NBER WORKING PAPER SERIES

FIRM EXPORTS AND MULTINATIONAL ACTIVITY UNDER CREDIT CONSTRAINTS

Kalina Manova
Shang-Jin Wei
Zhiwei Zhang

Working Paper 16905
http://www.nber.org/papers/w16905

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
March 2011

We thank Pol Antràs, Doireann Fitzgerald, Fritz Foley, Linda Goldberg, Penny Goldberg, Nathan Nunn, Katheryn Russ and Ana Maria Santacreu for insightful conversations, and seminar participants at Stanford, Princeton, Columbia, London School of Economics, Paris School of Economics, Oxford, Johns Hopkins SAIS, LMU Munich, New York Fed, Philadelphia Fed, 2010 NBER ITI spring meeting, 2010 NBER IFM spring meeting, 2010 AEA annual meeting, 2010 ERWIT meeting, 2010 UCSC SCIIE conference, 2010 CEPR St. Gallen conference, 2010 Beijing UIBE conference, and 2011 GEP-ifo Nottingham conference for their comments. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

Firm Exports and Multinational Activity Under Credit Constraints
Kalina Manova, Shang-Jin Wei, and Zhiwei Zhang
NBER Working Paper No. 16905
March 2011
JEL No. F10,F14,F23,F36,G32

ABSTRACT

This paper provides firm-level evidence that credit constraints restrict international trade flows and affect the pattern of foreign direct investment. Using detailed data from China, we show that foreign-owned affiliates and joint ventures have better export performance than private domestic firms, and that this advantage is systematically greater in sectors at higher levels of financial vulnerability measured in a variety of ways. These patterns are manifest in firms' export sales, export product scope and number of export destinations. They are also more pronounced when firms face higher trade costs. This evidence indicates that limited credit availability hinders firms' trade flows, and is consistent with foreign affiliates being less constrained because they can access additional funding from their parent company. Our results further imply that financial frictions and host-country financial institutions affect the sectoral and spatial composition of MNC activity. More broadly, our findings suggest that FDI can compensate for domestic financial market imperfections and alleviate their impact on aggregate growth, trade and private sector development.

Kalina Manova
Department of Economics
Stanford University
579 Serra Mall
Stanford, CA 94305
and NBER
manova@stanford.edu

Shang-Jin Wei
Graduate School of Business
Columbia University
Uris Hall 619
3022 Broadway
New York, NY 10027-6902
and NBER
shangjin.wei@columbia.edu

Zhiwei Zhang
China International Capital Corporation
zhangzw@cicc.com.cn

1 Introduction

A growing body of work has established that weak financial institutions severely impede countries' international trade activity and distort the sectoral composition of their export flows. At the same time, it has been presumed that foreign direct and portfolio investments can partially offset the detrimental consequences of local financial underdevelopment. However, direct firm-level evidence on the effect of credit constraints on export performance and the potential mitigating role of cross-border capital exchange has been limited and elusive. Moreover, the finance and trade literature has evolved largely independently of that on the optimal production and organizational decisions of multinational corporations (MNCs).

This paper fills this void by providing an integrated analysis of the role that financial frictions play in restricting firms' export participation and shaping the pattern of foreign direct investment. Using detailed customs data from China, we show that foreign-owned affiliates and joint ventures have better export performance than private domestic firms, and that this advantage is systematically greater in sectors at higher levels of financial vulnerability measured in a variety of ways. This evidence indicates that limited credit availability hinders firms' trade flows, and is consistent with foreign affiliates being less constrained because they can access additional funding from their parent company.[1] Our results further imply that financial frictions and host-country financial institutions affect the sectoral and spatial composition of MNC activity. More broadly, our findings suggest that FDI can compensate for domestic financial market imperfections and alleviate their impact on aggregate growth, trade and private sector development.

Our analysis exploits detailed customs data on the universe of Chinese firms that engaged in international trade in 2005. These data report the value of all firm-level shipments by product and destination country for the universe of trade transactions, which makes it possible to examine the effect of credit conditions on all margins of firms' export participation. We find that financial frictions limit exporters' product scope, number of trade partners, and volume of cross-border flows within each product-destination market. Foreign ownership, however, mitigates these distortions and allows firms to expand exports along all of these margins. These results indicate that firms face binding credit constraints in the financing of both fixed and variable trade costs, since the former affect market entry decisions while the latter influence the scale of foreign sales. This in turn has implications for the response of constrained exporters to trade reforms, exchange rate movements, and other cost or demand shocks. The evidence for firms' extensive margin of trade also indirectly corroborates priors that companies have to incur market-specific fixed costs of entry, and implies that financial frictions hamper cross-border activity disproportionately more than domestic operations.

[1] See Desai, Foley and Hines (2004) for evidence that MNCs employ internal capital markets opportunistically to overcome imperfections in external capital markets. The affiliates of US MNCs abroad use less external financing in countries with underdeveloped financial markets, but compensate with greater borrowing from the parent company.

We perform a series of sensitivity analyses to verify that our results are not driven by firm attributes correlated with ownership status or by sector characteristics correlated with financial vulnerability. The patterns we document are robust to controlling for sectors' technological sophistication, contract intensity, and physical and human capital intensity, which can affect the sectoral composition of MNC activity for reasons other than financial considerations. Since bigger Chinese firms might enjoy easier access to external capital, we further confirm that the role of foreign ownership in mitigating the effects of credit constraints on export performance is independent from that of firm size. Finally, we provide evidence that the advantage of joint ventures and MNC affiliates over private domestic firms in financially vulnerable industries is particularly strong when exporting is more costly. Specifically, we show that the relative performance of foreign-owned companies in such sectors is systematically better when the destination market is more distant or has higher entry costs.

Our empirical approach circumvents concerns with reverse causality and omitted variable biases that have posed important challenges in the prior literature. First, our estimation allows for the inclusion of firm fixed effects. This controls for firm characteristics that affect export activity equally in all industries, such as productivity, managerial competence, quality of the labor force, total availability of external finance, or access to foreign distribution networks. Our results are thus identified purely from the variation in trade outcomes across sectors within multi-sector firms, and reflect the way in which firms allocate their limited financial resources across production and exports in different industries.

Second, the interpretation of our findings does not rely on the assumption that firms' ownership status is exogenous to their need for and access to outside finance. As discussed below, foreign headquarters might in fact optimally integrate Chinese producers when the latter are especially constrained. Our results are thus consistent with multinationals being more prevalent than arms-length outsourcing in sectors with substantial requirements for external capital and limited availability of collateralizable assets.

Third, our findings cannot be attributed to MNCs choosing to integrate Chinese firms with superior export potential. While this could explain why foreign affiliates and joint ventures outperform domestic companies on average, it cannot rationalize the differential effect of foreign ownership on firm exports across sectors. Moreover, if MNC headquarters specifically target better Chinese firms in financially vulnerable industries, this would be consistent with the idea that MNCs do so precisely to exploit their comparative advantage in overcoming liquidity constraints.[2]

Understanding the role of financial frictions for firms' export participation has important policy implications, particularly for countries at lower levels of development that rely on extensive cross-border trade for economic growth. Given the difficulties of reforming domestic financial institutions, as well as the

[2] See Javorcik and Spatareanu (2009) for evidence that less credit-constrained Czech firms self-select into becoming arms-length suppliers for MNCs.

potential technological spillovers from the presence of foreign multinationals, it is equally important to evaluate the benefits from encouraging foreign direct investment. The rapid decline in international trade during the 2007-2009 global financial crisis has renewed interest in these questions, with recent studies affirming that credit tightening was an important channel through which the crisis distressed world trade.[3]

This paper makes three distinct contributions to the literature. First, it provides new evidence on the effects of financial frictions on international trade. The prior literature on this topic has shown theoretically and empirically that, in the presence of credit constraints, countries with more advanced financial markets and institutions have a comparative advantage in financially vulnerable sectors.[4] There is also growing micro-level evidence that credit market imperfections severely restrict firms' export capacity. For example, using an indicator of firms' credit worthiness, Muûls (2008) shows that liquidity-constrained firms in Belgium are less likely to become exporters and, conditional on trading, sell less, in fewer products, to fewer destinations. Similar results are reported by Berman and Héricourt (2008), who proxy firms' liquidity needs with balance-sheet variables in a sample of 5,000 firms in 9 developing and emerging economies, and by Minetti and Zhu (2010), who use survey data on firms' credit rationing in Italy. A challenge for these studies has been establishing a causal effect of credit conditions on firms' export performance since the measures of financial constraints they use are endogenous to firms' international trade decisions.[5] More recently, Amiti and Weinstein (2009) have explored exogenous shocks to firms' availability of external finance, and shown that Japanese banks transmitted financial shocks to exporters during the systemic crises that plagued Japan in the 1990s. Similarly, Bricongne et al. (2010) have found that the exports of French firms in more external-finance dependent sectors were more adversely hit during the recent global crisis.

Our results validate these findings in the prior literature using a new source of identification: Instead of analyzing firms' access to external capital through local banking institutions, we examine the role of foreign direct and portfolio investments. In particular, we exploit the systematic variation in export patterns across firms of different organizational structures and across sectors at different levels of financial vulnerability to establish a causal effect of credit constraints on different margins of firms' trade flows.

The second and primary contribution of this paper is to the literature on the determinants of MNC activity. Our work is most closely related to recent research linking the operations of foreign multinationals to financial frictions and firms' export performance. These papers specifically emphasize that the

[3] See Chor and Manova (2009) and Freund and Klapper (2009) on the current crisis, and Iacovone and Zavacka (2009) and Amiti and Weinstein (2009) on past financial crisis episodes.

[4] See Kletzer and Bardhan (1987), Beck (2002), Matsuyama (2005), Becker and Greenberg (2007), Chaney (2005), Manova (2008b) and Ju and Wei (2005, 2008 and 2010) for theoretical models; and Beck (2002, 2003), Becker and Greenberg (2007), Svaleryd and Vlachos (2005), Hur et al. (2006) and Manova (2008b) for empirical evidence.

[5] See also Greenaway et al. (2007) who find that the financial health of UK firms improves after they start exporting, although at the time of entry into exporting, future exporters do not appear financially healthier than firms serving only the domestic market.

subsidiaries of multinational companies can access internal capital markets to overcome liquidity constraints. For instance, Desai, Foley and Forbes (2008) show that the affiliates of US multinationals abroad respond faster and more effectively to profitable export opportunities than domestic firms. Following large real exchange rate devaluations, affiliates receive more financing from their parent company which allows them to increase sales, assets and investment, while local producers contract or do not expand. Unfortunately, Desai, Foley and Forbes (2008) are not able to directly examine the consequences of these effects for firms' exports.

More recently, Antràs, Desai and Foley (2009) propose a model which endogenizes the production location and integration decisions of multinational firms in the presence of credit constraints, relationship specific investments and contractual imperfections. In their framework, MNCs are more likely to integrate their foreign suppliers in financially less developed countries in order to incentivize local investors to finance these suppliers. Parent companies are also likely to partly fund their affiliates' operations. Using data on the activities of US multinationals abroad, Antràs, Desai and Foley (2009) find support for these predictions.[6] They do not, however, examine foreign affiliate exports, how they compare to those of domestic firms, or how they vary across sectors.

Our results are consistent with the implications of these papers that multinational firms have a comparative advantage and are hence more active in financially vulnerable sectors relative to domestic firms. Our contribution is thus in providing direct evidence on the extent to which credit constraints affect the sectoral composition of MNC activity.

Since we examine the export performance of foreign affiliates based in China, we implicitly study the behavior of foreign companies pursuing vertical or export-platform FDI. On the other hand, Buch et al. (2009) consider a model of horizontal FDI and present empirical evidence that credit conditions matter for firm's choice between directly exporting to a market and setting up a local affiliate there. In a richer framework that incorporates multinationals' complex global production strategies, Chor, Foley and Manova (2007) demonstrate theoretically and empirically that host country financial development increases the share of affiliate production meant for re-exporting back to the parent and to third-country destinations (i.e. vertical and export-platform FDI) relative to sales in the local market (i.e. horizontal FDI).[7]

[6] See also Bustos (2007), who shows that Argentinian firms in sectors with greater requirements for external finance are more likely to be foreign-owned and funded by their parent company. Huang et al. (2008), Héricourt and Poncet (2009) and Girma and Gorg (2009) argue that FDI helps private domestic firms in China overcome credit constraints and improve innovation activities.

[7] See Markusen (1984), Brainard (1997), Markusen and Venables (2000) and Helpman, Melitz and Yeaple (2004) for classical models of horizontal FDI, in which firms locate production in a foreign market when it is cheaper to service it that way instead of direct exporting. See Helpman (1984) and Yeaple (2003) for models of vertical FDI, in which firms move parts of the production process abroad to exploit cross-country differences in factor prices.

