1}$$

[27] It should be noted that the mild condition that $\eta$ be sufficiently high is not required to sign the effect of $dHOR(a)/d\eta$ in part (i). While $dPLA(a)/d\eta$ and $dRET(a)/d\eta$ cannot be signed conclusively, we can show that $d^2 \log PLA(a)/d\eta d\phi$ and $d^2 \log RET(a)/d\eta d\phi$ inherit the same sign as $dPLA(a)/d\eta$ and $dRET(a)/d\eta$ respectively when $\eta$ is sufficiently high. See the Online Appendix for further details.

[28] As discussed in the Online Appendix, this condition is not a restrictive one in practice, as $\eta$ would need to be very small ( $< 0.1$ ) to generate a numerical counter-example.

$$MNC_{aikt} = \beta FD_{it} \times EFD_k + \varphi_{it} + \varphi_a + \epsilon_{aikt}. \quad (3.2)$$

In (3.1), the dependent variable $MNC_{ikt}$ characterizes the aggregate activity in host country $i$ of U.S.-owned multinational firms from industry $k$, in year $t$. The outcomes we examine are: an indicator variable equal to 1 if at least one industry-$k$ U.S. parent has a foreign affiliate in country $i$, $\mathbf{1}(N_{ikt} > 0)$; the log number of such foreign affiliates (totalled across U.S. parent firms), $\log N_{ikt}$; the log of aggregate affiliate sales to each destination market, $\log HOR_{ikt}$, $\log PLA_{ikt}$ and $\log RET_{ikt}$, and across all markets, $\log TOT_{ikt}$; and the share of aggregate affiliate sales to each destination, $\frac{HOR_{ikt}}{TOT_{ikt}}$, $\frac{PLA_{ikt}}{TOT_{ikt}}$ and $\frac{RET_{ikt}}{TOT_{ikt}}$.

In (3.2), we study instead outcome variables $MNC_{aikt}$ that correspond to the country-$i$, year-$t$ affiliate operations of an industry-$k$ parent indexed by $a$. We consider the log of affiliate-level sales by destination, $\log HOR_{ikt}(a)$, $\log PLA_{ikt}(a)$ and $\log RET_{ikt}(a)$, and across all markets, $\log TOT_{ikt}(a)$; and the share of affiliate-level sales to each destination, $\frac{HOR_{ikt}(a)}{TOT_{ikt}(a)}$, $\frac{PLA_{ikt}(a)}{TOT_{ikt}(a)}$ and $\frac{RET_{ikt}(a)}{TOT_{ikt}(a)}$.

To assess the role of financial conditions, we analyze the interaction between two variables: the financial development of host country $i$ in year $t$, $FD_{it}$, and the external finance dependence of sector $k$, $EFD_k$. The main coefficient of interest, $\beta$, captures the differential effect of $FD_{it}$ across sectors with varying degrees of $EFD_k$. This effect is estimated conditional on country-year fixed effects, $\varphi_{it}$, and either industry fixed effects, $\varphi_k$, in the aggregate-level Eq. (3.1), or parent-firm fixed effects, $\varphi_a$, in the affiliate-level Eq. (3.2). These fixed effects play an important role in controlling for other potential determinants of FDI. First, the country-year fixed effects, $\varphi_{it}$, subsume the level effect of financial development, $FD_{it}$, as well as broader global demand and supply shocks that might affect the host country in a given year; these fixed effects also control for any observed or unobserved time-varying host-country characteristics, including that of corporate tax policies.[29] Second, the industry fixed effects in (3.1) and the parent-firm fixed effects in (3.2) each absorb the main effect of a sector's external finance dependence, $EFD_k$, in the respective specification. They also subsume the role of any industry-$k$ attributes relevant to MNC operations. The use of parent-firm fixed effects in (3.2) further accounts for any time-invariant firm characteristics – such as the productivity of the parent firm, $1/a$, in the model – that drives affiliate activity. The error terms, $\epsilon_{ikt}$ and $\epsilon_{aikt}$, contain any residual factors that shape multinational operations. We cluster standard errors by host country, to allow for correlated shocks across observations at the country level.

Eqs. (3.1) and (3.2) adopt the same coefficient labels across MNC outcomes to economize on notation, but we permit the estimated $\beta$'s to vary across outcomes. For expositional clarity, we sometimes denote the coefficients in regressions pertaining to horizontal, platform and return sales respectively as $\beta_{HOR}$, $\beta_{PLA}$ and $\beta_{RET}$. We will interpret the sign pattern of these estimated coefficients through the lens of the model (see Columns 1 and 2 of Table 1).

Based on Propositions 1 and 2, we expect host-country financial development to have distinct impacts across the different dimensions of MNC activity. These will moreover depend on the presence and relative strength of the competition and financing mechanisms. The competition effect arises as host-country financial development induces entry by domestic firms. The resulting increase in local competition reduces affiliate-level sales in the host country, $\log HOR_{ikt}(a)$, and raises instead platform and return sales, $\log PLA_{ikt}(a)$ and $\log RET_{ikt}(a)$. The shares of affiliate-level and aggregate sales to the host market, $\frac{HOR_{ikt}(a)}{TOT_{ikt}(a)}$ and $\frac{HOR_{ikt}}{TOT_{ikt}}$, both consequently decline, while the shares of export sales to the parent country and to third-country destinations, $\frac{RET_{ikt}(a)}{TOT_{ikt}(a)}$, $\frac{RET_{ikt}}{TOT_{ikt}}$, $\frac{PLA_{ikt}(a)}{TOT_{ikt}(a)}$ and $\frac{PLA_{ikt}}{TOT_{ikt}}$, all rise. These effects are further expected to be more pronounced in financially more vulnerable industries, which would be consistent with $\beta_{HOR} < 0$, $\beta_{PLA} > 0$ and $\beta_{RET} > 0$ in the regressions for affiliate sales levels, as well as in the regressions for sales shares (computed either at the affiliate or aggregate levels).[30]

If active and dominant, the financing effect implies that host-country financial development raises the aggregate level of MNC activity, as more multinational firms can access capital in the host country. Consequently, the number of offshore affiliates, $\log N_{ikt}$, and aggregate affiliate sales to each destination, $\log HOR_{ikt}$, $\log PLA_{ikt}$, $\log RET_{ikt}$ and $\log TOT_{ikt}$, all grow, and relatively more so in sectors with high requirements for external capital. Finding $\beta > 0$ for each of these outcome variables would thus be consistent with the presence of the financing effect, while $\beta < 0$ would indicate that it is either moot or small relative to the competition effect.

### 3.2. Discussion

The specifications in (3.1) and (3.2) identify the causal differential effect of host-country financial development on MNC activity across sectors by exploiting the exogenous cross-sector variation in the requirement for outside capital. This approach builds on Rajan and Zingales (1998) and has been used extensively in the finance and trade literature

[29] In the context of the model from Section 2, the country-year fixed effects would further pick up the role of factor costs ($\omega$) and aggregate expenditure, as well as any country-specific components of the fixed costs of production, exporting or FDI.

[30] The three sales shares across market destinations sum to 1 by definition, which implies that the estimated coefficients when the sales shares are the dependent variables will satisfy: $\beta_{HOR} + \beta_{PLA} + \beta_{RET} = 0$. Each regression nevertheless still delivers independent information, namely whether the effect of financial development on each outcome is significantly different from 0. Note that there are no efficiency gains from estimating the three equations simultaneously as seemingly unrelated regressions, since each includes the same set of explanatory variables and is run on the same set of observations.

(see Foley and Manova, 2015, for a review). Its main premise is that isolating the causal level effect of financial conditions in a representative industry faces endogeneity concerns, but these can be overcome by exploiting the technologically-determined variation in financial sensitivity across industries.

There are specifically two concerns over whether one can estimate the effect of $FD_{it}$ purely off the variation in financial conditions across host countries and over time. First, omitted variable bias can arise if an unobserved country-year characteristic both impacts MNC activity and is correlated with financial development. For example, countries that strengthen financial institutions might at the same time implement broader institutional or economic reforms that also affect multinational firms. If the latter changes are unobserved, the estimates of $\beta$ may reflect the influence of both financial development and these omitted country characteristics. Second, reverse causality remains a possibility, albeit one that is mitigated by the range of dependent variables we consider: In (3.1), even should financial development respond to aggregate MNC activity ($\log N_{ikt}$ and $\log TOT_{ikt}$), it is less clear how the shares of sales by destination market would affect $FD_{it}$. Moreover, for the affiliate-level regressions in (3.2), host-country financial development is more plausibly exogenous from the perspective of individual MNC affiliates.

Specifications (3.1) and (3.2) seek to address these concerns, by emphasizing the interaction term $FD_{it} \times EFD_k$, which captures the differential effect of financial development across sectors with exogenously varying degrees of financial dependence. The coefficient $\beta$ is shielded from the above concerns about omitted variables and reverse causality, to the extent that these considerations are not expected to exert effects that vary systematically across sectors. In particular, in regression (3.1) for aggregate MNC outcomes, $\beta$, is estimated off the variation across industries in $EFD_k$ within a given host country and year. In regression (3.2) for affiliate-level activity, the interaction term reflects the sales decisions that a given multinational company makes across its subsidiaries located in countries with different levels of financial development, and so $\beta$ is estimated using the variation in these sales patterns across parent firms operating in different sectors.

While (3.1) and (3.2) provide estimates regarding the relevance of host-country financial development that have a clear interpretation, they strictly capture differential effects across sectors. We thus complement this baseline evidence with a series of regressions in Section 6.5, in which we examine the level effect of financial development on MNC outcomes for an average industry. These latter estimates should be interpreted as correlations that contribute to a more complete picture of the effects of host-country financial development.

## 4. Data and motivating facts

Implementing the empirical strategy in Section 3 requires measures of multinational activity, host-country financial institutions, and industries' external finance dependence. This section describes our data and measurement approach.

### 4.1. Data

*U.S. multinational activity*: We examine the global operations of U.S.-based multinationals using firm-level data from the Bureau of Economic Analysis (BEA).[31] The BEA Survey of U.S. Direct Investment Abroad provides information on U.S. parent firms and their foreign affiliates on an annual basis during 1989–2009.[32] This dataset allows us to construct the dependent variables of interest at the aggregate and affiliate levels, $MNC_{ikt}$ and $MNC_{aikt}$, respectively for specifications (3.1) and (3.2).

A key element of the BEA dataset for our exercise is its detailed records of U.S. multinationals' affiliate sales. In addition to each subsidiary's total revenues, $TOT(a)$, the BEA reports its local sales in the host country, $HOR(a)$, exports to the United States, $RET(a)$, and exports to other destinations, $PLA(a)$.[33] We use these as measures of horizontal, return and export-platform sales, as well as to calculate sales shares. We compute aggregate MNC outcomes by host country and year for 115 NAICS 4-digit industries based on the primary industry affiliation of each parent company. The BEA data are most comprehensive in scope and coverage in benchmark years, namely 1989, 1994, 1999, 2004 and 2009.[34] We therefore analyze aggregate MNC measures for benchmark years only, and use the entire panel in affiliate-level regressions. (We have verified that the affiliate-level regression findings also hold in the subsample of benchmark years.)

