FINANCIAL DEVELOPMENT AND FIRM INTERNATIONALIZATION: THEORY AND EVIDENCE

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Lei Hou

Referent:	Professor Dr. Dalia Marin
Korreferent:	Professor Dr. Gerhard Illing
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To my parents

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Chapter 1

Introduction

Firms globalizing their operations have become a major feature of the world economy. Global firms, either exporters or multinational firms, rely more heavily on external finance compared to their domestic peers. Investigating the role of financial development on firm internationalization is an emerging topic in academic research. Moreover, the recent turmoil in the financial markets and simultaneous collapse in international trade and foreign direct investment (henceforth FDI) demonstrate the significance and urgency of such a research. During the recent financial crisis, global FDI inflows fell by 14% in 2008 to $1,697 billion, from a record high of $1,979 billion in 2007 and fell at an accelerated rate in 2009 (World Investment Report, 2009). Meanwhile, world trade experienced the largest decline in more than 70 years. The rate of trade growth slowed from 6.4 percent in 2007 to 2.1 percent in 2008 and underwent the 12.2 percent contraction in 2009 (WTO, 2010). How to facilitate firm

internationalization by developing domestic financial systems and thus better protecting firms from financial crisis is in the priority of policy makers' agenda. This thesis, which is written when the financial crisis is going on, aims to contribute to such discussions.

Financial development, as a part of economic development, is "accompanied by the 'institutionalization of saving and investment' that diversifies channels for the flow of loanable funds and multiplies varieties of financial claims." (Gurley and Shaw, 1955). In this thesis, I investigate three different aspects of financial development in three individual chapters and examine the effect of financial development on FDI and export.

In chapter 2, I study the benefit from financial system diversification in providing alternative sources of funding for firms, especially in the time when one financing market is enduring difficulties in funding supply. The availability of a wider array of financial instruments and multiple sources of finances provide a buffer against adversity and help to smooth firms' financing and investment. In chapter 3, I analyze the difference between bank finance and bond finance in collecting information and screening risks of investment projects and investigate how to reduce the volatility of FDI by structuring domestic financial system. Chapter 4 is a case study on the effect of Chinese financial system reform on its exporter survival, which focuses on the improved provision of funds as a result of financial development and examines the disproportional effect on regions and different types of firms due to prevailing distortional lending and heavy state intervention in allocation of financial resources.

In my research, firm heterogeneity is a key characteristic in distinguishing the effect of financial development. In chapter 2, I show that facing the change of financial conditions, whether a firm gains or loses depends on its productivity. With the existence

of multiple financing sources, although the substitute financing helps stabilize investment, only a small fraction of firms with high productivities benefit. Take the substitution of bond finance for bank finance as an example. Facing severe bank credit contraction, firms resort to bond finance. The increased bond supply exacerbates the competition in bond market and pushes up the bond rate. As a result, those less productive firms cannot afford the rising financing cost and are forced to exit from production. In chapter 3, I illustrate that productivity is an important determinant for firm's financing strategy. Firms varying in productivity differ in financing choices. Given the information advantage of banks over bondholders, less productive firms exploit bank finance to obtain funding as well as information to reduce uncertainty in foreign investment whereas more productive ones tap bond market for financing in order to save the intermediary cost. In chapter 4, ownership is a new dimension of firm heterogeneity which is highly related to firms' financing power in China where political connections and state intervention play important roles in allocating financial resources. I find that private exporters are most financially constrained and thus benefit most from financial development through better availability to financial resources and reduction of ownership bias in funding distribution.