Finally, the third main contribution of this paper is to the broader literature on the role of international financial integration in promoting growth, trade, investment and entrepreneurship in host countries. For example, Ju and Wei (2010) show theoretically that financial openness can generate two-way capital flows, whereby developing economies with poor financial institutions can simultaneously import FDI and export financial capital. While the FDI inflow can help to realize a country's relatively high marginal product of physical capital, the financial capital outflow can raise the financial return on household savings. These two-way capital flows may thus partially offset the effects of weak domestic financial systems. Consistent with this, Harrison, McMillan and Love (2004) find that foreign capital inflows are associated with a reduction in domestic firms' financing constraints in a cross-country panel. Using firm-level data from emerging markets during the 2007-2009 global financial crisis, Tong and Wei (2010) further show that manufacturing firms tended to face relatively milder liquidity shocks in economies that relied more on FDI before the crisis. In comparison, liquidity shocks were more severe in countries that had higher pre-crisis levels of international bank borrowing. Finally, prior evidence also suggests that the beneficial growth effects of FDI may be stronger in nations with better developed financial markets because of their greater absorptive capacity and ability to allocate resources.[8]

With regards specifically to international trade, Manova (2008a) shows that equity market liberalizations increase countries' exports disproportionately more in financially vulnerable sectors. Moreover, these effects are stronger in economies with less developed stock markets prior to reform. In this context, our findings indicate that not only foreign equity flows, but also foreign direct investment can lessen the detrimental effects of financial underdevelopment on countries' trade performance.

The remainder of the paper is organized as follows. The next section provides theoretical background for our empirical analysis. Section 3 describes the data, while Section 4 presents our results. The last section concludes.

2 Motivation and Theoretical Background

2.1 Why exporters require external finance

Domestic producers and exporters routinely rely on external capital because they have to incur substantial upfront costs that cannot be financed out of retained earnings or internal cash flows from operations. These costs may be sunk, in the sense that they need to be paid only once upon entry into an industry, market or product line, or recurrent per-period costs. Most upfront outlays are fixed in nature and, once met, have no bearing on firms' scale of operations, such as expenditures on R&D and product development, marketing research, advertising, and investment in fixed capital equipment. In addition, some variable expenses such

[8] See for example Alfaro and Charleton (2007) and Alfaro et al. (2009).

as intermediate input purchases, advance payments to salaried workers, and land or equipment rental fees are also typically sustained before production and sales take place.

Production for foreign markets is even more dependent on external financing than manufacturing for the home country for three reasons. First, exporting is associated with additional upfront expenditures. Sunk and fixed costs of international trade include learning about the profitability of potential export markets; making market-specific investments in capacity, product customization and regulatory compliance; and setting up and maintaining foreign distribution networks. Variable trade costs comprise mainly shipping, duties and freight insurance. As with production, most of these expenses have to be incurred before export revenues are realized. Second, cross-border shipping and delivery typically take 60 days longer to complete than domestic orders, which further aggravates exporters' working capital needs relative to those of domestic producers. Finally, the greater risk inherent in transnational operations requires exporters to obtain trade insurance. For these reasons, a very active market operates for the financing and insurance of international transactions, reported to be worth about $10-$12 trillion in 2008. Up to 90% of world trade has been estimated to rely on some form of trade finance.[9]

While access to external finance is important in all industries, some sectors depend considerably more on the financial system. This variation will be an important source of identification in our empirical analysis. The literature has identified two important determinants of sectors' financial vulnerability that are technologically determined, exogenous from the perspective of individual firms, and innate to the manufacturing process in an industry. First, firms in some sectors have substantially greater liquidity needs because they face higher upfront costs and thus require more outside capital (Rajan and Zingales, 1998). In our empirical analysis, we will employ three commonly used proxies for sectors' liquidity needs: external finance dependence, R&D intensity, and the ratio of inventories to sales. Second, industries differ in their endowment of tangible assets that can be pledged as collateral (Braun 2003, Claessens and Laeven 2003). As is standard in the literature, we will measure sectors' asset tangibility with the share of plant, property and equipment in total book value assets.

2.2 Theoretical framework

The literature has offered a number of theoretical models to rationalize the consequences of financial market imperfections for international trade. An important implication of these models is that the effect of credit constraints varies across countries and sectors, such that financially developed economies have a comparative advantage in financially vulnerable industries.[10] Here we outline a simplified framework that

[9] See Auboin (2009).

[10] By modeling financial frictions à la Holmstrom and Tirole (1997) rather than the more traditional credit rationing, Ju and Wei (2008) demonstrate that the quality of a country's financial system is not a source of comparative advantage beyond a certain threshold, in the sense that further financial development would not alter the structure of

ignores the country dimension, which we use to guide the empirical analysis of the variation in Chinese firms' export performance across sectors. We first summarize the predictions of a model that incorporates financial frictions in a heterogeneous-firm world à la Melitz (2003).[11] We then use it to infer the differential effects of credit constraints on domestic firms and MNC affiliates.

Assume that exporters require external capital, which they can raise in the financial market by pledging collateral. Contracts between firms and investors are enforced with a certain probability, which in a world with multiple economies depends on the country's strength of financial institutions. When a financial contract is honored, the borrower repays the investor; otherwise, the firm defaults and the creditor claims the collateral. Industries, however, differ in their reliance on outside finance and in their availability of tangible assets, as described above.

In the absence of liquidity constraints, all firms with productivity above a certain cut-off level would become exporters, as in Melitz (2003). Financial frictions, however, interact with firm heterogeneity and reinforce the selection of only the most productive firms into exporting: Because more efficient companies earn bigger revenues, they can offer creditors a higher return in case of repayment, and are thus more likely to secure the necessary outside capital. Importantly, the exporting cut-off varies systematically across sectors, and is higher in financially more vulnerable industries. In particular, entrepreneurs would find it more difficult to begin exporting when they need to obtain more trade financing or when potential investors expect a lower return in case of default. Credit constraints can thus preclude potentially profitable firms from engaging in international trade and result in inefficiently low aggregate trade flows.

When companies require outside funds only for their fixed costs of production and cross-border trade, credit conditions would affect the selection of firms into exporting but not the level of their sales abroad. On the other hand, when firms face liquidity constraints in the financing of their variable costs as well, limited access to outside capital would also restrict their scale of operations. While the most productive (and least constrained) exporters could still export at first-best levels, less productive firms would only be able to do so if they ship lower volumes than would be optimal in the absence of financial frictions. Such firms can secure less outside credit than would be necessary to trade at first-best levels, and optimally use it to support lower export quantities which entail lower variable costs. The extent of this distortion would once again vary systematically across sectors. Specifically, firms would have to curtail their export volumes more if they are active in a financially vulnerable industry.

---

the country's production and trade. In contrast, below this threshold, not only is the level of financial development a source of comparative advantage, but conventional factor endowments may stop being a source of comparative advantage, in the sense that an increase in the capital stock would not alter production and trade patterns.

[11] The discussion in this section is based on the model developed in Manova (2008b). Note that Manova (2008b) focuses on single-product firms only, but we also discuss an extension to the case of multi-product firms.

If exporters incur repeated fixed costs in every foreign market they enter, credit constraints can also affect the number of firms' export destinations. In the absence of liquidity constraints, firms' decision to sell in a particular country is independent of the decision to service other markets. By contrast, when firms have limited access to financing, they optimally add export destinations in decreasing order of profitability until they hit their budget constraint and exhaust their resources. This implies that, conditional on firm productivity, exporters in financially vulnerable sectors would transact with fewer trade partner countries.

Credit constraints have similar implications for another dimension of exporters' profile: the range of products they trade. The literature on multi-product firms has suggested that profitability varies across goods within a firm based on the efficiency level and consumer preferences specific to the firm-product pair.[12] With product-specific fixed export costs and limited access to external capital, firms must rationalize their product scope. While the number of goods a firm ships might vary across destinations depending on importer characteristics, exporters would offer a narrower set of products overall and sell fewer goods to any given market when they face tighter credit conditions. Moreover, these effects would intensify in sectors with greater requirements for external capital and limited availability of collateralizable assets.

The organizational structure of a firm can importantly affect its financing decisions and need for outside credit. Compared to private domestic companies, firms with partial or full foreign ownership are not restricted to borrowing externally, but can also tap deeper internal capital markets and obtain funds from their parent company. Therefore, foreign-owned firms should have an advantage over domestic companies in overcoming binding credit constraints, which would be manifest in all dimensions of firms' export activity: sales, number of trade partners, and product scope. In addition, this advantage should be greater in sectors characterized by particularly high liquidity needs and limited tangible assets.[13]

Foreign headquarters might plausibly have greater monitoring rights or managerial control over affiliate activities, and the allocation of financial resources in particular, at higher levels of foreign ownership. If so, headquarters would arguably be willing to extend more financing to wholy-owned parties relative to partially-controlled entities. This suggests that the integrated affiliates of multinational corporations should outperform private domestic firms in financially vulnerable sectors relatively more than joint ventures.

The discussion so far has assumed that firms' productivity level is fixed and predetermined by an exogenous productivity draw. However, companies might be able to improve their efficiency by investing in superior production technologies. This would typically entail substantial fixed upfront costs. Firms might also choose to upgrade product quality by employing more expensive inputs of higher quality, better skilled

[12] See for example Bernard, Redding and Schott (2009).
[13] This discussion does not consider MNCs' incentives to set up an affiliate abroad. We return to this issue and specifically address the potential endogeneity of foreign ownership in Section 4.2.

workers, or novel production processes. Credit constraints, however, could curb such investments in productivity and quality, with more severe distortions in financially vulnerable sectors. Moreover, two otherwise identical firms might have different export outcomes if one of them is foreign owned and thus able to upgrade its productivity or output quality. This suggests that in addition to curtailing production capacity for given export potential, financial frictions can also directly limit firms' export potential through these two additional mechanisms, since export revenues, number of trade partners and product scope would increase with production efficiency and product quality.

To summarize, we expect credit constraints to impede both the extensive margin (firm selection into exporting, firms' number of export products and destinations) and the intensive margin (firm exports) of trade. These effects would be magnified in financially vulnerable sectors, but mitigated by foreign ownership. For convenience, we will abuse standard terminology and refer to these patterns as MNC affiliates having a comparative advantage in financially dependent industries relative to domestic firms.

3 Data

We use detailed customs data on the activity of all Chinese firms that participated in international trade over the 2003-2005 period.[14] These data have been collected by the Chinese Customs Office and cover the universe of trade transactions. They report the free-on-board value of firm exports (in US dollars) by product and trade partner for 231 destination countries and 6,908 different products in the 8-digit Harmonized System.[15] The dataset also provides information on the organizational structure of the firm, which makes it possible to distinguish between state-owned enterprises (SOEs), private domestic firms (including collectively-owned firms), fully foreign-owned affiliates of multinational firms (MNCs), and joint ventures (with foreign ownership under 100%). While the data are available at a monthly frequency, we focus on annual exports in the most recent year in the panel, 2005.

Some firms in China are pure export-import companies that do not engage in manufacturing and serve exclusively as intermediaries between domestic producers (buyers) and foreign buyers (suppliers). In this paper, we examine the operations of firms that both make and trade goods, and exclude wholesalers from our analysis. Since the customs data do not directly indicate these intermediaries, we use keywords in firms' names to identify them.[16]

We are interested in the export decisions of profit-maximizing firms that operate in a financially constrained environment. Since the Chinese government exerts considerable control over the activities of

[14] Manova and Zhang (2008) describe the data and present stylized facts about firm heterogeneity in Chinese trade.
[15] Product classification is consistent across countries at the 6-digit HS level. The number of distinct product codes in the Chinese 8-digit HS classification is comparable to that in the 10-digit HS trade data for the United States.
[16] Ahn, Khandelwal and Wei (2010) use the same filter in order to identify intermediaries and analyze their role in Chinese trade. We drop 23,073 wholesalers which mediate a quarter of China's trade by value.

state-owned enterprises, and the sectors in which they produce in particular, SOEs' participation in international trade is not necessarily governed by profit maximization. For this reason, we exclude SOEs from our analysis and focus instead on the operations of private domestic and foreign-owned companies.

