Real versus Financial Barriers to Multinational Activity

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Abstract

Recent literature on multinational firms has stressed the importance of low productivity as a barrier to the cross-border expansion of firms. However, firms typically also need external finance to finance the costs of market entry. In addition to productivity-related real barriers, financial constraints may thus restrict market entry. Building on a model of multinational firms facing real and financial barriers to exporting and FDI, we provide empirical evidence on the importance of these barriers. We find that, in addition to productivity, financial factors at the affiliate and at the parent level affect firms' foreign activities, both along the intensive and the extensive margin.

Keywords: multinational firms, heterogeneity, productivity, financial constraints

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1 Motivation

The dominance of large firms in international trade and foreign direct investment (FDI) has become one of the main stylized facts in the international trade and finance literature. A recent study using European firm level data, for instance, concludes that multinational firms differ from national firms along a couple of dimensions. They are bigger, more productive, generate higher value added, pay higher wages, employ more capital per worker, and employ more skilled workers (Mayer and Ottaviano et al. 2007).

Similar differences in firm size prevail in Germany (Table 4). Firms owning foreign affiliates and exporters are larger than their domestic counterparts. Yet, the two groups of firms also differ along a couple of other dimensions. Multinational firms, for instance, have lower debt ratios, higher cash flow, and a higher liquidity than domestic firms.

The main explanation that the theoretical literature holds in store to explain the characteristic size patterns of multinational firms are differences in productivity. Observed internationalization patterns would thus reflect real constraints since only the more productivity firms can afford to shoulder the fixed costs of market entry. Most of this literature considers the impact of financial constraints to be less important, arguing that FDI and the associated financing decisions can largely be treated separately (see, e.g., Markusen 2002).

Yet, there is a potential second explanation for the dominance of large firms in international activities which rests on the presence of financial constraints. The corporate finance and banking literature emphasizes that smaller firms are more opaque and thus face greater difficulties in obtaining external finance than larger firms. If access to finance has an impact also on the way in which firms finance foreign entry, financial constraints might be a complementary explanation of prevailing patterns of multinational activity.

This explanation also assigns a dual role to banks and other financial intermediaries in paving the way to international markets. First, access to external finance can help firms to

overcome financial constraints and enable firms to finance the costs of market entry. This effect is likely to be more important for FDI than for exports as the former involves higher fixed costs. Second, the international expansion of banks and multinational firms often takes place in parallel, although the direction of causality has remained subject to debate. One reason for the link between the "follow-their-customer" patterns in the data could be that banks serve as information intermediaries in foreign markets. Home country banks that are active abroad could, for instance, lower information asymmetries in assessing the credit-worthiness of FDI projects.

The purpose of this paper is to disentangle the relative importance of real and financial barriers for the cross-border expansion of firms. We use a detailed firm level dataset on German firms' foreign direct investments abroad, on firms' exporter status, and on productivity and financial barriers faced at home.

Our empirical analysis is based on a theoretical framework allows studying the interaction between real and financial constraints as determinants of the international expansion of firms. The model is motivated by recent theoretical work stressing the importance of productivity for firms' international expansions. To this literature, Melitz (2003) has provided the seminal contribution; Greenaway and Kneller (2007) provide a recent survey. Helpman et al. (2004) extend the Melitz-model to account for multinational firms. The key to these models is that, ex ante, firms (as well as other market participants) do not know the firms' productivity. Upon entry, firms draw their productivity from a commonly known productivity distribution, and the level of productivity becomes common knowledge as well. Hence, information is symmetric. Depending on the level of productivity, firms exit the market, they produce only for the domestic market, they become exporters, or they set up affiliates abroad. Productivity matters because there are fixed and variable costs of entering new markets. Costs of entering domestic markets are lower than costs of exporting which, in turn, are lower than the costs of setting up foreign affiliates.

The implicit assumption in these models is that firms can either finance foreign operations internally and/or without incurring an external finance premium. This assumption is at odds with the large literature on financial constraints that in particular

smaller firms are facing. In the Melitz-model, firms are small and cannot enter foreign markets because they make a bad productivity draw. In reality, firms that are small are also particularly disadvantaged on capital markets due to asymmetries of information. Hence, they face an additional barrier to going international.

Two recent papers introduce financial market constraints into the Melitz-model. Manova (2006) analyzes the impact of financial constraints on the selection into exporting. Firms need external funds to finance foreign expansions, and they differ with regard to the level of collateral they can pledge.[1] The model implies that productivity cut-off levels for the selection into exporting differ across firms. Highly productive firms can offer higher returns to creditors and are less credit constrained than less productive firms. In this sense, credit constraints reinforce the negative impact that low productivity has on the entry into foreign markets. Manova (2006) tests these predictions using sector level panel data of bilateral exports. She finds that industries in more financially developed countries are more likely to export bilaterally and to ship greater volumes.

Chaney (2005) likewise has a Melitz-type model in which firms face financial constraints. In his model, firms not only make a random productivity draw upon entry, but they are also hit by a liquidity shock. Since productivity and liquidity shocks are imperfectly correlated, the link between productivity and the propensity to export is non-linear: firms with a very low productivity never export, regardless of their level of liquidity. Firms with a very high level of productivity always export, regardless of their liquidity. Firms with an intermediate level of productivity may or may not export, depending on their liquidity.

Recent empirical evidence at the firm level supports that financial constraints affect the probability to export. Greenaway et al. (2007) use a panel of UK manufacturing firms over the period 1993 to 2002, finding that exporters exhibit better financial conditions than domestic firms. When differentiating between continuous exporters and firms starting to export, they find that export-starters are in a worse financial state than continuing exporters and domestic firms. Exporting improves firms' financial health, but

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[1] Chor et al. (2007) use a similar theoretical framework but focus on the impact of host country financial development on the relative importance of horizontal and vertical FDI.

financially healthy firms are not more likely to become exporters. Findings by Ber et al. (2002) for Israelian and Campa and Shaver (2002) for Spanish firms also show that credit constraints are less tight for exporting than for non-exporting firms.[2]

Harrison et al. (2002) also study the link between financial constraints and FDI but their focus is on the impact of inward FDI on the tightness of the domestic credit market. If multinationals source their funds on international markets, domestic credit constraints might be relaxed. If multinationals source their funds on the domestic market, credit constraints may tighten. Hence, Harrison et al. (2002) take the perspective of the host countries of FDI. Their results are complementary to ours since we take a source country perspective.

Our approach differs from these studies in three main regards. First, we theoretically analyze how productivity and financial constraints affect firms' choices between FDI and exports under conditions of asymmetric information and limited internal funds. Our model also features contract enforceability and liquidation costs as two inefficiency in financial contracting. Second, we test our model using data for German firms, which allow analyzing the financial structures and the productivity of German firms and of their foreign affiliates. Third, our data allow analyzing different margins of international activities such as exports and FDI as well as the intensive and the extensive margin of FDI. In contrast to earlier work focusing on manufacturing firms, our sample also contains a large number of observations for services firms.

Our data source on the foreign affiliates of German firms is a detailed firm level database provided by the Deutsche Bundesbank. The Micro-Database Foreign Direct Investment (*MiDi*) provides balance sheet information on practically all affiliates of German firms worldwide. From *MiDi*, we obtain information on the internationalization patterns of German multinationals, and on the financial structures and size of their foreign affiliates. However, *MiDi* provides only very limited information on the German parent. In order to

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[2] Bridges and Guariglia (2006) test the impact of internationalization and financial constraints on firms' survival probabilities. Using a panel of newly established UK firms over the period 1997-2002, they find that higher collateral and lower leverage result in lower failure probabilities, while exporting or being foreign owned does not significantly affect these probabilities.

measure financial constraints at the parent level, we use a second database on the balance sheets of firms in Germany, the database *Dafne* provided by Bureau van Dyck. From *Dafne*, we also obtain information on the group of purely domestic firms as well as on domestic exporters without foreign affiliates.

In the following second part, we present a model of multinational firms which differ with regard to their productivity and their access to external finance. The model shows the interaction of productivity and financial barriers to the expansion into foreign markets. In part three, we describe our data and provide descriptive statistics. Part four tests the model, and part five concludes. We find that productivity and financial constraints have a significant impact on firms' intensive and extensive margins of foreign activities as well as on the choice between exports and FDI.

2 International Activity and Financial Constraints: Theory

In this section, we propose a theoretical framework, which allows analyzing firms' choices between exports and FDI. Our model differs from most previous models of multinational firms because firms need to obtain external finance to finance the fixed costs of market entry and to set up the production capacity. Financing decisions are made under uncertainty. Firms finance their foreign expansions using internally generated funds as well as external credit. These credits are secured by collateral. Financial contracting in our model involves two inefficiencies. The first inefficiency are differences in contract enforceability across countries, which could be linked to cross-country differences in financial institutions. (See Manova (2006) for a similar modeling strategy.). A second inefficiency in financial contracting arises from the fact that collecting collateral generates liquidation costs. The model provides a set of testable implications concerning the impact of financial constraints, productivity, and host country characteristics on firms' internationalization choices.

To see how the model works, consider the decision problem of a firm that has three choices. First, it can produce at home and serve only the home market. Second, it can produce at home and serve both the home and the foreign market via exports. Third, it can invest abroad and set up a foreign affiliate to serve the foreign market via FDI.

Hence, we focus on the case of horizontal FDI. The main qualitative results concerning the impact of financial frictions would go through if the model was reinterpreted for vertical FDI. The reason is that financial frictions operate through the fixed costs of entry and operations, not through the location of production versus the location of sales.

To serve the foreign market, the firm has to incur a fixed costs F_i that depends on the mode of entering the foreign market, with $i = E$ in case of exports, $i = I$ in case of foreign investment, and $F_E < F_I$. Hence, the fixed costs of production are higher in the case of FDI. In the case of exports, these fixed costs involve setting up a distribution network. In the case of FDI, additional overhead functions must be maintained abroad. Without loss of generality, we set the costs of purely domestic production equal to zero.

In addition to choosing where to produce, the multinational also has to decide how large a capacity to set up for production. Thus, we model the firm's FDI decision both at the extensive and the intensive margin. To produce a quantity x, the firm has to set up a capacity at cost $k(x) = \frac{x^2}{2(1+\beta)}$, where β captures the productivity of the parent firm, which also spills over onto the foreign affiliate. (See Yeaple (2008) for a similar assumption.) These differences in productivity are the 'real barriers' that firms face when entering foreign markets.

The firm faces a cash-in-advance constraint as the set up costs have to be paid before production resumes and before revenues are generated. Without loss of generality, we neglect any further variable production cost beyond the capacity cost $k(x)$.

Revenues that can be generated on the foreign market are uncertain.[3] Serving the foreign market yields positive revenues $\frac{px}{\tau_i}$ with probability q and zero revenues with probability $(1-q)$, where p is the price level. The probability of positive profits $q = f(q_C, q_f)$ depends both on country-specific macroeconomic risks that firms face on

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[3] We abstract from exchange rate changes, i.e. revenues generated on the foreign market can be remitted 1:1 into domestic currency. Russ (2007) has a model in which endogenous adjustment of exchange rates affects firms' entry decisions.

the foreign market (q_C) and that are the same for all firms and firm-specific features that are idiosyncratic (q_F).