The specific research questions and main findings of the next three chapters are summarized as follows[1]:

In chapter 2, based on a heterogeneous firm set-up, we model firms' access to the internal capital market, bank finance as well as bond finance and investigate how firms' adjustment among multiple sources of finance affects their performance in foreign

[1] Chapter 2 and 3 are joint work with Jiarui Zhang from Department of Economics, University of Munich, and Chapter 4 is assisted by Ziliang Deng from Renmin University of China with data processing.

direct investment and the aggregate industry productivity. We find that when facing a bank credit shock (e.g. tighter bank lending), firms with different productivities react differently. Less productive firms exit from the foreign market due to a lack of funds while those more productive ones resort to bond finance to sustain their multinational status. The increased demand for bond finance as compensation for decreased bank finance by the surviving multinationals exacerbates the competition in the bond market and bids up the bond return rate, which triggers a Melitz-type selection effect through the bond market and brings aggregate industry gains. However, the divestment of those failing FDI firms and thus reduced bond financing demand mitigate this effect.

Chapter 3 investigates how heterogeneous firms choose their lenders when they raise external finance to fund FDI and how the choice of the external financing affects FDI's performance. We establish an asymmetric information model to analyze why some firms use private bank loans while others use public bond to finance foreign production. Compared to public bondholders, the banks are informed creditors about the hidden information on FDI risk. Borrowing from banks requires extra information cost but guarantees the success of FDI. We show that the firms who are more productive and thus more resistant against bad productivity shocks prefer bond finance whereas the less productive firms exploit bank finance as insurance. Moreover, firms' financing choices also rely on the risk of FDI destinations. Firms investing in more risky countries tend to use bank finance whereas those investing in less risky locations employ bond finance. We also present some facts on outward FDI of OECD countries. We find that higher ratio of bond finance relative to bank finance is linked to lower risk of total FDI location portfolio, which is consistent with our model predictions.

Chapter 4 examines the impact of financial development on exporter survival in foreign market with Chinese firm level data over the period 1998-2008. We measure financial development using the size, lending efficiency, term structure of bank loans and the degree of state intervention in financial resource allocation respectively. We find that larger scale, higher efficiency of bank lending and less state intervention facilitate while the relative abundance of long term credit deteriorates exporter survival. These effects are more pronounced for private exporters. However, financial development has almost no effect on state-owned exporters. For foreign-invested exporters, the level of state intervention matters the most. We attribute this disproportional impact to the government's direct participation in funding investment and the distortional lending of banks, which vary across regions and industries with different levels of presence of state-owned enterprises.

In summary, this thesis provides theories and evidences to demonstrate the impact of financial development in facilitating firm internationalization, which helps the economists and policy makers to better understand the role and the mechanism of finance in influencing firm cross-border activities. Moreover, the variation of impact of financial development across firms derived in my research suggests the significance and necessity of designing layers of customized policies for heterogeneous firms.

Chapter 2

Multiple Finances, Margins of FDI, and Aggregate Industry Productivity

2.1 Introduction

An emerging body of literature documents the impact of financial development on facilitating firm internationalization. While its function through providing a larger scale of external finance and relaxing firms' financial constraints is widely accepted, it is not clear whether the diversification of financial channels and access to alternative finance accompanied by financial development play a role. Attention was drawn to the significance of multiple sources of financing by Chairman Alan Greenspan after the 1997–98 Asian financial crisis (Greenspan, 2000). He argued that the development of alternative financing channels helped to fill the funding gap and stabilize business financing, which are especially important when either banks or capital markets freeze up in a crisis. Following this argument and motivated by the observations of credit crunch and simultaneous drawdown in foreign direct investment (henceforth FDI) in the recent financial crisis, we address the question of whether the availability of alternative financing sources could help reduce the size of the collapse and influence welfare.

Multinational firms have better access to multiple sources of finance than their domestically oriented peers. Firstly, multinational firms are usually large and productive ones (Helpman et al., 2004; Mayer and Ottaviano, 2007). Thus, they have a better chance of accessing market finance other than bank borrowing (Cantillo and Wright,

2000). Moreover, some firms can gain additional financial support from business partners or from the government in the form of trade credit or special policy loans. Secondly, multinational firms have access to finance from different locations. They can obtain finance from their parent country, raise funds from their host country locally or in some cases explore lower-cost finance on a worldwide basis (Antras et al., 2009; Marin and Schnitzer, 2006). Meanwhile, the internal capital market among the parent company and its foreign affiliates plays an important role for multinational firms. The allocation of funds through the internal capital market extensively substitutes for external financing when the latter is costly (Desai et al., 2004). Finally, firms tend to keep a precautionary fund reserve to adapt to potential risks and uncertainty (Bates et al., 2009; Riddick and Whited, 2009), which is particularly the case for multinational firms considering the extra cost and higher risk in foreign operations.