We employ four different measures of sectors' financial vulnerability, which have been commonly used in the literature on the role of credit constraints for trade and growth.[17] These variables are meant to reflect technologically determined characteristics of each sector that are inherent to the nature of the manufacturing process and beyond the control of individual firms. First, while firms in all industries may face liquidity constraints, there are systematic differences across sectors in the relative importance of up-front costs and the lag between the time when production expenses are incurred and the time when revenues are realized. We capture these differences with a measure of sectors' external finance dependence ($ExtFin_i$), constructed as the share of capital expenditures not financed with cash flows from operations. For robustness, we also use the share of R&D spending in total sales (RD_i), since research and development typically occur at the beginning of a production cycle before a good can be manufactured and successfully marketed. We further exploit the ratio of inventories to sales ($Invent_i$), which proxies the duration of the manufacturing process and the working capital firms require in order to maintain inventories and meet demand. Note that while $ExtFin_i$ and RD_i reveal firms' long-term requirements for outside finance, $Invent_i$ indexes their liquidity needs in the short run. Second, sectors vary not only in firms' reliance on external capital, but also in firms' endowment of tangible assets that can serve as collateral. We thus also use a measure of asset tangibility ($Tang_i$), defined as the share of net plant, property and equipment in total book-value assets.

As is standard in the literature, our measures of sectors' financial vulnerability are constructed from data on all publicly traded U.S.-based companies from Compustat's annual industrial files. This approach is motivated by a number of considerations. First, the United States have one of the most advanced and sophisticated financial systems, which makes it reasonable that the behavior of U.S. companies reflects firms' optimal asset structure and use of external capital. Second, using the U.S. as the reference country eliminates the potential for the measure of sectors' financial vulnerability to endogenously respond to countries' level of financial development. In fact, if the most financially vulnerable industries in the U.S. use more internal financing and tangible assets in China because of the worse financial system there, our results would be biased downwards. Finally, what is required for identification in the empirical analysis is not that industries have the same tangibility and liquidity needs in the U.S. and China, but rather that the ranking of sectors remain relatively stable across countries. Kroszner, Laeven and Klingebiel (2007), Rajan

[17] These sector measures come from Kroszner, Laeven and Klingebiel (2007), and are constructed following the methodology of Rajan and Zingales (1998) and Claessens and Laeven (2003). They are averaged over the 1980-1999 period for the median U.S. firm in each sector, and appear very stable over time.

and Zingales (1998) and Claessens and Laeven (2003), among others, argue that the measures of financial vulnerability capture a large technological component that is innate to a sector and therefore a good proxy for ranking industries in all countries. Consistent with this argument, the measures vary substantially more across sectors than across firms within a sector, and the hierarchy of sectors is quite stable over time.

The four indicators of industries' financial vulnerability are available for 29 sectors in the ISIC 3-digit classification system. In our empirical analysis, we match Chinese HS 8-digit product codes to these ISIC 3-digit sector categories.

3.1 A first glance at the data

Before proceeding to the econometric analysis, in Table 1 we document the distribution of Chinese trade flows across firms with different ownership structure. Two patterns in particular stand out.

First, the lion's share of Chinese trade is conducted by firms with partial or full foreign ownership. China's total exports to the world amounted to $531.4 billion in 2005. Private domestic firms, however, were responsible for merely 13% of these flows. Joint ventures accounted for a quarter of all exports, while foreign affiliates sent more than half of China's exports. These statistics speak volumes about the importance of multinational companies and foreign direct investment for China's tremendous export success in the recent past.

The second pattern that emerges from Table 1 is that foreign-owned firms capture a systematically bigger share of Chinese exports in industries at higher levels of financial vulnerability. When we group sectors into three bins by external finance dependence, we find that MNC affiliates channel 52% of exports in industries at medium and high values of $ExtFin_i$, compared to 41% in industries with low values of $ExtFin_i$. On the other hand, private domestic firms mediate almost twice as big a share of exports in sectors with limited need for outside finance, relative to sectors that rely more heavily on external capital. Finally, the contribution of joint ventures to China's trade is more equally balanced across industries, and its distribution falls between that for fully foreign-owned and fully domestic firms.

We observe even more extreme sorting behaviors when we group sectors according to our other two measures of liquidity constraints: R&D intensity and inventories to sales ratio. Foreign affiliates account for an impressive 60% of exports in sectors with high liquidity needs, compared to only 30% in sectors with limited liquidity needs. On the other hand, private domestic firms capture roughly 9% of trade flows in industries with high R&D intensity and inventories ratio, and 23% in industries with more severe liquidity constraints. As before, joint ventures contribute about the same share of Chinese exports in all sectors. Qualitatively and quantitatively similar patterns obtain when we distinguish between sectors with low, medium and high levels of asset tangibility, with a greater proportion of trade conducted by foreign firms in sectors with few collateralizable assets.

The evidence from these summary statistics anticipates the results from our econometric analysis in the next section. It is furthermore broadly consistent with a credit-constraints view of international trade and investment, whereby private domestic firms are relatively more credit constrained, and thus under-represented in financially vulnerable sectors relative to foreign affiliates and joint ventures. This might arguably occur because private domestic firms can only borrow in the local financial market, while foreign ownership provides additional access to internal capital from the parent company.

4 Empirical Results

We begin the analysis by exploring the variation in export revenues across firms with different organizational structures and across sectors at different levels of financial vulnerability. We find results indicative of credit constraints restricting firms' worldwide trade flows, and foreign ownership relaxing these constraints. We further establish that these patterns are not driven by confounding factors such as firm size or sector characteristics unrelated to financial vulnerability that might nevertheless affect MNC activity. We then examine the effects of financial frictions on the extensive and intensive margins of firms' exports, and decompose the impact on firms' intensive margin into that on unit prices and on export quantities. Finally, we show that our findings are particularly strong for sales to destinations associated with higher trade costs.

4.1 Main specification

Variation across firm types within sectors

We first analyze the systematic variation in firms' worldwide export revenues across sectors and firm ownership types. To that end, we estimate the following specification:

$$\log Exports_{fi} = \alpha_0 + \alpha_1 \cdot D_{JV} + \alpha_2 \cdot D_{MNC} + \beta \cdot FinVuln_i \cdot D_{JV} + \gamma \cdot FinVuln_i \cdot D_{MNC} + \varphi_i + \varepsilon_{fi} \quad (1)$$

Here $Exports_{fi}$ are the free-on-board export sales of firm *f* in industry *i*, pooled across all of *f*'s export destinations. D_{JV} and D_{MNC} are binary indicator variables which take the value of 1 for joint ventures and fully foreign-owned multinational affiliates, respectively, and 0 otherwise. $FinVuln_i$ measures sector *i*'s level of financial vulnerability, which in alternative regressions we proxy with *i*'s external finance dependence, R&D intensity, inventories-to-sales ratio or asset tangibility. Finally, φ_i are industry fixed effects, and ε_{fi} is an error term. At this level of aggregation, we work with 209,329 observations covering 88,005 companies and 29 sectors. Throughout the paper we report results using robust standard errors.

The omitted category in this analysis is the set of private domestic firms. The main effects of the two dummies thus capture any differences in average export performance between firms of different

ownership type that are invariant across sectors. For example, joint ventures and MNC affiliates may have easier access to foreign distribution networks through their parent company, enjoy preferential tax treatment, be more productive, have better managerial practices, employ more skilled workers, or offer higher-quality products relative to domestic companies. If so, in any given industry, foreign firms may have superior export performance than local firms on average, and this advantage would be reflected in positive and significant point estimates for α_1 and α_2.

The industry fixed effects in this regression control for systematic differences in firm exports across sectors that do not depend on the organizational structure of the company. If China has a comparative advantage in a given industry such as textiles, for example, all textile producers may earn larger export revenues than manufacturers of electrical machinery, regardless of whether they are domestic or foreign owned. Similarly, within each firm active in multiple sectors, worldwide textile sales may exceed exports of electrical machines, irrespectively of the ownership status of the exporter. The industry dummies explicitly account for factor endowment and Ricardian determinants of China's comparative advantage, as well as for sector-specific demand shocks that affect the sales of all firms. The φ_i's also absorb the level effect of $FinVuln_i$.

The main coefficients of interest in (1) are those on the two interaction terms. They are identified from the variation in export sales across firms of different ownership types within a given industry. If credit constraints indeed limit firm exports, we anticipate lower worldwide sales in more financially vulnerable sectors. However, the distortionary effect of financial frictions would be mitigated in foreign-owned firms if Chinese affiliates can obtain internal funding from the parent company in addition to any credit they raise in the local financial market. We thus expect that $\gamma > \beta > 0$, where the first inequality reflects the notion that fully integrated MNC affiliates may benefit from deeper internal capital markets relative to joint ventures.

As column 1 in Table 2 shows, foreign-owned firms indeed earn systematically higher export revenues than private domestic firms, and this lead is more pronounced in sectors with greater requirements for external capital. Moreover, relative to Chinese-held companies, MNC affiliates exhibit an even greater comparative advantage in financially dependent sectors than joint ventures. Similar results obtain when we proxy the severity of firms' liquidity constraints with sectors' R&D intensity or inventories-to-sales ratio in columns 2 and 3. Foreign-owned firms also export disproportionately more in industries with few tangible assets relative to joint ventures, who in turn outperform local firms in those industries (column 4). Note that, as expected, the interactions of the ownership dummies with sectors' asset tangibility enter with the opposite sign to the interactions with the three measures of sectors' liquidity needs, since financially more vulnerable industries feature greater reliance on external finance and fewer hard assets that can serve as collateral.

Variation across sectors within firms

The analysis so far has exploited the variation across firms of different ownership type within a given sector, as well as the variation across sectors within firms of a given ownership type. Note that among firms of a certain organizational structure, some firms may be active in one sector only, while others may produce and export in multiple industries. In our sample, about half of all firms indeed trade goods in more than one ISIC 3-digit sector. The estimated coefficients in Table 2 thus reflect systematic differences between the exports of the *average* MNC affiliate or joint venture in a given sector relative to the exports of the *average* private domestic firm in the same sector. These estimates therefore capture the combined effect of credit constraints on firm-level exports and on the selection of firms into exporting.

We next decompose these effects and establish that financial frictions indeed constrain trade flows at the firm level. We do so by including firm fixed effects φ_f in (1):

$$\log Exports_{fi} = \alpha_0 + \beta \cdot FinVuln_i \cdot D_{JV} + \gamma \cdot FinVuln_i \cdot D_{MNC} + \varphi_f + \varphi_i + \varepsilon_{fi} \qquad (2)$$

The φ_f's subsume the main effects of the ownership dummies, and control for other firm characteristics that affect a company's export performance equally in all sectors. These may include the firms' managerial competence, production efficiency, the quality of its labor force, or its access to foreign distribution networks. Importantly, the φ_f's also capture the firm's total availability of external finance, be it from local banks or a foreign parent company. The coefficients on the interaction terms are thus identified purely from the variation in worldwide export revenues across sectors within multi-sector firms. They implicitly reflect the way in which firms choose to allocate their limited financial resources across production and exports in different industries. This approach also ensures that our results are not driven by some endogenous sorting of single-sector firms into industries and ownership types for reasons other than credit constraints.

Table 3 confirms that credit constraints affect the sectoral composition of firms' exports even in this stringent specification. Relative to domestic companies, foreign-owned firms earn a bigger share of their foreign revenues in financially vulnerable sectors that require more external finance, are more R&D intensive, have a higher inventories-to-sales ratio, and employ fewer tangible assets. These results are highly statistically and economically significant. The export advantage of firms with partial or full foreign ownership over domestic producers is 25% larger in sectors with high requirements for external capital relative to sectors with low dependence on outside finance. Moving from a sector with few assets that can serve as collateral to a sector with high asset tangibility increases the exports of domestic enterprises by fully 76% and 59% more than the exports of MNC affiliates and joint ventures, respectively.[18]

[18] These comparative statics are based on columns 1 and 4 in Table 3. For these calculations, we compare sectors at the 25th and 75th percentile of the distribution of external finance dependence (asset tangibility) across sectors.

Note that the point estimates we obtain for β and γ are on average 50% larger in magnitude than those in Table 2. This is consistent with the predictions of the theoretical framework in Section 2 for the effect of financial frictions on firm-level exports and on firm selection into exporting: Since joint ventures and MNC affiliates are less credit constrained than private domestic firms, they effectively face a lower productivity cut-off for exporting, especially in financially vulnerable sectors. This implies that a foreign affiliate might be able to sell abroad when a domestic manufacturer of the same productivity level is rationed out of foreign trade. Because less productive firms export less, this effect tends to reduce the average trade volumes of foreign-owned firms relative to private companies in financially dependent industries. This selection mechanism can thus explain why the regressions that exclude firm fixed effects underestimate the impact of credit constraints on the level and sectoral composition of firms' exports.

As Table 3 illustrates, the advantage of MNC affiliates over private domestic firms in financially vulnerable sectors either significantly exceeds that of joint ventures or is not statistically different from it. In particular, strict monotonicity ($\gamma > \beta$, significant at 1%) obtains when we consider sectors' R&D intensity or asset tangibility. By contrast, it does not hold when we instead explore industries' external finance dependence or inventories-to-sales ratio. However, in those instances we cannot reject the equivalence of the two coefficients at standard levels of confidence (10%). The same is true of all robustness specifications we present below: Whenever we record significant coefficients, we either observe significantly higher point estimates for the interaction with the dummy for full foreign ownership than with the dummy for joint ventures, or cannot reject their equality at 10%.

