Vertical Integration and Supplier Finance*

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Abstract

This paper studies access to finance by suppliers that are linked to a multinational enterprise. The theoretical framework consists of a property rights model featuring suppliers that are either vertically integrated or sell to the multinational at arm's-length, which in turn affects the availability of different sources of credit. Integrated suppliers are predicted to cover a relatively larger share of their costs using internal sources, consisting of initial wealth plus funds from the multinational parent. In addition, due to the diminished dependence on external funds (local bank credit) integrated suppliers' funding shares are less responsive to changes in their home country's level of financial development. We test the model's predictions using firm survey data from over 50 developing and emerging countries and find broad support.

Keywords: Vertical Integration; Financial Constraints; Multinational companies
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1 Introduction

Lack of access to finance is generally considered to be a major obstacle to growth, especially affecting small and medium enterprises in developing and emerging countries. As a consequence, encouraging financial development is a common recommendation made by researchers and policymakers in the development arena. Another common recommendation is to attract foreign direct investment (FDI). However, the most frequently emphasized benefits of FDI revolve around technological spillovers that raise local industry productivity and thus do not directly affect the scarcity of finance. This paper investigates whether attracting FDI may in fact also provide access to finance, specifically whether vertical FDI alleviates financial constraints of integrated suppliers.

We construct a simple model of the multinational-supplier relationship following the property rights theory of the firm (e.g. Grossman and Hart 1986). A multinational enterprise enters a production relationship with a supplier and chooses either vertical integration or arm's-length production (outsourcing). Financial markets do not work perfectly and suppliers may find themselves credit constrained conditional on their level of initial wealth. Building on evidence that internal capital markets plays a large role within the operation of multinationals we model integration to change the menu of financing options for the supplier.[1] In particular, an integrated supplier has the option to borrow from their multinational parent in addition to local banks. We use the model to generate a series of empirical predictions: Ceteris paribus, an integrated supplier is less likely to be credit constrained, uses internal funds to a larger extent and external funds to a smaller extent. The model also predicts that integrated suppliers will be more shielded from having to use local financial institutions. Improvement in a country's level of financial development will thus change the usage shares of internal versus external funds relatively more for locally-owned firms than for integrated ones.

Subsequently, we test these predictions using firm level data for 53 developing and emerging countries. Our identification strategy relies on propensity score matching. Controlling for observable factors that have been shown to determine integration decisions we construct a treatment group of foreign-owned firms and a control group of otherwise identical, locally-owned firms. In particular, we focus on host country firms that are exporting which suggests that they form a link in a larger production chain. The "treatment" of being foreign-owned leads to a larger share of costs being covered with internal funds, a smaller share with bank funds and to "access to finance" being self-reported to be a smaller obstacle to the firm. Furthermore, we use reweighting estimations to confirm the robustness of our propensity score results as well as test the predictions that correspond to interacted variables. In summary, we find broad support for the empirical predictions of our model, suggesting that the internal funding channel is important for suppliers of multinationals in countries with relatively low levels of financial development.

1.1 Related Literature

In our model integration occurs because it allows the multinational to secure at least partial property rights over the output of the supplier, following a view of the theory of the firm along the lines of Grossman and Hart (1986) or Hart (1995). This approach has been used extensively to study questions relating to the organization of production of multinationals, international capital flows and trade, for example in Antràs (2003) or Antràs and Helpman (2008).[2] The trade-off faced by

[1] See, for example, Desai et al. (2004), Aguiar and Gopinath (2005) and Desai et al. (2008) for studies providing evidence supporting the existence and importance of internal capital markets within multinationals.

[2] Also see the handbook chapter by Antràs and Yeaple (2014) for a more comprehensive list of references.

the multinational firm consists of weighing the benefit of control over the supplier's output against the cost of lowering the supplier's incentive to invest in the relationship. In our model the presence of financial constraints adds another benefit of integration: improving the supplier's access to loans.

Most closely related to our work, Carluccio and Fally (2012) examine a final good producing firm to either outsource to an unaffiliated foreign supplier or to vertically integrate with the supplier and become a multinational. Their focus is on the choice by the multinational parent firm, examining the impact of potentially financially constrained suppliers on these sourcing decisions. The authors show that in countries with less developed financial sectors parent firms are more likely to vertically integrate, especially in industries that are relatively more R&D intensive. Our analysis is complementary to their work as we shift focus from the decision taken by the parent to the implications for the supplier, in particular their financial situation. In contrast to Carluccio and Fally, we model integration to expand the borrowing options of the supplier and generate a different set of empirical predictions focusing on the usage shares of internal and external funds by the supplier.[3] As a consequence, our empirical strategy relies on data from suppliers located in developing and emerging economies, while Carluccio and Fally use data on multinational parent companies in France to validate their model's predictions.

More generally, our paper relates to various strands of the literature. Firstly, there are a number of papers starting with Harrison and McMillan (2003) and Harrison, Love, and McMillan (2004) that investigate the implications of inward FDI for financial constraints. In terms of local firms' financial circumstances, the effect of an increase in international capital inflows is ambiguous in theory. Harrison et al. (2004) find, using firm level data for 38 countries, that incoming foreign capital inflows alleviate financial constraints.[4] Splitting the sample along the line foreign/domestically-owned, the effect is stronger for foreign-owned firms, but significantly positive for both. While the authors are unable to examine the mechanisms with their data, this result suggests a possible sequence of events: First, the directly affected firm receives additional funds, which eases its financial constraint. Second, it borrows less from local banks, which, as a result, lend more to local firms. Third, as a direct result local firms' financial constraints are also eased. We present a model that formalizes the first two of these effects and provides related evidence. We show in our model that being integrated causes a supplier to be less financially constrained. In addition, it becomes less dependent on commercial banks, financing its operations with internal rather than external funds. Our results thus complement and expand on Harrison et al. (2004).

A related strand of research shifts the focus directly on the multinational enterprise, asking how its activity depends on host country financial development. Aguiar and Gopinath (2005) show that cross-border mergers and acquisitions (M&A) increase when a country is hit with a negative liquidity shock. This kind of fire sale FDI is interpreted to arise because the multinational has superior access to finance relative to domestic firms, and integration is thus used to overcome liquidity shortages. Desai, Foley, and Hines (2004) argue along similar lines and document how multinational firms adjust their internal capital markets to compensate for the lack of financial depth in some countries of operation. Studies such as these provide the foundation of our assumption of the presence of an internal capital market once the chosen organizational form is integration.

Next, our work also contributes to the literature studying the effect of foreign ownership on local affiliates of multinational enterprises empirically. For example, Desai, Foley, and Forbes (2008)

[3] In the working paper version of their article, Carluccio and Fally (2010) mention working through various alternative assumptions regarding the nature of financial constraints and whether they change as a result of integration, but without providing details and without investigating the implications for internal and external funding shares.

[4] Harrison and McMillan (2003) find the opposite, namely, that inward FDI exacerbates financial constraints for local firms. However, the paper uses data from only one country, Côte d'Ivoire, which the authors themselves admit is quite special.

show that U.S. affiliates abroad are in a better position than local firms to raise output and sales in response to a sharp currency depreciation due to financing from their parent company. Local firms suffer from the fall in value of their collateral, whereas integrated firms employ their multinational parents' financial resources to expand. A similar point is made by Blalock et al. (2008), who study the differential reaction of foreign-owned and domestically owned exporters to a sharp depreciation following a currency crisis. They find that foreign-owned exporters in Indonesia were able to expand activity to a larger extent than domestically owned ones and interpret this to indicate the presence of financial constraints. Alfaro and Chen (2012) also focus on the performance differential between locally- and foreign-owned firms and report that foreign ownership leads to better firm performance in times of financial crises. They explain this effect through the presence of vertical production linkages as well as financial linkages. Lacking affiliate-level data on financial transactions with the multinational parent, the authors compute industry-level measures of the intensity of financial linkages. By construction, this measure cannot consider differences in supplier financing arising from differences in organizational form across firms within the same industry. By contrast, our paper sheds direct light on the firm-level channels which cause the integrated supplier to be less constrained financially.

To sum up, the literature has established a link between host country financial sector development and multinational choice of organization (arm's length production versus acquisition and integration) as well as a link between host country financial sector development and post-integration internal capital flows within the multinational firm. These insights inform our modeling decisions below, and our contribution consists of making the internal capital market channel specific theoretically and subsequently providing empirical evidence supporting its existence and importance.

The paper proceeds as follows. Section 2 outlines the details of our theoretical model, while Section 3 derives the empirical predictions. The empirical strategy is explained in Section 4, empirical results presented in Section 5. Section 6 concludes.

2 Model

The model is based on Carluccio and Fally (2012) (CF hereafter) but departs from it in a number of ways.[5] Most importantly, we allow for the organizational form to impact the supplier's credit constraint. Consistent with the evidence on internal capital markets in, for example, Desai et al. (2004) and Desai et al. (2008), integration provides an additional credit line to the suppliers. For simplicity, we model this as an increase in the share of the supplier's surplus that can be pledged.