Basing on a heterogeneous firm set-up, we model firms' access to the internal capital market, bank finance as well as bond finance and investigate how firms' adjustment among multiple sources of finance affects their performance in foreign direct investment and the aggregate industry productivity. We find that given exogenous contraction in the supply of bank finance, firms with different productivities react differently. Some less productive firms exit from the foreign market due to less access to bank finance and the unaffordable high cost of bond finance as a result of tougher competition in the bond market. In comparison, some relatively more productive firms

can resort to bond finance as compensation for decreased bank finance to sustain their multinational status. The increased demand for bond finance as a substitute for bank finance by the surviving multinationals exacerbates the competition in the bond market and bids up the bond return rate, which triggers a Melitz-type selection effect through the bond market and brings aggregate industry productivity gains. However, the divestment of those failing FDI firms and thus their reduced bond financing demand mitigate this effect.

The contribution of this research is threefold. Firstly, it complements the quickly growing literature on credit constraint and firm internationalization by firstly proposing the impact of alternative financing and differentiating firm responses to the worsening financial condition. Manova (2007) introduces credit constraint into Melitz's (2003) research and argues that credit constraint restricts firms' participation and performance in cross-border activity. Arndt et al. (2009), Berman and Hericourt (2008), Buch et al. (2009), Li and Yu (2009) and Muuls (2008) provide supportive evidence for this argument using firm-level data from different countries. We reproduce this result that bad credit conditions impede firms from engaging in FDI. Furthermore, we show that this effect could be mitigated with the existence of alternative financing and could vary across firms with different productivities. Compensation from bond finance and the reallocation of the available funds stabilize firm financing and facilitate FDI. However, only the most productive firms are able to take advantage of multiple sources of finance

in smoothing foreign investment.

Secondly, this chapter contributes to the work on financial systems by analyzing the complementary and substitution effects of bank finance and bond finance. Precisely, we find that more productive firms use more alternative finance as substitution to reduce the risk of credit shortage and risk of investment; hence the failure rate of firms' FDI is endogenized in our model. The less productive firms, on the contrary, being unable to afford more expensive alternative finance, will choose to exit FDI market facing credit crunch; hence we also observe complementary effects. In existing literature, Datta et al. (1999) and Diamond (1991) document the complement of bank finance to bond finance by monitoring. Davis and Mayer (1991) show that the bank and bond markets can be alternatives to each other but they are not perfect substitutes. Saidenberg and Strahan (1999) focus on the role of bank finance in providing a back-up source and liquidity insurance for bond finance against market shocks. The complementary and substitution effects coexist in our model, which vary across firms. Although the substitution of multiple sources of finance could reduce the sensitivity of FDI to adverse shocks, only a fraction of more productive firms benefit from it. The complementary effect of bond finance on bank finance for those less productive firms implies that bond finance cannot fully substitute for bank finance when the banking sector faces a crisis. In our model, it is the higher cost of bond finance over bank finance that hinders less productive firms from employing alternative financing, thus

leading to the limited substitutability between the two sources. Our result suggests the importance of reducing the cost of bond finance and developing multi-layers of the financial system to satisfy the financing demand of various firms, especially those lower-quality firms.