To summarize, our results strongly suggest that credit constraints restrict firms' export activity but foreign ownership alleviates the effects of financial frictions. Our analysis thus serves two purposes. First, it corroborates the prior evidence in the literature on the detrimental consequences of financial market imperfections for international trade flows at the level of the firm. Second, our findings indicate that financial considerations are an important determinant of the sectoral composition of MNC activity abroad.

4.2 Sensitivity analysis

Endogeneity

Our identification strategy has relied on exploiting the variation in financial vulnerability across sectors and the variation in organizational structure across firms. While the former is arguably exogenous from the perspective of individual firms, ownership status might be endogenous to sectors' financial characteristics. In practice, however, this endogeneity does not pose a problem for our interpretation and would in fact be consistent with and reinforce it. We build this argument in three steps.

Consider first foreign acquisitions. Multinationals may intentionally choose to fully acquire or become part stake-holders in Chinese firms with greater export potential. While this could explain the

positive coefficient on the foreign ownership dummies, it cannot rationalize the differential effect of foreign ownership on firm exports across sectors. Moreover, if MNC headquarters specifically target better Chinese firms in financially vulnerable sectors, this would be consistent with the idea that MNCs do so precisely to exploit their comparative advantage in overcoming credit constraints. But the latter would only emerge if credit constraints indeed limit (local) firms' export performance and affect FDI decisions.

Second, in the presence of imperfect capital markets in a host country, multinationals may have an incentive to enter financially vulnerable industries if domestic firms find it more difficult to finance their operations and are thus underrepresented in such industries. For example, foreign affiliates might then face less competition in the local market for sector-specific inputs, as well as less competition from other Chinese producers in the local and export markets for final goods. Both of these forces would generate relatively higher profits for MNC affiliates in sectors intensive in external finance and intangible assets. This argument would apply to both foreign acquisitions and greenfield FDI, in which companies establish new production facilities in a foreign country. Once again, this mechanism would be based on financial considerations shaping the activities of multinational corporations as we argue.

Finally, the property-rights view of the firm could provide yet another reason why MNCs' integration decisions may be endogenous to the presence of financial frictions. In particular, consider a foreign headquarters that would like to move the production of a customized input to China. If this input requires relationship-specific investments that cannot be funded internally, the Chinese supplier would find it more difficult to raise working capital if it is active in a financially vulnerable sector. To ensure production takes place, the foreign company could then vertically integrate the Chinese supplier so as to help finance its activities. This would be consistent with Antràs, Desai and Foley (2009), who find that foreign ownership can emerge endogenously to alleviate credit constraints faced by the (Chinese) producer. In their framework, MNC headquarters either directly fund the affiliate or monitor its operations so that host country banks would be willing to finance it. They focus on the variation in financial development across countries and show that foreign integration is more likely to occur when the supplier is located in an economy with weak financial markets. Naturally, their model could be reformulated to generate precisely the result that integration will be more prevalent in financially vulnerable sectors.

As these arguments illustrate, the potential endogeneity of firms' organizational structure in our data would corroborate and be consistent with our conclusions that credit constraints restrict (local) firms' ability to engage in international trade and that foreign ownership mitigates this effect. In addition, the mechanisms we have considered here could generate incentives for full foreign control versus partial ownership in much the same way as the incentives to integrate versus to maintain an arms-length relationship. In turn, such endogeneity of the degree of foreign ownership would reinforce and be

congruent with our finding that MNC affiliates enjoy a greater advantage over domestic firms in financially vulnerable sectors relative to joint ventures.

Financial vulnerability vs. other sector characteristics

The large literature on foreign direct investment has identified a number of factors unrelated to financial frictions that affect companies' incentives to move production abroad. This raises the possibility that our measures of sectors' financial vulnerability are correlated with other industry characteristics that in fact determine the sectoral composition of MNC activity. The imperfect correlation among the four sector proxies we use, however, makes this alternative unlikely as it would be difficult for an omitted variable to move closely with each of our sector indicators (see Appendix Table 2).[19] Nevertheless, to address this concern, we perform three robustness exercises and consistently find our results unchanged.

We first account for the possibility that the production decisions of foreign multinationals respond to sectors' factor intensities. In the classical model of vertical FDI, for example, firms optimally splice the production chain across borders in order to exploit cross-country differences in factor prices.[20] This model, however, examines firms' production location decisions, without determining the boundaries of the firm. In other words, a U.S. company might move the unskilled-labor intensive stages of its manufacturing process to China, but it could use either an integrated supplier or an unrelated input provider. Because our analysis distinguishes between domestic and foreign-owned firms as opposed to final-good and intermediate-good exporters, it is thus not obvious that the classical predictions of vertical FDI models can explain our results. Nevertheless, recent work on the joint location and integration decisions of MNCs does suggest that multinationals may be more active in capital intensive industries.[21] If sectors' factor intensity is systematically correlated with our four measures of financial vulnerability, our results could be spurious.

Panel A in Table 4 confirms that our findings are not driven by MNCs moving production to China to exploit factor-price differences across countries. We expand specification (2) to include the interaction of each of the two ownership dummies with sectors' physical and human capital intensity. We find that joint ventures and foreign affiliates export systematically more than private domestic firms in industries that employ less physical capital and more skilled workers. However, these patterns are independent of the effect of credit constraints on firms' exports and on the sectoral composition of MNC activity. The coefficient estimates for β and γ remain qualitatively unchanged.

[19] The joint tests we perform in Appendix Table 3 reflect this low correlation among the four measures of sectors' financial vulnerability: When we include the interactions of D_{JV} and D_{MNC} with all four variables at the same time, we almost always obtain significant coefficients for each of the four indicators.
[20] See for example Helpman (1984) and Yeaple (2003).
[21] See Antràs (2003).

The prior literature has also suggested that sectors' technological sophistication and contract intensity can affect the activities of multinational companies. For example, Antràs (2003) has shown that vertical integration is more likely to occur than arms-length outsourcing in sectors intensive in R&D. If both headquarters and the foreign supplier have to incur relationship-specific investments, ownership and residual rights of control should optimally be given to the party whose input is more important to the joint operation. If headquarters are more essential in R&D intensive sectors, or if our sector measures are correlated with sectors' intensity of relationship-specific investments, our results could be picking up these mechanisms instead of the effects of credit constraints.

Sectors' technological sophistication might affect MNCs' decisions for reasons unrelated to the property rights view of the firm as well. For example, foreign companies might have a greater incentive to maintain production within the boundaries of the firm if they are worried about the expropriation of intellectual property in environments with weak contract enforcement.[22] Alternatively, multinationals might have access to superior technologies and thus have a comparative advantage in R&D intensive sectors. The relationship between this explanation and the credit constraints mechanism we propose, however, is more nuanced, as firms may require sufficient access to financing in order to develop or use more sophisticated technologies.

The results in the rest of Table 4 provide evidence that these alternative determinants of MNC activity appear independent from the role of financial frictions. In particular, our results for sectors' external finance dependence, inventories-to-sales ratio and asset tangibility are robust to explicitly controlling for the interactions of the foreign ownership dummies with R&D intensity (Panel B).[23] This is a very stringent test as high R&D expenditures reflect in part financial vulnerability and not just technological sophistication. Our findings also hold at comparable levels of economic and statistical significance when we control for the interactions of the ownership dummies with sectors' contract intensity in Panel C. For this specification, we measure sectors' contract intensity with the Nunn (2007) indicator of the importance of relationship-specific investments embodied in the inputs used by a sector.[24] As expected, we also find that foreign-owned affiliates indeed export relatively more than Chinese domestic firms in industries characterized by high contract intensity, whereas joint ventures are under-represented in such industries.

[22] Javorcik and Wei (2009) show that concerns about weak intellectual property protection and corruption in a host country may both incentivize R&D-intensive foreign investors to invest less, and once they invest, induce them to prefer a wholly foreign-owned structure over a joint venture.

[23] The only coefficient that is less precisely estimated is that on the $ExtFin_i \cdot D_{MNC}$ interaction. We attribute this to the high correlation between external finance dependence and R&D intensity (0.56) and the fact that these regressions exploit the variation in two sector variables across only 29 sectors.

[24] In particular, we use the (value-weighted) fraction of inputs to a sector not sold on an organized exchange. Qualitatively similar results obtain when we instead measure contract intensity with the (value-weighted) fraction of inputs to a sector that are neither sold on an organized exchange nor listed in reference-price trade publications, with the exception of the results for asset tangibility which are then imprecisely estimated. With that measure, the interactions of both D_{JV} and D_{MNC} with sectors' contract intensity enter positively and significantly.

Foreign ownership vs. firm size

Evidence in the finance literature indicates that smaller firms tend to be more credit constrained than larger companies.[25] Since partly or fully foreign owned firms in China might be bigger that private domestic exporters, our results could capture the role of firm size instead of the effect of foreign ownership *per se*. In particular, while the firm fixed effects in the regressions implicitly condition on firm size, it is possible that the interaction terms are driven by bigger firms having a comparative advantage in financially dependent sectors. Note that while this explanation would still be consistent with financial frictions restricting firms' export activity, it would imply that MNCs are less constrained because their size facilitates access to external finance and not because of their deeper internal capital markets.

To address this concern, we would ideally have information on firms' total sales in all markets they service. The customs data we use, however, do not contain statistics about firms' local operations in China. As a proxy for firm size, we therefore take firms' total export revenues across all destinations and sectors. While imperfect, this measure is arguably appropriate given the strong correlation prior researchers have established between firm size and firm exports for a number of countries.[26]

As we report in Table 5, bigger exporters sell relatively more in industries with greater requirements for outside capital or with fewer access to collateralizable assets, which is consistent with the prior literature. However, we continue to observe systematically higher exports for joint ventures and MNC affiliates in financially vulnerable sectors even when we control for the interaction of firm size with sectors' financial vulnerability. Moreover, the point estimates of interest are little affected by this additional control.

4.3 Intensive vs. extensive margin of firm exports

We next explore the mechanism through which credit constraints hamper firms' export performance by examining their effect on different margins of trade activity. As described in Section 2.2, frictions in the financing of variable trade costs would result in reduced trade volumes at the intensive margin, i.e. in the value of foreign sales firms earn in individual export markets. If exporters incur fixed upfront costs in each market they penetrate, limited access to outside capital would further restrict the number of markets firms enter, i.e. the extensive margin of firms' cross-border activity.

The detailed nature of the Chinese customs data allows us to define export markets very narrowly at either the destination-sector or the destination-product level. While we have so far distinguished between 29 sectors in the ISIC-3 digit industry classification, we can further differentiate between 6,054 distinct products at the HS-8 digit level. This makes it possible to control for unobserved market characteristics with fixed effects so as to cleanly isolate the impact of credit constraints at the intensive margin of firms'

[25] See for example Gertler and Gilchrist (1994), Beck et al. (2008), and Guiso, Sapienza and Zingales (2004).
[26] See for example Bernard, Jensen, Redding and Schott (2007) for evidence for the US.

exports. We are also able to identify their consequences for different dimensions of firms' extensive margin, such as the number of products shipped to a country or the total number of destination-product markets. This has the advantage that we do not have to take a stance on the specific level at which firms incur fixed entry costs or the potential synergies in market entry costs across destinations within a product or across products within a destination country.

We first study the impact of financial frictions on firms' bilateral shipments by sector. Our estimating equation becomes:

$$\log Exports_{fdi} = \alpha_0 + \beta \cdot FinVuln_i \cdot D_{JV} + \gamma \cdot FinVuln_i \cdot D_{MNC} + \varphi_f + \varphi_d + \varphi_i + \varepsilon_{fdi} \qquad (3)$$

where $Exports_{fdi}$ is the value of firm f's exports to destination d in industry i. As before, we include industry fixed effects φ_i to account for cross-sector differences in transportation costs, demand shocks and any other industry specific factors (including financial vulnerability) that affect all exporters. We also continue to incorporate firm fixed effects φ_f to absorb differences across firms such as overall productivity, managerial talent, skill composition of the labor force, average product quality, or total availability of financial resources. Of note, we now also condition on country fixed effects φ_d to control for the variation in trade costs, market size, consumer income, the bilateral exchange rate and any other characteristics of the destination market that influence firms' export sales. This exhaustive set of fixed effects allows us to identify the coefficients on the interaction terms from the variation in financial vulnerability across sectors and across firms of different ownership types within individual destination markets, and from the variation across sectors and destinations within firms. At this level of disaggregation, we analyze 953,475 observations spanning 88,004 companies, 231 importing countries and 29 sectors.