In choosing between exports and FDI, firms also have to consider transportation costs. Revenues generated from exports are subject to iceberg transportation costs that reduce the revenues to $\frac{px}{\tau_E}$, with $\tau_E = \tau > 1$. In the case of FDI, there are no such iceberg transportation costs, i.e. $\tau_I = 1$.

We distinguish two cases concerning the presence of liquidity constraints. In Case 1, the firm is not liquidity constrained, i.e. it can finance both the fixed cost of entry and the cost of setting up capacity *x* from internal funds, and it maximizes the following profit function:

$$q\frac{px}{\tau_i} - k(x) - F_i = q\frac{px}{\tau_i} - \frac{x^2}{2(1+\beta)} - F_i$$

Taking the first order condition, solving for the optimal x and inserting it back into the profit function yields the following profits in case exports and FDI:

$$\Pi_E = \frac{1}{2}\frac{q^2 p^2}{\tau^2}(1+\beta) - F_E \quad \text{and} \quad \Pi_I = \frac{1}{2}q^2 p^2 (1+\beta) - F_I$$

It is straightforward to see that profits depend positively on the firm's productivity parameter β. A comparison of the two profit functions leads to the well known result that the likelihood that the firm prefers FDI to exports depends positively on the iceberg cost τ, negatively on the fixed cost difference $(F_I - F_E)$ and positively on the productivity parameter β.

In Case 2, the firm is liquidity constrained, i.e. its retained earnings *L* are not sufficient to cover the costs associated with market entry and capacity building. We assume that firms raise external finance in the form of debt finance. This is a realistic assumption, given that the role of external equity finance for German firms is very limited (Bayraktar et al. 2005). Let $D_i = k(x) + F_i - L$ denote the credit necessary to finance these cost. Furthermore, let $(1 + r_i)D_i$ denote the repayment of principal plus the interest rate that the

firm promises to pay in case of positive revenues. For now, we assume that firms and creditors have the same information set. Hence, there are no asymmetries in information. This assumption will be relaxed in Section 2.3 below.

Even if the project is successful and generates positive returns, difficulties in contract enforcement imply that the creditor cannot be sure to receive the promised repayment. Repayment can be enforced with probability μ_i, where μ_i captures the probability of contract enforcement even if revenues are positive (which occurs with probability q). A natural assumption is $\mu_I < \mu_E \leq 1$. Hence, contract enforcement becomes more difficult if the firm has set up an affiliate abroad. This limited degree of contract enforcement in a foreign environment could be due to legal uncertainty. In our empirical analysis, we will capture this through a country-specific measure of political risk.

The credit can be partially secured with collateral that is related to the size of the investment (*D*). Thus, if the credit is not repaid, the creditor can seize the investment financed with the credit, but there will be some efficiency loss when the collateral is liquidated, implying that the creditor realizes only a fraction of the collateral $\theta_i D$, with $\theta_I < \theta_E \leq 1$, when seizing the collateral *D*.[4] The intuition is that the efficiency loss of liquidating the collateral is larger if the assets are located in a foreign country than if they are located at home. Another way to think about liquidation costs is its relation to the tangibility of assets. The higher the degree of tangibility of the affiliate's assets, the lower will be liquidation costs. This efficiency loss due to liquidation costs has an intuition similar to the degree of contract enforcement (μ_i), but it is related to the collateral, not the enforcement of the credit.

Firms borrow from domestic banks. Implicitly, we thus assume that foreign banks have a competitive disadvantage when lending to domestic firms and that credit markets are de facto segmented. We assume perfect competition in the domestic banking market so that the banks expect to break even. This zero profit condition for banks implicitly determines the interest rate:

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[4] Without loss of generality, we assume that the efficiency loss is the same for the part of the credit used to finance the fixed costs of entry and for capacity building.

$$q\mu_i(1+r_i)D_i+(1-q\mu_i)\theta_i D_i = D_i \qquad (1)$$

The firm's expected profits, in turn, can be summarized as follows:

$$q\left[\frac{px}{\tau_i}-\mu_i(1+r_i)D_i\right]+D_i-(1-q\mu_i)D_i-F_i-k(x) \qquad (2).$$

The terms in parenthesis denote the revenues minus interest payments in the good state of the world. To this we add the credit received minus the expected loss due to the liquidation of the collateral if the credit is not repaid, which happens with probability $(1-q\mu_i)$. Finally, we need to subtract the fixed cost and the variable capacity cost.

2.1 Determinants of Exports and FDI

In a first step, we solve the model for the determinants of exports and FDI separately. The interest rate is chosen endogenously by the banks, and it is determined by the banks' zero profit condition as

$$(1+r_i)=\frac{1-\theta}{q\mu_i}+\theta$$

Higher project risk (a lower q) implies that banks charge a risk premium over and above the market rate of interest. Interest rate the optimal interest rate into the expected profit function of the firm yields

$$\Pi_i = q\frac{px}{\tau_i}-D_i(1-q\mu_i)(1-\theta_i)-F_i-k(x) \qquad (3)$$

Inserting $D_i = F_i+k(x)-L$ and the cost function $k(x)$ and taking the first order condition with respect to x yields the following optimal capacity to be set up:

$$x_i^* = \frac{qp(1+\beta)}{[1+(1-q\mu_i)(1-\theta_i)]\tau_i}$$

Inserting this optimal capacity back into the profit function yields the following profits for exports and FDI:

$$\Pi_E = \frac{1}{2} \cdot \frac{(1+\beta)}{1+(1-q\mu_E)(1-\theta_E)} \frac{q^2 p^2}{\tau^2} + (L - F_E)(1-q\mu_E)(1-\theta_E) - F_E \qquad (4)$$

and

$$\Pi_I = \frac{1}{2} \cdot \frac{(1+\beta) q^2 p^2}{1+(1-q\mu_I)(1-\theta_I)} + (L - F_I)(1-q\mu_I)(1-\theta_I) - F_I \qquad (5)$$

The investor will undertake exporting or FDI only if the following two conditions hold:

(i) The expected profit in each mode of entry is non-negative.

(ii) The promised credit repayment $(1+r_i)D_i$ can be covered by the revenues $\frac{px}{\tau_i}$ if revenues are positive.

If the probability of contract enforcement (μ) is sufficiently large, it can be shown that the second condition is always fulfilled if the first condition is satisfied. A sufficient, but not necessary, condition for this is $\mu > 1/2$. In the following, we will assume that this is the case, so we restrict our attention to the first condition.

We can now analyze the firms' adjustment along the extensive and intensive margin of foreign entry as well as the choice between FDI and exports. We first investigate how expected profits of exports and FDI react to changes in the parameters. From these expected profits, we can deduce the following comparative static results for adjustments along the extensive margin, which hold for FDI and for exports:

1. The larger the productivity of the project, measured by β, the larger are the expected profits.
2. The more profitable or larger the market, measured by p, the larger are the expected profits.
3. The higher the fixed costs of the project, measured by F, the smaller are the expected profits.
4. The lower the risk of the project, captured by a larger q, the larger are the expected profits.

5. The better the legal environment for contract enforcement (higher μ) and the more efficiently the collateral can be liquidated (higher θ), the larger are the expected profits.
6. The weaker financial constraints, captured by larger liquidity/retained earnings L, the larger are the expected profits.
7. The higher the variable costs of exporting τ, the lower are expected profits in case of exports.

Hence, the probability of a firm to engage in FDI (or exports) and to adjust along the extensive margin is given by:

$$\Pr(FDI) = a_0 + a_1\beta + a_2 p + a_3 F + a_4 q + a_5\mu + a_6\theta + a_7 L + a_8\tau \qquad (6)$$

where $a_1, a_2, a_4, a_5, a_6, a_7, a_8 > 0$ and $a_3 < 0$. A similar condition can be derived for the probability to become an exporter, the only qualitative difference being that the expected sign for variable exporting costs would be negative: $a_8 < 0$.

Furthermore, we investigate how the capacity investment chosen and thus the intensive margin reacts to changes in the parameters. Recall that the optimal capacity choice is determined by

$$x^* = \frac{qp(1+\beta)}{[1+(1-q\mu_i)(1-\theta_i)]\tau_i}$$

It is straightforward to see that the optimal capacity investment reacts positively to

1. an increase in the firm's productivity β
2. a decrease in the risk of the project (captured by a larger q)
3. a decrease in the iceberg cost (τ)
4. an increase in the efficiency of contract enforcement (μ) and liquidation (θ).

The corresponding equation for the volume of FDI is thus given by:

$$\ln FDI = a_0 + a_1\beta + a_2 p + a_3 q + a_4\mu + a_5\theta + a_6\tau$$

where $a_1, a_2, a_3, a_4, a_5, a_6 > 0$.

2.2 Relative Choice Between Exports and FDI

We now turn to the *relative* attractiveness of exports versus FDI. The main trade off between exports and FDI are fixed versus variable costs of entry. FDI is more costly in terms of fixed market entry costs, but it helps saving on variable transportation costs. To see the firms' choices between exports and FDI more explicitly, we compare expected profits in case of exports (4) with those in case of FDI (5). Like in the situation without financial constraints, we can make the following well known observations:

1. The larger the productivity of the project, measured by β, the larger are the expected profits in case of FDI relative to the expected profits in case of exports.
2. The larger market size, measured by *p*, the larger are the expected profits in case of FDI relative to the expected profits in case of exports.
3. The larger the fixed cost disadvantages of FDI, the smaller are the expected profits in case of FDI relative to the expected profits in case of exports.
4. The higher transportation costs, the more likely is FDI relative to exports.

However, our model also has implications concerning the choice between FDI and exports which go beyond these standard hypotheses. The probability of success of a given project, the degree of contract enforcement, and the tangibility of the collateral – which affects liquidation costs, likewise affect the FDI-versus-exports decision. To see this, note that our maintained assumptions imply the following relationships: $(1-q\mu_E) \leq (1-q\mu_I)$, and $(1-\theta_E) \leq (1-\theta_I)$. Thus, we can make the following observations:

1. The more liquidity or retained earnings a firm has, as measured by L, the larger the expected profits in case of FDI relative to the expected profits in case of exports.
2. Retained earnings increase the relative expected profits of FDI versus exports more if
    a. the risk of the project is larger, i.e. if q is smaller,
    b. the inefficiency in case of liquidation is larger, i.e. if θ is smaller,
    c. contract enforcement is less efficient, i.e. if μ is smaller.