Thirdly, we propose FDI-induced aggregate productivity gains for the parent country through the selection effect in the capital market. Although the question of whether FDI benefits its host country in productivity through technology spillover to local firms is widely discussed (Aitken and Harrison, 1999; Bitzer and Görg, 2005; Haskel et al., 2002; Javorcik, 2004; Keller and Yeaple, 2003), the impact of FDI on the parent country is rarely considered. Compared with Pottelsberghel and Lichtenberg (2001), who present evidence that a country gains from outward FDI through technology sourcing, we show that FDI could bring aggregate productivity gains for the parent country through the reallocation of financial resources towards more productive firms. The tougher competition in the bond market induced by the large FDI financing demand selects the least productive firms out of production and enhances the aggregate productivity. However, this effect is dampened due to firms' adjustment among multiple sources of finance.

This chapter is organized as follows: section 2.2 starts with the model in a closed economy as a benchmark case. After that, we introduce multiple sources of finance in an open economy setting, allowing firms to go abroad where the interaction of bank

finance and bond finance and its impact on the margins of FDI are investigated. Section 2.3 characterizes the general equilibrium and discusses the aggregate outcome on industry productivity. Section 2.4 concludes.

2.2 The Model

Consider a world with two countries. We call one country the home (domestic) country and the other the host (foreign) country for FDI. There is a continuum of firms, indexed by i, producing differentiated varieties in each country.

Firm i is born with initial internal fund N_i, which is a random number from a common distribution $\Gamma(N_i)$. After paying an entry cost of f_e ($f_e<N_i$)., the firm draws productivity φ_i from a common distribution $g(\varphi)$ (Melitz, 2003). With the knowledge of its own productivity, the firm makes the investing decision among three potential options: (1) purchasing corporate bonds B_i; (2) investing in domestic production, i.e. producing and selling a distinct product ω in the home country, the output being denoted by q_{iD}; (3) engaging in FDI, i.e. producing and selling ω in the host country, the output being denoted by q_{iF}. Note that the subscript D denotes variables for domestic production whereas F denotes those for foreign production; these apply to the whole chapter.

There is a perfect bond market in the economy in which firms can either buy or

issue bonds, B_i being positive or negative accordingly. Upon a draw of very low productivity, producing is not as profitable as buying bonds. The firm therefore invests all its internal funds in bond holdings to achieve a safe return. Upon a draw of high productivity, on the contrary, the firm will produce. If its internal fund is not enough to pay the production cost, the firm will raise the working capital by issuing corporate bonds through bond markets.

There is no fixed cost for the firm to invest in the bond market. In contrast, if the firm engages in production, regardless of whether it is domestic production or FDI, it must pay a fixed overhead cost f to set up the factory. In addition, there is an extra fixed cost C_F for FDI. f and C_F are measured in labor units.

2.2.1 Closed Economy

This subsection provides the closed economy case as a benchmark in which firms only serve the domestic market and obtain external finance merely by issuing corporate bonds.

2.2.1.1 Demand

The utility function of a representative consumer is

$$U = \left[\int_{\omega \in \Omega} q(\omega)^{\frac{\varepsilon-1}{\varepsilon}} d\omega \right]^{\frac{\varepsilon}{\varepsilon-1}}$$

where the set Ω represents the mass of available varieties and ε denotes the elasticity of

substitution between any two varieties. Defining the aggregate good $Q \equiv U$ with the aggregate price

$$P = \left[\int_{\omega \in \Omega} p(\omega)^{1-\varepsilon} d\omega\right]^{\frac{1}{1-\varepsilon}}$$

and solving the expenditure minimization problem of the consumer, we have the demand function for every variety ω.

$$q(\omega) = \left(\frac{P}{p(\omega)}\right)^{\varepsilon} Q \tag{2.1}$$

2.2.1.2 Production

Each firm i produces a distinct variety ω and its output for the domestic market is denoted as q_{iD}. Labor is the only input. Define the cost function for producing q_{iD} as:

$$l_{iD} = \frac{q_{iD}}{\varphi_i} + f \tag{2.2}$$

where $f>0$ is the fixed cost for production, which is the same for any single firm. φ_i is the firm-specific productivity. The domestic nominal wage is denoted as w_D. Assume that labor must be prepaid.