As Panel A in Table 6 indicates, MNC affiliates and joint ventures have systematically higher bilateral exports in financially vulnerable industries relative to private domestic firms in such sectors. These results are highly statistically and economically significant, with point estimates comparable in magnitude to those for firms' worldwide exports in Table 3. In unreported regressions, we have also confirmed that these findings are robust to controlling for firm size or allowing other sector characteristics to affect MNC activity as in the previous section.

Very similar patterns obtain when we explore the full richness of the data, and define firms' intensive margin of trade as bilateral exports by HS 8-digit product (Panel B). The estimating equation remains the same as (3), but the outcome variable is now measured at the firm-product-destination level instead of at the firm-sector-destination level. This allows us to explore the systematic variation in trade flows across 88,004 firms, 231 importing countries and 6,054 products, for a total sample of 1,824,950.

We next explore the consequences of financial market imperfections for the extensive margin of firms' exports. The granularity in the data allows us to define this margin in a number of different ways. At

the firm-sector level, we first document how financial considerations influence firms' export product scope, number of export destinations, and total number of product-trade partner relationships. We use the following specifications to explore how these three extensive margins vary across firms of different organizational structure and across sectors at different levels of financial vulnerability:

$$\log \#ProdDest_{fi} = \alpha_0 + \beta \cdot FinVuln_i \cdot D_{JV} + \gamma \cdot FinVuln_i \cdot D_{MNC} + \varphi_f + \varphi_i + \varepsilon_{fi} \quad (4)$$

$$\log \#Products_{fi} = \alpha_0 + \beta \cdot FinVuln_i \cdot D_{JV} + \gamma \cdot FinVuln_i \cdot D_{MNC} + \varphi_f + \varphi_i + \varepsilon_{fi} \quad (5)$$

$$\log \#Dest_{fi} = \alpha_0 + \beta \cdot FinVuln_i \cdot D_{JV} + \gamma \cdot FinVuln_i \cdot D_{MNC} + \varphi_f + \varphi_i + \varepsilon_{fi} \quad (6)$$

$\#Products_{fi}$ measures the number of HS-8 products that firm *f* exports to at least one market in industry *i*. $\#Dest_{fi}$ gives the number of destination countries, to which firm *f* exports at least one product in sector *i*. Finally, $\#ProdDest_{fi}$ represents the total number of product-importer trading relationships that firm *f* maintains in industry *i*. It is given by the sum of the number of bilaterally traded products to country *d* ($\#Products_{fdi}$) across all destinations *d*, or $\#ProdDest_{fi} = \sum_d \#Products_{fdi}$. In all regressions, we include firm and sector fixed effects to identify the coefficients of interest from the variation within firms across sectors.

The evidence in Table 7 strongly suggests that MNC affiliates and joint ventures offer a broader range of products to more countries in financially vulnerable sectors relative to private domestic firms. These results are robust to the choice of sector measure for the number of export destinations and number of product-trade partner relationships (Panels A and B), but somewhat mixed for firms' overall product scope (Panel C).

As a fourth indicator of firms' extensive margin, we finally study the number of products that firms export bilaterally in each sector. The advantage of this approach is that it allows us to include destination fixed effects to control for unobserved importer characteristics which might determine firms' optimal export product scope:

$$\log \#Products_{fdi} = \alpha_0 + \beta \cdot FinVuln_i \cdot D_{JV} + \gamma \cdot FinVuln_i \cdot D_{MNC} + \varphi_f + \varphi_d + \varphi_i + \varepsilon_{fi} \quad (7)$$

We find that relative to private domestic firms, foreign affiliates and joint ventures export a broader range of products in financially vulnerable sectors to each of their destination markets even when we control for importer fixed effects (Table 8). These results are qualitatively and quantitatively significant when we compare sectors at different levels of R&D intensity, inventories ratio and asset tangibility, but are imprecisely estimated or small and of the wrong sign for the case of external capital dependence.

These findings indicate that credit constraints severely restrict firms' ability to enter more markets, to widen their product scope, and to expand their trade volumes. The evidence also further corroborates the idea that foreign ownership is associated with access to deeper internal capital markets which can substantially alleviate the consequences of limited external capital availability.

The analysis of firms' extensive and intensive margins of trade has three additional implications in the context of the model discussed in Section 2.2. First, our results are consistent with firms facing credit constraints in the financing of both fixed and variable costs of exporting. If financial frictions were binding only with respect to the fixed costs of international trade, they would hamper the extensive margin of firms' exports but not export revenues. Conversely, if only the funding of variable costs were affected, firms would limit their trade volumes but not necessarily expansion along the extensive margin.

Second, our findings indirectly confirm prior evidence in the literature that firms face repeated costs of exporting in each destination-product market they enter. If these fixed trade costs were instead market specific but invariant with product scope, or were constant at the product level regardless of the number of export destinations, credit constraints would have affected either only $\#Dest_{fi}$ or $\#Products_{fi}$, but not $\#ProdDest_{fi}$ or $\#Products_{fdi}$.

Finally, the results for firms' export product scope and trade-partner intensity imply that credit market imperfections distort trade flows above and beyond their effect on firms' domestic production. If cross-border sales were instead as sensitive to financial frictions as domestic activities, distortions to trade volumes would be proportional to distortions to total production but there would be no adjustments along the extensive margin of trade. Our findings are thus consistent with exporters being more reliant on external finance than domestic producers because they face additional upfront costs specific to international trade, have longer shipping times, and face greater transaction risks.

4.4 Export prices vs. export quantities

Recall that limited access to external capital can impede firms' export activity through different channels. Holding companies' potential profitability from foreign sales fixed, credit constraints can restrict firms' production capacity and preclude them from exporting at their full potential. In addition, financial frictions can reduce firms' export potential by curtailing productivity upgrading or improvements in product quality, because investments in superior technology, higher-quality inputs and more skilled workers are costly and frequently require outside finance.

While we do not directly observe firms' production efficiency or product quality, we can nevertheless shed light on these different mechanisms by exploiting the information on the export quantities that firms ship and the export prices that they charge. In particular, our data report both the value and quantities that firms sell by product and destination, which makes is possible to construct unit prices.

We can therefore decompose the effects of credit constraints on firms' bilateral exports into two components, by re-estimating specification (3) with either bilateral export quantities or bilateral export prices by firm-product-destination triplet as the outcome variable.

As reported in Table 9, we consistently find that joint ventures and foreign affiliates export greater volumes than private domestic firms in financially vulnerable sectors. This suggests that financial frictions likely operate in part by restricting firms' capacity to export at their full potential, i.e. by limiting their ability to obtain sufficient outside capital in order to export at first-best levels. The evidence for export prices, however, is less conclusive: While MNC affiliates set lower export prices in financially vulnerable sectors, joint ventures have higher unit values in such industries. On the one hand, if we interpret lower export prices as an indicator of more efficient production, the former result might imply that fully foreign-owned entities use their additional access to capital to improve productivity, reduce marginal production costs, and thereby boost exports. On the other hand, if we interpret higher export prices as a signal of higher product quality, the latter result might suggest that joint ventures have superior export performance relative to domestic manufacturers because laxer credit constraints allow them to improve quality. When this entails the use of more expensive inputs, it would manifest in higher marginal costs and possibly higher prices.[27] It is also possible that both fully and partly foreign-owned companies simultaneously undertake more productivity enhancing investments and more quality upgrading than domestic producers, but these adjustments have different net effects on export prices for MNC affiliates and joint ventures. Given the ambiguity of our results and the likely variation in mark-ups across firms, we leave it to future work to definitely establish the mechanisms through which financial frictions distort firms' export activity.

4.5 Trade costs across destinations

The interpretation of our results rests on the assumption that credit constraints restrict cross-border trade flows because firms are unable to finance the costs associated with exporting. Evidence that foreign affiliates ship relatively more than domestic firms not only in financially vulnerable sectors in general, but specifically when they face high export costs, would therefore confirm this mechanism and provide further support for our interpretation.

To establish this mechanism, we would ideally observe firms' actual trade costs in each product-destination market they enter. In the absence of such systematic data, we use instead two destination-specific proxies for the outlays associated with international transactions: bilateral distance from China, and an indicator for the costs of doing business in an economy. The former has commonly been used as a

[27] See Verhoogen (2008) and Manova and Zhang (2010) among others for theory and evidence relating input and output prices to input and output quality.

measure of the transportation costs of trade, and comes from CEPII.[28] The latter, on the other hand, captures the (log) monetary cost of setting up a new business in a country, relative to the country's average income (GDP per capita), and is obtained from the *Doing Business Report* of the World Bank. It reflects the fixed costs of business transactions, and has been used as a proxy for export entry costs in the prior literature.[29] Virtually identical results obtain when we instead use the number of procedures or the number of days needed to establish a new business from the same database (available on request).

Using these two measures of trade costs, we expand (3) to include three additional interaction terms:

$$\log Exports_{fdi} = \alpha_0 + \delta_0 \cdot TradeCost_d \cdot FinVuln_i + \delta_1 \cdot TradeCost_d \cdot D_{JV} + \delta_2 \cdot TradeCost_d \cdot D_{MNC}$$

$$+ \beta \cdot FinVuln_i \cdot TradeCost_d \cdot D_{JV} + \gamma \cdot FinVuln_i \cdot TradeCost_d \cdot D_{MNC} + \varphi_f + \varphi_d + \varphi_i + \varepsilon_{fi} \quad (7)$$

In this regression, the outcome variable is bilateral exports by firm and sector, $\log Exports_{fdi}$. The main variables of interest are the triple interaction terms. In particular, β and γ capture the extent to which the advantage of joint ventures and MNC affiliates in financially vulnerable sectors increases with export costs. We include firm, sector and destination fixed effects as before, as well as pair-wise interactions between the ownership dummies, sectors' financial vulnerability, and countries' trade costs. These additional controls allow the effects of trade costs on exports to vary with sectors' financial dependence regardless of ownership type (δ_0) and with firms' ownership type regardless of sector characteristics (δ_1 and δ_2).

As expected, we find that in financially more vulnerable industries, foreign affiliates export more than domestic firms to destinations associated with higher trade costs. This result obtains consistently across the four sector measures of financial dependence. In unreported regressions we have also confirmed that these patterns are robust to controlling for firm size or sectors' factor, contract and R&D intensity.[30] This very stringent test provides further corroborative evidence that financial frictions distort international trade flows and affect the sectoral composition of MNC activity.

5 Conclusion

This paper provides micro-level evidence on the harmful consequences of financial market imperfections for firms' ability to engage in international trade. We show that credit constraints

[28] The data on bilateral distance are available at http://www.cepii.fr/anglaisgraph/bdd/distances.htm.
[29] See for example Manova (2008b) and Helpman, Melitz and Rubinstein (2008).
[30] These robustness checks include interactions that allow firm size (sector controls) to enter equation (7) symmetrically with respect to foreign ownership (sectors' financial vulnerability).

severely restrict companies' overall export sales, hamper their capacity to enter more destination markets, and limit the range of products they trade.

We also demonstrate that MNC affiliates and joint ventures in China have superior export performance compared to private domestic firms, and that this advantage is systematically higher in sectors that require more external finance or have fewer collateralizable assets. These results are consistent with foreign affiliates accessing internal capital markets in order to overcome binding credit constraints, and thereby enjoying a comparative advantage in financially vulnerable industries. Our findings thus highlight the importance of credit conditions in determining the organizational and financing activities of multinational corporations.

One broader implication of our results is that foreign direct investment can mitigate the detrimental effects of credit market frictions on growth, trade and private sector development in financially underdeveloped economies. On the other hand, the 2007-2009 global crisis has raised concerns about the spread of financial shocks across countries via the financing and production decisions of multinational companies. Whether MNC activity and foreign capital flows improve steady-state credit conditions in host countries at the expense of greater volatility and exposure to world crises constitutes a fruitful area for future research.

References

Ahn, J.B., Khandelwal, A. and S.-J. Wei (2010). "The Role of Intermediaries in Facilitating Trade." *Journal of International Economics* (forthcoming).

Alfaro, L. and A. Charleton (2007). "International Financial Integration and Entrepreneurial Firm Dynamics." NBER Working Paper 13118.

Alfaro, L., A. Chanda, S. Kalemli-Ozcan and S. Sayek (2009). "Does Foreign Direct Investment Promote Growth? Exploring the Role of Financial Markets on Linkages." *Journal of Development Economics* 91(2), p.242-56.

Amiti, M. and D. Weinstein (2009). "Exports and Financial Shocks." *Columbia University mimeo.*

Antràs, P. (2003). "Firms, Contracts, and Trade Structure." *Quarterly Journal of Economics* 118 (4), p. 1374-418.

Antràs, P., Desai, M. and F. Foley (2008). "Multinational Firms, FDI Flows and Imperfect Capital Markets." *Quarterly Journal of Economics* 124(3), p.1171-219.