2.3 Information Asymmetry and the Relevance of Multinational Banks

So far, we have assumed that banks and firms base their decisions on the same information set. In reality, firms are likely to have superior information about their profitability. In the following, we thus consider the situation where the banks granting credits are not perfectly informed about the firm's potential. We capture this informational asymmetry by assuming that the bank expects the firm to generate positive revenues with probability $q^e < q$. This affects the required repayment as follows

$$q^e \mu_i (1+r_i) D_i + (1 - q^e \mu_i) \theta_i D_i = D_i .$$

Inserting this into the firms' profit function yields

$$\Pi_i = q \frac{px}{\tau_i} - D_i \left(\frac{q}{q^e} - q\mu_i \right) (1-\theta_i) - F_i - k(x)$$

Taking the first order condition and solving for the optimal capacity yields

$$x_i^* = \frac{qp(1+\beta)}{\left[1 + \left(\frac{q}{q^e} - q\mu_i \right) (1-\theta_i) \right] \tau_i}$$

The profit functions in case of exports now look as follows

$$\Pi_E = \frac{1}{2} \cdot \frac{(1+\beta)}{1 + \left(\frac{q}{q^e} - q\mu_E \right) (1-\theta_E)} \frac{q^2 p^2}{\tau^2} + (L - F_E) \left(\frac{q}{q^e} - q\mu_E \right) (1-\theta_E) - F_E \qquad (4')$$

In the case of FDI, we obtain

$$\Pi_I = \frac{1}{2} \cdot \frac{(1+\beta) q^2 p^2}{1 + \left(\frac{q}{q^e} - q\mu_I \right) (1-\theta_I)} + (L - F_I) \left(\frac{q}{q^e} - q\mu_I \right) (1-\theta_I) - F_I \qquad (5').$$

It is straightforward to see that the smaller q^e, i.e. the more pessimistic the bank is about the firm's prospects, the less it lends, the smaller the capacity investment set up by the firm, and the less likely the firm will be able to profitably carry out its exports or FDI. Given this informational asymmetry, though, more productive firms are still more likely to pass the zero profitability threshold. Hence, if the informational situation is difficult,

we expect to see only the most productive firms active in this market. Or, looking at it the other way round, if the informational asymmetry is reduced, say because of a larger presence of multinational banks in the host country, we expect also less productive firms to be active in this market. Although we assume that lending takes place through the domestic headquarters of multinational banks – which are located in the same country as the headquarters of non-financial multinational firms – we assume that these banks acquire useful information on the host country environment through their affiliates abroad.

Comparing the profits shows that the impact of improving the informational gap on FDI versus exports is ambiguous. Lower information asymmetries could benefit FDI relative to exports due to the fact that

$$(F_I - L)\left[\left(\frac{q}{q^e} - q\mu_I\right)(1-\theta_I)\right] > (F_E - L)\left[\left(\frac{q}{q^e} - q\mu_E\right)(1-\theta_E)\right]$$

but they could also benefit exports relative to FDI if the effect of q^e in the denominator is larger for exports, i.e. if $\frac{q}{q^E}(1-\theta_I) < \frac{q}{q^E}(1-\theta_E)\tau^2$.

As before, the optimal capacity investment reacts positively to an increase in the firm's productivity, a decrease in risk, a decrease in iceberg costs, an improvement in contract enforceability, and higher liquidation efficiency. It also increases in the bank's judgement with respect to the project's success probability, captured by a larger q^e.

In sum, the above model has rich implications concerning the determinants of firms' extensive margins of foreign activities, the relative choice between exports and FDI, and the determinants of firms' intensive margin of foreign activities. Our data provide information on the population of domestic firms as well as their exporter and FDI status. For FDI, we also have information on the countries of destination. Hence, we can test the model's implications for the choice between exports and FDI which are related to parent characteristics. We can also test implications of host country determinants for the volume of FDI. In the following section, we describe the data and the empirical modelling approach in more detail.

3 Data[5]

3.1 Balance Sheets and Multinational Status

The aim of this paper is to test the importance of real and financial constraints for the foreign investment and export choices of firms. Our data come from two sources. The main data source is *Dafne*, a commercial database providing financial information for about 14,000 German firms in 2001 and 120,000 firms in 2006.[6] This database provides information on a large panel of firms that are active in Germany. We use it to obtain information on parent-level financial constraints, productivity, and control variables such as total assets and sales.

The second data source is the firm level database on multinational firms *MiDi* (Micro-Database Direct Investment) provided by the Deutsche Bundesbank (Lipponer 2006). From this database, we obtain information on the countries in which FDI firms are active, the volume of their activities abroad, and on the financial structures and productivity of their affiliates. We can also use *MiDi* to obtain information on the number of affiliates that a given firm owns abroad and on the volume of FDI of German banks by country.

Coverage of the *Dafne* database has increased over time, and service sector firms are well covered. In terms of sales and the numbers of firms, providers of business services, including holding companies, account for about one third of the observations. This comprehensive coverage of service sector firms sets our study apart from earlier research focusing mostly on the manufacturing sector.

To eliminate outliers, we start from the full *Dafne* dataset and drop firms with negative values for key variables such as sales, total assets, or total liabilities. Also, since we need information on cash flow and sales, we eliminate observations for firms which do not report an income statement. Since we do not have information on mergers among the firms in the sample, we correct for possible merger-induced outliers by dropping observations with large changes in sales. We eliminate all entries where these variables

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5 See the Appendix for details.

6 *Dafne* is the German equivalent to the European firm level database *Amadeus*. Bayraktar et al. (2005), for instance, use the German data from Amadeus for an analysis of firm level investment behaviour.

double of half. Due to missing data for quite a number of firms, in particular with regard to financial ratios, we use only about 10% or a maximum of about 20,000 firm-year observations for our regressions.[7]

The number of firms included and thus the representativeness of the data increases over time. While the median firm age is 12 years, the median duration in the dataset is only 3 years. Reducing the sample to those firms being in the dataset for at least 3 or 4 years as in other papers (see, e.g., Bond et al. 2004) would reduce our sample size to one half or one third, respectively, of all observations.

Table 3 compares the structure of the full and of the reduced sample used for the regressions. The two samples are fairly similar in terms of the percentage allocation of the number of firms across sectors. In terms of the volume of sales, financial services are somewhat underrepresented in the reduced sample (share of 2.4% versus 8. 5% of total sales). Similarly, business services are underrepresented with a share of 29.1% versus 41.1%. The sector transport and communication, in contrast, has a higher share in total sales in the reduced than in the full sample (22.9% versus 15.9%). Apart from these differences, the cross-sectoral patterns in the data are quite similar, with rank correlation coefficients close to one for the number of firms and the volume of sales. Although the sample is not randomly chosen from the population of German firms, the rank correlation in terms of sectoral structure of sales is also quite high (0.78).[8]

Using *Dafne*, we also obtain information on the extensive margin of German firms' international activities. We can identify German firms which hold 10% or more of the equity capital in foreign firms and German firms that export. We thus create three groups of firms:

- Purely domestic German firms, i.e. firms which do not export and which do not hold affiliates abroad ('Domestic Firms') (91.1% of the firm-year observations),

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[7] Note that the number of observations shown in the regressions is smaller since we use lagged values of the explanatory variables in order to reduce simultaneity problems.

[8] Data on the sectoral structure of output of German firms has been taken from the EUKLEMS database (www.euklems.net) and refers to the average for the years 2001-2005.

- Domestic firms that export but that do not have foreign affiliates ('Domestic Exporters') (4.5%),
- German firms with foreign affiliates ('German MNEs') (4.4%). Our maintained assumption is that these firms also export.

Since we have no time-varying ownership and export information in *Dafne*, we use information on firms' status for the most recent year. Due to the relatively short sample period, this is unlikely to bias our results.

3.2 Financial Constraints and Productivity

As regards the measurement of firm level productivity, we start with a simple measure of capital productivity, i.e. total sales divided by the capital stock. To obtain a measure of the firms' capital stock, we include measures of financial capital in addition to plant and equipment to accommodate the fact that plant and equipment are insufficient measures of capital for firms in the services sector. We use productivity measures based on employment only as a robustness test since data on employment are patchy and seem unreliable. Only about 10% of the firms included in the database report employment figures. In addition to the ratio between sales and factor inputs, we use the residuals from estimating a simple production function by regressing output on labor, capital, time dummies, and industry dummies (see, e.g., Yeaple 2008). Alternatively, we also use cash flow and profits instead of sales.

As regards the measurement of financial constraints, a standard measure in the corporate finance literature is cash flow, the idea being that a company's investment should depend on cash flow only if credit constraints bind. (See Bond et al. (2004) for details and a review of the literature.) Applying this strategy to our German data would be the preferred option for estimating the impact of financial variables on the volume of FDI. However, one stylized facts of the German corporate sector is the relatively small share of traded firms. In our sample, only 1% of the firms are listed on the stock market. This implies that we do not have information on Tobin's *q* for most firms of interest, and we also lack analysts' forecasts. We deal with this problem by including sales growth and the stock of cash as proxies for future profitability (see Bond et al. 2004). Similarly, Campa

and Shaver (2002) use lagged sales growth and profit margins to capture time-varying, firm-specific investment opportunities.

Moreover, we follow Greenaway et al. (2007) and proxy financial constraints using a number of firm level balance sheet variables. We use the debt ratio, i.e. the ratio of total debt over total assets in our baseline specifications. A higher debt ratio reduces internal funds that are available for investment. Hence, the expected sign is negative. Alternatively, one might think of the debt ratio to increase the external finance premium (Bayraktar et al. 2005). This measure is available for the largest number of firms in the sample. Using alternative measures reduces the size of the sample. Higher leverage can be taken as an indication that a firm has lower retained earnings. Hence, it implies that a firm is more likely to be credit constrained. Manova (2006) additionally suggests using the share of net property, plant and equipment relative to the total book value of assets as a measure for asset tangibility.

One problem with different measures of financial frictions is that they highlight different facets of firms' financial standing, we also use a variant of the so-called Z-Score model tracing back to Altman (1968) (See also Altman and Saunders (1998).). The Z-Score model uses discriminant analysis for financial ratios to discriminate between solvent and insolvent firms. As a multivariate tool, it combines several financial ratios into a single indicator of financial distress, the so-called Z-Score. While the Z-Score model cannot be structurally derived from our theoretical model, it yet serves as a useful robustness check since it is widely used by practitioners and banks when assessing the financial situation of firms (Bundesbank 1999).

To construct each firm's Z-Score, we run a logit regression of an indicator variable obtained from *Dafne* that indicates whether a firm has filed for bankruptcy. We regress this indicator variable on financial indicators such as the debt ratio, the ratio of cash to tangible assets, and working capital (excluding cash) over tangible assets. Since the sample of insolvent firms is quite small, we draw a random sample of equal size from the remaining firms, and we repeat these random draws 1,000 times. Then, we estimate the logit regression on the probability to file for bankruptcy. We repeat this procedure 1,000 times, and we use the mean of the estimated ßs as weights to calculate a financial

constraints score that is then included in our regressions. The weights are 0.320 for the debt-ratio, -0.261 for the ratio of cash flow over assets, and 0.005 for working capital.

As the method is sensitive to outliers, we use the method of winsoring, i.e. observations below the 1% percentile or above the 99 % are set equal to the percentile. Furthermore, the sum of fixed and financial assets is used instead of total assets, because intangible assets such as goodwill should not be used to assess financial constraints.