2.1 Production

A multinational firm M is active in an imperfectly competitive market for final goods. The elasticity of substitution between varieties of goods is given by σ. Total revenues from final good sales are given by

$$Y = A^{1-\rho} Q^{\rho}, \tag{1}$$

where Q is the total quantity of the final good and A is a demand factor that arises from the Dixit-Stiglitz model. The exponent ρ is linked to the elasticity of substitution by $\sigma = 1/(1-\rho) > 1$. In order to produce one unit of the final good, the multinational has to contract with a supplier S to produce one unit of a specific intermediate good. Producing one unit of the intermediate good,

[5] The model in CF, in turn, builds on earlier work by Antràs and Helpman (2008) and Grossman and Hart (1986).

in turn, requires the supplier to invest effort e, and one unit of effort incurs a marginal cost of c. Therefore, total costs C are simply given by

$$C = ce \tag{2}$$

and total revenue can also be written as

$$Y = A^{1-\rho} e^{\rho}. \tag{3}$$

2.2 Bargaining

The project-specific effort put forth by the supplier is unverifiable and can thus not be specified in a contract.[6] The supplier first chooses the level of e, and afterwards bargaining between the supplier and the multinational commences. Following CF, the bargaining scheme is assumed to be Nash bargaining with symmetric shares. In the case of agreement, each party receives half of the value of the partnership plus its outside option. For the supplier, the outside option is always zero because the input produced is specific and thus has no outside value. The outside option for the multinational depends crucially on the choice of organizational form: if the multinational has chosen to integrate the supplier (backward vertical FDI), the supplier does not hold the property rights and can thus not prevent the multinational from acquiring the intermediate goods. However, the multinational can only obtain a fraction $(1-\delta) < 1$ of the value of the supplier's efforts, due, for example, to the costs of replacing the supplier's management or engaging legal channels to secure the goods. Formally, the multinational's outside option under integration is given by $(1-\delta) A^{1-\rho} e^{\rho}$. If the supplier has not been integrated the outside option is zero for both parties, because the effort is specific and sunk, and the multinational has no claim on it.

The offer by the multinational consists of two items, the form of organization (integration or outsourcing) and an up-front transfer from supplier to multinational T. In the non-constrained case, the transfer (e.g. a licensing fee) allows the multinational to extract all of the surplus generated by the match, leaving the supplier's participation constraint satisfied with equality. In the case of binding credit constraints, however, the supplier may in fact need liquidity from the multinational, in which case the transfer may be negative.[7]

2.3 External and Internal Funding

By assumption financial markets in the supplier's country are inferior to those in the multinational's home country, raising the possibility of credit constraints. The supplier has to finance both the costs of its production effort C and the transfer to the multinational T at the outset. The available loan options depend on the organizational form: a non-integrated supplier can only borrow from local

[6] Note the difference to CF, where the share of non-contractable tasks is parameterized and represents the "complexity" of an industry. Differences in complexity are linked to the need for external financing, which in turn determines whether outsourcing or integration is chosen by the multinational. In the present paper, we are interested in changes in financial constraints and the supplier's choice of financing sources *as a result of being integrated*, so modeling industry differences of this kind is of secondary interest. As a result, assuming that all tasks are complex is innocuous and allows the derivation of clearer empirical predictions.

[7] These initial transfers are standard in the property-rights literature. In this model, they serve primarily a mathematical purpose rather than an economic one. With these transfers in place, we can find analytical solutions for the multinational's profit in the case of unconstrained as well as constrained suppliers, which is crucial when we find the initial supplier wealth level at which the multinational is indifferent between integration and outsourcing. See also footnote 12 below.

banks, whereas integration implies an additional credit line from the multinational which reflects the multinational parent's superior access to finance.[8][9] In addition, each supplier has initial wealth denoted by W. The supplier's budget constraint is thus given by

$$C = W + L^X - T, \qquad X \in \{I, O\} \tag{4}$$

where L^I and L^O denote the loans taken out by integrated and non-integrated suppliers, respectively. Let F_I and F_E denote the loans from the multinational (internal funds) and commercial banks (external funds), respectively, so that $F_I + F_E = L^I$. The amount the supplier can borrow is determined by three factors: the supplier's share of total revenue Y_S, the overall development of the country's financial sector κ and the organizational form of the supplier $X \in \{I, O\}$, where I denotes integration and O outsourcing. The borrowing constraints are given by

$$L^O \leq \kappa Y_S \tag{5}$$

and

$$L^I \leq (\kappa + \gamma) Y_S. \tag{6}$$

The supplier can borrow up to a fraction of the revenue arising from the business relationship with the multinational.[10] Integrated suppliers can also borrow from their multinational parent up to a fraction γ of their share of the revenue, where $\kappa + \gamma < 1$. The additional credit line is immediately available once the supplier has been integrated by the multinational. It is completely exogenous and can be interpreted as representing the superior access to finance by the multinational parent.[11] Note that the repayment of the loan is not conditional on the outcome of the bargaining process. In general, the timing follows CF and unfolds as follows:

1. The multinational proposes a contract to the supplier (X, T), where X is the organizational form (outsourcing O or integration I) and T is the monetary transfer. The transfer T takes into account the resources of the supplier, consisting of initial wealth as well as debt from local sources or the multinational parent.

2. Transfer T takes place.

3. The supplier decides on the level of e and produces the intermediate good.

4. Nash bargaining takes place on the value of joint production, and all loans are repaid.

To sum up, the multinational's choice of transfer is potentially restricted by the suppliers initial wealth and its ability to borrow. With integration, the multinational directly improves the latter,

[8] The latter financing option is not available in CF.

[9] Of course one might also consider the possibility of a supplier being granted additional credit by a multinational customer under an outsourcing agreement. While these kinds of arrangements exist in practice, the transaction costs within a firm will generally be lower than between two independent firms (Coase 1952). Interpreted along these lines, our model displays a case of a large drop in transaction costs arising from integration.

[10] This is a standard assumption of imperfect collateralization: in case of default, the bank would be unable to obtain the full value of the debtor's assets and thus reduces its exposure by limiting the fraction of total assets the borrower can collateralize. The parameter κ is generally interpreted as representing the country's degree of financial development.

[11] In reality, the share γ is influenced by the supplier country's capital controls, and the amount of funds that can be transferred from multinational parent to integrated supplier may be restricted. We abstract from this complication here, but adding this particular effect of a change in the country's regulatory environment would be straightforward.

which in turn allows it to extract a bigger surplus, ceteris paribus. Note that this also implies that the integrated supplier uses a larger share of internal funds to cover its costs.

2.4 Solution

The bargaining outcomes in the case of outsourcing are just one half of total revenue:

$$Y_M^O = \frac{1}{2} A^{1-\rho} e^{\rho} \tag{7}$$

$$Y_S^O = \frac{1}{2} A^{1-\rho} e^{\rho} \tag{8}$$

In the case of integration, the multinational obtains a larger share due to the positive outside option:

$$Y_M^I = \left(1 - \frac{\delta}{2}\right) A^{1-\rho} e^{\rho} \tag{9}$$

$$Y_S^I = \frac{\delta}{2} A^{1-\rho} e^{\rho} \tag{10}$$

The superscript denotes the organizational form (O for outsourcing and I for integration) and the subscript indicates multinational (M) or supplier (S). Note that integration leads to a larger share of the revenue going to the multinational because the bargaining position of the supplier is weakened by the loss of property rights. As a result, the model predicts that the supplier chooses a lower level of effort in the case of integration. Formally, in the case of outsourcing the supplier solves the problem

$$\max_e \frac{1}{2} A^{1-\rho} e^{\rho} - ce \tag{11}$$

and thus chooses

$$e^O(c) = a\rho(2c)^{-\sigma}, \tag{12}$$

where $a = A\rho^{\sigma-1}$ is a constant that depends on demand factors and the substitutability of one final good variety for another. In the case of integration, the level of effort is given by

$$e^I(c) = a\rho\delta^{\sigma}(2c)^{-\sigma}. \tag{13}$$

Intuitively, the smaller the loss to the multinational from removing the current management after a disagreement and replacing it with a new one, the less bargaining power the supplier has under integration. At the extreme, when δ goes towards zero, so does the effort by the supplier.[12]

As a next step, we find the optimal transfer offered by the multinational planning to outsource if the supplier is not financially constrained.

2.4.1 Outsourcing

[12] Just like in CF, the effort chosen by the suppliers is only contingent on organizational form, not financial constraints per se. It is the transfer T that is part of the original offer which leads to the link between the supplier's financial environment and the multinational's profit.

If a supplier's financial constraint is non-binding, the up-front transfer T is simply determined by the participation constraint

$$T \leq Y_S^X(e^X) - C. \tag{14}$$

In the case of outsourcing, the result is

$$\bar{T}^O(c) = a(2c)^{1-\sigma}\left(\frac{1-\rho}{2}\right). \tag{15}$$

The bar above T denotes the value for the transfer conditional on the supplier being unconstrained. The higher the cost of one unit of effort for the supplier, the lower is the transfer the multinational can demand. The reason is that a higher cost translates into lower effort by the supplier, who thus receives a smaller rent that can be captured by the multinational.

Knowing what transfer is offered in the case of unconstrained suppliers, we are now in position to find the exact boundaries beyond which a supplier's wealth suffices to be unconstrained. Using the financial constraint given by

$$T \leq W + \kappa Y_s^O - C, \tag{16}$$

as well as the solution for supplier's effort under outsourcing from (12), we find

$$\bar{W}^O(c,\kappa) = a(2c)^{1-\sigma}\frac{1-\kappa}{2}. \tag{17}$$

Note that the cut-off wealth level depends negatively on the level of development of its country's financial sector as well as the costs of intermediate good production.

Should the supplier fall below this critical wealth level, the multinational will optimally adjust the level and potentially even the direction of the transfer T. Using the now-binding financial constraint, we get

$$T^O(W,\kappa,c) = W + a(2c)^{1-\sigma}\left(\frac{\kappa-\rho}{2}\right) \tag{18}$$

This transfer can be negative, in which case it represents funding of the supplier by the multinational. As an inspection of (18) reveals, this is the case if the level of financial sector development in the supplier's country is low (small κ) and if the elasticity of substitution between final goods is high (large ρ).