Auboin, M. (2009). "Boosting the Availability of Trade Finance in the Current Crisis: Background Analysis for a Substantial G20 Package." CEPR Working Paper 35.

Beck, T. (2003). "Financial Dependence and International Trade." *Review of International Economics* 11, p.296-316.

Beck, T. (2002). "Financial Development and International Trade. Is There a Link?" *Journal of International Economics* 57, p.107-31.

Beck, T., Demirgüç-Kunt, A., Laeven L. and R. Levine (2008). "Finance, Firm Size, and Growth." *Journal of Money, Banking and Finance* 40(7), p.1371-405.

Becker, B. and D. Greenberg (2007). "Financial Development, Fixed Costs and International Trade." *Harvard Business School mimeo*.

Berman, N. and J. Héricourt (2008). "Financial Factors and the Margins of Trade: Evidence from Cross-Country Firm-Level Data." CES Working Paper 2008.50.

Bernard, A., Jensen, J., Redding, S. and P. Schott (2007). "Firms in International Trade." *Journal of Economic Perspectives* 21(3), p.105-130.

Bernard, A., Redding, S. and P. Schott (2009). "Multi-Product Firms and Trade Liberalization." NBER Working Paper 12782.

Brainard, L. (1997). "An Empirical Assessment of the Proximity-Concentration Trade-off between Multinational Sales and Trade." *American Economic Review* 87, p.520-44.

Braun, M. (2003). "Financial Contractibility and Asset Hardness." *University of California - Los Angeles mimeo.*

Buch, C., I. Kesternich, A. Lipponer and M. Schnitzer (2009). "Financial Constraints and the Margins of FDI." *University of Munich mimeo.*

Bustos, P. (2007). "FDI as a Source of Finance in Imperfect Capital Markets: Firm-Level Evidence from Argentina." *University of Barcelona - CREI mimeo.*

Chaney, T. (2005). "Liquidity Constrained Exporters." *University of Chicago mimeo*.

Chor, D., F. Foley and K. Manova (2007). "Host Country Financial Development and MNC Activity." *Stanford University mimeo.*

Chor, D. and K. Manova (2009). "Off the Cliff and Back: Credit Conditions and International Trade during the Global Financial Crisis." *Stanford University mimeo*.

Claessens, S. and L. Laeven (2003). "Financial Development, Property Rights, and Growth." *Journal of Finance* 58(6), p.2401-37.

Desai, M., F. Foley and K. Forbes (2008). "Financial Constraints and Growth: Multinational and Local Firm Responses to Currency Depreciations." *Review of Financial Studies* 21(6), p.2857-88.

Desai, M., F. Foley and J. Hines (2004). "A Multinational Perspective on Capital Structure Choice and Internal Capital Markets." *Journal of Finance* 59, p.2451-88.

Dollar, D. and S.-J. Wei (2007). "Das (Wasted) Kapital: Firm Ownership and Investment Efficiency in China." NBER Working Paper 13103.

Freund, C. and L. Klapper (2009). "Has the Decline in the Supply of Financing Affected Trade during the Crisis?" *World Bank mimeo.*

Gertler, M. and S. Gilchrist (1994). "Monetary Policy, Business Cycles, and the Behavior of Small Manufacturing Firms." *Journal of Financial Economics* 109, p.309-40.

Girma, S. and H. Gorg (2009). "Foreign Direct Investment, Access to Finance, and Innovation Activity in Chinese Enterprises." *University of Nottingham mimeo.*

Greenaway, D., Guariglia, A. and R. Kneller (2007). "Financial Factors and Exporting Decisions." *Journal of International Economics* 73(2), p.377-95.

Guiso, L., Sapienza, P. and L. Zingales (2004). "Does Local Financial Development Matter?" *Quarterly Journal of Economics* 119, p.929-69.

Harrison, A., M. McMillan and I. Love (2004). "Global Capital Flows and Financing Constraints." *Journal of Development Economics* 75(1), p.269-301.

Helpman, E. (1984). "A Simple Theory of International Trade with Multinational Corporations." *Journal of Political Economy* 92, p.451–71.

Helpman, E., M. Melitz, and Y. Rubinstein (2008). "Estimating trade Flows: trading Partners and trading Volumes." *Quarterly Journal of Economics* 123, p.441-87.

Helpman, E., M. Melitz, and S. Yeaple (2004). "Exports versus FDI with Heterogeneous Firms." *American Economic Review* 94, p.300–16.

Héricourt, J. and S. Poncet (2009). "FDI and Credit Constraints: Firm-Level Evidence from China." *University Paris I mimeo.*

Huang, Y., Y. Ma, Z. Yang and Y. Zhang (2008). "A Fire Sale without Fire: An Explanation of Labor-Intensive FDI in China." *MIT mimeo.*

Hur, J., Raj, M. and Y. Riyanto (2006). "Finance and Trade: A Cross-Country Empirical Analysis on the Impact of Financial Development and Asset Tangibility on International Trade." *World Development* 34(10), p.1728-41.

Iacovone, L. and V. Zavacka (2009). "Banking Crises and Exports: Lessons from the Past." World Bank Policy Research Working Paper 5016.

Javorcik, B. and M. Spatareanu (2009). "Liquidity Constraints and Linkages with Multinationals." *Oxford University mimeo.*

Javorcik, B. and S.-J. Wei (2009). "Corruption and Cross-Border Investment in Emerging Markets: Firm-Level Evidence." *Journal of International Money and Finance* 28(4), p.605-24.

Ju, J. and S.-J. Wei (2005). "Endowment vs. Finance: A Wooden Barrel Theory of International Trade." CEPR Discussion Paper 5109.

Ju, J. and S.-J. Wei, (2008). "When Is Quality of Financial System a Source of Comparative Advantage?" NBER working paper 13984. *Journal of International Economics* (forthcoming).

Ju, J. and S.-J. Wei, (2010). "Domestic Institutions and the Bypass Effect of Financial Globalization." *American Economic Journal: Economic Policy* 2(4), p.173–204.

Kletzer, K. and P. Bardhan (1987). "Credit Markets and Patterns of International Trade." *Journal of Development Economics* 27, p.57-70.

Kroszner, D., Laeven, L. and R. Klingebiel (2007). "Banking Crises, Financial Dependence, and Growth." *Journal of Financial Economics* 84(1), p.187-228.

Manova, K. (2008a). "Credit Constraints, Equity Market Liberalizations and International Trade." *Journal of International Economics* 76, p.33-47.

Manova, K. (2008b). "Credit Constraints, Heterogeneous Firms and International Trade." NBER Working Paper 14531.

Manova, K. and Z. Zhang (2008). "China's Exporters and Importers: Firms, Products, and Trade Partners." *Stanford University mimeo.*

Manova, K. and Z. Zhang (2010). "Export Prices across Firms and Destinations." *Stanford University mimeo.*

Markusen, J. (1984). “Multinationals, Multi-Plant Economies, and the Gains from Trade,” *Journal of International Economics* 16, p.205–26.

Markusen, J. and A. Venables (2000). “The Theory of Endowment, Intraindustry and Multi-national Trade,” *Journal of International Economics* 52, p.209–34.

Matsuyama, K. (2005). "Credit Market Imperfections and Patterns of International Trade and Capital Flows." *Journal of the European Economic Association* 3, p.714-23.

Melitz, M. (2003). "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity." *Econometrica* 71(6), p.1695-725.

Minetti, R. and S.C. Zhu (2010). “Credit constraints and firm export: microeconomic evidence from Italy.” *Journal of International Economics* (forthcoming).

Muûls, M. (2008). "Exporters and Credit Constraints. A Firm Level Approach." *London School of Economics mimeo*.

Nunn, N. (2007). "Relationship-Specificity, Incomplete Contracts, and the Pattern of Trade." *Quarterly Journal of Economics* 122(2), p.569-600.

Poncet, S., W. Steingrass and H. Vandenbussche (2008). “Financial Constraints in China: Firm-Level Evidence.” *University Paris I mimeo.*

Rajan, R. and L. Zingales (1998). "Financial Dependence and Growth." *American Economic Review* 88, p.559-86.

Svaleryd, H. and J. Vlachos (2005). "Financial Markets, the Pattern of Industrial Specialization and Comparative Advantage: Evidence from OECD Countries." *European Economic Review* 49, p.113-44.

Tong, H. and S.-J. Wei (2010). "The Composition Matters: Capital Inflows and Liquidity Crunch During a Global Economic Crisis." *Review of Financial Studies* (forthcoming).

Verhoogen, E. (2008). "Trade, Quality Upgrading and Wage Inequality in the Mexican Manufacturing Sector." *Quarterly Journal of Economics* 123(2), p.489-530.

Yeaple, S. (2003). “The Role of Skill Endowments in the Structure of U.S. Outward FDI.” *Review of Economics and Statistics* 85, p.726-34.

Table 1. Distribution of Trade Flows across Firms and Sectors

This table examines the distribution of Chinese trade flows across firms with different organizational structure and across sectors with different levels of financial vulnerability, in 2005. All sector measures come from KLK and are based on 1980-1999 Compustat data for U.S. firms. External finance dependence is the share of capital expenditures not financed with cash flows from operations. R&D intensity is the share of R&D expenditures in total sales. The inventories ratio is the ratio of inventories to sales. Asset tangibility is the share of net plant, property and equipment in total book value assets. The trade values in the first column are in billion US Dollars. The percentage shares reported in each row sum to 1.

Firm Type	All Firms	State-Owned	Private Domestic	Joint Ventures	Foreign-Owned
Total Exports	531.36	9.8%	12.9%	26.3%	51.0%
Panel A. Classifying sectors by external finance dependence					
Low	58.88	10.7%	21.1%	27.6%	40.6%
Medium	234.09	11.8%	12.0%	24.1%	52.1%
High	238.38	7.6%	11.6%	28.2%	52.6%
Panel B. Classifying sectors by R&D intensity					
Low	156.18	18.1%	23.1%	28.4%	30.4%
High	375.18	6.3%	8.6%	25.4%	59.6%
Panel C. Classifying sectors by inventories ratio					
Low	52.55	22.4%	21.2%	28.7%	27.6%
Medium	95.89	19.2%	25.2%	27.7%	27.9%
High	382.91	5.7%	8.6%	25.6%	60.0%
Panel D. Classifying sectors by asset tangibility					
Low	384.20	5.7%	8.6%	25.6%	60.1%
Medium	91.07	15.6%	25.8%	28.5%	30.1%
High	56.09	28.4%	20.8%	27.6%	23.2%

Table 2. Firm Exports by Sector

This table examines the effect of credit constraints on (log) firm exports by 3-digit ISIC sector in 2005. Each column reports results using a different measure of sectors' financial vulnerability. These measures come from KLK and are based on 1980-1999 Compustat data for U.S. firms. External finance dependence is the share of capital expenditures not financed with cash flows from operations. R&D intensity is the share of R&D expenditures in total sales. The inventories ratio is the ratio of inventories to sales. Asset tangibility is the share of net plant, property and equipment in total book value assets. All regressions include a constant term and sector fixed effects, and employ robust standard errors. T-statistics in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10% level.

Dependent variable: (log) firm exports by 3-digit ISIC sector

Sector measure of financial vulnerability:	Ext Finance Dependence	R&D Intensity	Inventories Ratio	Asset Tangibility
Joint venture	0.525 (28.12)***	0.343 (14.27)***	-0.297 (-3.64)***	1.022 (20.04)***
Foreign owned	0.320 (21.17)***	-0.025 (-1.24)	-0.904 (-13.04)***	1.328 (31.02)***
Joint venture x Financial vulnerability	**0.336** **(5.74)***	**7.317** **(8.77)***	**4.739** **(10.06)***	**-1.866** **(-10.53)***
Foreign owned x Financial vulnerability	**0.511** **(10.95)***	**13.979** **(21.43)***	**7.053** **(17.63)***	**-3.773** **(-25.40)***
Controls:		Sector F.E.		
R-squared	0.151	0.152	0.151	0.153
# observations	209,329	209,329	209,329	209,329
# firms	88,005	88,005	88,005	88,005
# sectors	29	29	29	29

Table 3. Firm Exports by Sector: Firm Fixed Effects

This table identifies the effect of credit constraints on (log) firm exports from the within-firm variation across 3-digit ISIC sectors in 2005. Each column reports results using a different measure of sectors' financial vulnerability. These measures come from KLK and are based on 1980-1999 Compustat data for U.S. firms. External finance dependence is the share of capital expenditures not financed with cash flows from operations. R&D intensity is the share of R&D expenditures in total sales. The inventories ratio is the ratio of inventories to sales. Asset tangibility is the share of net plant, property and equipment in total book value assets. All regressions include a constant term, firm fixed effects and sector fixed effects, and employ robust standard errors. T-statistics in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10% level.