Finally, from *MiDi*, we obtain information on financial variables of the affiliates, which we model as closely as possible to the constraints faced by the domestic parent. Similarly, we compute capital and labor productivity of the affiliate, using total sales over capital and employment, respectively.

3.3 Country Level Data

Country-level explanatory variables such as host-country GDP and interest rate spreads are taken from the World Bank's World Development Indicators. GDP controls for the size of the market, and we expect a positive impact on the volume of FDI. Interest rate spreads are included as a measure of the state of development of the host country's financial system, with higher spreads indicating a lower competitiveness and/or greater inefficiency of the banking system.

To obtain a host-country measure of contract enforceability, we use a measure of host-country political risk taken from the International Country Risk Guide (ICRG).

Table 1 summarizes the theoretical predictions on the determinants of exports and FDI and the empirical measurement of these determinants.

4 Stylized Facts

When comparing the three groups of firms – purely domestic firms, exporters, and FDI firms, as is done in Table 4, we find that firm size (total assets) is continuously increasing, productivity first increases and then decreases, the debt ratio of firms (leverage) is falling, and cash flow is increasing.

In Graphs 1-4, we visualize the differences between exporters, FDI firms, and the rest of the sample by plotting the Kernel densities of size (Graph 1), capital productivity (Graph 2), cash flow (Graph 3), and the debt ratio (Graph 4) for the sub-sets of firms.

Graph 1 confirms stylized facts reported in many earlier papers using firm level data: exporters and FDI firms are larger than purely domestic firms. Unreported one-sided t-tests on equality of the means between the two sup-samples also show that this difference is also statistically significant. Measuring size through the volume of sales gives a very similar result.

Graph 2 compares the different sub-samples of firms by their capital productivity. Here, the patterns in the data are not so clear. While exporters indeed have a higher productivity than non-exporters, FDI firms have a lower productivity. Both of these differences are significant.

Hence, while the dividing line between multinationals and non-multinationals is not as clear cut as might have been expected on the basis of the productivity of these firms, the dividing line is again clear for measures of financial status. Multinationals and exporters have significantly higher cash flow (Graph 4), lower debt ratios (Graph 5), higher liquidity (unreported), and a lower degree of bank dependence (unreported) than domestic firms.

Prima facie, these graphs suggest that heterogeneity with regard to the openness and international orientation of firms could be driven by financial factors just as by real factors and productivity. In the following, we turn to a more systematic analysis of these patterns in the data.

5 Productivity versus Financial Constraints: Regression Results

Our main testing equation relates financial constraints and productivity to the pattern to internationalization at the firm level. We are interested in two main questions. First, do financial constraints and productivity affect the probability to invest abroad or to become exporters? And what is the relative importance of these variables on the choice between

FDI and exports? Second, to what extent do these factors affect the size of affiliates? We answer these questions in two steps. In a first step, we use the *Dafne* database to analyze the determinants of firms' extensive margins of foreign activities and the relative choice between the two modes of entry. In a second step, we use the *MiDi* data to analyze the size of affiliates and the volume of FDI across countries, i.e. the intensive margin.

5.1 Extensive Margin

Our first set of regression results refers to the extensive margin of international activities of German firms. We study the characteristics of firms which are exporters and which own affiliates abroad, each compared to purely domestic firms. Our empirical model is based on equation (4) but we add a number of control variables. Regressors are lagged by one period to account for the potential simultaneity of the explanatory variables. Our baseline regression for the extensive margin – the decision to enter a foreign market – is given by the following probit model:

$$\Pr(FDI)_{i,t} = \alpha_0 + \alpha_1 \left(\frac{Y}{K} \right)_{i,t-1} + \alpha_2 \, financial \;\; frictions_{i,t-1} + \alpha_3 controls_{i,t-1} + \varepsilon_{i,t} \qquad (8)$$

where $\Pr(FDI)_{i,t}$ indicates whether a firm *i* has invested abroad in year *t*. In a similar way, we model $\Pr(X)_{i,t}$ as the probability of being an exporter in year *t*. We use the ratio of sales over fixed and financial capital (Y/K) as a measure of capital productivity. The different measures for financial constraints ($financial \;\; frictions_{i,t-1}$) have been discussed above. The vector of control variables ($controls_{ks,t-1}$) includes measures for firm size, sales growth, and the stock of cash. We estimate equation (7) using a full set of sector and year dummies. These capture systematic differences across industries as well as common macroeconomic effects, in particular systematic changes in the financial constraints faced by all firms in the sample.

Tables 4 and 5 show the results of probit regressions using a 0/1-dummy of being an exporter and owning foreign affiliates, as indicated in *Dafne*, as the dependent variable. Column (1) has the baseline specification. In columns (2)-(4), we add alternative proxies for firms' financial constraints such as the short-term debt ratio, the degree of bank

dependence, or asset tangibility. In column (5), we restrict the estimation to the last year only since information on exporter and FDI status in *Dafne* is not time-varying. In column (6), we estimate the model only for those firms reporting positive cash flow (about 93% of the firm-year observations). In column (7), we add the Z-Score as a measure of financial frictions.

Turning to the determinants of exporter status first, Table 5 shows a robust relationship between size, productivity, and firm age. Larger and more productive firms have a higher probability of being exporters than the rest of the sample. Also, older firms are more likely to export. These findings are largely in line with expectations and with earlier empirical evidence.

Results for financial variables are somewhat mixed. Consistent with expectations, more leveraged firms and firms with lower cash flow are less likely to be exporters. The negative sign on the debt ratio is consistent with results on the investment behavior of German firms. Bayraktar et al. (2005) find that the investment of German firms is a negative function of firms' leverage, and they interpret this as evidence for the presence of financial frictions.

However, while all coefficients have the expected sign, they are not always significant. Firms with a higher degree of bank dependence are also more likely to be exporters, which is consistent with lower asymmetries in information due to closer banking relationships. The negative sign on the degree of tangibility of assets is inconsistent with expectations as a greater tangibility of assets should increase borrowing capacity. The fact that tangibility is measured at the parent, not the affiliate level, could be an explanation for this. The short-term debt ratio is insignificant. The same holds for holdings of cash and sales growth, which we include as control variables.

The positive sign on the negative cash flow variable is puzzling though. Recalling that this variable is defined as the absolute value of cash flow for firms reporting negative cash flow, it indicates that a more negative cash flow increases the probability of being an exporter. Obviously, some exporters in our sample make negative profits on their foreign operations. Unfortunately, the time dimension of our data is too short to check how long such a situation can be sustained. Also, we have no information on the countries in which

these firms are active to detect possible reasons for negative cash flow. It is comforting though that our remaining results remain valid even if we drop firms with negative cash flow and re-estimate the model (Column 6).

The Z-Score measure added in Column 7 is defined such that a higher value indicates tighter financial frictions (i.e. a greater probability of becoming insolvent). Accordingly, the expected sign is negative. We in fact obtain the expected negative sign, but it is insignificant in the baseline specification. In unreported regressions adding different measures of productivity, the Z-Score becomes significant.

Unreported regressions using a TFP estimate obtained from a simple estimate of a production function show a negative sign for the productivity variable. However, this result should be interpreted with caution since sample size shrinks considerably due to a lack of employment data. Using cash flow or profits over assets instead of sales gives a positive sign for productivity.

Turning next to the results using the probability of being a multinational firm as a dependent variable (Table 6), we find that larger firms are more likely to be multinationals. Productivity, in contrast, has a negative and significant sign, reflecting the earlier descriptive statistics that multinationals are not necessarily more productive than domestic firms. The age of a firm is insignificant.

The financial variables are more in line with the findings for exports. For cash flow and the debt ratio, we find the same positive and negative signs as before. Tangibility is again negative, bank dependence positive but insignificant, and the short-term debt ratio is positive and significant. The Z-Score variable is insignificant, but becomes negative and significant – as expected – in specifications using alternative productivity measures.

One tentative conclusion from these probit regressions is that productivity constitutes a more significant barrier to exports than to FDI. Financial frictions matter for both, exports and FDI. We will return to the relative importance of these variables for exports and FDI below (see Table 7).

To check the robustness of our results, we split the sample along different dimensions. Table 7 shows results for small and large firms as well as firms from manufacturing and

services sectors. Small/large firms are those with an asset size below/above the median. We expect financial frictions to matter more for the smaller firms in the sample. It is interesting to note that some of our results are driven by the service-sector firms, which also dominate the sample in terms of their number. About 12,000 firm-year observations used for the regressions are for service-sector firms, only about 5,100 for manufacturing firms.

For size (positive), cash, and sales growth (both insignificant), we confirm the earlier findings. Results for cash flow are driven by certain sub-samples of firms. Smaller firms are more likely to be exporters when they have high and positive cash flow. For FDI, in contrast, the cash flow results are driven by the larger firms. The (unexpected) positive coefficient on negative cash flow is entirely due to services firms. Higher debt has a consistently negative impact on FDI but not on exports – which could be an indication that higher fixed costs of FDI indeed matter.

Turning next to the results for productivity, the positive effect found for the full sample of exporters is very consistent for the different sub-samples, and even the point estimates are close. The (unexpected) negative coefficient for FDI though is mostly due to manufacturing firms. For the remaining sub-samples, productivity is insignificant. And, finally, the negative impact of age on the probability of being a multinational is a feature of small firms and of firms in the services sector.

So far, we have analyzed the decision to engage in FDI or exports separately. Table 8 reports results from multinomial regressions using the group of purely domestic firms as the reference case. We show coefficient estimates and relative risk ratios (RRR). A RRR smaller than one means an event is less likely to occur in the multinational group (exporters or FDI firms) than in the control group of domestic firms. A RRR larger than one means an event is more likely to occur in the multinational group than in the control group.

Generally, these results show that size has a positive impact on the probability of exporting and FDI, but the effect is stronger for FDI. Also, results confirm the positive impact of productivity on the probability of exporting but not on the probability of doing

FDI. The debt ratio affects the probability of FDI but not of exporting. These patterns are similar for manufacturing and services firms.

In sum, our results show that parent-level financial constraints and productivity affect the extensive margin of foreign entry. At the same time, productivity has a stronger impact on exports than on FDI, and financial frictions matter more for FDI. This would be consistent with the theoretical model which suggests that tighter financial frictions make FDI more difficult.

5.2 Intensive Margin[9]

In a second step, we analyze the determinants of the intensive margin of firms' foreign activities. We now focus on the size of the foreign investment while taking the decision to *become* a multinational as well as its location as given. We check whether the volume of firms' foreign activities depends on parent, affiliate, and country characteristics. The dependent variable now becomes the size of the affiliate (balance sheet total) $\log(FDI)_{ijk,t}$ of parent *i* in affiliate *j* in county *k*, and the regression equation includes control variables at the parent level ($Z_{i,t}$), at the affiliate level ($Z_{j,t}$), and at the country-level ($Z_{k,t}$):

$$\log(FDI)_{ijk,t} = \alpha_0 + \alpha_1\left(\frac{Y}{K}\right)_{i,t-1} + \alpha_2\, financial\ \ frictions_{i,t-1} + \alpha_3 Z_{i,t} + \alpha_4 Z_{j,t} + \alpha_5 Z_{k,t} + \varepsilon_{ijk,t} \qquad (9)$$

We estimate this model as a panel fixed effects model. The cross-section dimension is given by combinations of parents and host countries. Therefore, time-invariant control variables such as distance drop out.