Profit by the multinational is given by

$$\bar{\Pi}^O(c) = a(2c)^{1-\sigma}(1-\frac{\rho}{2}) \tag{19}$$

in case the supplier is not financially constrained. In contrast, if the financial constraint is binding multinational profit is given by

$$\Pi^O(W,\kappa,c) = W + a(2c)^{1-\sigma}\left[\frac{1+\kappa-\rho}{2}\right]. \tag{20}$$

Note that the supplier country's financial sector development has an impact on the multinational's profits only if the financial constraints are binding. In that case, the multinational cannot extract the first-best transfer and thus faces lower profits.

2.4.2 Integration

The derivations are parallel to the case of outsourcing with the exception of the altered borrowing constraint. The up-front transfer in the case of a non-credit-constrained integrated supplier is

$$\bar{T}^I(c) = \delta^\sigma a \left(\frac{1-\rho}{2}\right)(2c)^{1-\sigma} = \delta^\sigma \bar{T}^O(c) < \bar{T}^O(c). \tag{21}$$

Profit by the multinational in this case is equal to

$$\bar{\Pi}^I(c) = a\delta^{\sigma-1}(2c)^{1-\sigma}\left(1-\frac{\delta\rho}{2}\right) \tag{22}$$

It is easy to show that the multinational will never choose to integrate if the supplier has sufficient wealth to be unconstrained under outsourcing ($W > \bar{W}^O$). However, the lower the supplier's amount of initial liquidity, the more heavily weigh financial constraints. Therefore, we can find the level of W at which the multinational is indifferent between outsourcing and keeping the supplier financially constrained and independent on one hand and integrating the supplier and thus relieving the financial constraint (but lowering the supplier's efforts) on the other hand. It is implicitly defined by

$$\bar{\Pi}^I(c) = \Pi^O(W^{I/O}, \kappa, c). \tag{23}$$

This yields

$$W^{I/O} = a(2c)^{1-\sigma}\left[\delta^{\sigma-1}\left(1-\frac{\delta\rho}{2}\right) - \frac{(1+\kappa-\rho)}{2}\right] < \bar{W}^O. \tag{24}$$

Becoming integrated opens up a new source of funds to the supplier: direct loans from the multinational parent. As shown above, this credit line is limited to a fraction γ of revenue. An integrated supplier is credit-constrained if $C + T \geq W + L^{\max}$, where $L^{\max} = (\kappa+\gamma)\, Y_I^S$. We denote the wealth cut-off level $\bar{W}^I$:

$$\bar{W}^I = a\delta^\sigma(2c)^{1-\sigma}\left[\frac{1-\kappa-\gamma}{2}\right]. \tag{25}$$

Not surprisingly, the availability of direct credit from the multinational lowers the threshold below which an integrated supplier would find themselves constrained. As $\kappa+\gamma$ approaches 1 (perfect capital markets) (25) shows that $\bar{W}^I$ approaches zero, implying that no integrated supplier would be credit constrained.

Generally, some suppliers will still be credit-constrained even after integration, and in those cases the transfer to the multinational gets adjusted. Using the financial constraint again we obtain

$$T^I(W, \kappa, c) = W + a\delta^\sigma(2c)^{1-\sigma}\left[\frac{\kappa+\gamma-\rho}{2}\right]. \tag{26}$$

Note that the multinational in fact lessens the need for an up-front transfer to the supplier (corresponding to $T^I < 0$) by improving the supplier's access to finance. As $\kappa+\gamma$ approaches 1 the sum surpasses ρ, at which point the term in brackets is strictly positive. Letting the integrated supplier benefit from the multinational's superior access to finance is thus also in the multinational's best interest. Total profit is given by

$$\Pi^I(W, \kappa, c) = W + a\delta^\sigma(2c)^{1-\sigma}\left[\frac{1}{\delta} - \frac{1}{2} + \frac{(\kappa+\gamma)-\rho}{2}\right] \tag{27}$$

In this case, financial sector development of both the supplier's country (through κ) as well as the multinational's (through γ) has an impact on the profit of the multinational.

To summarize, this model predicts different organizational forms depending on the supplier's initial liquidity, holding everything else constant. At high levels of W, the multinational will choose outsourcing and extract the surplus with up-front transfers (licensing fees). As W falls below $\bar{W}^O$, those transfers shrink until the multinational finds itself providing up-front financing to a supplier to which it outsources. Then, the boundary $W^{I/O}$ is reached and the multinational is indifferent between outsourcing and integrating the supplier, which implies lower effort but also improves the supplier's financial position. At wealth levels below $W^{I/O}$ integration is optimal. Crucially, as the supplier now finds itself with more credit in addition to a decreased need for funds (due to the decrease in effort because of the lost property rights), the credit line with the multinational will be used first. As W drops further, commercial banks are also used again until, for very low levels of W, the integrated supplier still finds itself credit constrained and the multinational provides up-front financing in form of T as well as internal credit.

3 Empirical Predictions

Our paper studies the relationship between organizational form, level of financial development and a supplier's financial constraints. In particular, we are interested in the effect of becoming part of a multinational firm on the financial situation of the acquired supplier. We also examine whether this effect depends on the level of financial sector development in the supplier's country.[13] In terms of variables, we compare the extent to which the firm is financially constrained overall, the proportion of internal funds used by the supplier to cover costs, and the proportion of external funds (loans from commercial and state-owned banks) used to cover costs for the cases of integrated and non-integrated suppliers. Before we describe our empirical strategy, we turn to a discussion of the model's implications for each of these three variables.

3.1 Access to Finance

Two simple and fairly straightforward predictions relate to the overall access to finance for firms. This overall access to finance in the model corresponds to the share of surplus it can use as collateral, which is given by κ in the case of outsourcing and $\kappa + \gamma$ if the supplier is integrated. Therefore, it depends on the country's level of financial development κ as well as whether the firm's ownership is domestic or foreign. Predictions 1 and 2 immediately follow.

Prediction 1 (ACCESS TO FINANCE)

Integrated suppliers will be less constrained by lack of access to finance.

Prediction 2 (FINANCIAL DEVELOPMENT)

[13] In contrast, CF focus on the link between a country's level of financial development and the choices of multinational firms with respect to affiliates in those countries. Their main predictions state that multinationals are more likely to import inputs from a country with a higher level of financial sector development. At the same time intrafirm trade, i.e. receiving inputs from an integrated supplier, is more likely if the supplier is located in a country with a low level of financial development. Both of these effects are stronger if the degree of complexity of the input is high. In summary, CF focus on the perspective of the multinational parent and consequently use data on multinational headquarters. We focus on the suppliers, instead.

An increase in financial sector development will ease suppliers' financial constraints regardless of ownership.

More novel and insightful are predictions relating to the use of internal versus external funds. Here we show that there are interesting interactions between the level of financial development and the firm's supplier status, which we can exploit in the empirical analysis. We turn to developing these predictions now.

3.2 Proportion of Working Capital Financed with Internal Funds

The supplier's budget constraint is given by $C = W + L - T$, where the contents of L depend on the organizational form. Under outsourcing, internal funds are given by $W - T$. Note that this would be true even if we explicitly allowed for credit from multinational to arm's length supplier (see footnote 8 above): The loan would still consist of funds external to the firm. Beginning with the case of financially constrained suppliers, using (18) and (12) we get

$$\begin{aligned}\frac{W - T^O(W,\kappa,c)}{C^O} &= a\left(\frac{\rho-\kappa)}{2}\right)(2c)^{1-\sigma}\frac{1}{a\rho 2^{-\sigma}c^{1-\sigma}} \\ &= 1 - \frac{\kappa}{\rho}. \end{aligned} \tag{28}$$

For suppliers with liquidity sufficient not to be constrained we use (15) to find

$$\begin{aligned}\frac{W - \bar{T}^O}{C^O} &= \left[W - a\left(\frac{1-\rho}{2}\right)(2c)^{1-\sigma}\right]\frac{1}{a\rho 2^{-\sigma}c^{1-\sigma}} \\ &= \frac{W}{C^O} - \left(\frac{1-\rho}{\rho}\right) \end{aligned} \tag{29}$$

In the case of suppliers under integration, internal funds are given by $W - T + F_I$, since the loan obtained from the multinational parent also represents internal funds. We first focus on the case where the additional credit line from the multinational is sufficient to relieve the credit constraint. Then it must hold that $W + L^{\max} > C^I + \bar{T}^I$, where $L^{\max}$ is the biggest possible loan the supplier can take out, namely $(\kappa + \gamma) Y_S^I$. It then follows that

$$L^{\max} > L^I = C^I - W + \bar{T}^I \tag{30}$$

$$F_I = \min\left[\gamma Y_S^I, C^I - W + \bar{T}^I\right] \tag{31}$$

$$F_E = L^I - F_I \tag{32}$$

Here F_I and F_E represent the components of L^I that are borrowed from the multinational parent (internal) and the local banks (external), respectively. The second line states that the supplier will first cover its funding needs with credit from its multinational parent and only second with commercial bank loans. This assumption is easy to motivate keeping in mind that we already assumed that the multinational has better access to finance than the supplier and can thus deliver funds to its affiliate at a lower cost than an external bank. Monitoring costs might also be lower within a firm than between external contract partners.

Let us first consider the case where $(C - W + \bar{T}^I) < \gamma Y_S^I$. This implies that all of the supplier's

borrowing needs can be met using internal funds. Consequently, we get

$$\frac{W - \bar{T}^I + F_I}{C^I} = \frac{W - \bar{T}^I + L^I}{C^I} = \frac{C^I}{C^I} = 1. \tag{33}$$

For these firms, integration implies that no external funds are required and the share of internal funds used to finance working capital is 100 percent.

Let us now consider the other extreme, where borrowing needs still exceed total credit. In this case we have

$$\frac{W - T^I + F_I}{C^I} = 1 - \frac{F_E}{C^I} = 1 - \frac{\kappa Y_S^I}{C^I} = 1 - \frac{\kappa}{\rho}. \tag{34}$$

Note that this case mirrors the constrained supplier under outsourcing.