Dependent variable: (log) firm exports by 3-digit ISIC sector

Sector measure of financial vulnerability:	Ext Finance Dependence	R&D Intensity	Inventories Ratio	Asset Tangibility
Joint venture x Financial vulnerability	0.787	13.360	8.511	-3.110
	(8.98)***	(8.95)***	(10.96)***	(-11.02)***
Foreign owned x Financial vulnerability	0.757	17.009	8.417	-3.988
	(11.10)***	(15.96)***	(13.68)***	(-17.99)***
Controls:	Firm F.E., Sector F.E.			
R-squared	0.525	0.526	0.526	0.526
# observations	209,317	209,317	209,317	209,317
# firms	88,004	88,004	88,004	88,004
# sectors	29	29	29	29

Table 4. Robustness I: Other Sector Characteristics

This table tests the robustness of the effect of credit constraints on (log) firm exports by 3-digit ISIC sector in 2005 to controlling for other sector characteristics. Each column reports results using a different measure of sectors' financial vulnerability. These measures come from KLK and are based on 1980-1999 Compustat data for U.S. firms. External finance dependence is the share of capital expenditures not financed with cash flows from operations. R&D intensity is the share of R&D expenditures in total sales. The inventories ratio is the ratio of inventories to sales. Asset tangibility is the share of net plant, property and equipment in total book value assets. Physical (K) and human (H) capital intensity come form Braun (2003) and are based on 1985-1995 U.S. data. Contract intensity reflects the importance of relationship-specific investments in the production of inputs for a given sector, from Nunn (2007). All regressions include a constant term, firm fixed effects and sector fixed effects, and employ robust standard errors. T-statistics in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10% level.

Panel A. Controlling for sectors' physical and human capital intensity

Dependent variable: (log) firm exports by 3-digit ISIC sector

Sector measure of financial vulnerability:	Ext Finance Dependence	R&D Intensity	Inventories Ratio	Asset Tangibility
Joint venture x Financial vulnerability	**0.751**	**8.934**	**3.485**	**-0.065**
	(8.25)* **	**(5.32)*** **	**(3.78)*** **	**(-0.12)**
Foreign owned x Financial vulnerability	**0.680**	**13.220**	**2.992**	**-2.776**
	(9.49)* **	**(10.97)*** **	**(4.00)*** **	**(-6.66)*** **
Joint venture x K intensity	-17.57	-15.93	-14.77	-17.40
	(-14.76)***	(-12.94)***	(-10.65)***	(-8.03)***
Foreign owned x K intensity	-17.97	-15.68	-15.63	-8.94
	(-19.11)***	(-16.19)***	(-13.96)***	(-5.33)***
Joint venture x H intensity	1.69	1.51	1.84	2.01
	(8.63)***	(7.07)***	(9.31)***	(9.77)***
Foreign owned x H intensity	1.75	1.32	1.92	1.69
	(11.81)***	(8.20)***	(12.89)***	(10.93)***
Controls:	Firm F.E., Sector F.E.			
R-squared	0.528	0.528	0.528	0.528
# observations	203,989	203,989	203,989	203,989
# firms	87,291	87,291	87,291	87,291
# sectors	28	28	28	28

Table 4. Robustness I: Other Sector Characteristics (cont.)

This table tests the robustness of the effect of credit constraints on (log) firm exports by 3-digit ISIC sector in 2005 to controlling for other sector characteristics. Each column reports results using a different measure of sectors' financial vulnerability. These measures come from KLK and are based on 1980-1999 Compustat data for U.S. firms. External finance dependence is the share of capital expenditures not financed with cash flows from operations. R&D intensity is the share of R&D expenditures in total sales. The inventories ratio is the ratio of inventories to sales. Asset tangibility is the share of net plant, property and equipment in total book value assets. Physical (K) and human (H) capital intensity come form Braun (2003) and are based on 1985-1995 U.S. data. Contract intensity reflects the importance of relationship-specific investments in the production of inputs for a given sector, from Nunn (2007). All regressions include a constant term, firm fixed effects and sector fixed effects, and employ robust standard errors. T-statistics in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10% level.

Panel B. Controlling for sectors' R&D intensity

Dependent variable: (log) firm exports by 3-digit ISIC sector

Sector measure of financial vulnerability:	Ext Finance Dependence	Inventories Ratio	Asset Tangibility
Joint venture x Financial vulnerability	**0.412**	**7.237**	**-2.614**
	(3.72)* **	**(9.11)*** **	**(-9.02)*** **
Foreign owned x Financial vulnerability	**0.050**	**6.497**	**-3.270**
	(0.55)	**(10.30)*** **	**(-14.25)*** **
Joint venture x R&D intensity	9.205	10.466	10.128
	(4.87)***	(6.85)***	(6.59)***
Foreign owned x R&D intensity	16.475	14.445	12.879
	(11.66)***	(13.19)***	(11.65)***
Controls:	Firm F.E., Sector F.E.		
R-squared	0.526	0.527	0.527
# observations, # firms, # sectors	209,317 observations, 88,004 firms, 29 sectors		

Panel C. Controlling for sectors' contract intensity

Dependent variable: (log) firm exports by 3-digit ISIC sector

Sector measure of financial vulnerability:	Ext Finance Dependence	R&D Intensity	Inventories Ratio	Asset Tangibility
Joint venture x Financial vulnerability	**0.788**	**14.236**	**8.558**	**-3.247**
	(9.00)* **	**(9.38)*** **	**(11.01)*** **	**(-11.40)*** **
Foreign owned x Financial vulnerability	**0.747**	**16.845**	**8.389**	**-3.949**
	(10.95)* **	**(15.50)*** **	**(13.63)*** **	**(-17.70)*** **
Joint venture x Contract intensity	-0.483	-1.009	-0.720	-0.962
	(-1.75)*	(-3.60)***	(-2.61)***	(-3.46)***
Foreign owned x Contract intensity	0.879	0.231	0.749	0.396
	(3.96)***	(1.02)	(3.37)***	(1.78)*
Controls:	Firm F.E., Sector F.E.			
R-squared	0.525	0.526	0.526	0.526
# observations, # firms, # sectors	209,317 observations, 88,004 firms, 29 sectors			

Table 5. Robustness II: Foreign Ownership vs. Firm Size

This table tests the robustness of the effect of credit constraints on (log) firm exports by 3-digit ISIC sector in 2005 to controlling for firm size. Each column reports results using a different measure of sectors' financial vulnerability. These measures come from KLK and are based on 1980-1999 Compustat data for U.S. firms. External finance dependence is the share of capital expenditures not financed with cash flows from operations. R&D intensity is the share of R&D expenditures in total sales. The inventories ratio is the ratio of inventories to sales. Asset tangibility is the share of net plant, property and equipment in total book value assets. Firm size is proxied by firms' (log) total worlwide exports. All regressions include a constant term, firm fixed effects and sector fixed effects, and employ robust standard errors. T-statistics in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10% level.

Dependent variable: (log) firm exports by 3-digit ISIC sector

Sector measure of financial vulnerability:	Ext Finance Dependence	R&D Intensity	Inventories Ratio	Asset Tangibility
Joint venture x Financial vulnerability	**0.690**	**10.604**	**6.670**	**-2.569**
	(7.91)* **	**(7.19)*** **	**(8.63)*** **	**(-9.18)*** **
Foreign owned x Financial vulnerability	**0.692**	**14.903**	**7.259**	**-3.687**
	(10.23)* **	**(14.22)*** **	**(11.93)*** **	**(-16.82)*** **
Firm size x Financial vulnerability	0.188	4.136	3.316	-1.289
	(11.15)***	(16.06)***	(21.84)***	(-23.98)***
Controls:	Firm F.E., Sector F.E.			
R-squared	0.526	0.527	0.528	0.529
# observations	209,317	209,317	209,317	209,317
# firms	88,004	88,004	88,004	88,004
# sectors	29	29	29	29

Table 6. The Intensive Margin of Trade: Firm Exports by Sector and Destination

This table examines the effect of credit constraints on the intensive margin of firm exports in 2005. The dependent variable is (log) firm exports by 3-digit ISIC sector and destination in Panel A, and (log) firm exports by 8-digit HS product and destination in Panel B. Each column reports results using a different measure of sectors' financial vulnerability. These measures come from KLK and are based on 1980-1999 Compustat data for U.S. firms. External finance dependence is the share of capital expenditures not financed with cash flows from operations. R&D intensity is the share of R&D expenditures in total sales. The inventories ratio is the ratio of inventories to sales. Asset tangibility is the share of net plant, property and equipment in total book value assets. All regressions include a constant term, firm, destination and sector fixed effects, and employ robust standard errors. T-statistics in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10% level.

Sector measure of financial vulnerability:	Ext Finance Dependence	R&D Intensity	Inventories Ratio	Asset Tangibility
Panel A. Dep. variable: (log) firm exports by 3-digit ISIC sector and destination				
Joint venture x Financial vulnerability	0.783	12.796	10.022	-3.150
	(23.94)***	(22.70)***	(31.69)***	(-27.52)***
Foreign owned x Financial vulnerability	0.708	12.769	11.412	-4.207
	(27.21)***	(30.01)***	(45.27)***	(-45.92)***
Controls:	Firm F.E., Destination F.E., Sector F.E.			
R-squared	0.370	0.370	0.371	0.371
# observations	953,475	953,475	953,475	953,475
# firms, # destinations, # sectors	88,004 firms, 231 destinations, 29 sectors			
Panel B. Dep. variable: (log) firm exports by 8-digit HS product and destination				
Joint venture x Financial vulnerability	0.715	8.571	8.893	-2.732
	(28.31)***	(20.40)***	(35.71)***	(-30.63)***
Foreign owned x Financial vulnerability	0.655	6.484	10.795	-3.653
	(32.77)***	(20.55)***	(54.95)***	(-51.41)***
Controls:	Firm F.E., Destination F.E., Sector F.E.			
R-squared	0.332	0.332	0.333	0.333
# observations	1,824,950	1,824,950	1,824,950	1,824,950
# firms, # destinations, # products	88,004 firms, 231 destinations, 6,054 products			

Table 7. The Extensive Margin of Trade I: Firm # Products and # Destinations by Sector

This table examines the effect of credit constraints on the extensive margin of firm exports in 2005. In Panel A, the dependent variable is the (log) number of destination-HS-8 product markets firms enter, by 3-digit ISIC sector. In Panel B, it is the (log) number of destinations firms export to, by 3-digit ISIC sector. In Panel C, it is the (log) number of 8-digit HS products firms export to at least one country, by 3-digit ISIC sector. Each column reports results using a different measure of sectors' financial vulnerability. These measures come from KLK and are based on 1980-1999 Compustat data for U.S. firms. External finance dependence is the share of capital expenditures not financed with cash flows from operations. R&D intensity is the share of R&D expenditures in total sales. The inventories ratio is the ratio of inventories to sales. Asset tangibility is the share of net plant, property and equipment in total book value assets. All regressions include a constant term, firm fixed effects and sector fixed effects, and employ robust standard errors. T-statistics in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10% level.

Sector measure of financial vulnerability:	Ext Finance Dependence	R&D Intensity	Inventories Ratio	Asset Tangibility
Panel A. Dep variable: (log) firm # destination-product pairs by 3-digit ISIC sector				
Joint venture x Financial vulnerability	0.161***	3.750***	0.966***	-0.473***
Foreign owned x Financial vulnerability	0.050*	3.960***	0.285	-0.523***
R-squared	0.538	0.538	0.538	0.538
Panel B. Dep variable: (log) firm # destinations by 3-digit ISIC sector				
Joint venture x Financial vulnerability	0.178***	3.581***	1.002***	-0.408***
Foreign owned x Financial vulnerability	0.096***	3.002***	0.213	-0.317***
R-squared	0.569	0.569	0.569	0.569
Panel C. Dep variable: (log) firm # HS-8 products exported by 3-digit ISIC sector				
Joint venture x Financial vulnerability	-0.037*	1.087***	-0.445**	-0.049
Foreign owned x Financial vulnerability	-0.089***	2.076***	-0.737***	-0.120**
R-squared	0.597	0.597	0.597	0.597
Controls:	Firm F.E., Sector F.E.			
# observations, # firms, # sectors	209,317 observations, 88,004 firms, 29 sectors			

Table 8. The Extensive Margin of Trade II: Firm # Products by Sector and Destination

This table examines the effect of credit constraints on the extensive margin of firm exports in 2005. The dependent variable is the (log) number of 8-digit HS products firms export by 3-digit ISIC sector and destination. Each column reports results using a different measure of sectors' financial vulnerability. These measures come from KLK and are based on 1980-1999 Compustat data for U.S. firms. External finance dependence is the share of capital expenditures not financed with cash flows from operations. R&D intensity is the share of R&D expenditures in total sales. The inventories ratio is the ratio of inventories to sales. Asset tangibility is the share of net plant, property and equipment in total book value assets. All regressions include a constant term, firm, destination and sector fixed effects, and employ robust standard errors. T-statistics in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10% level.