Table 2 summarizes key patterns in U.S. multinational activity. The total revenues of U.S. multinational affiliates amount to $561 million in the average country-industry-year triplet. The typical affiliate sells primarily to its local market (74%),

[31] These data are collected for the purpose of producing publicly available aggregate statistics on the activities of U.S. multinational enterprises.

[32] A U.S. entity is considered to have a foreign affiliate if it has direct or indirect ownership or control of at least 10% of the voting securities of an incorporated foreign business enterprise, or an equivalent interest in an unincorporated foreign business enterprise, at any time during a benchmark fiscal year. For very small affiliates that do not own another affiliate, parents are exempt from reporting with the standard survey form. Foreign affiliates are required to report separately unless they are in the same country and three-digit industry. Each affiliate is considered to be incorporated where its physical assets are located.

[33] Affiliate sales by destination are observed only for majority-owned affiliates. We therefore restrict the sample to affiliates for which the U.S. parent firm has direct or indirect ownership or control exceeding 50% of the voting securities. There are changes over time in the affiliate size threshold above which sales by destination need to be reported, but we have checked that our findings hold for each benchmark year. The sum of the reported local, U.S. and third-country sales falls short of the total sales recorded for a handful of affiliates. To ensure that the three corresponding sales shares sum to 1, we measure total sales with the sum of the three sales components; all results are robust to using the raw total sales data instead.

[34] In a typical benchmark year, the survey covers over 99% of affiliate activity by total assets, sales, and U.S. FDI. In case of missing survey responses, the BEA may report imputed values; these are flagged and we exclude them from the analysis.

**Table 2**
Summary statistics.

| | N | Mean | Standard deviation |
|---|---|---|---|
| **Country-industry-year level** | | | |
| Total affiliate sales (thousand USD) | 17,811 | 561,256 | 2,450,158 |
| Local affiliate sales (thousand USD) | 17,811 | 363,112 | 1,502,995 |
| 3rd country affiliate sales (thousand USD) | 17,811 | 147,074 | 1,009,672 |
| US affiliate sales (thousand USD) | 17,811 | 51,070 | 626,707 |
| Local / Total sales | 17,811 | 0.78 | 0.32 |
| 3rd country / Total sales | 17,811 | 0.16 | 0.27 |
| US / Total sales | 17,811 | 0.06 | 0.17 |
| Number of Affiliates | 17,811 | 4.08 | 6.56 |
| **Affiliate-year level** | | | |
| Total affiliate sales (thousand USD) | 163,215 | 172,902 | 710,310 |
| Local affiliate sales (thousand USD) | 163,215 | 103,395 | 372,961 |
| 3rd country affiliate sales (thousand USD) | 163,215 | 49,471 | 366,203 |
| US affiliate sales (thousand USD) | 163,215 | 20,035 | 253,507 |
| Local / Total sales | 163,215 | 0.74 | 0.36 |
| 3rd country / Total sales | 163,215 | 0.20 | 0.32 |
| US / Total sales | 163,215 | 0.07 | 0.20 |
| Log Total affiliate debt | 140,899 | 9.91 | 1.79 |
| Local share affiliate liabilities | 30,933 | 0.63 | 0.28 |
| Parent share affiliate liabilities | 30,933 | 0.18 | 0.29 |
| **Industry level** | | | |
| External finance dependence | 115 | −0.22 | 1.46 |
| **Country-year level** | | | |
| Private credit / GDP | 1,794 | 0.51 | 0.44 |
| Financial reform indicator | 1,114 | 14.56 | 4.66 |
| **General** | | | |
| Number of parent companies per year | – | 1,465 | 304 |
| Number of affiliates per parent-year | – | 7.38 | 15.74 |

*Notes:* This table summarizes multinational activity, host-country institutions, and industry characteristics across 95 countries and 115 industries for 1989–2009. External finance dependence follows the methodology of Rajan and Zingales (1998). The financial development and financial reforms measures are from Beck et al. (2009) and Abiad et al. (2010) respectively. All other variables are from the Bureau of Economic Analysis Survey of U.S. Direct Investment Abroad.

while earning a smaller share of revenues from exports to the United States (7%) and to third countries (20%). This composition, however, varies substantially across affiliates and years: The standard deviations around these means are 36%, 20% and 32%, respectively. Fig. 4 provides a Venn diagram for the distribution of affiliates and affiliate sales by destination type (local, U.S., third-country). Subsidiaries selling in only one destination capture 22% of U.S. multinationals' global sales, while affiliates serving all three destinations contribute over 52%. Multinational firms also maintain production facilities across a broad set of locations. In 2009 for example, 1892 parent companies operated 14,804 affiliates in 142 countries. In an average year, there are 1465 U.S. parents, each managing 7.38 foreign affiliates, with some large corporations owning many more subsidiaries (standard deviation: 15.74).

*Host-country financial development*: Our primary measure of $FD_{it}$ is the total amount of bank credit extended to the private sector as a share of GDP, from Beck et al. (2009). This is an outcome-based measure that captures the actual availability of external capital in an economy, and implicitly reflects the extent to which local institutions support formal lending activity and enforce financial contracts. This empirical measure of financial development can moreover be justified within the context of the model from Section 2: As formally shown in the Online Appendix, the ratio of aggregate credit to GDP in the FDI host country is increasing in the parameter $\eta$ that governs financial frictions in the model.

Financial development varies significantly across the 95 host countries and 21 years in the sample (Table 2, Appendix Table 2). The mean value of $FD_{it}$ in the panel is 0.51, with a standard deviation of 0.44. Notice that the cross-sectional dispersion of $FD_{it}$ exceeds its time-series variation: The standard deviation of private credit across countries was 0.62 in 2009, but it was only 0.15 for the average economy over the 1989–2009 period. While private credit to GDP is arguably the most commonly-used indicator of financial development in the trade, growth and finance literatures, we will also demonstrate in Section 6.1 the robustness of our results to using an alternative measure of financial reforms.

*Industry external finance dependence*: $EFD_k$ is measured following Rajan and Zingales (1998) as the empirical counterpart to model parameter $\phi^k$. We calculate $EFD_k$ as the share of capital expenditures not financed with internal cash flows from operations using data on all publicly-listed U.S. companies in sector $k$ from Compustat North America.[35] This aims to capture

[35] We first compute the external finance dependence ratio for each firm over the 1996–2005 period. We calculate $EFD_k$ as the median such ratio across all firms in sector $k$; sectors with fewer than ten firms are dropped. We provide robustness exercises with alternative $EFD_k$ measures in Section 6.1.

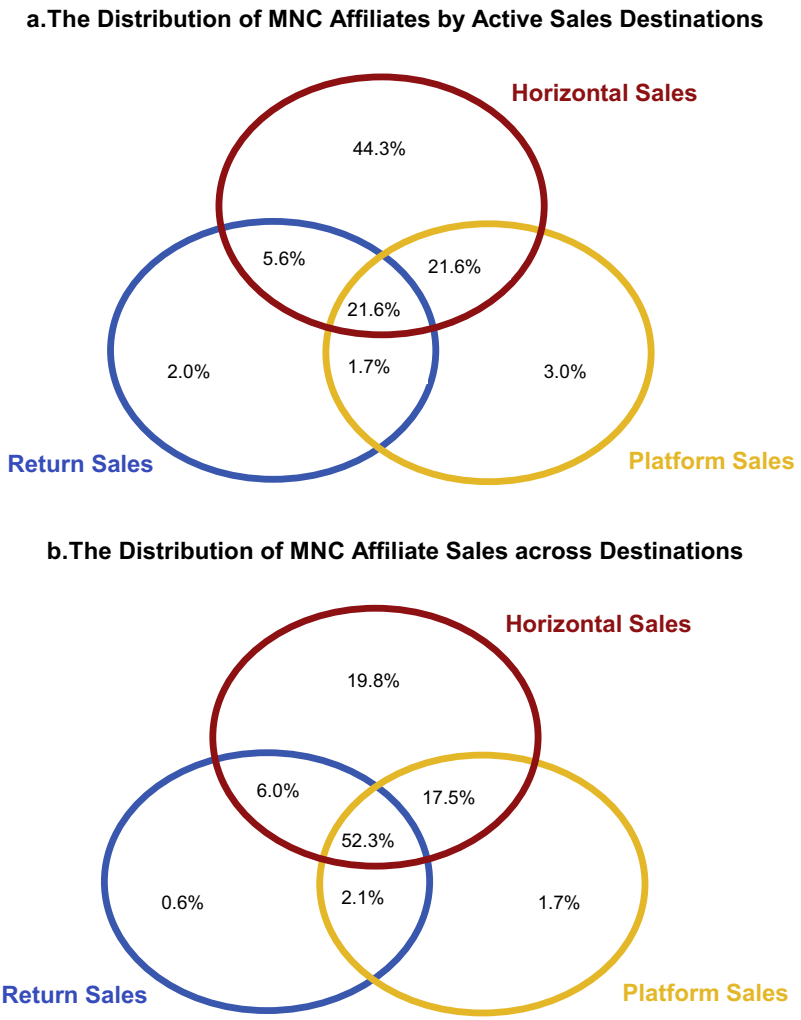


**Fig. 4.** *Notes:* This figure summarizes the breakdown of multinational firms' affiliate activity by market destination in 1989. Affiliates in overlapping segments of the three circles pursue multiple sales destinations. The percentages reported sum to 100%. Each segment reports the percentage share of affiliates active in a given set of destinations (Fig. 4a) or the percentage share of total affiliate sales captured by affiliates in that segment (Fig. 4b).

industries' inherent need for outside capital given their technologically determined cash flow and investment structure. There is significant variation in observed external finance dependence across the 115 industries in the sample (mean: −0.22, standard deviation: 1.46, Table 2).[36]

Constructing $EFD_k$ with U.S. data has three distinct advantages. First, the United States has a well-developed financial system; companies' observed behavior thus plausibly approximates optimal financing practices. Second, industries' financial sensitivity is not measured endogenously with respect to host-country financial conditions. Finally, estimating $\beta$ in specifications (3.1) and (3.2) requires only that the true rank ordering of external finance dependence remains relatively stable across countries. The level of $EFD_k$ may therefore differ across countries without impacting the interpretation of $\beta$, although measurement error could bias the results downwards.

### 4.2. Motivating facts

Before turning to the formal econometric analysis, we provide some motivating snapshots from the data that point to a link between host-country financial conditions and multinational activity.