Results using the volume of FDI as the dependent variable are reported in Table 9. A number of parent-level explanatory variables affect the volume of FDI. Larger, more

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[9] Note that results in this section are preliminary. In this section, negative cash flow is the log of the absolute value of cash flow, and the log of negative cash flow is the log of the absolute value times a dummy which is equal to one if cash flow is negative.

productive, and less indebted parents have large affiliates. Larger parents also have larger foreign affiliates. This is shown by the positive impact of assets held at home and by the positive impact of the number of affiliates in foreign markets. Cash flow, cash, and sales growth have no significant impact.

The higher the tangibility of the affiliate's assets, the larger the affiliate, as expected. An affiliate's idiosyncratic risk, computed as the deviation of an affiliate's sales growth relative to the sample mean, does not have a significant impact.

Splitting the sample into large and small as well as firms from manufacturing and services gives some interesting additional results. For small firms, cash flow has a negative impact on the size of the affiliate. Productivity is significant for large but not for small firms. It is also insignificant when splitting the sample into manufacturing and services firms. The positive impact of tangibility is driven by the manufacturing firms.

As regards the host country explanatory variables, we find a positive impact of foreign GDP. Lower political risk has a negative impact, contrary to expectations.[10] The volume of German bank FDI is insignificant. The same holds for the the foreign lending rate as a proxy for the degree of development of the foreign capital market and the macroeconomic environment is insignificant though.

6 Conclusions

Large firms dominate the group of multinational firms. Earlier literature focuses on differences in productivity across firms as an explanation for this stylized fact. More productive firms find it easier to shoulder the fixed costs of foreign entry, thus being more likely to entering new markets. This paper adds financial constraints an additional, complementary explanation for the characteristic size patterns of multinationals.

Building on a theoretical model of firms' choices between serving the domestic market, exporting, and FDI, we show that the severity of financial constraints affects firms' internationalization patterns in a number of characteristic ways. Firms are more likely to

[10] Note that the political risk variable is higher the lower a country's political risk.

engage in FDI or to export the higher their productivity, the weaker financial constraints, the larger foreign markets, the lower the fixed costs of investment, the lower project risk, the better contract enforcement, and the lower liquidation costs. Also, the presence of home country banks abroad should lower information asymmetries and stimulate FDI.

We test the model using data on German firms which comes from two data sources. From *Dafne*, we obtain information on German firms' balance sheets and financial ratios as well as on their exporter status. From *MiDi*, we obtain information on the volume of FDI and the countries in which these firms are active. We analyze the firms' extensive margin of foreign activities, i.e. the decision to become an exporter or a multinational firm, as well as their intensive margin, i.e. the volume of FDI across countries.

Our empirical results provide support for the hypothesis that financial constraints as well as productivity matters for foreign activities. As regards the extensive margin of foreign activities, productivity barriers are relatively more important for export decisions than for FDI. High leverage affects FDI but not the probability of exporting. Overall, the empirical results are not inconsistent with the hypothesis that financial frictions affect FDI more than exports because of higher fixed costs of entry.

The findings of our paper have a couple of implications for different literatures. To the literature of multinational firms, we add a mechanism through which productivity and financial frictions interact. In the data, the outcome may be observationally equivalent since financial frictions reinforce the impact of already existing productivity differences. However, in terms of possible policy implications, the two mechanisms should be distinguished. Models ignoring financial constraints would predict that enhancement of firm productivity could improve firms' access to foreign markets. Our results imply that lowering financial constraints might be just as important for some firms.

To the banking literature, we add a mechanism explaining why banks and non-financial firms typically expand into foreign markets in tandem. This does not ultimately resolve the 'follow-their-customer' question, but the specific interaction between financial and real barriers to entry may provide the possibility to test this link more structurally. Finally, we believe that our findings can have implications for the international macroeconomic literature. Essentially, the financial frictions imbedded in our model are

similar to financial accelerator mechanism. In this sense, extensions of our model might provide useful insights into credit channel mechanisms in open economies and the persistence of shocks triggering entry into foreign markets.

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8 Data Appendix

Unless indicates otherwise, parent-level information comes from *Dafne* (Bureau van Dijk), affiliate level information comes from *MiDi* (Microdatabase Direct Investment, Deutsche Bundesbank), codes in italics refer to the original time series identifiers. Country-level information comes from the World Bank's World Development Indicators.

Variable	Definition
	Firm level data (parent)
Age	Actual year minus founding year (negative values due to mis-reporting of the founding year have been dropped)
Bank dependence	Liabilities vis-à-vis banks (*a300287*) / total liabilities (*a300274*) , truncated at 10
Cash	Cash (*a300167*)
Cash flow	Cash flows from operations (*a386099*). We generate two variables
	lncashflow = ln(cashflow) if cashflow > 0 and = 0 if cashflow < 0,
	lncashflow = ln(abs(cashflow) if cashflow < 0 and = 0 if cashflow > 0
Debt ratio	Total debt (*a300274*) / total assets (*a300001*) , truncated at the 99%, at 99.991
Employment	Number of employees
Exporter	0/1 dummy for domestic exports for last reporting year (*a11*)
Firms with foreign affiliate	(i) based on *Dafne*: 0/1 dummy for German firms with foreign affiliates for the last reporting year, (ii) based on *MiDi* 0/1 dummy for firms with foreign affiliates from *Dafne-MiDi*-merge
Liquidity	Short-term assets (*a300109 – a309650*) / short-term liabilities (*a309109*) , truncated at 10
Number of foreign affiliates	Count of total number of affiliates world-wide obtained from *MiDi*.
Productivity	(i) labor productivity: turnover (*a300671*) / employment, (ii) capital productivity: turnover (*a300671*) / fixed assets (*a300022 + a300044*), truncated at the 99% percentile
Sector definitions	We use two definition of sectors: (i) A broad definition of 28 sectoral groups is used for sample splits (see also Table 4), (ii) a narrow definition of about 64 sectors at the 2-digit-level, used to generate sector-level dummy variables
Size	Total assets €1,000 (*a300001*)
Sales	Turnover in €1,000 (*a380999*)
Short-term debt ratio	Short-term debt (*a309109*) / total assets (*a300001*) , truncated at 10
Tangibility	Fixed and financial assets (*a300022+ a300044*) / total assets (*a300001*) * 10, truncated at 10
Wages	Personnel expenditure per employee in €1,000

Variable	Definition
	Firm level data (affiliate)
Debt ratio	Total debt (*p33*) / total assets (*p40*) , truncated at 100%
Employment	Number of employees (*p05*)
Foreign direct investment	Aggregate foreign direct investment of parent *i* in country *j* in year *t*, i.e. data are aggregated across all affiliates in a given country for a given parent (*pdum1*).
Holding company	0/1 dummy for foreign affiliates of holding companies
Idiosyncratic risk	(Growth of sales of affiliate *i* in country *j* in year *t* – mean growth of German affiliates in country *j* in year *t*)²
Productivity	(i) labor productivity: turnover (*p04*) / employment (*p05*), (ii) capital productivity: turnover (*p04*) / fixed assets (*p40*)
Sales	Turnover in €1,000 (*p04*)
Tangibility	Fixed and financial assets (*p11+p12*) / total assets (*p40*) * 100, truncated at 100%
	Country-level data
GDP	Host country GDP in constant USD, converted into 1,000 euro
GDP per capita	Host country GDP per capita in constant USD
Number of banks	Aggregate volume of FDI of German banks in country *j* in year *t*, calculated from *MiDi*.
Political risk	Composite risk index obtained from the International Country Risk Guide (ICRG). The data range from 0 to 100, with a higher number indicating lower country risk.

Table 1: Theoretical Hypotheses and Empirical Measurement

Theoretical hypotheses	Empirical measure	Extensive margin			Intensive margin
		Exports	FDI	FDI $\succ$ Exports	Volume of FDI
Productivity of the project (β)	Capital productivity (parent)	+	+	+	+
Market size (p)	Host country GDP	+	+	+	+
Fixed costs (F)	Capital intensity	–	–	–	
Probability of success project (q)	Volatility of affiliate's sales	+	+	+	+
Contract enforcement (μ)	Host country political risk	+	+	(*)	+
Efficiency loss from liquidation (θ)	Asset tangibility	+	+	(*)	+
Financial constraints (L)	Debt ratio, cash flow, cash	–	–	+	
Variable costs of exporting (τ)	Absorbed by fixed effects	–	+	+	+

(*) Interaction terms with liquidity, see main text for details

Table 2: Descriptive Statistics

Data in panel (a) are based on *Dafne* and are used for the probit regressions on the determinants of the extensive margin. Data in panel (b) are used for the panel fixed effects regressions on the determinants of the intensive margin.

a) Extensive margin

Variable	Obs	Mean	Std. Dev.	Min	Max
Exporter (0/1)	191,613	0.06	0.23	0.00	1.00
FDI (0/1) (MiDi)	222,613	0.04	0.19	0.00	1.00
FDI (0/1) (Dafne)	222,613	0.04	0.19	0.00	1.00
Log size	222,575	7.59	2.32	0.00	20.01
Log capital productivity	77,701	1.43	1.99	-12.57	12.63
Log cash flow	211,914	4.13	3.77	-16.06	16.58
Log debt ratio	215,652	3.84	0.92	-7.63	4.61
Log cash	190,101	4.81	2.31	0.69	15.66
Log sales growth	108,314	0.81	2.50	-7.19	6.12
Log age	218,203	2.46	1.10	0.00	5.33
Liquidity	20,347	1.12	1.31	0.00	10.00
Short-term debt ratio	61,696	0.37	0.29	0.00	0.98
Tangibility	84,787	0.39	0.28	0.00	1.00
Bank dependence	129,610	3.34	1.33	-9.48	4.61

b) Intensive margin

	Obs	Mean	Std. Dev.	Min	Max
Affiliate-level					
Log debt ratio affiliate	15,174	3.65	1.04	…	…
Log size affiliate	15,989	9.61	1.63	…	…
Log FDI	15,989	8.61	1.66	…	…
Log asset tangibility	15,724	2.71	1.53	…	…
Log risk	13,136	4.98	2.40	…	…
Parent-level					
Log size	15,989	12.65	1.97	3.30	18.67
Log cash flow	15,574	7.97	6.03	-14.90	16.58
Log negative cash flow	15,574	-0.89	2.73	-14.90	0.00
Log capital productivity	13,170	0.61	1.70	-9.17	7.44
Log debt ratio	15,924	3.42	0.81	-6.41	4.60
Log cash	15,151	8.29	3.10	0.69	15.65
Log sales growth	9,678	0.89	2.12	-3.91	5.43
Log number of foreign affiliates	15,989	2.38	1.16	0.69	5.37
Log age	15,564	3.41	1.17	0.00	5.31
Holding (0/1)	15,989	0.21	0.41	0.00	1.00
Country-level					
Log GDP (constant €)	15,820	19.92	1.61	13.14	23.43
Log lending rate	12,904	1.88	0.59	0.51	5.63
Log bank FDI	15,255	13.69	2.03	4.75	20.75
Log political risk	15,866	2.88	0.47	1.37	4.35

Table 3: Full versus Reduced Sample

This Table compares the full sample and the reduced sample used for the regressions. Data are based on *Dafne*.