Dependent variable: (log) firm # HS-8 products exported by 3-digit ISIC sector and destination

Sector measure of financial vulnerability:	Ext Finance Dependence	R&D Intensity	Inventories Ratio	Asset Tangibility
Joint venture x Financial vulnerability	-0.001	1.200	0.585	-0.299
	(-0.21)	(10.26)***	(9.39)***	(-13.14)***
Foreign owned x Financial vulnerability	-0.046	1.632	0.690	-0.459
	(-8.10)***	(16.91)***	(13.29)***	(-23.70)***
Controls:	Firm F.E., Destination F.E., Sector F.E.			
R-squared	0.352	0.353	0.352	0.353
# observations	953,475	953,475	953,475	953,475
# firms, # destinations, # sectors	88,004 firms, 231 destinations, 29 sectors			

Table 9. Export Prices vs. Export Quantities

This table examines the effect of credit constraints on the intensive margin of firm exports in 2005. The dependent variable is (log) firm export quantity or (log) firm export unit price by 8-digit HS product and destination in Panel A and Panel B respectively, after these variables have been demeaned by their product-specific average. Each column reports results using a different measure of sectors' financial vulnerability. These measures come from KLK and are based on 1980-1999 Compustat data for U.S. firms. External finance dependence is the share of capital expenditures not financed with cash flows from operations. R&D intensity is the share of R&D expenditures in total sales. The inventories ratio is the ratio of inventories to sales. Asset tangibility is the share of net plant, property and equipment in total book value assets. All regressions include a constant term, firm, destination and sector fixed effects, and employ robust standard errors. T-statistics in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10% level.

Sector measure of financial vulnerability:	Ext Finance Dependence	R&D Intensity	Inventories Ratio	Asset Tangibility
Panel A. Dep. variable: (log) firm export quantity by 8-digit HS product and destination				
Joint venture x Financial vulnerability	0.262 (10.28)***	2.977 (7.02)***	5.262 (22.17)***	-2.030 (-23.30)***
Foreign owned x Financial vulnerability	0.446 (21.71)***	5.411 (16.44)***	7.525 (39.33)***	-2.867 (-40.45)***
Controls:	Firm F.E., Destination F.E., Sector F.E.			
R-squared	0.267	0.267	0.268	0.268
# observations	1,815,596	1,815,596	1,815,596	1,815,596
# firms, # destinations, # sectors	87,939 firms, 231 destinations, 29 sectors			
Panel B. Dep. variable: (log) firm export price by 8-digit HS product and destination				
Joint venture x Financial vulnerability	0.067 (4.75)***	1.448 (5.75)***	0.236 (1.91)*	0.098 (2.27)**
Foreign owned x Financial vulnerability	-0.128 (-11.61)***	-1.909 (-10.15)***	-1.239 (-12.85)***	0.430 (12.67)***
Controls:	Firm F.E., Destination F.E., Sector F.E.			
R-squared	0.442	0.442	0.442	0.442
# observations	1,815,596	1,815,596	1,815,596	1,815,596
# firms, # destinations, # products	88,004 firms, 231 destinations, 6,054 products			

Table 10. Trade Costs across Destinations

This table examines the effect of credit constraints on firm exports across destinations with different trade costs, in 2005. The dependent variable is (log) firm exports by 3-digit ISIC sector and destination. Panel A studies destinations' (log) distance from China. Panel B studies destinations' (log) cost of exporting, from the World Bank's *Doing Business* report. Each column reports results using a different measure of sectors' financial vulnerability. These measures come from KLK and are based on 1980-1999 Compustat data for U.S. firms. External finance dependence is the share of capital expenditures not financed with cash flows from operations. R&D intensity is the share of R&D expenditures in total sales. The inventories ratio is the ratio of inventories to sales. Asset tangibility is the share of net plant, property and equipment in total book value assets. All regressions include a constant term, firm, sector and destination fixed effects, and employ robust standard errors. T-statistics in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10% level.

Dependent variable: (log) firm exports by 3-digit ISIC sector and destination

Sector measure of financial vulnerability:	Ext Finance Dependence	R&D Intensity	Inventories Ratio	Asset Tangibility
Panel A. Destination characteristic: (log) distance to China				
Joint venture x Distance	0.063***	0.028***	-0.145***	0.148***
Foreign owned x Distance	0.028***	-0.003	-0.209***	0.137***
Distance x Financial vulnerability	-0.071***	-2.616***	-1.176***	0.274***
Joint x Distance x Fin vulnerability	**0.088*** **	**1.441*** **	**1.144*** **	**-0.359*** **
Foreign x Distance x Fin vulnerability	**0.078*** **	**1.382*** **	**1.287*** **	**-0.476*** **
Controls:	Firm F.E., Destination F.E., Sector F.E.			
R-squared	0.370	0.370	0.371	0.371
# observations	952,463	952,463	952,463	952,463
# firms, # destinations, # sectors	88,001 firms, 210 destinations, 29 sectors			
Panel B. Destination characteristic: (log) cost of doing business				
Joint venture x Cost	-0.070***	-0.139***	-0.523***	0.104***
Foreign owned x Cost	-0.138***	-0.210***	-0.629***	0.096***
Cost x Financial vulnerability	-0.107***	-2.066***	-2.328***	0.861***
Joint x Cost x Fin vulnerability	**0.195*** **	**2.524*** **	**2.564*** **	**-0.682*** **
Foreign x Cost x Fin vulnerability	**0.174*** **	**2.726*** **	**2.787*** **	**-0.899*** **
Controls:	Firm F.E., Destination F.E., Sector F.E.			
R-squared	0.372	0.372	0.373	0.373
# observations	885,938	885,938	885,938	885,938
# firms, # destinations, # sectors	87,103 firms, 139 destinations, 29 sectors			

Appendix Table 1. Industry Characteristics

This table lists all sector measures used in the empirical analysis, by 3-digit ISIC sector. The bottom two rows of the table report the mean and standard deviation of these measures across the 29 sectors.

ISIC	Industry	Ext Fin Depend	R&D Intensity	Invent Ratio	Asset Tangibility	Physical K Intensity	Human K Intensity	Contract Intensity
311	Food products	-0.15	0.01	0.10	0.37	0.06	0.81	0.56
313	Beverages	0.03	0.00	0.10	0.40	0.06	1.13	0.95
314	Tobacco	-1.14	0.00	0.28	0.19	0.02	1.35	0.48
321	Textiles	0.01	0.01	0.17	0.31	0.07	0.69	0.82
322	Apparel	-0.21	0.00	0.21	0.15	0.02	0.50	0.98
323	Leather products	-0.95	0.01	0.23	0.12	0.03	0.69	0.85
324	Footwear	-0.74	0.01	0.22	0.13	0.02	0.53	0.93
331	Wood products	0.05	0.01	0.11	0.32	0.07	0.74	0.67
332	Furniture	-0.38	0.01	0.15	0.28	0.04	0.70	0.91
341	Paper products	-0.35	0.01	0.13	0.42	0.13	1.14	0.89
342	Printing and publishing	-0.42	0.01	0.07	0.21	0.05	0.93	1.00
352	Other chemical products	-0.30	0.02	0.15	0.27	0.06	1.21	0.95
353	Petroleum refineries	-0.02	0.00	0.07	0.62	0.20	1.66	0.76
354	Petroleum and coal products	0.13	0.01	0.12	0.46	0.07	1.15	0.89
355	Rubber products	-0.02	0.02	0.15	0.36	0.07	0.99	0.92
356	Plastic products	-0.02	0.02	0.13	0.38	0.09	0.83	0.98
361	Pottery, china, earthenware	-0.41	0.02	0.17	0.28	0.05	0.80	0.95
362	Glass products	0.03	0.02	0.15	0.42	0.09	1.01	0.97
369	Non-metallic products	-0.29	0.01	0.15	0.48	0.07	0.95	0.96
371	Iron and steel	0.05	0.01	0.17	0.44	0.10	1.25	0.82
372	Non-ferrous metals	-0.12	0.01	0.16	0.32	0.10	1.10	0.46
381	Fabricated metal products	-0.25	0.01	0.17	0.28	0.05	0.91	0.94
382	Machinery, except electrical	-0.04	0.02	0.20	0.22	0.06	1.12	0.97
383	Electrical machinery	0.24	0.07	0.18	0.21	0.08	1.06	0.96
384	Transport equipment	-0.08	0.02	0.18	0.23	0.07	1.32	0.98
385	Prof and scient equipment	0.72	0.09	0.21	0.16	0.05	1.23	0.98
390	Other manufactured products	0.28	0.02	0.20	0.18	0.04	0.76	0.86
3511	Industrial chemicals	-0.19	0.03	0.14	0.43	0.12	1.41	0.88
3513	Synthetic resins	0.03	0.03	0.13	0.40			0.88
	Average across Industries	-0.1555	0.0176	0.1586	0.3117	0.0695	0.9995	0.8677
	St Dev across Industries	0.3636	0.0192	0.0476	0.1220	0.0376	0.2771	0.1475

Appendix Table 2. Correlations between Industry Characteristics

	Ext Fin Depend	R&D Intensity	Invent Ratio	Asset Tangibility	Physical K Intensity	Human K Intensity	Contract Intensity
Ext Fin Dependence	1.000						
R&D Intensity	0.562	1.000					
Inventories Ratio	-0.321	0.205	1.000				
Asset Tangibility	0.251	-0.278	-0.691	1.000			
Physical K Intensity	0.324	-0.015	-0.588	0.808	1.000		
Human K Intensity	0.190	0.170	-0.195	0.492	0.646	1.000	
Contract Intensity	0.255	0.312	-0.056	-0.115	-0.112	-0.140	1.000

Appendix Table 3. Joint Tests

This table performs joint tests for the effect of credit constraints on firm export activity in 2005, using all four industry measures of financial vulnerability in the same regression. Each column reports results for a different outcome variable as described in the column heading. All regressions include a constant term, firm and sector fixed effects, and employ robust standard errors. T-statistics in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10% level.

Dependent variable:	(log) firm exports by sector	(log) firm exports by sector and destination	(log) firm exports by product and destination	(log) # product-destination markets by firm and sector	(log) # destinations by firm and sector	(log) # products by firm and sector	(log) # products by firm, sector and destination
Joint venture x Ext Fin Dependence	0.694 (5.97)***	0.702 (16.20)***	0.762 (22.98)***	0.046 (1.00)	0.083 (2.23)**	-0.144 (-4.90)***	-0.061 (-6.44)***
Foreign owned x Ext Fin Dependence	0.405 (4.27)***	0.641 (17.92)***	0.895 (33.06)***	-0.177 (-4.90)***	-0.034 (-1.17)	-0.322 (-13.43)***	-0.171 (-21.37)***
Joint venture x R&D Intensity	2.072 (1.02)	1.975 (2.59)***	-1.602 (-2.85)***	2.892 (3.66)***	2.343 (3.69)***	2.802 (5.37)***	1.628 (9.67)***
Foreign owned x R&D Intensity	8.306 (5.42)***	1.441 (2.41)**	-6.138 (-14.05)***	5.599 (9.55)***	3.238 (7.02)***	5.741 (14.06)***	3.052 (21.90)***
Joint venture x Inventories Ratio	3.906 (3.95)***	6.864 (14.85)***	6.395 (17.16)***	-0.076 (-0.23)	0.202 (0.71)	-0.945 (-4.35)***	-0.050 (-0.59)
Foreign owned x Inventories Ratio	1.142 (1.44)	5.829 (15.63)***	6.661 (22.24)***	-1.223 (-4.68)***	-0.763 (-3.50)***	-1.558 (-8.85)***	-0.339 (-4.94)***
Joint venture x Asset Tangibility	-2.172 (-5.81)***	-1.351 (-7.84)***	-1.121 (-8.18)***	-0.356 (-2.73)***	-0.254 (-2.36)**	-0.121 (-1.41)	-0.230 (-7.17)***
Foreign owned x Asset Tangibility	-3.266 (-10.89)***	-2.643 (-18.81)***	-2.186 (-19.50)***	-0.496 (-4.87)***	-0.320 (-3.85)***	-0.157 (-2.23)**	-0.374 (-13.93)***
Firm F.E.	Y	Y	Y	Y	Y	Y	Y
Sector F.E.	Y	Y	Y	Y	Y	Y	Y
Destination F.E.	--	Y	Y	--	--	--	Y
R-squared	0.527	0.373	0.334	0.538	0.569	0.598	0.353
# observations	209,317	953,475	1,824,950	209,317	209,317	209,317	953,475