Fig. 1 provides an illustrative example of how the level and composition of affiliate sales vary with host-country credit conditions in the BEA data. The figure compares U.S. multinational operations in three hosts whose financial development

[36] While there is data in Compustat to construct this measure of external finance dependence for up to 220 NAICS four-digit industries, only 115 of these are present after merging into the BEA dataset.

corresponds to the 50th, 60th and 75th percentiles in the panel: Brazil in 1999, Chile in 1994, and Norway in 1989. The value of aggregate MNC affiliate sales (scaled by host-country market size) increases with host-country financial development. At the same time, the share of aggregate MNC affiliate sales going to the local economy declines with host-country private credit, and the shares of sales to the parent country (i.e., the U.S.) and to other destinations both rise. While this figure provides an illustration based on a cross-section of countries, the formal analysis in Section 5 will reveal a consistent message in the variation within countries across sectors as well.

The above pattern of MNC sales shares to the different destination markets can be explained by the competition effect (Section 2.3). On the other hand, the increase in aggregate MNC activity with host-country financial development can be rationalized if firms rely on host-country sources to meet some portion of their external financing needs (as demonstrated in Section 2.4). The BEA data confirm that such host-country financing is relevant: The mean and standard deviation of log total affiliate debt are respectively 9.91 and 1.79 in our sample. The share of affiliates' total liabilities held by host-country entities averages 0.63, with a standard deviation of 0.28. Conversely, the average share of affiliate liabilities held by the parent firm stands at 0.18, with a standard deviation of 0.29.[37] This dispersion in observed affiliate financing practices is moreover related to host-country financial development: The correlation of host-country private credit as a share of GDP with log total affiliate debt is 0.126, suggesting that affiliates' overall access to external credit improves with local financial conditions. In addition, host-country private credit is positively correlated with the local share of affiliate liabilities (0.022), while negatively correlated with the share held by the parent firm (−0.041).[38] This is consistent with foreign subsidiaries seeking to fund operations with locally raised external capital particularly when host-country financial institutions are strong, and to partly compensate the shortfall with financing from the parent company (Desai et al., 2004).

The importance of local sources of financing for MNCs is further supported by a range of anecdotal evidence pointing to how weak financial development in the host economy can pose a significant obstacle. For example, recent analyses have highlighted the challenges Japanese firms face in funding would-be profitable operations in emerging markets in Asia, especially when they are small or medium-sized enterprises. Firms prefer local financing because home-country financing exposes them to exchange rate risk, and ties up liquid funds and collateralizable assets that could be otherwise deployed. However, accessing external capital in the host country is often difficult and costly, especially when local financial institutions are weak and prospective MNCs have no pre-existing business relationships: Japanese firms have lamented that they face strict collateral requirements from local banks, who also insist on supporting guarantees from Japanese banks (Oba, 2012). This experience of Japanese firms has been echoed elsewhere. Financing by local banks in emerging economies is often insufficient, expensive, and of shorter duration; this can altogether deter entry, as in the case of a U.S. telecommunications firm interested in the post-Soviet Russian market (Gordin, 2011). In fact, many countries have implemented financial sector reforms in part to stimulate FDI inflows, such as measures to tighten accounting standards, strengthen financial contract enforcement, or relax restrictions on foreign bank entry and cross-border bank alliances.

## 5. Main results

We evaluate the impact of host-country financial conditions on the operations of U.S. multinationals using the estimation strategy in Section 3. For ease of reference, we juxtapose the model predictions in Columns 1 and 2 of Table 1 with our empirical results in Column 3. The model has rich predictions across as many as 15 outcomes of interest, which stand in subtle contrast for the cases with and without a strong financing effect. As we will see below, the patterns that we find are consistent with host-country financial development exhibiting a competition effect, in tandem with a strong financing effect, on U.S. multinational activity abroad.

### 5.1. Presence of multinational affiliates

We first examine the relationship between the financial environment of the host country and the presence of multinational affiliates. For this exercise, we work with data only from benchmark years where the BEA survey in principle covers the universe of U.S. multinational activity abroad. Columns 1 and 2 of Table 3 provide estimates of Eq. (3.1), in which $MNC_{ikt}$ is an indicator equal to one if at least one foreign subsidiary of a sector-$k$ parent is active in country $i$ during year $t$, $\mathbf{1}(N_{ikt} > 0)$.[39] Economies with strong financial institutions are significantly more likely to attract multinational activity in industries more reliant on external finance. This result obtains robustly whether we use OLS (Column 1) or the Probit estimator (Column 2).

In Column 3, we focus on the subsample of country-industry-year triplets in which there is at least one U.S. multinational affiliate, and define the dependent variable $MNC_{ikt}$ as the log number of affiliates present, $\log N_{ikt}$. We find that conditional

[37] These are consistent with the summary statistics reported in Feinberg and Phillips (2004) mentioned earlier in the Introduction. Note that the BEA collected this detailed information on the composition of affiliate financing in benchmark surveys up until 2004, after which the questions were discontinued.

[38] These correlations are all significant at the 1% level, and are broadly comparable when conditioning further on parent industry and year fixed effects.

[39] The regression sample in Columns 1 and 2 includes all country-sector-year triplets where the country hosts at least one affiliate from a sector-$k$ parent in at least one year in the panel.

**Table 3**
Number of multinational affiliates.

| Dependent variable: | N > 0, OLS | N > 0, Probit | Log N | Log Min Affiliate Sales |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Fin development × | 0.007 | 0.078 | 0.032 | −0.087 |
| Ext fin dependence | (2.50)** | (3.44)*** | (3.33)*** | (−2.65)*** |
| Country-year FE | Y | Y | Y | Y |
| Industry FE | Y | Y | Y | Y |
| # Obs | 45,540 | 45,540 | 11,357 | 11,357 |
| $R^2$ | 0.47 | – | 0.63 | 0.24 |

*Notes:* * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; $t$-statistics based on robust standard errors clustered by country appear in parentheses. The unit of observation is the country-industry-year triplet and the sample includes all benchmark years during 1989–2009. The dependent variable in Columns 1–2 is a binary indicator equal to 1 if there is at least one US multinational affiliate present. The dependent variables in Columns 3–4 are the log number of US multinational affiliates present, and the log first percentile affiliate sales, respectively. Financial development is measured by the ratio of private credit to GDP. All regressions include country-year and parent industry fixed effects.

on multinational presence, financially advanced countries host more affiliates in financially more dependent sectors.[40] Finally, we consider in Column 4 the size of the smallest subsidiary active, as captured by the log sales at the first percentile of the distribution for affiliates within each country-sector-year triplet. We document that the threshold MNC affiliate, as proxied for in this manner, is systematically smaller in host countries with stronger financial markets for sectors that are financially more sensitive.

In light of Propositions 1 and 2, the above results are consistent with the presence of a financing effect that is strong enough to overturn the competition effect on the extensive margin of multinational activity and stimulate greater affiliate entry. Our findings are both statistically and economically significant. Taking the Column 3 estimates as an example, when comparing two industries at the 10th and 90th percentiles by external finance dependence $EFD_k$, improving private credit $FD_{it}$ from the 10th to 90th percentile would generate 7.8% more MNC subsidiaries in the financially more vulnerable industry.[41]

### 5.2. Level of aggregate MNC sales

We next quantify the impact of host-country credit conditions on the aggregate volume of MNC operations in Panel A of Table 4. In Columns 1–3, we estimate (3.1) setting $MNC_{ikt}$ as the log sales totalled across all affiliates in country $i$ and industry $k$ during year $t$, separately for each destination market, $\log HOR_{ikt}$, $\log PLA_{ikt}$ and $\log RET_{ikt}$. In Column 4, we then consider the log aggregate sales across all destination markets, $\log TOT_{ikt}$.

We document patterns that once again align with the case of a strong financing effect in Table 1: Compared to host countries with weak financial institutions, aggregate MNC sales in financially advanced hosts are larger in financially more sensitive sectors. This is true of overall sales, as well as of sales to each market. The economic magnitude of these relationships is sizeable: A rise in $FD_{it}$ from its 10th to 90th percentile value is associated with total affiliate revenues expanding 18.6% more in the industry at the 90th percentile by $EFD_k$ relative to the industry at the 10th percentile (based on the Column 4 estimates). Breaking down these revenues by destination, the analogous cross-country, cross-sector 10th-90th percentile effects implied would be an increase of 12.8% for sales to the host-country market, 17.3% for sales to third-countries, and 37.9% for return sales to the U.S. (based on Columns 1–3).

### 5.3. Composition of aggregate MNC sales

We also assess the influence of host-country financial development on the composition of aggregate MNC sales. Should the competition effect be present, subsidiaries would be more export-oriented when based in recipient countries with strong financial institutions and sell a smaller share of their output to the local market due to its heightened competitiveness. Of note, this result is independent of the financing effect and holds whether or not multinationals rely on local credit for their operations.

Columns 5–7 of Panel A in Table 4 provide the corresponding estimates. The three dependent variables are in turn the fraction of aggregate affiliate sales destined for the local market, $\frac{HOR_{ikt}}{TOT_{ikt}}$, third countries, $\frac{PLA_{ikt}}{TOT_{ikt}}$, and the United States, $\frac{RET_{ikt}}{TOT_{ikt}}$. We find evidence strongly consistent with the competition channel: MNC subsidiaries in financially more sensitive industries direct a smaller share of their sales to the local economy when it has mature credit markets. At the same time, they sell a

[40] In the model from Section 2, each foreign affiliate serves all three markets of interest (host, home and third countries). This need not be the case in practice due to the presence of other economic forces outside the model. We have nevertheless confirmed that the finding in Column 3 holds when we examine instead the number of subsidiaries that sell respectively to each of the three destinations.

[41] The 90th to 10th percentile gap in $FD_{it}$ in our panel is 1.029, while the corresponding gap across sectors for $EFD_k$ is 2.393. This leads to the implied effect of 7.8% reported in the main text, as: $0.032 \times 1.029 \times 2.393 = 0.078$. The economic magnitudes of other coefficient estimates reported in the rest of the paper are calculated analogously.