Lastly, we consider the case where borrowing needs exceed the credit granted by the multinational parent but are still low enough to keep the financing constraint slack, i.e. $L^{\max} > (C^I - W) > \gamma Y_S^I$:

$$\frac{W - \bar{T}^I + F_I}{C^I} = \frac{W - \bar{T}^I + \gamma Y_S^I}{C^I} = \frac{W}{C^I} - \left(\frac{1-\rho}{\rho}\right) + \frac{\gamma}{\rho}. \tag{35}$$

One can show that this expression is strictly greater than $1 - \kappa/\rho$. In other words, as we move from constrained to unconstrained the share of costs covered with internal funds increases monotonically from $1 - \kappa/\rho$ to 1.

Setting $W = W^{I/O}$ and using (24) one can show that the internal funds share depends on the organizational form and the country's financial sector development as summarized in Prediction 3:

Prediction 3 (INTERNAL FUNDS SHARE)

If integration lifts the supplier's financial constraints, the proportion of costs that is covered using internal funds is larger if the supplier is integrated.

For suppliers that use any external funding, the internal funds share decreases with financial development.

This effect is weakened if the supplier is integrated.

3.3 Proportion of Working Capital Financed with External Funds

The only alternative to internal funds are loans from commercial banks. Therefore, the shares can be easily computed using the results from the last section. Beginning with the case of outsourcing, we get

$$\frac{L^O}{C^O} = \frac{\kappa}{\rho} \tag{36}$$

for financially constrained suppliers and

$$\frac{\bar{L}^O}{C^O} = \frac{1}{\rho} - \frac{W}{a\rho 2^{-\sigma} c^{1-\sigma}} \tag{37}$$

for unconstrained ones. In the case of integrated suppliers we again differentiate between the three cases i) suppliers whose borrowing needs are met by the new credit line from the multinational

parent ii) suppliers who are still constrained even after integration and iii) those between i) and ii). Loans from commercial banks F_E are now only a part of L (the other part being loans from the multinational parent, which count as internal funds).

For case i) we get

$$\frac{F_E}{C^I} = 0, \tag{38}$$

for case ii)

$$\frac{F_E}{C^I} = \frac{\kappa Y_S^I}{C^I} = \frac{\kappa}{\rho} \tag{39}$$

and, finally, for case iii)

$$\frac{F_E}{C^I} = 1 - \left(\frac{W}{C^I} - \left(\frac{1-\rho}{\rho}\right) + \frac{\gamma}{\rho}\right) = \frac{L^I}{C^I} - \frac{\gamma}{\rho}. \tag{40}$$

Parallel to the previous section one can show that $0 < L^I/C^I - \gamma/\rho < \kappa/\rho$. The more liquidity the integrated supplier has, the smaller the share of financing it requires from local banks.

Our empirical prediction is thus the inverse of Prediction 3:

Prediction 4 (EXTERNAL FUNDS SHARE)

If integration lifts the supplier's financial constraints, the proportion of costs that is covered using bank loans is smaller if the supplier is integrated.

For suppliers that use any external funding, the external funds share increases with financial development.

This effect is weakened if the supplier is integrated.

4 Empirical Methodology and Data

The theoretical model predicts that there is a relationship between the ownership status of the supplier – i.e., whether it is part of a foreign multinational or not – and aspects of its financial status. We also showed that the level of financial development in the country plays a role, and that this effect may differ depending on a firm's supplier status.

We now turn to look at some empirical evidence related to these theoretical ideas. To do so, we take a host country perspective and compare the financial status of suppliers that are foreign owned – i.e., are part of a foreign multinational – and suppliers that are independent and owned by domestic owners.

We use data from the World Bank Enterprise Survey for 53 emerging economies and developing countries. The list of countries included in the sample is provided in the Appendix Table A1.[14] We only consider manufacturing companies. As in many firm level data sets, we cannot directly identify suppliers in our data. Our assumption is that all exporting, foreign owned firms (which

[14] The surveys were carried out at different times in the 2006 - 2011 period. We generally have one survey year per country. In some cases, data are available for two survey years. However, these two survey years do not constitute a panel, but two independent cross sections. We control for the different time periods in the estimation using year dummies. The survey years are included in Table A1.

are part of a multinational) supply intermediates to the multinational parent abroad, at least to some extent. This assumption is based on the empirical fact that intra-firm trade between parent and foreign affiliates is highly prevalent. For example, Bernard, Jensen, Redding and Schott (2010) argue that almost half of US imports are intra-firm.[15] The fact that the country coverage of the data set leans towards low-income countries may strengthen our interpretation, as alternative scenarios such as multinationals engaging in export platform or other kinds of more horizontal FDI are more prevalent between high-income countries. In addition, in order to identify firms whose relationship with their parent company matches the model presented above most closely, we focus on firms with a foreign ownership share of 100 percent.[16] This ensures that the internal funding channels that potentially alleviate suppliers' financial constraints do, in fact, exist.

In order to identify a control group of domestically owned suppliers (which are not part of a multinational), we only consider domestic firms which export part of their output. The idea is that those firms export, at least to a small extent, intermediates to firms located abroad akin to the foreign owned exporters.[17] This may not be an unreasonable assumption for our data, as Miroudout et al. (2009) show that the lion's share of exports from emerging economies in Latin America, CIS or Africa is in intermediate goods.[18]

An alternative method to identify suppliers uses the four-digit ISIC code of the main product produced by the firm. Using Appendix 2 of Sturgeon and Memedovic (2011), we identify firms that are in purely intermediate goods sectors. Unfortunately, this reduces our sample considerably because a large number of ISIC codes encompasses both intermediate and final goods, preventing us from definitively categorizing all intermediate goods firms. For this reason, we choose the characterization based on exporter status as our primary approach. The results using the ISIC code method (which are, in fact, stronger) can be found in appendix C.

We compare the financial status of the two types of firms – foreign affiliates and independent domestic firms. We turn to the role of country level financial development later. The model predicts that integrated suppliers will be less financially constrained and will rely more on internal funds (and less on bank loans) than unaffiliated firms. The World Bank Enterprise Surveys provide proxies for these aspects of the financial status, which we exploit in the empirical analysis. In order to gauge financial constraints, we use a firm's response to a question as to whether access to finance is an obstacle to firm operations. This question is answered on a scale of 0 (no obstacle), 1 (minor obstacle), 2, 3 and 4 (very severe obstacle). Also, the data provide information on the firms' shares of cost covered with internal funds and external funds (bank loans).

Table 1 presents a simple comparison of means for the two groups of firms, 100%-foreign-owned affiliates and domestic suppliers. We see that, on average, foreign owned firms are less likely to report that access to finance is problematic, which is in line with the idea that they are less financially constrained. They also report higher use of internal funds and lower use of bank loans to cover costs. This preliminary evidence is, thus, in line with our hypotheses developed earlier.

[Table 1 about here]

[15] Note that our definition does not presuppose that there is no export platform FDI, which is also important empirically (e.g., Tintelnot, 2014). We just assume that foreign owned affiliates will supply at least a small quantity to their parent company in the home country.

[16] Our results are robust to varying the share of foreign ownership. See discussion in the robustness section below.

[17] In a robustness check, we further limit the sample both for treatment and control to firms that export and import some of their inputs, as these are even more likely to be firms that are part of global production networks.

[18] For example, they report that 82 percent of exports from CIS countries in 2006 were intermediate goods. Comparable numbers for Asia (including China and Japan, which are not in our data), Latin America and Sub-Saharan Africa are 49, 62 and 70, respectively.

However, Table 1 also shows that foreign-owned and domestic firms differ along a range of other firm characteristics. On average, the former are larger, more skill intensive, younger and more productive. They also tend to have experienced lower growth rates of sales and employment over the three years prior to the survey. Hence, selection on observables makes a simple comparison of foreign and domestic firms problematic. This suggests that, in order to identify an effect of foreign ownership on aspects of financial status, we need to control appropriately for these differences in firm characteristics.

In this paper we attempt to identify the effects using a propensity score reweighting estimator (due to Hirano, Imbens, and Ridder, 2003) combined with a covariate adjustment regression. In other words, we firstly estimate a firm's probability (propensity) of being foreign owned conditional on a set of observable firm characteristics, and then use the estimated propensity score as a weight in a regression of financial variables on the foreign ownership (i.e., treatment) dummy, controlling for firm characteristics. Hence, we provide two opportunities to adjust for selection on observables by combining inverse probability weighting with regression covariates adjustment.[19]

Accordingly, we first identify the probability (or propensity score) of firm i being fully foreign owned using a probit model

$$P(Foreign_i = 1) = F(X_i, d_i) \tag{41}$$

where X is a vector of covariates observed in the same or previous time period. Specifically, the vector consists of the following firm characteristics: size (logged, number of employees), age (logged, in years), skill intensity (the number of skilled production workers as a share of the total), productivity (sales per worker relative to the median firm's sale per worker in the same country-industry cell), employment growth (average annual rate for the three years before the survey), and sales growth (average annual rate for the three years before the survey).[20] To allow for non-linearities we use the squared terms of the variables as well. Finally, the estimation includes a vector d with dummy variables for industry, geographical region and survey year.[21] Out of concern that the size of the cells created by our dummy variables is still too large, we alternatively computed propensity scores using industry/region and even industry/country dummies. The results reported below hold using these alternative scores, as well.

In a first step, in order to establish a benchmark result, we calculate a standard matching estimate, i.e., the average treatment effect based on kernel matching. That is, we calculate the difference between the outcome variables for the treated and control group firms, where the observations for the latter are weighted by their propensity score. The standard matching approach does not allow us to gauge the impact of country level financial development, or the important interactions of this variable with the supplier status that we identified in Predictions 3 and 4.