	Full sample				Sample used for regressions			
	Number	%	Sales (million €)	%	Number	%	Sales (million €)	%
Agriculture	3,691	1.91	14,987	0.14	2,296	3.1	12,505	0.19
Chemicals	1,942	1.01	247,316	2.26	989	1.34	211,805	3.25
Construction	22,870	11.85	212,646	1.95	8,289	11.21	163,013	2.5
Education	1,031	0.53	13,391	0.12	318	0.43	10,852	0.17
Energy	4,986	2.58	813,695	7.45	3,127	4.23	684,904	10.5
Financial services	2,343	1.21	923,784	8.45	655	0.89	159,061	2.44
Fishing	37	0.02	63	0	18	0.02	43	0
Food & Tobacco	2,768	1.43	134,325	1.23	1,545	2.09	122,241	1.87
Furniture	1,993	1.03	20,280	0.19	806	1.09	15,580	0.24
Glas	1,576	0.82	117,942	1.08	706	0.95	105,663	1.62
Health	4,548	2.36	146,172	1.34	2,109	2.85	110,213	1.69
Hotels & restaurants	1,853	0.96	9,765	0.09	458	0.62	5,990	0.09
Coking plants	177	0.09	103,541	0.95	101	0.14	37,026	0.57
Leather	99	0.05	1,555	0.01	38	0.05	1,299	0.02
Machinery	6,199	3.21	174,282	1.59	2,585	3.49	136,108	2.09
Metals	9,160	4.74	196,414	1.8	3,443	4.65	138,301	2.12
Mining	660	0.34	83,044	0.76	300	0.4	64,434	0.99
Office equipment	4,873	2.52	137,886	1.26	2,116	2.86	101,839	1.56
Other services	7,811	4.05	253,850	2.32	2,525	3.41	163,942	2.51
Paper	3,155	1.63	85,713	0.78	1,420	1.92	67,825	1.04
Public administration	811	0.42	12,361	0.11	263	0.36	7,939	0.12
Business services	55,960	28.98	4,489,353	41.08	18,120	24.49	1,900,997	29.14
Rubber & plastics	2,261	1.17	45,080	0.41	899	1.22	34,088	0.52
Textiles	1,221	0.63	30,818	0.28	539	0.73	17,786	0.27
Trade & repair	38,410	19.89	641,963	5.87	15,079	20.38	487,334	7.47
Transport & comm.	10,288	5.33	1,738,127	15.9	4,188	5.66	1,496,675	22.94
Vehicles	1,326	0.69	271,604	2.49	611	0.83	259,959	3.98
Wood	1,017	0.53	9,092	0.08	430	0.58	7,014	0.11
Total	193,070	100	1.0929E+10	100	73,975	100	6,524,437.205	100

Table 4: Descriptive Statistics Domestic versus International Firms

Number of German firms and descriptive statistics refer to the non-exporters. Foreign firms according to *Dafne* are those reporting foreign affiliates for the last year of observations.

	Small firms			Large firms		
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
Log size	94,129	5.73	1.19	96,116	9.46	1.61
Log liquidity	8,875	1.10	1.31	11,205	1.14	1.31
Debt ratio	91,146	0.60	0.30	95,816	0.56	0.28
Log capital productivity	22,321	2.19	1.56	51,254	1.17	1.90
Log cash flow	90,727	3.03	1.80	94,850	6.00	2.66
Bank dependence	49,519	0.39	0.27	65,050	0.47	0.30
Tangibility	25,485	0.30	0.25	58,831	0.43	0.29
Log capital intensity	1,288	2.21	1.46	23,049	4.32	2.07
Log wages per capita	4,903	5.70	0.63	31,735	6.15	0.53
Log sales	77,817	6.54	1.45	83,702	9.38	1.84
		Non-Exporter			Exporter	
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
Log size	179,559	7.52	2.34	10,686	9.15	1.85
Log liquidity	18,655	1.11	1.32	1,425	1.23	1.17
Debt ratio	176,283	0.58	0.29	10,679	0.54	0.25
Log capital productivity	67,642	1.44	1.90	5,933	1.93	1.26
Log cash flow	174,946	4.45	2.70	10,631	6.12	2.62
Bank dependence	107,079	0.44	0.30	7,490	0.38	0.24
Tangibility	77,470	0.40	0.29	6,846	0.31	0.20
Log capital intensity	21,438	4.28	2.16	2,899	3.70	1.47
Log wages per capita	32,884	6.08	0.58	3,754	6.17	0.40
Log sales	152,182	7.90	2.16	9,337	9.78	1.78
		Non-FDI			FDI	
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
Log size	183,962	7.50	2.27	6,283	10.98	2.03
Log liquidity	18,698	1.10	1.30	1,382	1.43	1.44
Debt ratio	180,701	0.59	0.29	6,261	0.44	0.25
Log capital productivity	68,797	1.50	1.88	4,778	1.22	1.62
Log cash flow	179,396	4.46	2.65	6,181	7.14	3.51
Bank dependence	110,345	0.44	0.29	4,224	0.38	0.28
Tangibility	78,653	0.39	0.28	5,663	0.40	0.24
Log capital intensity	20,839	4.13	2.09	3,498	4.69	2.10
Log wages per capita	33,016	6.06	0.55	3,622	6.38	0.60
Log sales	156,313	7.91	2.13	5,206	10.86	2.08

Table 5: Probability of Being an Exporter

This Table reports results of probit regressions using a 0/1 dummy variable of being an exporter as the dependent variable. A full set of sector, region (German state), and time dummies is included. Columns (1)-(4) have results for the full panel, column (5) for the last year only, column (6) for firms with positive cash flow only. All explanatory variables are at the parent level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log size t-1	0.112***	0.110***	0.101***	0.106***	0.137***	0.092***	0.155***
	(5.01)	*(3.77)*	*(3.76)*	*(4.70)*	*(5.73)*	*(3.74)*	*(12.10)*
Log capital productivity t-1	0.074***	0.079***	0.116***	0.024	0.077***	0.002***	0.074***
	(4.01)	*(2.94)*	*(4.61)*	*(0.82)*	*(4.50)*	*(2.85)*	*(4.41)*
Log cash flow t-1	0.037*	0.018	0.054**	0.046**	0.025	0.042*	
	(1.93)	*(0.71)*	*(2.31)*	*(2.29)*	*(1.15)*	*(1.87)*	
Log negative cash flow t-1	0.045**	0.031	0.054**	0.051**	0.018		
	(2.21)	*(1.12)*	*(2.13)*	*(2.45)*	*(0.69)*		
Log debt ratio t-1	-0.129	-0.108	-0.345***	-0.112	-0.175*	-0.111	
	(1.27)	*(0.67)*	*(2.71)*	*(1.11)*	*(1.82)*	*(1.09)*	
Log cash t-1	0.005	0.012	0.005	0.002	-0.004	0.008	
	(0.46)	*(0.92)*	*(0.41)*	*(0.21)*	*(0.39)*	*(0.71)*	
Log sales growth t-1	-0.011	0.006	-0.023	-0.011	0	-0.008	-0.002
	(0.45)	*(0.16)*	*(0.73)*	*(0.48)*	*(0.02)*	*(0.32)*	*(0.06)*
Log age	0.156***	0.172***	0.135***	0.157***	0.177***	0.161***	0.154***
	(5.72)	*(4.94)*	*(4.42)*	*(5.76)*	*(6.82)*	*(5.88)*	*(5.76)*
Log tangibility t-1				-0.405**			
				(2.27)			
Log bank dependence t-1			0.212**				
			(2.07)				
Log short-term debt ratio t-1		-0.121					
		(0.69)					
Z-Score							-0.021
							(0.39)
Constant	-2.514***	-2.713***	-1.709**	-2.303**	-2.753***	-2.425***	-2.71***
	(2.72)	*(2.72)*	*(2.26)*	*(2.48)*	*(3.01)*	*(2.62)*	*(2.96)*
Observations	19,302	9,072	14,402	19,302	8,753	17,605	20,352
# clusters	9,545	5,216	7,416	9,545	8,753	9,036	9,999
Pseudo R2	0.29	0.29	0.3	0.29	0.28	0.29	0.29
Log likelihood	-4,926	-2,432	-3,649	-4,921	-2,109	-4,500	-5,062

Table 6: Probability of Owning Affiliates Abroad

This Table reports results of probit regressions using a 0/1 dummy variable of owning foreign affiliates as the dependent variable. FDI status is based on *Dafne*. A full set of sector, region (German state), and time dummies is included. Columns (1)-(4) have results for the full panel, column (5) for the last year only, column (6) for firms with positive cash flow only. All explanatory variables are at the parent level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log size t-1	0.244***	0.201***	0.271***	0.234***	0.247***	0.270***	0.289***
	(9.85)	*(6.79)*	*(9.11)*	*(9.50)*	*(9.52)*	*(9.97)*	*(19.46)*
Log capital productivity t-1	-0.03	-0.080***	-0.007	-0.132***	-0.029*	-0.003***	-0.033*
	(1.62)	*(3.20)*	*(0.32)*	*(4.87)*	*(1.77)*	*(2.74)*	*(1.85)*
Log cash flow t-1	0.034*	0.057**	0.019	0.056***	0.03	0.02	
	(1.67)	*(2.38)*	*(0.76)*	*(2.81)*	*(1.23)*	*(0.84)*	
Log negative cash flow t-1	0.079***	0.101***	0.060**	0.095***	0.067**		
	(3.78)	*(4.08)*	*(2.31)*	*(4.63)*	*(2.51)*		
Log debt ratio t-1	-0.588***	-1.213***	-0.866***	-0.541***	-0.390***	-0.517***	
	(5.52)	*(6.65)*	*(6.31)*	*(5.13)*	*(3.91)*	*(4.67)*	
Log cash t-1	0.012	0.007	0.009	0.003	0.018*	0.016	
	(1.08)	*(0.51)*	*(0.65)*	*(0.31)*	*(1.68)*	*(1.42)*	
Log sales growth t-1	0.002	-0.02	0	-0.004	0.007	0.009	-0.007
	(0.09)	*(0.72)*	*(0.02)*	*(0.20)*	*(0.29)*	*(0.44)*	*(0.37)*
Log age	-0.02	-0.019	-0.032	-0.015	-0.011	-0.024	-0.035
	(0.76)	*(0.58)*	*(1.04)*	*(0.57)*	*(0.45)*	*(0.87)*	*(1.34)*
Log tangibility t-1				-0.882***			
				(5.25)			
Log bank dependence t-1			0.137				
			(1.28)				
Log short-term debt ratio t-1		0.897***					
		(4.87)					
Z-Score							0.051
							(0.90)
Constant	-2.469***	-3.022***	-3.217***	-2.076***	-2.446***	-2.853***	-2.70***
	(4.03)	*(4.18)*	*(2.69)*	*(3.55)*	*(3.31)*	*(4.69)*	(3.14)
Observations	21,693	10,596	16,088	21,693	9,637	19,909	22,881
# clusters	10,410	5,918	8,015	10,410	9,637	9,877	10,922
Pseudo R2	0.32	0.33	0.34	0.32	0.28	0.32	0.3
Log likelihood	-4,730	-2,598	-3,356	-4,698	-1,866	-4,126	-5,015

Table 7: Probability of Owning Affiliates Abroad or of Being an Exporter, Sample Splits

This Table reports results of probit regressions using a 0/1 dummy variable of owning foreign affiliates as the dependent variable. A full set of sector, region (German state), and time dummies is included. All explanatory variables are at the parent level.