**Table 4**
Level and composition of multinational affiliate sales.

| Dependent variable: | Local sales | 3rd ctry sales | US sales | Total sales | Local sales / Total sales | 3rd ctry sales / Total sales | US sales / Total sales |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| **Panel A. Aggregate level** | | | | | | | |
| Fin development × | 0.052 | 0.070 | 0.154 | 0.076 | −0.011 | 0.009 | 0.003 |
| Ext fin dependence | (2.42)** | (2.88)*** | (5.48)*** | (4.08)*** | (−3.25)*** | (2.66)*** | (1.91)* |
| Country-year FE | Y | Y | Y | Y | Y | Y | Y |
| Industry FE | Y | Y | Y | Y | Y | Y | Y |
| # Obs | 10,977 | 7,146 | 5,428 | 11,357 | 11,357 | 11,357 | 11,357 |
| $R^2$ | 0.51 | 0.44 | 0.35 | 0.50 | 0.32 | 0.32 | 0.20 |
| **Panel B. Affiliate level** | | | | | | | |
| Fin development × | −0.009 | 0.039 | 0.110 | 0.004 | −0.007 | 0.005 | 0.003 |
| Ext fin dependence | (−0.88) | (2.46)** | (4.42)*** | (0.43) | (−4.12)*** | (2.62)** | (1.74)* |
| Country-year FE | Y | Y | Y | Y | Y | Y | Y |
| Parent firm FE | Y | Y | Y | Y | Y | Y | Y |
| # Obs | 150,099 | 86,148 | 58,700 | 163,215 | 163,215 | 163,215 | 163,215 |
| $R^2$ | 0.24 | 0.32 | 0.34 | 0.21 | 0.31 | 0.30 | 0.26 |

*Notes:* * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; $t$-statistics based on robust standard errors clustered by country appear in parentheses. In Panel A, the unit of observation is the country-industry-year triplet and the sample includes all benchmark years during 1989–2009. In Panel B, the unit of observation is the affiliate-year and the sample includes all years during 1989–2009. The dependent variables in Columns 1–4 are the log of local sales, 3rd-country sales, US sales, and total sales by all US multinational affiliates (Panel A) or of each US multinational affiliate (Panel B). In Columns 5–7, they are the ratio of local sales, 3rd-country sales and US sales to total sales at the affiliate level (Panel B) or at the aggregate level after the numerator and the denominator have been summed across all US multinational affiliates (Panel A). The regressions in Panel A include country-year and parent industry fixed effects, while the regressions in Panel B include country-year and parent firm fixed effects.

larger share of their output to consumers in their parent country and in the rest of the world. As for the magnitude of these effects, consider a host nation where access to capital improves from the 10th to the 90th percentile in the sample. The share of aggregate MNC horizontal sales would then be 2.8 percentage points lower for the industry at the 90th percentile by $EFD_k$ relative to the industry at the 10th percentile. Conversely, the differential increase in the shares of platform and return sales would be 2.1 and 0.7 percentage points, respectively.

As we show in the Online Appendix, the finding that the return sales share is less sensitive to host-country financial conditions than the platform sales share is consistent with an extension of the model with home bias in consumption: Intuitively, when the elasticity of substitution between varieties of the same nationality is higher than that between varieties of different nationalities, and when there is selection into exporting and FDI, U.S. multinationals face more competition from other U.S. producers in the U.S. than in third countries. As a result, changes in host-country financial conditions trigger a bigger adjustment in platform sales to third markets than in return sales to the U.S.

### 5.4. Level of individual affiliate sales

We next examine the effects on affiliate-level outcomes in Panel B of Table 4. We now estimate specification (3.2), where $MNC_{aikt}$ refers to an active subsidiary of parent firm $a$ from sector $k$ which is located in country $i$ during year $t$. We expect affiliates in financially more advanced hosts to sell less locally due to the competition mechanism and to instead export more to the United States and to third countries. Indeed, Columns 1–4 show that at the affiliate level, log local sales, $\log HOR_{ikt}(a)$, decrease with host-country financial development in financially more vulnerable industries, although the effect is weak in terms of statistical significance. On the other hand, log sales to the United States, $\log RET_{ikt}(a)$, and to third-country destinations, $\log PLA_{ikt}(a)$, both rise with $FD_{it}$, and disproportionately more in financially sensitive sectors. The overall impact on log total sales, $\log TOT_{ikt}(a)$, is indistinguishable from zero.

It is instructive to compare the pattern of response in affiliate-level sales in Panel B against that in aggregate sales in Panel A. Host-country financial development is associated with weakly lower horizontal sales and unchanged total sales at the intensive margin of affiliate-level activity, which is consistent with the competition effect. By contrast, the regression results point to a strong positive effect on both horizontal and total sales at the aggregate level. These findings can be jointly rationalized if financial development increases the extensive margin of FDI in the host country. This would be the case when the financing effect on affiliate entry is sufficiently strong, in line with the evidence seen earlier in Table 3 that improvements in host-country financial conditions attract more foreign affiliates. Taken together, the results are therefore consistent with the presence of both the competition effect and a strong financing effect on multinational activity.

### 5.5. Composition of individual affiliate sales

Finally, we study the composition of affiliate-level sales across destinations in the rest of Table 4. In Columns 5–7 of Panel B, we estimate (3.2) with the shares of subsidiary revenues earned in the host country, $\frac{HOR_{ikt}(a)}{TOT_{ikt}(a)}$, in third markets, $\frac{PLA_{ikt}(a)}{TOT_{ikt}(a)}$, and in the United States, $\frac{RET_{ikt}(a)}{TOT_{ikt}(a)}$, as dependent variables.

In line with the results in Section 5.3 for aggregate sales shares, the evidence corroborates the competition effect: Affiliates in financially more vulnerable industries sell a smaller fraction of their output locally when they operate in financially more advanced countries, compared with affiliates in financially less sensitive industries based in financially less developed hosts. By contrast, such affiliates export a higher proportion of their output back home to the U.S. and to other destinations. In addition, the return sales share is less sensitive to host-country financial conditions than the platform sales share.

## 6. Additional results and robustness

The baseline results in Section 5 demonstrate that host-country financial development has far-reaching effects on multinational activity, and that these effects are consistent with a combination of increased competition and easier access to external finance for MNC subsidiaries. In this section, we establish the robustness of these findings to a series of sensitivity analyses. We also present additional evidence that sheds further light on the mechanisms through which affiliates' access to financing influences the pattern of FDI. We report below results based on the affiliate-level specification (3.2), as this allows us to exploit the rich micro data. In unreported results, we have confirmed a similar set of findings for those exercises that can be performed using the aggregate-level specification (3.1).

### 6.1. Alternative measures and specifications

*Alternative $FD_{it}$ measures*: We first verify that the findings are robust when adopting alternative measures of host-country financial development. Our baseline variable for $FD_{it}$ is an outcome-based measure of the availability of bank-originated debt financing in a country. In Panel A of Table 5, we instead use an index that captures structural reforms to financial institutions, as coded up by Abiad et al. (2010). In particular, $FD_{it}$ is now a binary variable equal to 1 in all years after country $i$ has undergone various reforms deemed necessary for a well-functioning financial system, such as removing excessively high reserve requirements, interest controls, and entry barriers in the banking sector. Using this financial reforms index produces patterns similar to the baseline reported in Panel B of Table 4 in terms of coefficient signs and statistical significance for the full range of affiliate outcomes.

In separate regressions (available on request), we have found robust results when considering a broader measure of access to debt financing, namely the credit extended by banks and other non-bank financial institutions as a share of GDP (from Beck et al., 2009). Likewise, we have obtained similar results when using a measure of total stock market capitalization, defined as the total value of publicly-listed shares normalized by GDP (from Beck et al., 2009), to account for the potential role of equity financing as an alternative source of capital.

*Alternative $EFD_k$ measures*: We next consider alternative constructions for the measure of a sector's dependence on external finance. Our baseline variable, $EFD_k$, reflects the financial sensitivity of the primary industry of activity of the parent firm. This would be an appropriate measure insofar as the headquarters of a multinational company makes joint production and financing decisions across all its affiliates worldwide. In practice though, the affiliates of the same parent firm may have different main industries of activity either because they perform different production stages and/or because the firm in fact produces output in multiple industries. To account for this possibility, we construct a parent firm-specific measure of

**Table 5**
Alternative measures.

| Dependent variable: | Local sales | 3rd ctry sales | US sales | Total sales | Local sales / Total sales | 3rd ctry sales / Total sales | US sales / Total sales |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| **Panel A. Financial development = Financial reform indicator** | | | | | | | |
| Fin reform × | −0.0024 | 0.0077 | 0.0120 | 0.0002 | −0.0011 | 0.0007 | 0.0004 |
| Ext fin dependence | (−2.85)*** | (2.97)*** | (3.84)*** | (0.15) | (−3.73)*** | (3.12)*** | (2.99)*** |
| # Obs | 123,761 | 70,023 | 47,703 | 133,529 | 133,529 | 133,529 | 133,529 |
| $R^2$ | 0.24 | 0.33 | 0.35 | 0.21 | 0.31 | 0.30 | 0.27 |
| **Panel B. External finance dependence = Firm-specific sales-weighted average EFD across affiliates** | | | | | | | |
| Fin development × | −0.010 | 0.047 | 0.151 | 0.009 | −0.009 | 0.006 | 0.004 |
| Ext fin dependence | (−0.70) | (2.00)** | (3.92)*** | (0.62) | (−3.94)*** | (2.26)** | (1.88)* |
| # Obs | 149,319 | 85,749 | 58,372 | 162,315 | 162,315 | 162,315 | 162,315 |
| $R^2$ | 0.24 | 0.32 | 0.35 | 0.21 | 0.31 | 0.30 | 0.26 |
| Country-year FE | Y | Y | Y | Y | Y | Y | Y |
| Parent firm FE | Y | Y | Y | Y | Y | Y | Y |

*Notes:* * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; $t$-statistics based on robust standard errors clustered by country appear in parentheses. Panel A replicates Panel B in Table 4 using an indicator for financial reforms instead of the baseline measure of financial development. Panel B replicates Panel B in Table 4 using a firm-specific measure of external finance dependence that is the sales-weighted average external finance dependence across the industries of a parent and all its affiliates, instead of the external finance dependence of the parent's industry. All regressions include country-year and parent firm fixed effects.

reliance on outside capital, $EFD_a$, by taking the sales-weighted average of $EFD_k$ across firm $a$'s affiliates in different sectors $k$. This yields qualitatively similar findings, as reported in Panel B of Table 5.

In Appendix Table 3, we further confirm the robustness of the results under two other $EFD_k$ measure. First, we have constructed $EFD_k$ using data on U.S. firms from 1990–1999 instead of the 1996–2005 baseline, to show that the analysis is not overly sensitive to this choice of time period for the underlying Compustat data. Second, we have computed a variant of $EFD_k$ using only those firms that are above the 25th percentile of the sales distribution in a given industry in Compustat. This latter measure in principle better captures the external financing needs of larger firms, who are themselves more likely to be multinational companies.[42] In practice, both exercises deliver quantitatively and qualitatively similar results as in our baseline regressions. This is consistent with the interpretation that there is a persistent technological component – such as the importance of upfront R&D or investment costs – that drives sectors' reliance on outside capital.

*Alternative estimators and subsamples*: We have performed a series of checks to address potential concerns with sampling (see Appendix Table 4). Since some country-sector-year observations feature no multinational activity in one of the three sales categories, we have verified that the results for aggregate MNC sales by destination market in (3.1) hold also under Tobit estimation instead of OLS. We have also confirmed that the affiliate-level findings are not driven by small firms that contribute little to overall multinational activity, by estimating (3.2) with Weighted Least Squares using total affiliate sales as weights.