[19] Propensity score matching (without regression adjustment) has been quite popular in the literature on foreign ownership, see, for example, Arnold and Javorcik (2009) and Girma and Görg (2007). Guadalupe et al. (2012) and Girma et al. (2015) provide examples of a propensity score reweighting approach combined with regression adjustment.

[20] The exact variables used are as follows: $k30$ contains the value for the answer to the 'access to finance' obstacle question. To be considered part of the treatment group, the firm must have exported (variable $d3c > 0$) and be 100% foreign owned (according to variable $b2b$). The share of internal funds used is given by $k3a$. The share of bank funds used is $k3bc$, which combines privately owned and state owned banks. Sometimes, the variables $k3b$ and $k3c$ are filled in separately, instead, in which case we use the sum. *Skill_share* uses $l4a$ and $l4b$, *prod_ratio* is generated from $d2/l1$, *age* is taken from $b5$, *sales_growth* and *employment_growth* are computed using $d2/n3$ and $l1/l2$, respectively, and the number of employees is found in $l1$.

[21] The geographic regions follow the World Bank classification and are given by Sub-Saharan Africa (AFR), East Asia and Pacific (EAP), Europe and Central Asia (ECA), Latin America and the Caribbean (LAC) and South Asia (SAR).

In order to be able to focus on those, we use the propensity score reweighting estimator (Hirano et al., 2003).[22] This approach enables us to include the country's financial development ($FinDev$) plus interactions in the empirical analysis. In addition, from an econometric point of view, it allows for including additional regressors in the estimation (the so-called covariates adjustment) in order to avoid any bias in the matching estimate.

Specifically, we consider a weighted least squares estimation of the regression function

$$Y_{ijkt} = \beta_0 + \beta_1 Foreign_i + \beta_2 FinDev_t + \beta_3 Foreign_i * FinDev_t + \iota_j + \iota_k + \iota_t + e_{ijkt} \qquad (42)$$

where Y_{ijkt} is the financial status of firm i in industry j and geographic region k that was surveyed in year t. The specification includes fixed effects for industry, geographic region and survey year. Financial sector development is country-specific and also varies by year. The error term e is clustered at the country level.

Intuitively, the propensity score reweighting method adjusts for differences between groups of firms by assigning greater (lower) weights to control group firms that are more (less) similar to treated firms. Since our aim is to estimate the average treatment effects on the foreign firms, we want to find control groups of domestic supplier firms that are as close as possible to the treated firms. To this end, we weight each foreign firm by 1 and each domestic supplier firm by $\hat{P}/(1-\hat{P})$, where $\hat{P}$ is the conditional probability of being foreign-owned, i.e. our propensity score index.

5 Estimation

5.1 Propensity Score Estimation

The propensity score is estimated using a simple probit estimator. The results are reported in Table 2. In line with the summary statistics presented above, a firm is more likely to be foreign owned the more productive it is. We also find statistically significant non-linear relationships between foreign ownership and age, skill intensity, and employment size. Furthermore, firms that experienced high sales or employment growth in the past three years are less likely to be foreign owned.

[Table 2 about here]

Based on the estimated propensity scores we impose the common support condition to ensure that any combination of characteristics observed in the group of treated firms can also be observed among the group of domestic firms. Thus, we restrict our attention to the group of domestic firms that fall within the support of the propensity score distribution of the group of foreign firms. In addition, we carry out a balancing test to check that the propensity score is successful in controlling for differences in observable characteristics across treated and domestic firms. The tests proceed by dividing the observations into 10 blocks within which there are no statistically significant differences in the mean propensity score between treated and control group firms. We then test that within these blocks, there are no statistically significant differences between foreign and domestic firms in terms of the covariates included in the vector X. These tests are passed.[23]

[22] This estimator uses the propensity score to weight observations in a regression framework. Specifically, Hirano et al. (2003) show that reweighting by the inverse of the propensity score, rather than the true propensity score, leads to an efficient estimate of the average treatment effects on the treated. We opt for this estimator since Busso, DiNardo, and McCrary (2009) show that propensity score reweighting estimators typically outperform propensity score matching estimators.

[23] The detailed results are not reported here to save space, but are available from the authors upon request.

5.2 Standard propensity score matching estimates

The results from the standard propensity score matching based on Kernel matching are reported in Table 3. While these do not allow us to look at Predictions 3 and 4, they provide us with a benchmark set of results.

[Table 3 about here]

We find that, as suggested by our theoretical model, suppliers that are part of a foreign multinational are less likely to report that access to finance is an obstacle to their operations. This is in line with the suggestion that they are less financially constrained than the control group of domestic suppliers. The point estimate implies that the average multinational supplier scores 0.33 units lower on the score between 0 and 4 than a comparable domestic firm. We also find that the group of foreign owned firms relies more on internal funds, rather than bank loans, for covering their costs.

The estimates suggest that the foreign owned firms' ratio of internal funds as a share of costs is roughly 15 percentage points higher for multinational affiliates than purely domestic suppliers. Their share of bank loans is, by contrast, around 12 percentage points lower. In light of our model this suggests that integration provides additional sources of internal funds while not always alleviating financial constraints sufficiently to make bank finance completely unnecessary. In addition, while bank loans and internal funds are the only two available sources of funding in our model, this is not true in the data. For that reason the two numbers can be different.[24]

Note that we assume that the self-reported "internal funds" by the surveyed firms include loans from the multinational parent in the case of integrated suppliers. On the flip side, we also assume that there are no flows that correspond to our model that we fail to capture. One candidate for this would be a variable in the data which measures the share of funds from "supplier credit/customer advance". One could add this to our measure of internal funds, for foreign owned firms only based on the assumption that the multinational parent is the supplier/customer in question. Doing this leaves the qualitative results unchanged, while the quantitative effect increases in magnitude.[25] This can be interpreted as an upper bound of the overall effect, since in reality less than 100% of the credit from suppliers/customers correspond to transfers from the parent. Interpreted in this light, the numbers we report present a lower bound and are conservative.

5.3 Results from the propensity score reweighting estimations

Before turning to estimations, we simply plot the data to investigate the differential effect of financial sector development on foreign-owned and domestically owned suppliers. Figure 1 depicts country averages of the bank loan share on the y-axis and the ratio of bank credit to GDP on the x-axis.

[Figure 1 about here]

The lines represent simple linear fits as the graph is merely descriptive. The unconditional correlations suggest that locally owned firms in countries with a more developed financial sector rely on bank loans to a larger degree, while foreign-owned firms do not.

[24] About 18% of the firms report using internal funds and bank loans to cover less than half of their expenses. Additional sources provided are "supplier credit / customer advance" and "non-bank financial institution".

[25] Results are not reported here to save space, but can be obtained from the authors.

In order to look at Predictions 3 and 4 more analytically we now move on to estimation results from reweighting regressions with covariates adjustment, that is estimating equation (42). This equation allows us to test whether there is an interaction between the supplier status and the level of financial development in the country as predicted by our model. For this purpose, we interact our foreign ownership dummy with an indicator of financial development of the country in some specifications. We choose private credit divided by GDP as our measure of financial development, using data from Beck, Demirgüç-Kunt, and Levine (2000). We also include this variable on its own in the regression. This does not cause a colinearity problem because our main specification uses region fixed effects, rather than country fixed effects. If we use the latter, the effect of private credit over GDP can only be identified by time series variation in the countries with two survey years. Nonetheless, we conduct this robustness check and confirm that it does not change our main results.[26]

Table 4 reports the results of the baseline regressions. As can be seen, the coefficients on the foreign ownership dummy are generally similar to the simple matching results reported above, in terms of both magnitude and statistical significance.

[Table 4 about here]

The first two columns of Table 4 confirm that financial development has the expected effect on firms' financial constraints: An increase in a country's ratio of private credit to GDP corresponds with firms reporting access to finance to be less of an obstacle. The second column specifically confirms Prediction 2: The statistically insignificant interaction between foreign ownership and financial development indicates that ownership does not matter for the effect of financial sector development on firms' access to finance.

Column three relates to Prediction 3 and shows that foreign-owned firms cover a larger share of their costs using internal funds, with the effect being slightly smaller than estimated in Table 3, but still statistically significant at the 5 percent level. As for the effect of financial sector development on internal funds usage, it has the sign that the model predicts, but the statistical significance misses the 10% mark. The same holds for the interaction effect introduced in column 4, but again the sign supports the hypothesis that foreign ownership shelters the supplier from the effects of changes in the country's financial sector development. Note also that the coefficient on foreign ownership decreases considerably once the interaction term is added. The reason is the high degree of correlation between the two measures, which may also prevent us from precisely estimating the interaction effect.

Columns five and six analyze the question from the other angle by examining firms' use of external bank loans for funding, as in Prediction 4. Here, a clearer picture emerges. Foreign owned firms cover a smaller share of their funding needs with external bank loans. In addition, bank loans are used more in countries with a higher ratio of bank credit over GDP, but this effect is eliminated for foreign-owned firms. Note that we cannot reject the hypothesis that the sum of the two coefficients on $fin\_dev + fin\_dev \times foreign\_owned$ is zero at conventional levels of confidence. Thus, our results are in line with all aspects of Prediction 4. When interpreting this result jointly with the less significant effect depicted in columns three and four, the reason for the discrepancy must lie in the funding alternatives available to firms other than internal funds. In other words, when bank loans are used less or more, that does not mean that the opposite has to happen to internal funds usage, since supplier credit, customer advances or informal funding through families etc. are also practical options for firms.

[26] The details are ommitted here for space reasons but are available from the authors.