	FDI					Exporter				
	Full sample	Large firms	Small firms	Manu-facturing	Services	Full sample	Large firms	Small firms	Manu-facturing	Services
Log size t-1	0.244***	0.178***	0.320***	0.333***	0.176***	0.112***	0.016	0.234***	0.168***	0.075**
	(9.85)	*(5.84)*	*(4.92)*	*(7.56)*	*(5.68)*	*(5.01)*	*(0.47)*	*(4.96)*	*(4.81)*	*(2.37)*
Log cash flow t-1	0.034*	0.047**	-0.019	0.025	0.048*	0.037*	0.014	0.080**	0.036	0.035
	(1.67)	*(2.16)*	*(0.39)*	*(0.71)*	*(1.83)*	*(1.93)*	*(0.59)*	*(2.28)*	*(1.22)*	*(1.25)*
Log negative cash flow t-1	0.079***	0.086***	0.074	0.047	0.101***	0.045**	0.024	0.062	0.026	0.058**
	(3.78)	*(3.77)*	*(1.57)*	*(1.21)*	*(3.89)*	*(2.21)*	*(0.96)*	*(1.54)*	*(0.80)*	*(2.11)*
Log capital productivity t-1. sales	-0.03	-0.033	0.004	-0.131***	-0.016	0.074***	0.071***	0.068**	0.088***	0.065***
	(1.62)	*(1.56)*	*(0.11)*	*(3.22)*	*(0.74)*	*(4.01)*	*(2.88)*	*(2.39)*	*(3.08)*	*(2.62)*
Log debt ratio t-1	-0.588***	-0.505***	-0.547***	-0.318*	-0.516***	-0.129	-0.228	-0.004	-0.01	-0.113
	(5.52)	*(4.17)*	*(2.69)*	*(1.75)*	*(3.81)*	*(1.27)*	*(1.62)*	*(0.02)*	*(0.07)*	*(0.74)*
Log cash t-1	0.012	0.009	0.021	0.023	0.009	0.005	0.015	-0.022	0.019	-0.013
	(1.08)	*(0.75)*	*(0.73)*	*(1.40)*	*(0.62)*	*(0.46)*	*(1.16)*	*(1.24)*	*(1.33)*	*(0.84)*
Log sales growth t-1	0.002	-0.004	0.003	-0.097**	-0.002	-0.011	-0.017	0.011	-0.060*	0.007
	(0.09)	*(0.22)*	*(0.10)*	*(2.05)*	*(0.11)*	*(0.45)*	*(0.61)*	*(0.26)*	*(1.81)*	*(0.29)*
Log age	-0.02	0.011	-0.249***	0.077*	-0.099***	0.156***	0.163***	0.132***	0.207***	0.075*
	(0.76)	*(0.37)*	*(3.55)*	*(1.75)*	*(2.67)*	*(5.72)*	*(4.77)*	*(3.06)*	*(5.51)*	*(1.80)*
Constant	-2.469***	-0.541	-3.364***	-4.022***	-2.281***	-2.514***	-1.646**	-4.593***	-2.955***	-2.130***
	(4.03)	*(0.75)*	*(3.86)*	*(4.87)*	*(3.74)*	*(2.72)*	*(2.16)*	*(6.04)*	*(4.44)*	*(3.87)*
Observations	21,693	11,908	7,687	5,146	12,478	19,302	10,164	7,866	5,042	11,497
Pseudo R2	0.32	0.26	0.21	0.32	0.27	0.29	0.31	0.21	0.14	0.15
# clusters	10,410	4,889	4,372	2,483	6,081	9,545	4,343	4,464	2,426	5,637
Log likelihood	-4,730.6	-3,903.69	-644.34	-1,671.47	-2,540.52	-4,926.86	-3,132.11	-1,606.37	-2,703.72	-1,925.12

Table 8: Probability of FDI versus Exporting: Multinomial Logit

The dependent variable is defined as 0 = purely domestic firm, 1 = exporter but not FDI firm, 2 = FDI firm. A full set of sector, region (German state), and time dummies is included.

	Coefficient		t-ratio	RRR
Full sample				
1 = Exporter				
Log size (t-1)	0.253	***	(5.07)	1.288
Log cash flow (t-1)	0.028		(0.66)	1.028
Log negative cash flow (t-1)	0.063		(1.37)	1.065
Log capital productivity (t-1)	0.187	***	(4.82)	1.205
Log debt ratio (t-1)	0.033		(0.16)	1.033
Log cash (t-1)	0.008		(0.37)	1.008
Log sales growth (t-1)	-0.011		(-0.23)	0.989
Log age	0.257	***	(4.39)	1.293
2 = FDI				
Log size (t-1)	0.528	***	(12.19)	1.695
Log cash flow (t-1)	0.036		(1.03)	1.037
Log negative cash flow (t-1)	0.127	***	(3.44)	1.136
Log capital productivity (t-1)	-0.019		(-0.60)	0.981
Log debt ratio (t-1)	-1.053	***	(-5.66)	0.349
Log cash (t-1)	0.008		(0.39)	1.008
Log sales growth (t-1)	-0.003		(-0.08)	0.997
Log age	0.066		(1.41)	1.068
Pseudo R^2: 0.32				
Observations: 22,566				
Cluster: 10,892				
Manufacturing				
1 = Exporter				
Log size (t-1)	0.412	***	(6.12)	1.510
Log cash flow (t-1)	0.009		(0.16)	1.009
Log negative cash flow (t-1)	0.036		(0.58)	1.036
Log capital productivity (t-1)	0.124	**	(2.09)	1.132
Log debt ratio (t-1)	0.243		(0.89)	1.275
Log cash (t-1)	0.029		(1.03)	1.030
Log sales growth (t-1)	-0.123	**	(-2.03)	0.884
Log age	0.382	***	(4.80)	1.465
2 = FDI				
Log size (t-1)	0.726	***	(8.80)	2.066
Log cash flow (t-1)	0.064		(0.98)	1.066
Log negative cash flow (t-1)	0.126	*	(1.75)	1.134
Log capital productivity (t-1)	-0.111		(-1.45)	0.895
Log debt ratio (t-1)	-0.645	**	(-2.02)	0.525
Log cash (t-1)	0.039		(1.18)	1.040
Log sales growth (t-1)	-0.260	***	(-2.66)	0.771
Log age	0.307	***	(3.89)	1.359
Pseudo R^2: 0.25				
Observations: 5,209				
Cluster: 2,513				

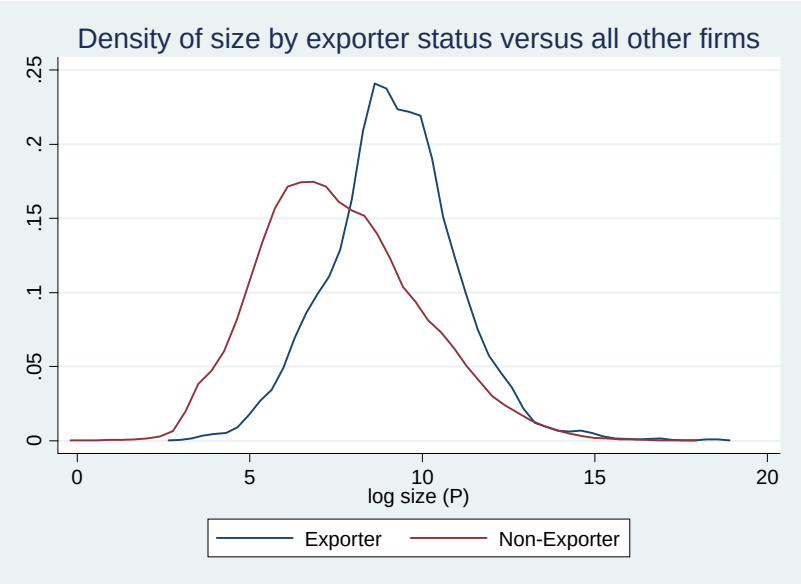
	Coefficient		t-ratio	RRR
Services				
1 = Exporter				
Log size (t-1)	0.104		(1.16)	1.109
Log cash flow (t-1)	0.061		(0.84)	1.062
Log negative cash flow (t-1)	0.071		(0.90)	1.074
Log capital productivity (t-1)	0.221	***	(3.94)	1.247
Log debt ratio (t-1)	-0.033		(-0.09)	0.967
Log cash (t-1)	-0.009		(-0.22)	0.991
Log sales growth (t-1)	0.044		(0.68)	1.045
Log age	0.169	*	(1.73)	1.184
2 = FDI				
Log size (t-1)	0.416	***	(7.90)	1.516
Log cash flow (t-1)	0.028		(0.66)	1.029
Log negative cash flow (t-1)	0.130	***	(2.99)	1.138
Log capital productivity (t-1)	-0.008		(-0.23)	0.992
Log debt ratio (t-1)	-0.866	***	(-3.68)	0.421
Log cash (t-1)	-0.004		(-0.16)	0.996
Log sales growth (t-1)	0.004		(0.11)	1.004
Log age	-0.101		(-1.57)	0.904
Pseudo R^2: 0.25				
Observations: 12,891				
Cluster: 6,321				

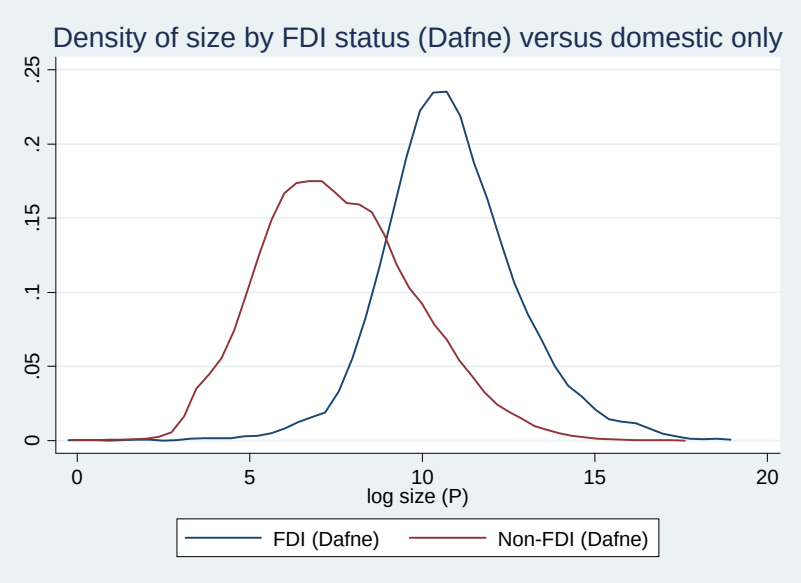
Table 9: Determinants of the Size of the Affiliate

This table reports results of fixed effects panel regressions using the Log volume of FDI of domestic multinational *i* in host country *j* as the dependent variable. Hence, the cross-section dimension of the panel is each combination of parents and host countries.