Separately, we have checked that the baseline patterns are unaltered when restricting the sample to 1989–2006, instead of the full 1989–2009 panel. The findings are therefore not driven by the global financial crisis years. Given the distinctiveness of the E.U. as an integrated economic region with low trade barriers, we have also verified that E.U. host countries do not drive the results for affiliates' export-platform sales by removing E.U. members from the estimation sample.

### 6.2. Additional controls

The coefficient on the interaction term $FD_{it} \times EFD_k$ in principle identifies the differential effect of financial development on multinational activity across sectors with varying dependence on external finance. This interpretation would be compromised if $EFD_k$ were picking up instead the effect of other sector characteristics that systematically correlate with FDI patterns across countries for reasons unrelated to financial frictions. To allay this concern, we show in Panel A of Table 6 that the baseline findings are similar when controlling for the interaction of $FD_{it}$ with measures of the capital and skill intensity of industry $k$.[43] Since physical capital investment in machinery and equipment purchases is often incurred upfront, capital-intensive sectors typically require significant amounts of external finance. Our coefficient estimates are thus dampened in this set of regressions, although the qualitative pattern of the effect of $FD_{it} \times EFD_k$ is preserved across the affiliate outcome measures. In a further specification check, Panel B of Table 6 corroborates the baseline results even when controlling for the interaction of $FD_{it}$ with affiliate-level measures of R&D intensity (R&D expenditures divided by total sales) and skill intensity (log average wage) constructed from the BEA data. To the extent that different production technologies are associated with different needs for external capital, this constitutes a conservative sensitivity check that our findings are not driven by multinationals that happen to be more research- or skill-intensive.

### 6.3. Firm heterogeneity

The specification in (3.2) includes parent firm fixed effects, so that identification comes from the variation within a firm across its subsidiaries in different countries and over time. A potential concern is omitted variable bias related to time-varying firm or affiliate characteristics that might affect MNCs' operations, such as productivity, managerial practices, labor skill composition, or R&D intensity. To accommodate this possibility, Panel A in Table 7 adds controls for productivity (log value-added per worker), R&D intensity, and skill intensity at the affiliate-year level. The baseline findings on the interaction term between host-country financial development and sectors' external finance dependence remain robust. In addition, the results confirm that more productive affiliates feature a higher level of sales to all three markets (Columns 1–3). At the same time, affiliate value-added per worker does not significantly affect the share of sales destined for each market (Columns 5–7). Both patterns are consistent with the model where sales levels depend on productivity, while sales shares do not (c.f., Eqs. (2.6)–(2.8)). In short, firm heterogeneity along the productivity dimension affects the level of affiliate sales, but not its composition in terms of destination markets.

In Panel B of Table 7, we further allow for the possibility that host-country financial development might affect multinational affiliates differentially along the productivity distribution. To do so, we expand specification (3.2) to include the above measure of affiliate productivity and its interaction with $FD_{it}$. This once again leaves the findings for the key interaction

[42] Our preferred measure of $EFD_k$ is based on the full set of firms across the sales distribution for two reasons. First, the competition effect in the model reflects the impact of host-country financial development on all firms in the host economy and especially those in the left tail of the distribution that respond to movements in the productivity cut-off for survival. Second, a firm's observed use of external finance reflects exogenous, technologically-determined requirements at the sector level, and the firm's own ability to raise capital which could be endogenous to firm size; using the full sample of firms thus better captures the former exogenous component.

[43] We compute capital and skill intensity from the NBER CES Manufacturing Dataset as the log real capital stock divided by total employment and as the log number of non-production workers divided by total employment, respectively.

**Table 6**
Robustness to additional interactions.

| Dependent variable: | Local sales | 3rd ctry sales | US sales | Total sales | Local sales / Total sales | 3rd ctry sales / Total sales | US sales / Total sales |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| **Panel A. Controlling for FD × industry capital and skill intensity** | | | | | | | |
| Fin development × | 0.001 | 0.032 | 0.093 | 0.007 | −0.004 | 0.002 | 0.002 |
| Ext fin dependence | (0.12) | (1.79)* | (4.68)*** | (0.56) | (−2.14)** | (1.06) | (1.88)* |
| Fin development × | −0.092 | 0.041 | 0.055 | −0.072 | −0.020 | 0.012 | 0.008 |
| Industry K intensity | (−1.91)* | (0.59) | (0.41) | (−1.83)* | (−2.17)** | (1.45) | (0.98) |
| Fin development × | 0.119 | 0.198 | 0.597 | 0.158 | −0.027 | 0.007 | 0.020 |
| Industry H intensity | (0.82) | (0.86) | (2.52)** | (1.12) | (−0.98) | (0.33) | (0.95) |
| # Obs | 111,434 | 73,260 | 48,709 | 121,054 | 121,054 | 121,054 | 121,054 |
| $R^2$ | 0.24 | 0.31 | 0.34 | 0.19 | 0.28 | 0.29 | 0.27 |
| **Panel B. Controlling for FD × affiliate R&D intensity and average wage** | | | | | | | |
| Fin development × | −0.003 | 0.031 | 0.091 | 0.007 | −0.005 | 0.003 | 0.002 |
| Ext fin dependence | (−0.31) | (1.82)* | (4.11)*** | (0.87) | (−3.30)*** | (1.97)* | (1.74)* |
| Aff R&D/Sales | −0.0007 | 0.0024 | 0.0330 | −0.0008 | 0.0000 | −0.0000 | 0.0000 |
| | (−2.96)*** | (8.68)*** | (7.28)*** | (−4.79)*** | (0.96) | (−1.60) | (0.87) |
| Fin development × | 0.0002 | −0.0024 | −0.0452 | 0.0002 | −0.0000 | 0.0000 | −0.0000 |
| Aff R&D/Sales | (1.90)* | (−8.88)*** | (−7.36)*** | (2.75)*** | (−0.08) | (0.96) | (−1.06) |
| Log Aff wage | 0.094 | −0.548 | −0.613 | −0.058 | 0.086 | −0.036 | −0.050 |
| | (1.76)* | (−5.03)*** | (−5.04)*** | (−0.93) | (4.78)*** | (−2.56)** | (−1.96)* |
| Fin development × | 0.080 | 0.414 | 0.421 | 0.155 | −0.056 | 0.025 | 0.031 |
| Log Aff Wage | (1.74)* | (3.18)*** | (3.22)*** | (2.42)** | (−3.48)*** | (1.75)* | (1.52) |
| # Obs | 139,915 | 82,765 | 56,774 | 150,629 | 150,629 | 150,629 | 150,629 |
| $R^2$ | 0.32 | 0.34 | 0.36 | 0.31 | 0.34 | 0.33 | 0.29 |
| Country-year FE | Y | Y | Y | Y | Y | Y | Y |
| Parent firm FE | Y | Y | Y | Y | Y | Y | Y |

*Notes:* * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; $t$-statistics based on robust standard errors clustered by country appear in parentheses. The table replicates Panel B in Table 4 but additionally controls for the interaction of financial development with parent industries' physical and human capital intensity (Panel A) or with affiliates' R&D and skill intensity, measured respectively by the R&D-to-sales ratio and log wage (Panel B). All regressions include country-year and parent firm fixed effects.

**Table 7**
Affiliate controls and heterogeneous effects.

| Dependent variable: | Local sales | 3rd ctry sales | US sales | Total sales | Local sales / Total sales | 3rd ctry sales / Total sales | US sales / Total sales |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| **Panel A. Controlling for affiliate productivity, R&D and skill intensity** | | | | | | | |
| Fin development × | −0.003 | 0.031 | 0.096 | 0.007 | −0.006 | 0.004 | 0.003 |
| Ext fin dependence | (−0.33) | (1.80)* | (3.96)*** | (0.86) | (−3.47)*** | (2.07)** | (1.76)* |
| Log Aff value added | 0.103 | 0.176 | 0.232 | 0.122 | 0.002 | 0.002 | −0.004 |
| per worker | (5.82)*** | (3.93)*** | (3.55)*** | (5.03)*** | (0.28) | (0.57) | (−0.97) |
| Aff R&D/Sales | −0.0003 | −0.0000 | −0.0003 | −0.0004 | 0.0000 | −0.0000 | 0.0000 |
| | (−4.91)*** | (−0.54) | (−13.0)*** | (−6.44)*** | (2.12)** | (−2.24)** | (0.56) |
| Log Aff wage | 0.084 | −0.345 | −0.453 | −0.028 | 0.044 | −0.020 | −0.024 |
| | (2.87)*** | (−4.22)*** | (−3.82)*** | (−0.72) | (3.90)*** | (−2.68)*** | (−2.59)** |
| # Obs | 132,294 | 79,475 | 54,758 | 142,204 | 142,204 | 142,204 | 142,204 |
| $R^2$ | 0.35 | 0.35 | 0.36 | 0.35 | 0.34 | 0.33 | 0.30 |
| **Panel B. Heterogeneous effects across affiliates: productivity** | | | | | | | |
| Fin development × | −0.004 | 0.030 | 0.090 | 0.006 | −0.006 | 0.004 | 0.003 |
| Ext fin dependence | (−0.41) | (1.80)* | (3.93)*** | (0.73) | (−3.68)*** | (2.08)** | (1.88)* |
| Log Aff value added | 0.152 | −0.147 | −0.200 | 0.071 | 0.047 | −0.019 | −0.028 |
| per worker | (4.24)*** | (−2.31)** | (−2.33)** | (2.19)** | (3.66)*** | (−2.52)** | (−1.80)* |
| Fin development × | −0.032 | 0.259 | 0.335 | 0.049 | −0.039 | 0.018 | 0.021 |
| Log Aff VA per worker | (−0.93) | (3.54)*** | (4.58)*** | (1.45) | (−3.21)*** | (2.05)** | (1.67)* |
| # Obs | 132,297 | 79,475 | 54,758 | 142,207 | 142,207 | 142,207 | 142,207 |
| $R^2$ | 0.35 | 0.35 | 0.36 | 0.34 | 0.34 | 0.33 | 0.30 |
| Country-year FE | Y | Y | Y | Y | Y | Y | Y |
| Parent firm FE | Y | Y | Y | Y | Y | Y | Y |

*Notes:* * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; $t$-statistics based on robust standard errors clustered by country appear in parentheses. Panel A expands the regressions in Panel B in Table 4 to include an affiliate's time-varying log value added per worker, R&D-to-sales ratio, and log average wage per worker. Panel B expands the regressions in Panel B in Table 4 to include an affiliate's time-varying log value added per worker and its interaction with financial development. All regressions include country-year and parent firm fixed effects.