To further aid with the interpretation of the interaction terms in Table 4, Figure 2 depicts the external funds share (point estimate and 95 percent confidence interval) at different levels of private credit over GDP for the cases of outsourcing and full foreign ownership.

[Figure 2 about here]

Starting at a credit over GDP ratio of around 20 percent (which is, incidentally, roughly the value for Uruguay), the external funds share for foreign owned firms is significantly below that of the domestic firms, and the higher the amount of credit in the economy, the larger is the difference.

5.4 Discussion and Robustness

In this section we turn to a discussion of the implications and limitations of our results. First, there may be a concern that our results are due to 'cherry picking', that is, foreign firms may pick the better performing suppliers. Of course, if we pick two firms, one of which has been purchased by a multinational and the other one has not, we naturally would expect these firms to be different. In fact, there is plenty of evidence showing that multinationals are good at picking winners and thus the performance of these two firms - as well as their treatment by the financial sector - are different and correlated with foreign ownership. However, the differences are not *caused* by foreign ownership. The nature of our propensity score matching helps to alleviate such concerns. Controlling for firm-specific factors such as productivity, employment growth, sales growth, number of employees and age when we compute the propensity scores allows us to be more confident that we are in fact creating the correct counterfactual. We are, in essence, comparing two firms that have the same observable performance characteristics (and would look the same to a bank deciding on a credit line), with the exception that one is fully foreign-owned and the other is not.

A second concern is the possibility that lack of access to finance might be precisely the reason that the multinational buys the supplier in the first place. This is the so-called 'fire sale' argument. While we cannot deal with this in our empirical estimation due to the nature of our data, we are careful to point out the following. According to the model, the multinational is only indifferent between integration and outsourcing if the firm is at a specific level of initial liquid wealth given by $W^{I/O}$ (for a given level of financial sector development, demand for the final good and marginal cost of production). In theory, none of these marginal firms are more constrained than the other by assumption. In the data, some firms with foreign ownership may of course have been purchased because they were financially distressed in the past, an issue that we cannot control for explicitly in the analysis. Note, however, that this would bias our results on the lack of access to finance upwards, as these firms would report access to finance to be a large obstacle. Hence, a bias in our favor seems unlikely and we would therefore expect that, in the presence of 'fire sale' acquisitions, our results provide a lower bound of the true effect.

In addition to the 'fire sale' story there are other potential direct links between financial constraints and vertical integration. In recent work, Macchiavello (2012) shows that the effect of financial development on vertical integration depends crucially on the nature of firm heterogeneity in the specific industry, but the net impact is ambiguous.[27] That finding complements results by

[27] In particular, when small firms are more prevalent in an industry, more financial development reduces the amount of vertical integration, akin to the model in this paper where multinationals would be more likely to choose outsourcing if the credit constraints are lifted. In contrast, in an industry that obtains most of its revenue from large firms vertical integration increases as a result of more financial development (exit of non-integrated firms outweighs the smaller degree of integration of remaining firms).

Acemoglu, Johnson and Mitton (2009), who also find no effect of financial development on vertical integration. Related to our study, Machiavello's work raises the possibility of a multinational choosing integration for competitive reasons, for example if there is only a small number of potential suppliers. We rely on our observables to capture these circumstances indirectly: market power of this kind should have led to higher profits and/or growth, which in turn impact factors we do observe and control for (i.e. profitability, number of employees, sales and employment growth over the previous three years). The same argument applies for potential up-front investments made by the supplier only to be considered by the multinational, as reported by Javorcik and Spatareanu (2009).

Since suppliers are not directly identified in the data, we may be too generous in considering all 100% foreign-owned exporting firms likely suppliers in a vertical production chain. For that reason, we also consider a more stringent criterion by adding the requirement that firms import some of their inputs. There are two reasons for doing so. The first is that domestic firms that both export and import may be more likely to be involved in international production networks, hence, they may also be more likely to be suppliers. The second reason is that by also considering imports we are eliminating a further aspect of firm heterogeneity, as it is generally the case that firms that both export and import are more productive than firms that only export (Bernard, Jensen, Redding, and Schott, 2007). We, therefore, redo the analysis with the narrower treatment and control groups and Table 5 presents the results.

[Table 5 about here]

As one can see, the results are similar to those reported in Table 4. The coefficients on $foreign\_owned$ are, in fact, generally larger while the interaction effect in column six now marginally misses statistical significance. More importantly, however, an effect of financial development on integrated suppliers is still absent, due to the sum of coefficients on $fin\_dev + fin\_dev \times foreign\_owned$ not being statistically different from zero in column six.

Closer inspection of the list of countries in Table A1 may raise the concern that results are driven by countries where a lot of surveyed firms are neither exporters nor foreign owned, which results in them having only a few observations in our sample (and even fewer that are part of the treatment group). In addition, some countries were surveyed twice, implying that the countries were at different points of the business cycle, which may bias our estimation (especially since the years fall before and after the global financial crisis). This is dealt with by using year dummies in the main specification. However, here we follow a more conservative approach and simply drop countries with fewer than 50 observations as well as using only the survey data from 2006, as pre-financial crisis data points are arguably more suitable for inference on the impact of financial development. Table 6 shows the results after we have limited our sample in this fashion.

[Table 6 about here]

First let us note that the main results of the paper are still intact even though the number of countries is strongly reduced and standard errors remain clustered at the country level. Furthermore, the impact of financial development is measured more precisely and the coefficients are larger than in the previous specifications. The results thus still conform with our empirical predictions from the model: Financial development lowers the importance of internal funds and raises the importance of bank funds in financing working capital. This story is altered for foreign owned firms that generally make heavier use of internal funds. We interpret this as supportive evidence for the internal lending channel outlined above.

Finally, since foreign ownership is reported as a share we might consider firms that have *any* foreign ownership for the treatment group instead of only those that are completely foreign owned (i.e. that have a share of 100 percent). Note that this is somewhat of a departure from our theoretical framework, in that joint ventures or minority stakes will not lead to a complete internalization of the supplier's financial position by the multinational. The results are qualitatively similar to those reported here, but the effects are generally of smaller magnitudes and statistical significance, as we would expect.[28]

6 Conclusions

This paper looks at the implications of a multinational firm's choice between outsourcing and vertical integration for the supplier's financial position. To motivate the empirical analysis we, firstly, develop a simple model which we use to explore the extent to which an integrated supplier's access to finance, as well its sources of funding, change relative to a firm supplying a multinational at arm's-length. The model predicts that integrated firms have better access to finance and cover a larger share of their costs using internal funds. Furthermore, improvements in a host country's level of financial development have less of an impact on the financial situation of integrated suppliers.

We, secondly, use firm-level data for 53 developing and transition countries from the World Bank Enterprise Surveys to investigate the empirical relevance of the theoretical predictions. Using a propensity score reweighting estimation framework, we compare the financial position of foreign affiliates and comparable domestic suppliers.

We find broad support in the data for the financial impact for the suppliers predicted by the model. Specifically, we find foreign-owned affiliates to have easier access to finance, use internal funds more and external funds less to cover their costs. In addition, the evidence suggests that financial sector development is more crucial for locally owned firms. The financing choices by foreign affiliates, in particular with respect to bank loans, are shown to depend less on the development of the local financial sector than those by domestically owned suppliers.

Our findings imply that attracting FDI may be an important policy for developing and emerging economies for an additional reason beyond the benefits related to technological spillovers. Access to finance is crucial for many aspects of sophisticated firm activities with highly uncertain outcomes, such as exporting, conducting R&D or investing in other innovative activities, in particular in developing countries. Hence, an improvement in the financial position of a host country firm through integration with a multinational may, through improved access to finance, benefit the host economy through an expansion of suppliers' business activities.

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Figure 1: Average Bank Fund Shares by Country