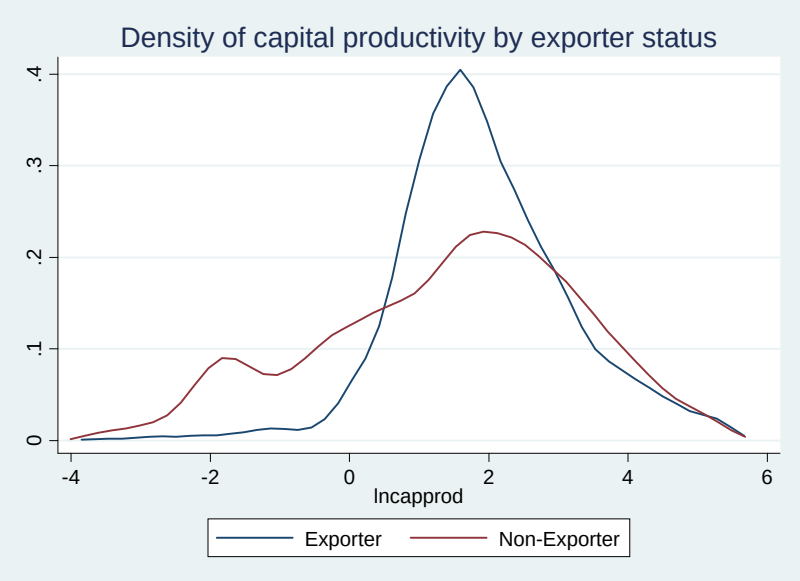
	Full sample	Full sample	Small	Large	Manu-facturing	Services
Parent characteristics						
Log size	0.265***	0.251***	0.386***	0.249**	0.154	0.372***
	(4.33)	*(3.80)*	*(3.46)*	*(2.19)*	*(1.59)*	*(3.43)*
Log cash flow	-0.008	-0.006	-0.037**	0.021	-0.010	-0.013
	(0.71)	*(0.53)*	*(2.15)*	*(1.42)*	*(0.72)*	*(0.56)*
Log negative cash flow	0.000	-0.002	0.062*	-0.063*	0.017	-0.001
	(0.02)	*(0.07)*	*(1.87)*	*(1.96)*	*(0.60)*	*(0.03)*
Log capital productivity	0.054*	0.078**	0.043	0.094*	0.054	0.064
	(1.85)	*(2.44)*	*(0.91)*	*(1.88)*	*(1.10)*	*(0.94)*
Log debt ratio	-0.003**	-0.002	-0.002	-0.005**	-0.001	-0.003
	(2.23)	*(1.56)*	*(1.17)*	*(2.18)*	*(0.72)*	*(1.20)*
Log cash	0.002	-0.001	-0.011	-0.002	-0.011	0.001
	(0.32)	*(0.21)*	*(1.64)*	*(0.15)*	*(1.55)*	*(0.09)*
Log sales growth	-0.000	-0.000	-0.000	0.000	-0.001	0.000
	(0.14)	*(0.92)*	*(0.66)*	*(0.07)*	*(1.43)*	*(0.36)*
Log number foreign affiliates	0.446***	0.395***	0.184***	0.683***	0.209***	0.542***
	(8.22)	*(6.39)*	*(3.27)*	*(5.57)*	*(3.78)*	*(5.05)*
Log age	-0.059	-0.114	-0.039	-0.325***	-0.084	0.308
	(0.85)	*(1.58)*	*(0.42)*	*(2.97)*	*(1.10)*	*(1.27)*
Holding company (MiDi)	0.359***	0.426***	0.315*	0.564**	0.161**	0.740**
	(3.19)	*(3.78)*	*(1.94)*	*(2.45)*	*(1.98)*	*(2.18)*
Affiliate characteristics						
Log idiosyncratic risk	0.000	0.000	0.000	0.000	0.000	0.000
	(0.50)	*(0.64)*	*(0.42)*	*(0.31)*	*(0.35)*	*(1.04)*
Log tangibility	0.002*	0.001	0.003	0.001	0.005**	-0.001
	(1.76)	*(0.89)*	*(1.15)*	*(0.41)*	*(2.41)*	*(0.35)*
Country characteristics						
Log foreign GDP, USD		1.047***	0.813**	1.313***	1.190***	0.790
		(3.40)	*(2.42)*	*(3.06)*	*(3.46)*	*(1.26)*
Log foreign lending rate		-0.004	-0.008	-0.004	-0.005	-0.004
		(1.13)	*(0.92)*	*(0.88)*	*(0.88)*	*(0.82)*
Log FDI of German banks		0.033	0.018	0.032	0.004	0.098
		(1.24)	*(0.54)*	*(1.02)*	*(0.21)*	*(1.54)*
Political risk (ICRG)		-0.944**	-0.641	-1.576**	-0.876*	-0.974
		(2.10)	*(1.20)*	*(2.53)*	*(1.81)*	*(1.03)*
Constant	5.330***	-15.580**	-12.066*	-20.648**	-16.219**	-14.558
	(7.25)	*(2.44)*	*(1.69)*	*(2.34)*	*(2.31)*	*(1.15)*
Observations	5693	4384	2196	2188	2653	1586
Number of group	2204	1770	1021	749	1025	679
R-squared	0.12	0.13	0.20	0.15	0.15	0.18

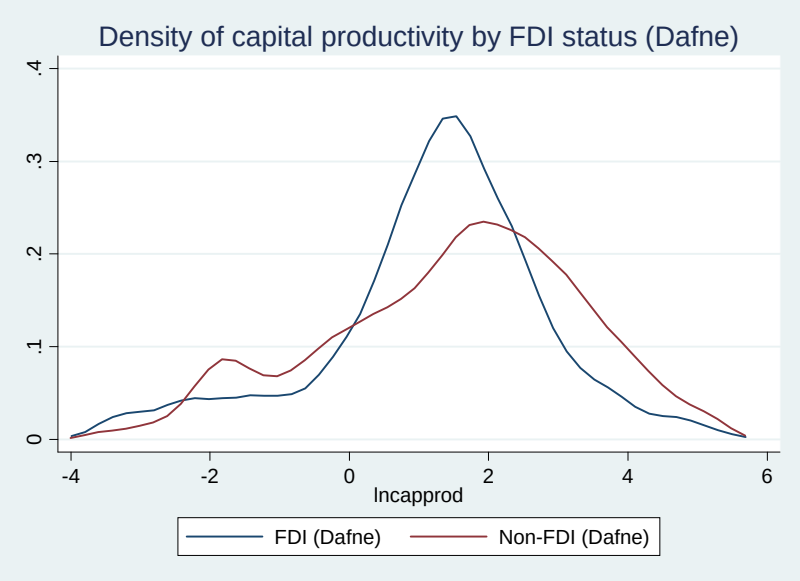
Graph 1: Firm Size by Multinational Status



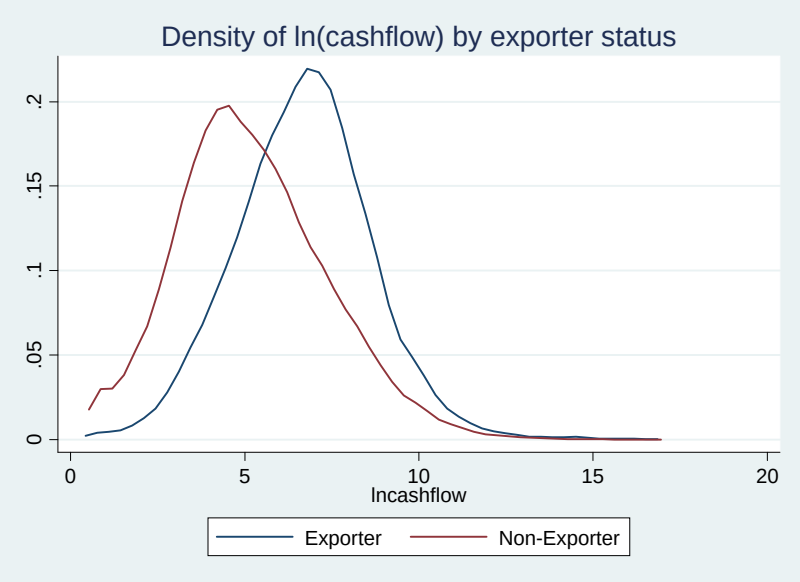


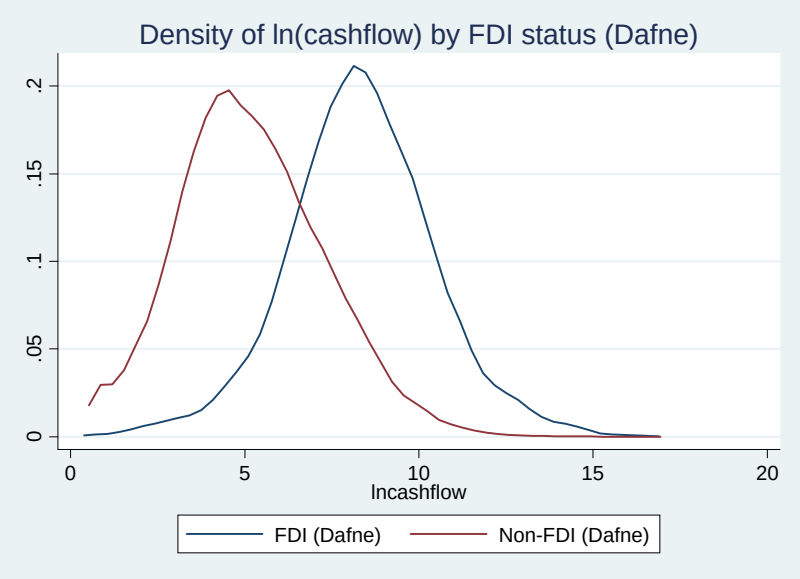
Graph 2: Capital Productivity by Multinational Status





Graph 4: Cash Flow by Multinational Status





Graph 4: Debt Ratio by Multinational Status