**Table 8**
Affiliate financing practices.

| Dependent variable: | Local sales | 3rd ctry sales | US sales | Total sales | Local sales / Total sales | 3rd ctry sales / Total sales | US sales / Total sales |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| **Panel A. Controlling for affiliate total debt** | | | | | | | |
| Fin development × | −0.010 | 0.030 | 0.090 | 0.002 | −0.006 | 0.004 | 0.003 |
| Ext fin dependence | (−1.40) | (1.80)* | (3.17)*** | (0.25) | (−3.47)*** | (2.28)** | (1.72)* |
| Log Aff debt | 0.517 | 0.650 | 0.552 | 0.571 | −0.023 | 0.020 | 0.003 |
| | (19.6)*** | (21.8)*** | (21.6)*** | (33.8)*** | (−5.84)*** | (5.34)*** | (1.71)* |
| # Obs | 129,553 | 75,097 | 51,331 | 140,685 | 140,685 | 140,685 | 140,685 |
| $R^2$ | 0.38 | 0.43 | 0.41 | 0.40 | 0.32 | 0.32 | 0.27 |
| **Panel B. Controlling for local share of affiliate liabilities** | | | | | | | |
| Fin development × | −0.020 | 0.043 | 0.070 | −0.004 | −0.005 | 0.003 | 0.002 |
| Ext fin dependence | (−1.26) | (2.12)** | (2.31)** | (−0.36) | (−2.31)** | (1.60) | (1.46) |
| Local share aff liab | −0.075 | −0.625 | −0.057 | −0.278 | 0.072 | −0.073 | 0.001 |
| | (−1.26) | (−3.56)*** | (−0.46) | (−2.89)*** | (3.47)*** | (−3.89)*** | (0.18) |
| # Obs | 28,522 | 12,796 | 9,447 | 30,562 | 30,562 | 30,562 | 30,562 |
| $R^2$ | 0.26 | 0.36 | 0.37 | 0.22 | 0.30 | 0.29 | 0.28 |
| **Panel C. Controlling for parent share of affiliate liabilities** | | | | | | | |
| Fin development × | −0.020 | 0.045 | 0.073 | −0.003 | −0.005 | 0.003 | 0.002 |
| Ext fin dependence | (−1.26) | (2.27)** | (2.36)** | (−0.30) | (−2.44)** | (1.73)* | (1.46) |
| Parent share aff liab | −0.192 | 0.084 | −0.274 | −0.170 | −0.015 | 0.017 | −0.002 |
| | (−4.05)*** | (0.72) | (−2.22)** | (−3.53)*** | (−1.28) | (1.78)* | (−0.41) |
| # Obs | 28,522 | 12,796 | 9,447 | 30,562 | 30,562 | 30,562 | 30,562 |
| $R^2$ | 0.26 | 0.35 | 0.37 | 0.22 | 0.30 | 0.29 | 0.28 |
| Country−year FE | Y | Y | Y | Y | Y | Y | Y |
| Parent firm FE | Y | Y | Y | Y | Y | Y | Y |

*Notes:* * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; $t$-statistics based on robust standard errors clustered by country appear in parentheses. Panels A, B and C replicate Panel B in Table 4 controlling for affiliate time-varying log total debt (Panel A), local share of total debt (Panel B), or parent share of total debt (Panel C). All regressions include country-year and parent firm fixed effects.

term $FD_{it} \times EFD_k$ unaffected. For each of the outcome measures, we also find that the effect of host-country financing conditions tends to be more pronounced for affiliates that are more productive, in that the coefficient of $FD_{it}$ interacted with log value-added per worker inherits the same sign as the $\beta$ coefficient on $FD_{it} \times EFD_k$. This pattern is in line with the logic of the model for the affiliate sales measures in Columns 1–4: From the expressions for $HOR(a)$, $RET(a)$, $PLA(a)$ and $TOT(a)$ in Section 2.2, one can see that host-country financing conditions affect these sales levels through the aggregate demand terms ($A_{ww}$, $A_{ew}$, and $A_{sw}$), and these effects are in turn amplified when productivity (as captured by $a^{1-\varepsilon}$) is higher. That said, the sales shares that are the dependent variables in Columns 5–7 do not depend directly on firm productivity in the model; the significant coefficients we find in these latter columns suggest that there are potentially forces outside the scope of our model contributing to a larger response of these sales shares to financing conditions for more productive firms.[44]

### 6.4. Affiliate financing practices

The baseline evidence in Section 5 is consistent with financial conditions shaping multinational activity via both the competition and the financing effects. When only the competition effect is active, host-country financial development induces affiliates to reduce local sales and to instead increase exports back to the U.S. and to third destinations. When the financing effect is also present, strengthening local financial markets improves an affiliate's overall access to outside capital and tends to stimulate sales to all three markets. We now directly exploit detailed information on the financing practices of U.S.-owned MNC affiliates to shed more light on these two effects.

The BEA records each subsidiary's total debt by year, comprising both current liabilities and long-term debt. Conceptually, total debt reflects an affiliate's overall ability to raise external financing given its optimal production scale. Controlling for an affiliate's log total debt directly in Eq. (3.2) would thus capture the financing effect of credit conditions, such that the coefficient $\beta$ on $FD_{it} \times EFD_k$ would now reflect the residual competition effect of credit conditions. This is precisely what we observe when we implement this exercise in Panel A of Table 8: Affiliate sales to each consumer market are increasing in log affiliate debt (Columns 1–4), consistent with the financing effect of host-country financial development. At the

[44] While we obtain significant estimates for the main effect of log value-added per worker in Columns 5–7 of Panel B in Table 7, one should bear in mind that the overall effect of this variable would need to be evaluated taking into account the effect through its interaction with $FD_{it}$. This latter interaction term bears the opposite sign as the main effect of log affiliate productivity, which helps to reconcile why no significant effect of log affiliate value-added per worker is found in Columns 5–7 of Panel A in Table 7.

same time, the point estimates for $\beta$ remain positive and significant in the case of affiliates' return and platform sales shares, while retaining their negative and significant sign in the case of horizontal sales, consistent with the competition effect.

We have thus far focused on how host-country financial development increases affiliates' total available external funding by allowing them to borrow more in local credit markets and to rely less on parent financing. This can be rationalized with asymmetric information or contractual frictions that incentivize financiers to fund production activities that take place in their home country rather than abroad. In the same spirit, one could envision too that host-country lenders may be more willing to finance affiliates' production for sales to the local market rather than to other destinations, for example because of higher monitoring costs for foreign sales.

We explore these questions with BEA data on the sources of MNC affiliates' debt, namely the fraction held by the U.S. parent firm, by host-country lenders, or by other entities. Since this information is available only for affiliates above a minimum size threshold and only in benchmark years in our panel, the sample size for this analysis is substantially reduced. We nevertheless find qualitatively similar results when we include in specification (3.2) either the local share or the parent share of affiliate liabilities in Panels B and C of Table 8, respectively: Controlling for these affiliate financing practices, host-country financial development is still associated with a shift in affiliate sales away from the local market towards the U.S. and other destinations, that is disproportionately larger in financially more sensitive sectors.[45] The evidence moreover suggests that increased use of host-country financing facilitates affiliates' local sales (Column 5) but reduces the propensity to export to third-country markets (Column 6); on the other hand, the share of parent financing tends to play the converse role. The financing that affiliates receive from host-country sources thus appears to affect the composition of affiliate sales, but this does not detract from the competition effect captured by the $FD_{it} \times EFD_k$ interaction term.

### 6.5. Level effects of financial development

The baseline specifications have identified the differential impact of financial development across sectors with varying reliance on external capital. In order to also assess the level effect of host-country financial development, we now estimate two alternative regressions that replace the fixed effects in Eqs. (3.1) and (3.2) with a more parsimonious set that comprises sector dummies, $\varphi_k$, and year dummies, $\varphi_t$:

$$MNC_{(a)ikt} = \alpha FD_{it} + \Gamma X_{it} + \varphi_k + \varphi_t + \epsilon_{(a)ikt}, \tag{6.1}$$

$$MNC_{(a)ikt} = \alpha FD_{it} + \beta\ FD_{it} \times EFD_k + \Gamma X_{it} + \varphi_k + \varphi_t + \epsilon_{(a)ikt}. \tag{6.2}$$

Note that each of the above specifications can be run either at the aggregate level (with $MNC_{ikt}$ as the outcome variable) or at the affiliate level (with $MNC_{aikt}$ instead). The right-hand side of these regressions features a vector $X_{it}$ of host-country variables to control for forces that could be relevant for MNC activity. This includes log GDP from the Penn World Tables (PWT) Version 7.0, as a measure of aggregate demand in the host country, as well as log GDP per capita and the stocks of physical and human capital per worker, as proxies for factor costs.[46] As further controls, we add the average corporate tax rate faced by U.S. firms in the host country (computed using BEA data on observed tax incidence) and a rule of law index from the International Country Risk Guide, both of which help to capture country-specific components of the fixed cost of investment.[47] We also account for the fixed and variable trade costs between country $i$, the United States, and third-country markets, with the log distance between $i$ and the U.S. (from CEPII), as well as time-varying dummies for $i$'s membership in 11 U.S. regional trade agreements (RTAs) and 8 other major multilateral agreements.[48] Of note, controlling for GDP per capita, corporate taxes and rule of law helps isolate the impact of financial development from that of overall economic development, tax arbitrage motives and broader institutional capacity.

In principle, the coefficient $\alpha$ in Eq. (6.1) picks up the effect of host-country financial development on MNC activity in a representative industry with average financial vulnerability, while the coefficient $\alpha$ in Eq. (6.2) can capture the impact of $FD_{it}$ on a benchmark industry with no need for external finance. However, $\alpha$ is identified from the variation in financial conditions across host countries and over time, and faces the endogeneity concerns discussed in Section 3.2. By contrast, coefficient $\beta$ in Eq. (6.2) reflects the differential effect of $FD_{it}$ across sectors with exogenously varying degrees of $EFD_k$.

[45] Despite the smaller sample size, the magnitudes of all coefficients on $FD_{it} \times EFD_k$ remain comparable to those in the baseline. The point estimates for the horizontal sales share (and by extension, for the combined share of return and platform sales) are significant, even while the coefficients on the two components of the export share are not always precisely pinned down.

[46] For physical capital, we apply the perpetual inventory method to data from the PWT, setting the initial capital stock equal to $I_0/(g+d)$, where $I_0$ is investment in the initial year, $g$ is the average growth rate of investment over the first ten years, and $d = 0.06$ is the assumed depreciation rate. For human capital, we calculate the average years of schooling from Barro and Lee (2013), weighted by the Mincerian returns to education function adopted by Hall and Jones (1999).

[47] The BEA reports the profits and corporate taxes paid for each US multinational affiliate. For each year in the panel, we calculate the corporate tax rate paid by each affiliate and average across affiliates to the country level.