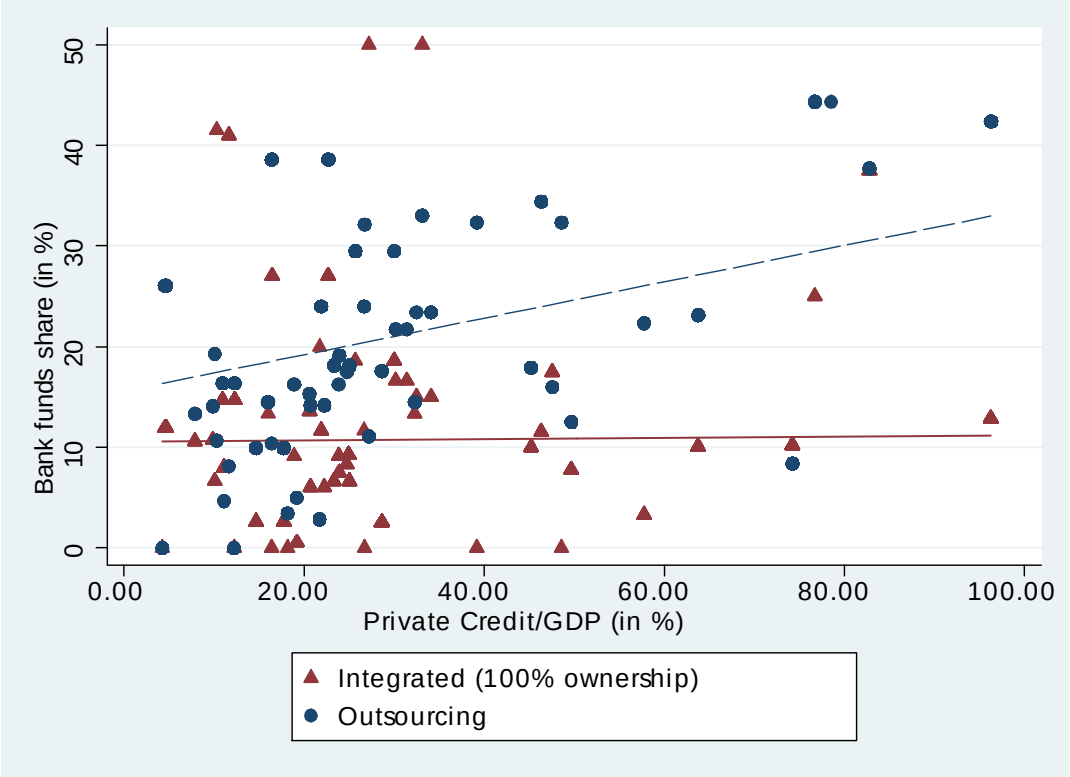

Figure 2: Predictive Margins of Organizational Forms

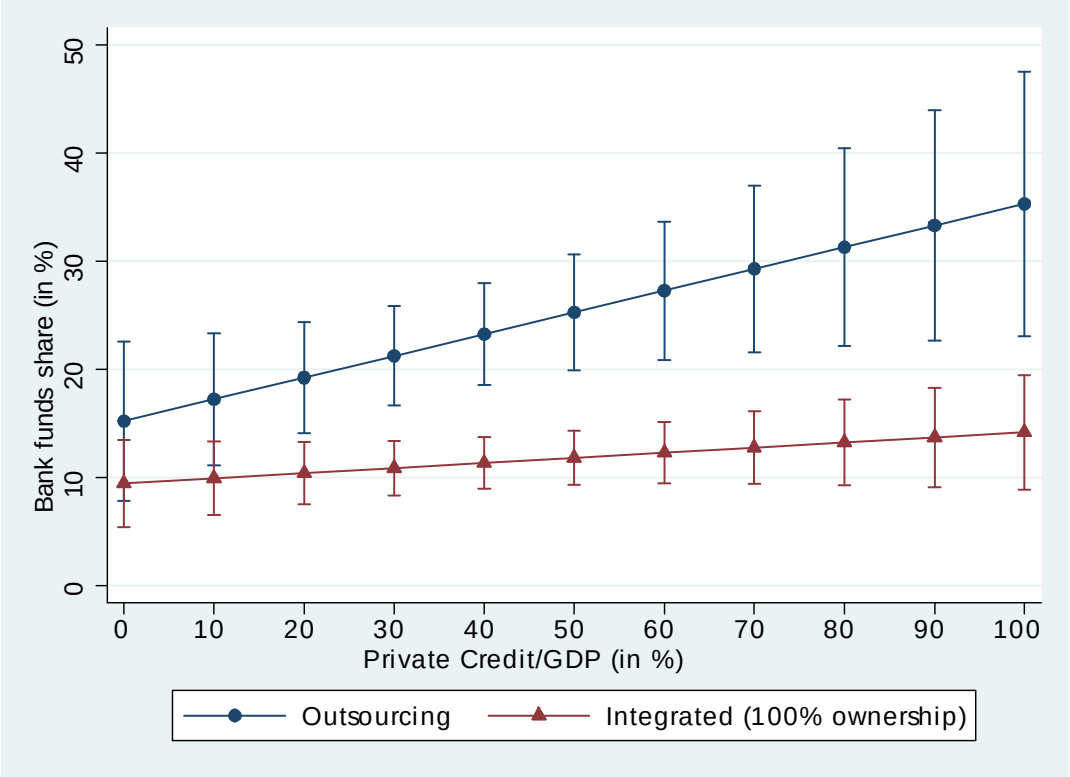

Table 1: Summary Statistics – Comparisons of means

	domestic			foreign		
Variable	Obs	Mean	Std.Dev.	Obs	Mean	Std.Dev.
access to finance***	3026	1.572	1.310	559	1.114	1.251
internal_funds***	2753	52.27	36.05	519	66.92	35.81
bank_funds***	2753	21.66	27.49	518	11.38	22.11
*skill_share***	3026	0.622	0.328	559	0.661	0.331
*prod_ratio***	3026	1.733	1.464	559	2.38	1.89
*age (logged)***	3026	3.083	0.721	559	2.808	0.804
sales_growth	3026	0.079	0.181	559	0.072	0.177
empl_growth	3026	0.030	0.106	559	0.027	0.110
*employees (logged)***	3026	4.398	1.352	559	5.165	1.272

'foreign' and 'domestic' refer to 100% and 0% foreign ownership share, respectively.

***p<.01, **p<.05, *p<.1 denote the statistical significance of the difference.

For variable definitions see text or Table B1.

For corresponding variable names in the survey data see footnote 13.

Table 2: Propensity score estimation

Dependent variable is $forowned$	Coef.	Std.Err.	$P > \|z\|$
$prod\_ratio$	0.143***	0.016	0.000
$\ln(age)$	-1.269***	0.223	0.000
$(\ln(age))^2$	0.132***	0.037	0.000
$skill\_share$	-0.567	0.379	0.134
$(skill\_share)^2$	0.683**	0.327	0.037
$sales\_growth$	-0.389**	0.164	0.018
$empl\_growth$	-0.666**	0.271	0.014
$\ln(employees)$	0.773***	0.118	0.000
$(\ln(employees))^2$	-0.047***	0.011	0.000

The dependent variable is binary. Probit estimation. ***p<.01, **p<.05

The specification includes dummies for year, industry and geographic region.

For variable definitions see text or Table B1.

For corresponding variable names in the survey data see footnote 13.

Table 3: Standard propensity score matching estimates (ATT)

	Matching estimate	Standard error
Access to finance	-0.331***	0.054
Internal funds	14.661***	1.656
Bank funds	-11.690***	1.063

Standard errors based on bootstrapping with 50 replications. Kernel matching. ***p<.01
Access to finance is rated on a scale from 0 (no obstacle) to 4 (very severe obstacle).
Internal and bank funds shares are stated in percentage points.

Table 4: Reweighting Equations, fully-foreign owned exporting firms

	(1)	(2)	(3)	(4)	(5)	(6)
	Access to finance	Access to finance	Internal funds	Internal funds	Bank funds	Bank funds
foreign_owned	-0.272***	-0.246**	13.34***	10.19***	-11.21***	-5.761**
	(-3.65)	(-2.09)	(4.76)	(2.77)	(-4.76)	(-2.03)
fin_dev	-0.00743**	-0.00708**	-0.104	-0.146	0.129**	0.201**
	(-2.54)	(-2.05)	(-1.37)	(-1.39)	(2.51)	(2.37)
foreign_owned × *fin_dev*		-0.000689		0.0885		-0.154*
		(-0.24)		(0.96)		(-1.72)
skill_share	-0.0224	-0.0223	4.661	4.622	-2.012	-1.955
	(-0.19)	(-0.19)	(1.59)	(1.58)	(-1.39)	(-1.36)
prod_ratio	-0.0654***	-0.0654***	0.254	0.250	0.649	0.653
	(-3.66)	(-3.67)	(0.36)	(0.36)	(1.51)	(1.50)
age	-0.105**	-0.106**	-2.731*	-2.688*	2.100*	2.024*
	(-2.05)	(-2.06)	(-1.98)	(-1.94)	(1.73)	(1.69)
sales_growth	-0.209	-0.211	-8.771	-8.573	3.948	3.553
	(-1.11)	(-1.12)	(-1.20)	(-1.18)	(0.67)	(0.63)
empl_growth	0.429	0.429	-7.076	-7.021	15.44**	15.37**
	(1.24)	(1.24)	(-0.78)	(-0.78)	(2.61)	(2.62)
employees	-0.0983***	-0.0982***	0.622	0.605	0.179	0.212
	(-3.25)	(-3.23)	(0.51)	(0.49)	(0.26)	(0.32)
N	3585	3585	3316	3316	3314	3314
Number of Countries	53	53	43	43	43	43

z statistics based on country clustered standard errors in parantheses. * p<.1, ** p<.05, *** p<.01

All specifications include fixed effects for industry, year and geographic region. For variable definitions see text or Table B1.

Access to finance is rated on a scale from 0 (no obstacle) to 4 (very severe obstacle). Internal and bank funds shares are stated in percentage points.

Column (4): Test of $H_0 : fin\_dev + foreign\_owned \times fin\_dev = 0$: $F(1, 42) = 0.78; P = 0.3822$)

Column (6): Test of $H_0 : fin\_dev + foreign\_owned \times fin\_dev = 0$: $F(1, 42) = 1.42; P = 0.2403$)

Table 5: Reweighting Equations, fully-foreign owned exporting firms that import inputs

	(1) Access to finance	(2) Access to finance	(3) Internal funds	(4) Internal funds	(5) Bank funds	(6) Bank funds
foreign_owned	-0.343***	-0.339***	14.33***	11.31***	-12.38***	-7.927***
	(-4.11)	(-2.53)	(5.32)	(3.04)	(-5.60)	(-2.73)
fin_dev	-0.00643**	-0.00638*	-0.102	-0.142	0.120**	0.180**
	(-2.29)	(-1.71)	(-1.33)	(-1.43)	(2.30)	(2.24)
foreign_owned × *fin_dev*		-0.0001		0.0855		-0.126
		(-0.03)		(1.13)		(-1.60)
skill_share	0.0071	0.0071	3.956	3.935	-1.887	-1.865
	(0.05)	(0.05)	(1.10)	(1.10)	(-1.09)	(-1.08)
prod_ratio	-0.0527***	-0.0527***	-0.0085	-0.0154	0.764	0.772
	(-2.86)	(-2.86)	(-0.01)	(-0.02)	(1.65)	(1.66)
age	-0.0913	-0.0913	-3.412**	-3.365**	1.450	1.381
	(-1.63)	(-1.62)	(-2.38)	(-2.36)	(1.06)	(1.03)
sales_growth	-0.300	-0.300	-5.704	-5.514	4.217	3.890
	(-1.66)	(-1.66)	(-0.68)	(-0.66)	(0.66)	(0.63)
empl_growth	0.532	0.533	-9.193	-9.349	15.09**	15.34**
	(1.46)	(1.45)	(-1.07)	(-1.09)	(2.55)	(2.61)
employees	-0.114***	-0.114***	0.582	0.567	0.233	0.258
	(-3.47)	(-3.47)	(0.45)	(0.43)	(0.30)	(0.34)
N	2993	2993	2775	2775	2773	2773
Number of Countries	53	53	43	43	43	43

z statistics based on country clustered standard errors in parantheses. * p<.1, ** p<.05, *** p<.01

All specifications include fixed effects for industry, year and geographic region. For variable definitions see text or Table B1.