[48] The United States participates in 11 RTAs: US-Israel, NAFTA, US-Jordan, US-Singapore, US-Chile, US-Australia, US-Morocco, CAFTA-DR (Dominican Republic-Central America), US-Bahrain, US-Peru, US-Oman. The 8 multilateral trade agreements are: GATT/WTO, EU = European Union, EFTA = European Free Trade Area, CARICOM = Caribbean Community, CACM = Central American Common Market, ASEAN = Association of Southeast Asian Nations, ASEAN-China, Mercosur. All trade agreement data come from Rose (2004), augmented with information from the World Trade Organization's website.

We report estimation results for Eqs. (6.1) and (6.2) in Appendix Tables 5 and 6. In line with Propositions 1 and 2 and consistent with limited estimation bias, we systematically find that $\alpha$ and $\beta$ have the same sign, that $\alpha$ is typically as statistically significant as $\beta$, and that the point estimates for $\beta$ from the baseline specifications (3.1)–(3.2) are very similar to those in specification (6.2).[49]

The estimates indicate that both the level and the cross-sector effects of financial conditions are substantial. For instance, increasing private credit from the 10$^{th}$ to the 90$^{th}$ percentile is associated with 13.9% more MNC subsidiaries on average (based on Column 2, Panel A of Appendix Table 5). This impact is 10.9% higher in the industry at the 90$^{th}$ percentile by external finance dependence relative to the industry at the 10$^{th}$ percentile (based on Column 2, Panel A of Appendix Table 6). Moving $FD_{it}$ from the 10$^{th}$ to the 90$^{th}$ percentile also implies a 36% expansion in total affiliate revenues in the typical sector (Column 6, Appendix Table 5), with a differential increase of 21.8% between sectors at the 90$^{th}$ and 10$^{th}$ percentile by $EFD_k$ (Column 6, Appendix Table 6). In terms of sales composition, such an improvement in $FD_{it}$ entails an average decline of 5.8 percentage points in the share of local sales, with an inter-percentile spread of 3.2 percentage points across industries that differ in external finance dependence. The corresponding average increase in the shares of platform and return sales to the U.S. stands at 3.4 and 2.4 percentage points, with an inter-percentile sector difference of 2.4 and 0.8 percentage points (based on Columns 6–8, Appendix Tables 5 and 6).

In unreported regressions, we have confirmed the above results when adding further controls $X_{it}$ that are available for a subsample of countries in the panel. These include an additional proxy for entry and FDI costs, which we construct as the first principal component of the log cost, log number of procedures and log number of days required to establish a new business, from the World Bank Doing Business Report.[50] We have likewise checked that the results hold when using an additional measure of trade costs, namely the first principal component of the log cost per shipping container, log number of procedures and log number of days necessary for exporting from the host country.[51] The results are also unaffected when controlling for a measure of export-platform potential, which we compute as the log average GDP of all destination markets excluding $i$ and the United States, weighted by their inverse bilateral distance from $i$ (à la Blonigen et al., 2007).

## 7. Conclusion

This paper brings new insights to the literature examining how conditions in recipient countries affect multinational activity. Using comprehensive data on U.S. multinational activity abroad, we uncover several novel effects of financial development in the host economy. Financially advanced countries attract more MNC subsidiaries. Strong financial institutions in the host country also induce higher aggregate affiliate sales to the local market, to the United States, and to third-country destinations. For individual affiliates, however, exports to the United States and to other markets are increased, but local sales are reduced. Yet both in the aggregate and at the affiliate level, the share of local sales in total affiliate sales falls with host-country financial development, while the shares of U.S. and third-country sales rise. Importantly, all of these patterns are more pronounced in financially vulnerable sectors that require more external capital. This suggests that financial development in the host country is a key institutional characteristic that dampens the horizontal motive for FDI and favors vertical and export-platform forms of multinational activity.

We propose that these empirical regularities are consistent with two effects of financial development on multinational activity in the presence of capital market imperfections: (1) a *competition effect* that reduces individual affiliates' revenues in the local market due to increased entry by domestic firms; and (2) a *financing effect* that encourages MNC entry and aggregate activity in the host country due to improved access to external financing for MNC affiliates. These effects point to important factors governing MNCs' global operations, and have policy implications for developing countries seeking to attract FDI as a means to technology transfer and foreign capital inflows.

There remains much scope for further research. One promising avenue is understanding how host-country financial development jointly affects the decisions of multinational companies regarding the location, ownership (i.e., integration versus arm's length sourcing), financing, and type (i.e., horizontal versus vertical versus platform FDI) of their affiliates worldwide. Of related interest is how local economic conditions and financial policies in different host countries and consumer markets shape MNCs' global activity in light of their network of affiliates. Separately, we have focused on the effects of local credit conditions on FDI patterns, and more work is needed to understand how foreign subsidiaries and domestic firms interact in local and international capital markets. Finally, our findings suggest that the state of the financial system in different countries might affect the organizational and operational structure of global supply chains more broadly, beyond the behavior of multinational companies.

[49] The results (available on request) also indicate that the controls $X_{it}$ correlate with MNC activity in an intuitive way. For example, larger hosts attract more MNC activity and a bigger share of affiliate sales, consistent with a market-size effect that favors horizontal FDI. Bilateral distance to the U.S. deters the level of multinational activity, but has only a limited impact on the composition of MNC sales. E.U. membership has a positive effect on the export-platform share of affiliate revenues, while NAFTA membership induces a higher share of sales back to the U.S. Consistent with profit-shifting motives, multinationals direct sales away from host countries with high corporate taxes and towards the U.S.

[50] These data are available for a subset of countries in 2003–2009; we use the average value for each country in our panel.

[51] These data are available for a subset of countries in 2006–2009; we use the average value for each country in our panel.

## Appendix

**Table A.1**
Economic growth and multinational activity.

| Dependent variable: | Cumulative GDP Per Capita Growth, 1989–2009 | | 5-Year GDP Per Capita Growth, 1989–2009 | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Aggregate MNC sales growth | 0.165*** | 0.189*** | 0.107*** | 0.137*** |
| | (0.032) | (0.028) | (0.030) | (0.020) |
| Growth in local MNC sales share | | 0.618* | | 0.193** |
| | | (0.324) | | (0.082) |
| Growth in US MNC sales share | | 0.479 | | −0.131 |
| | | (0.349) | | (0.087) |
| Initial log GDP per capita | −0.053 | −0.058 | −0.015* | −0.020** |
| | (0.037) | (0.039) | (0.008) | (0.009) |
| # Obs | 44 | 38 | 204 | 164 |
| $R^2$ | 0.55 | 0.59 | 0.20 | 0.33 |

*Notes:* * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; robust standard errors in Columns 1–2 and clustered by country in Columns 3–4 appear in parentheses. The unit of observation is the country in Columns 1–2 and the country-period in Columns 3–4, where a period is a 5-year interval between benchmark years in 1989–2009. The dependent variable is the cumulative growth in GDP per capita over the period indicated in the row heading. The right-hand side variables are cumulative growth rates in aggregate MNC sales or in the composition of aggregate MNC sales over the concurrent period.

**Table A.2**
Host-country financial development.

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

*Notes:* This table summarizes the variation in financial development in the panel, as measured by private credit normalized by GDP.

**Table A.3**
Alternative measures of external finance dependence.

| Dependent variable: | Local sales | 3rd ctry sales | US sales | Total sales | Local sales / Total sales | 3rd ctry sales / Total sales | US sales / Total sales |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| **Panel A. Alternative time period: 1990–1999** | | | | | | | |
| Fin development × | −0.017 | 0.052 | 0.162 | 0.003 | −0.010 | 0.006 | 0.004 |
| Ext fin dependence | (−1.14) | (2.19)** | (4.08)*** | (0.18) | (−3.69)*** | (2.20)** | (1.83)* |
| # Obs | 149,492 | 85,991 | 58,519 | 162,547 | 162,547 | 162,547 | 162,547 |
| $R^2$ | 0.24 | 0.32 | 0.34 | 0.21 | 0.31 | 0.30 | 0.25 |
| **Panel B. Alternative firm sample: firms above 25th percentile** | | | | | | | |
| Fin development × | −0.016 | 0.055 | 0.140 | 0.007 | −0.010 | 0.007 | 0.003 |
| Ext fin dependence | (−1.11) | (2.66)*** | (3.47)*** | (0.45) | (−4.11)*** | (2.98)*** | (1.75)* |
| # Obs | 150,099 | 86,148 | 58,700 | 163,215 | 163,215 | 163,215 | 163,215 |
| $R^2$ | 0.24 | 0.32 | 0.34 | 0.21 | 0.31 | 0.30 | 0.26 |
| Country−year FE | Y | Y | Y | Y | Y | Y | Y |
| Parent firm FE | Y | Y | Y | Y | Y | Y | Y |

*Notes:* * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; $t$-statistics based on robust standard errors clustered by country appear in parentheses. The regressions replicate Panel B in Table 4 using industries' external finance dependence in the 1990–1999 period (Panel A), and constructed across firms above the 25th size percentile within each industry (Panel B), instead of the baseline measure based on all firms in Compustat in 1996–2005. All regressions include country-year and parent firm fixed effects.

**Table A.4**
Multinational affiliate selection.

| Dependent variable: | Local sales | 3rd ctry sales | US sales | Total sales | Local sales / Total sales | 3rd ctry sales / Total sales | US sales / Total sales |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| **Panel A. Aggregate level: Tobit** | | | | | | | |
| Fin development × | 0.026 | 0.090 | 0.277 | – | −0.012 | 0.006 | 0.005 |
| Ext fin dependence | (6.62)*** | (8.14)*** | (20.6)*** | | (−18.9)*** | (9.41)*** | (12.9)*** |
| Country-year FE | Y | Y | Y | | Y | Y | Y |
| Industry FE | Y | Y | Y | | Y | Y | Y |
| # Obs | 11,392 | 11,392 | 11,392 | | 11,392 | 11,392 | 11,392 |
| **Panel B. Affiliate level: weighted least squares** | | | | | | | |
| Fin development × | 0.004 | 0.040 | 0.154 | 0.035 | −0.011 | 0.008 | 0.003 |
| Ext fin dependence | (0.26) | (1.47) | (4.34)*** | (2.42)** | (−3.39)*** | (2.36)** | (1.40) |
| Country-year FE | Y | Y | Y | Y | Y | Y | Y |
| Parent firm FE | Y | Y | Y | Y | Y | Y | Y |
| # Obs | 150,099 | 86,148 | 58,700 | 163,215 | 163,215 | 163,215 | 163,215 |
| $R^2$ | 0.59 | 0.55 | 0.60 | 0.65 | 0.47 | 0.49 | 0.46 |

*Notes:* * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; $t$-statistics based on robust standard errors clustered by country appear in parentheses. The dependent variables in Panel A are aggregate sales in levels and shares, as in Panel A of Table 4. Estimation is by tobit; no results are reported under the "Total sales" column as the set of host country by industry pairs in the sample are those for which there is at least one multinational affiliate recording positive total sales. The dependent variables in Panel B are affiliate sales in levels and shares, as in Panel B of Table 4. Estimation is by weighted least squares with the total sales of the affiliate as weights, controlling for country-year and parent firm fixed effects.

**Table A.5**
Level effects of financial development: industry and year FE.

| Dependent variable: | N>0, OLS | Log N | Local sales | 3rd ctry sales | US sales | Total sales | Local sales / Total sales | 3rd ctry sales / Total sales | US sales / Total sales |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| **Panel A. Aggregate level** | | | | | | | | | |
| Fin development | 0.109 | 0.135 | 0.233 | 0.376 | 0.756 | 0.350 | −0.057 | 0.033 | 0.023 |
| | (3.41)*** | (2.00)** | (1.49) | (1.51) | (3.20)*** | (2.30)** | (−2.81)*** | (1.88)* | (3.53)*** |
| Controls | Log GDP, Log GDP per capita, Log Distance, Log K/L, Log H/L, Rule of Law, Tax Rate, GATT/WTO Dummy, RTA Dummies, Industry FE, Year FE | | | | | | | | |
| # Obs | 73,684 | 11,188 | 14,988 | 8,832 | 6,880 | 15,528 | 15,528 | 15,528 | 15,528 |
| $R^2$ | 0.43 | 0.41 | 0.44 | 0.32 | 0.26 | 0.42 | 0.22 | 0.23 | 0.13 |
| **Panel B. Affiliate level** | | | | | | | | | |
| Fin development | – | – | −0.153 | 0.237 | 0.469 | −0.031 | −0.047 | 0.030 | 0.018 |
| | | | (−2.27)** | (1.84)* | (2.94)*** | (−0.60) | (−2.46)** | (1.86)* | (2.20)** |
| Controls | Log GDP, Log GDP per capita, Log Distance, Log K/L, Log H/L, Rule of Law, Tax Rate, GATT/WTO Dummy, RTA Dummies, Industry FE, Year FE | | | | | | | | |
| # Obs | | | 198,103 | 103,892 | 71,146 | 215,120 | 215,120 | 215,120 | 215,120 |
| $R^2$ | | | 0.12 | 0.18 | 0.16 | 0.11 | 0.14 | 0.16 | 0.08 |

*Notes:* * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; *t*-statistics based on robust standard errors clustered by country appear in parentheses. The regressions report level effects of financial development on an average industry without interaction terms for its differential effect across industries. The unit of observation in Panel A is the country-industry-year and the outcome variables are the same as in Tables 3 and 4, Panel A. The unit of observation in Panel B is the affiliate-year and the outcome variables are the same as in Table 4, Panel B. All regressions control for log(GDP), log(GDP per capita), log(Distance), log(K/L), log(H/L), Rule of Law, Corporate Tax Rate, a GATT/WTO dummy, and Regional Trade Agreement (RTA) dummies. GDP and GDP per capita are from the Penn World Tables. Bilateral Distance is from CEPII. Rule of Law is from the International Country Risk Guide. The RTA dummies are from Rose (2004) and WTO. All other variables are as described in the notes to Table 2. All regressions include industry and year fixed effects.

**Table A.6**
Level and differential effects of financial development: industry and year FE.

| Dependent variable: | N>0, OLS | Log N | Local sales | 3rd ctry sales | US sales | Total sales | Local sales / Total sales | 3rd ctry sales / Total sales | US sales / Total sales |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| **Panel A. Aggregate Level** | | | | | | | | | |
| Fin development | 0.131 | 0.142 | 0.148 | 0.403 | 0.684 | 0.298 | −0.058 | 0.037 | 0.021 |
| | (3.50)*** | (1.89)* | (0.95) | (1.50) | (2.61)** | (1.92)* | (−2.87)*** | (1.99)** | (3.27)*** |
| Fin development × | 0.005 | 0.044 | 0.058 | 0.103 | 0.188 | 0.089 | −0.013 | 0.010 | 0.003 |
| Ext fin dependence | (2.01)** | (4.05)*** | (2.70)*** | (4.16)*** | (6.47)*** | (4.78)*** | (−3.67)*** | (3.02)*** | (2.28)** |
| Controls | Log GDP, Log GDP per capita, Log Distance, Log K/L, Log H/L, Rule of Law, Tax Rate, GATT/WTO Dummy, RTA Dummies, Industry FE, Year FE | | | | | | | | |
| # Obs | 38,870 | 7,522 | 10,108 | 6,561 | 5,045 | 10,434 | 10,434 | 10,434 | 10,434 |
| $R^2$ | 0.46 | 0.43 | 0.47 | 0.35 | 0.28 | 0.45 | 0.24 | 0.24 | 0.15 |
| **Panel B. Affiliate level** | | | | | | | | | |
| Fin development | – | – | −0.231 | 0.216 | 0.418 | −0.091 | −0.040 | 0.030 | 0.010 |
| | | | (−3.13)*** | (1.59) | (2.51)** | (−1.65) | (−1.90)* | (1.69)* | (1.10) |
| Fin development × | | | −0.001 | 0.044 | 0.126 | 0.014 | −0.007 | 0.004 | 0.003 |
| Ext fin dependence | | | (−0.07) | (2.69)*** | (4.35)*** | (1.39) | (−3.88)*** | (2.39)** | (1.98)* |
| Controls | Log GDP, Log GDP per capita, Log Distance, Log K/L, Log H/L, Rule of Law, Tax Rate, GATT/WTO Dummy, RTA Dummies, Industry FE, Year FE | | | | | | | | |
| # Obs | | | 148,538 | 85,339 | 58,433 | 161,384 | 161,384 | 161,384 | 161,384 |
| $R^2$ | | | 0.13 | 0.18 | 0.16 | 0.11 | 0.15 | 0.17 | 0.10 |

*Notes:* * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; t-statistics based on robust standard errors clustered by country appear in parentheses. The regressions report level and differential effects of financial development across industries. The unit of observation in Panel A is the country-industry-year and the outcome variables are the same as in Tables 3 and 4, Panel A. The unit of observation in Panel B is the affiliate-year and the outcome variables are the same as in Table 4, Panel B. All regressions control for log(GDP), log(GDP per capita), log(Distance), log(K/L), log(H/L), Rule of Law, Corporate Tax Rate, a GATT/WTO dummy, and Regional Trade Agreement (RTA) dummies. GDP and GDP per capita are from the Penn World Tables. Bilateral Distance is from CEPII. Rule of Law is from the International Country Risk Guide. The RTA dummies are from Rose (2004) and WTO. All other variables are as described in the notes to Table 2. All regressions include industry and year fixed effects.

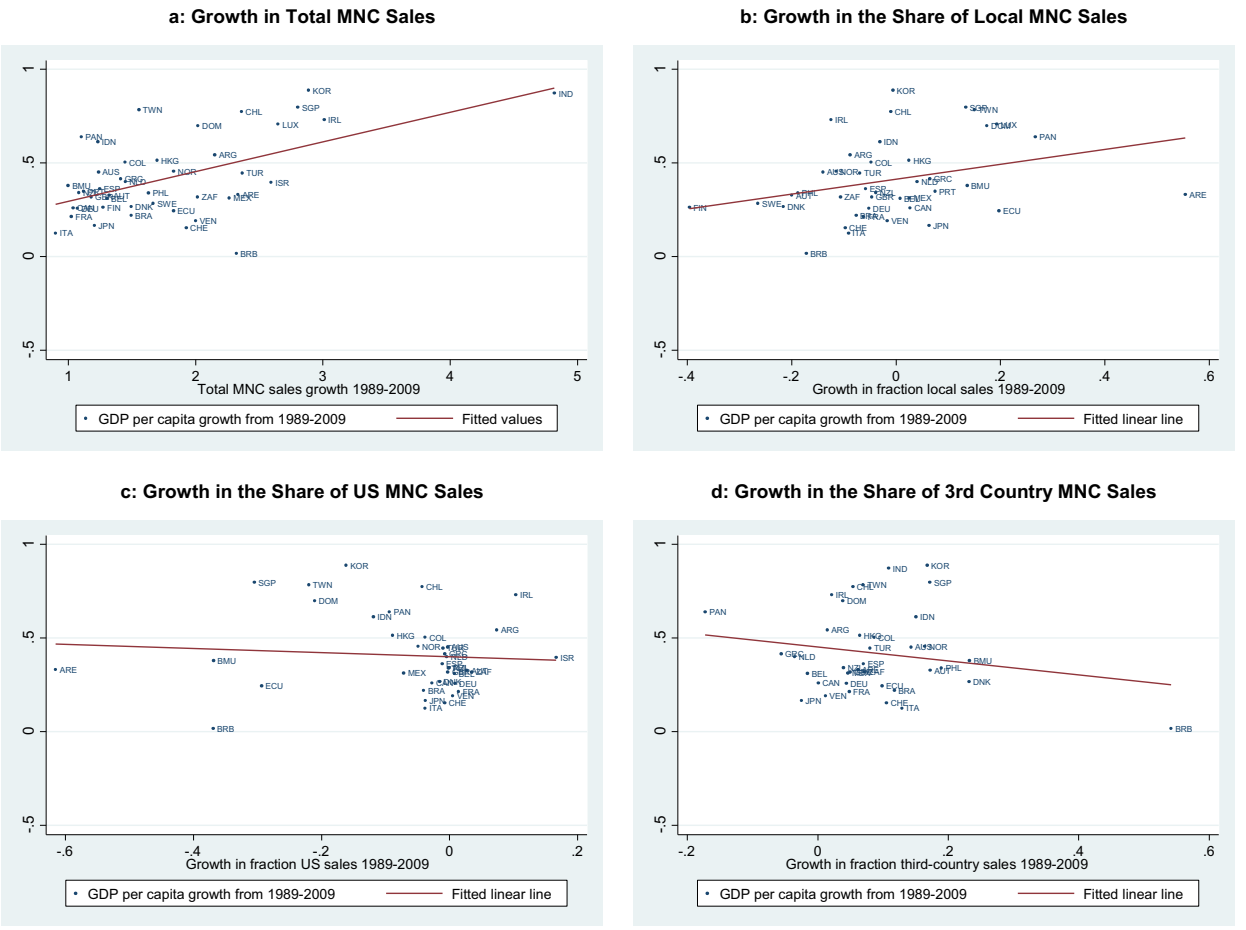


**Fig. A.1.** Economic growth and multinational activity, 1989–2009. *Notes:* This figure illustrates the relationship between economic growth and growth in aggregate multinational activity from 1989 to 2009 across 44 host countries. Observations are labeled by their country ISO code. Plotted on the vertical axis of each figure is the cumulative growth in GDP per capita. Plotted on the horizontal axis is the cumulative growth in aggregate MNC sales (Fig. 1a), as well as the cumulative growth in the shares of aggregate MNC sales sold in the host-country market (Fig. 1b), in the US (Fig. 1c), and in third-country markets (Fig. 1d).

## Supplementary material

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.euroecorev.2019.02.008.

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