Access to finance is rated on a scale from 0 (no obstacle) to 4 (very severe obstacle). Internal and bank funds shares are stated in percentage points.

Column (4): Test of $H_0 : fin\_dev + foreign\_owned \times fin\_dev = 0$: $F(1, 42) = 0.77; P = 0.3851$)

Column (6): Test of $H_0 : fin\_dev + foreign\_owned \times fin\_dev = 0$: $F(1, 42) = 1.73; P = 0.1961$)

Table 6: Reweighting Equations, dropping countries with few observations and using only one survey year per country

	(1)	(2)	(3)	(4)	(5)	(6)
	Access to finance	Access to finance	Internal funds	Internal funds	Bank funds	Bank funds
$foreign\_owned$	-0.339***	-0.272	14.85***	11.57**	-13.47***	-7.498
	(-4.06)	(-1.61)	(4.53)	(2.23)	(-4.11)	(-1.51)
fin_dev	-0.00492	-0.00428	-0.219**	-0.250*	0.169***	0.225**
	(-1.55)	(-1.17)	(-2.33)	(-2.04)	(2.91)	(2.26)
$foreign\_owned \times fin\_dev$		-0.00143		0.0687		-0.126
		(-0.61)		(0.67)		(-1.11)
$skill\_share$	-0.152	-0.152	8.045**	8.032**	-3.998**	-3.986**
	(-1.45)	(-1.46)	(2.62)	(2.64)	(-2.55)	(-2.54)
$prod\_ratio$	-0.0952***	-0.0952***	0.972	0.966	0.0779	0.0864
	(-3.41)	(-3.42)	(1.12)	(1.11)	(0.15)	(0.16)
age	-0.0606	-0.0612	-4.103**	-4.060**	3.557*	3.477**
	(-0.98)	(-1.01)	(-2.51)	(-2.55)	(2.07)	(2.14)
$sales\_growth$	0.0391	0.0407	-4.631	-4.798	3.730	3.973
	(0.16)	(0.16)	(-0.45)	(-0.47)	(0.50)	(0.54)
$empl\_growth$	0.127	0.129	-14.71	-14.75	22.65***	22.73***
	(0.31)	(0.31)	(-1.23)	(-1.24)	(2.98)	(2.99)
$employees$	-0.107**	-0.107**	0.977	0.955	-0.755	-0.710
	(-2.42)	(-2.42)	(0.75)	(0.70)	(-1.17)	(-1.03)
N	1884	1884	1779	1779	1777	1777
Number of Countries	20	20	18	18	18	18

z statistics based on country clustered standard errors in parantheses. * p<.1, ** p<.05, *** p<.01

All specifications include fixed effects for industry, year and geographic region. For variable definitions see text or Table B1.

Access to finance is rated on a scale from 0 (no obstacle) to 4 (very severe obstacle). Internal and bank funds shares are stated in percentage points.

Column (4): Test of $H_0 : fin\_dev + foreign\_owned \times fin\_dev = 0$: $F(1, 17) = 4.46; P = 0.0498$)

Column (6): Test of $H_0 : fin\_dev + foreign\_owned \times fin\_dev = 0$: $F(1, 17) = 3.70; P = 0.0713$)

7 Appendix A

Table A1: List of countries and number of firms

Country	Freq.	Percent	# foreign owned	Survey year(s)
Albania	7	0.20	3	2007
Argentina	405	11.30	67	2006, 2010
Bolivia	50	1.39	6	2006, 2010
Botswana	14	0.39	6	2006, 2010
Brazil	78	2.18	13	2009
Bulgaria	104	2.90	9	2007
Cameroon	10	0.28	3	2009
Chile	160	4.46	27	2010
Colombia	237	6.61	12	2006, 2010
Costa Rica	64	1.79	24	2010
Côte d'Ivoire	7	0.20	2	2009
Croatia	99	2.76	6	2007
Dominican Republic	23	0.64	7	2010
Ecuador	65	1.81	9	2006, 2010
El Salvador	136	3.79	18	2006, 2010
Estonia	30	0.84	10	2009
Georgia	8	0.22	1	2008
Guatemala	132	3.68	13	2006, 2010
Guinea	10	0.28	1	2006
Honduras	33	0.92	3	2006, 2010
Indonesia	75	2.09	12	2009
Jamaica	8	0.22	1	2010
Kazakhstan	5	0.14	1	2009
Kenya	107	2.98	20	2007
Macedonia, FYR	30	0.84	4	2009
Madagascar	26	0.73	10	2009
Mauritius	28	0.78	4	2009
Mexico	270	7.53	35	2006, 2010
Moldova	21	0.59	3	2009
Montenegro	5	0.14	1	2009
Namibia	15	0.42	6	2006
Nicaragua	32	0.89	6	2006, 2010
Pakistan	60	1.67	1	2007
Panama	26	0.73	4	2006, 2010
Paraguay	46	1.28	3	2006, 2010
Peru	254	7.09	27	2006, 2010
Philippines	122	3.40	52	2009

Country	Freq.	Percent	# foreign owned	Survey year(s)
Romania	14	0.39	3	2009
Russian Federation	55	1.53	1	2009
Senegal	22	0.61	1	2007
Serbia	57	1.59	4	2009
Slovak Republic	25	0.70	2	2009
Slovenia	48	1.34	4	2009
South Africa	123	3.43	22	2007
Swaziland	19	0.53	11	2006
Tanzania	20	0.56	2	2006
Trinidad and Tobago	29	0.81	1	2010
Uganda	17	0.47	5	2006
Uruguay	126	3.51	14	2006, 2010
Vietnam	172	4.80	45	2009
Zambia	29	0.81	7	2007
Total	3,585	100.00	559	

8 Appendix B

Table B1: Definition of Variables

Variable	Definition
Access to finance	Reported severity of the obstacle arising from access to finance. Ranges from 0 (no obstacle) to 4 (very severe obstacle)
Internal funds	Share of the firm's working capital financed with internal funds (in percentage points)
Bank funds	Share of the firm's working capital finaced with commercial bank loans (private or state-owned) (in percentage points)
foreign_owned	Dummy variable that is equal to one if the percentage of ownership by foreigners is 100
fin_dev	Ratio of private credit held by banks to GDP
skill_share	The share of skilled production workers in the total number of production workers
prod_ratio	A firm's sales per worker relative to the median firm's sales per worker in the same country-industry cell
age	Age of the firm in years, logged
sales_growth	Average annual percentage growth in total sales over the last three years
empl_growth	Average annual percentage growth in total employment over the last three years
employees	Total number of employees, logged

9 Appendix C

Table C1: Re-weighting regression using ISIC codes

	(1) Access to Finance	(2) Access to Finance	(3) Internal Funds	(4) Internal Funds	(5) Bank funds	(6) Bank funds
fo_fo	-0.553***	-0.821***	21.93***	28.81**	-11.55***	-7.589
	(-3.48)	(-2.93)	(3.08)	(2.46)	(-2.97)	(-1.38)
pcrdbgdp	-0.0129***	-0.0158***	-0.124	-0.0509	0.209**	0.252**
	(-3.07)	(-3.17)	(-0.81)	(-0.27)	(2.17)	(2.09)
fofo_pc		0.00575		-0.152		-0.0875
		(1.59)		(-0.91)		(-0.77)
skill_share	-0.0359	-0.0191	12.42	11.81	-2.684	-3.036
	(-0.14)	(-0.07)	(1.41)	(1.38)	(-0.42)	(-0.49)
prod_rat	0.0241	0.0125	-1.960*	-1.668	0.443	0.611
	(0.56)	(0.30)	(-1.78)	(-1.33)	(0.46)	(0.60)
l_age	-0.185	-0.190	3.930	3.952	2.843	2.856
	(-0.98)	(-1.00)	(0.88)	(0.87)	(0.73)	(0.74)
sales_growth	-0.120	-0.0948	-5.137	-5.808	-15.85	-16.23
	(-0.32)	(-0.25)	(-0.27)	(-0.30)	(-1.16)	(-1.22)
empl_growth	0.979*	0.986*	7.009	6.745	12.08	11.93
	(1.76)	(1.73)	(0.40)	(0.38)	(1.00)	(1.02)
ll1	0.0620	0.0621	-4.513*	-4.480*	1.892	1.911
	(0.72)	(0.74)	(-1.96)	(-1.96)	(1.05)	(1.06)
N	492	492	445	445	445	445
Number of Countries	43	43	34	34	34	34

z statistics based on country clustered standard errors in parentheses. *** p<.01, ** p<.05, * p<.1

Regression includes only observations where the ISIC code unambigously identifies the firm's industry to be intermediate goods.

Column (4): Test of $H_0 : fin\_dev + foreign\_owned \times fin\_dev = 0$: $F(1, 33) = 1.52; P = 0.2257$)

Column (6): Test of $H_0 : fin\_dev + foreign\_owned \times fin\_dev = 0$: $F(1, 33) = 2.64; P = 0.1137$)