2.2.1.3 Bond Market

Assume that the bond market is perfect in the sense that it is competitive and there is no information asymmetry, and the equilibrium bond rate is r. Firms can invest their internal funds in buying a bond and achieve a return rate of $1+r$. In comparison, firms

for which the domestic production is confined by limited internal funds can also issue bonds at the rate of $1+r$. In the general equilibrium setting, the bond return rate r is determined by the condition that there is no aggregate net demand for bonds. For a single firm, however, r is given.

2.2.1.4 Firms' Optimal Decision

In a closed economy, firm i allocates its own disposable internal fund after entry cost is paid between bond holding B_i and domestic production q_{iD} (if it produces) and maximizes the total profit from the investment portfolio. Firm i solves

$$\max_{p_{iD},B_i} \quad \pi_{iD} = p_{iD}q_{iD} - w_D l_{iD} + rB_i$$

$$s.t. \quad w_D l_{iD} + B_i \le N_i - f_e \text{; (2.1); (2.2)}$$

where p_{iD} is the product price in the home country. We have:

$$p_{iD} = \frac{\varepsilon}{\varepsilon - 1}\frac{w_D}{\varphi_i}(1+r) \tag{2.3}$$

$$q_{iD} = \left[\frac{(\varepsilon-1)\varphi_i P}{\varepsilon w_D(1+r)}\right]^{\varepsilon} Q \tag{2.4}$$

$$l_{iD} = \varphi_i^{\varepsilon-1}\left[\frac{(\varepsilon-1)P}{\varepsilon w_D(1+r)}\right]^{\varepsilon} Q + f \tag{2.5}$$

Bond holdings B_i can be calculated from the budget constraint.

$$B_i = N_i - f_e - w_D\left\{\varphi_i^{\varepsilon-1}\left[\frac{(\varepsilon-1)P}{\varepsilon w_D(1+r)}\right]^{\varepsilon} Q + f\right\} \tag{2.6}$$

Proposition 2.1 **(composition of pricing under limited internal funds)**: *Both the financing cost (bond rate r) and the labor cost (wage rate w_D over firm-specific productivity φ_i) compose the product price. Other things being equal, the higher r, higher w_D or lower φ_i, the higher the product price and the lower the output.*

In our setting, the derived price p_{iD} consists of three parts: labor cost w_D/φ_i, markup $\varepsilon/(\varepsilon-1)$ and an additional part $1+r$, where $1+r$ reflects the extra external financing cost. If a firm does not have sufficient internal funds for production, it issues a bond with a cost of $1+r$ to raise working capital. Therefore, the limited internal fund set-up results in a higher price and lower output compared to traditional set-up (e.g., Melitz 2003). To focus on the discussion on productivity in this chapter, we do not model firm heterogeneity in terms of internal fund N, though the effect of N on firm financing and production works through aggregation. If all the firms have more internal funds (N increases), they will issue fewer (or hold more) bonds, hence the bond demand increases relative to the supply and the bond return rate r declines. Other things being equal, the decreased financing cost results in a lower price and the supply of each variety will increase.

2.2.1.5 Cutoff Productivity for Domestic Production

As in Melitz (2003), a firm's profit from domestic production depends on its

productivity. The less productive the firm is, the less profit it earns from production. Therefore, only those firms with productivities above a certain threshold will produce because of the existence of outside option. In our model, safe return rate from bond market is the outside option, and firms compare the profits from production and those from investing all their internal funds in purchasing bonds and choose to produce if and only if the former is greater than the latter; therefore, the cutoff productivity for domestic production φ^*_{iD} is determined by equation (2.7) below:

$$p_{iD}q_{iD} - w_D l_{iD} + rB_i = r\left(N_i - f_e\right) \tag{2.7}$$

Using (2.3), (2.4), (2.5) and the binding budget constraint, we have

$$\varphi^*_{iD} = \left\{ \frac{f(\varepsilon-1)}{Q}\left[\frac{\varepsilon w_D(1+r)}{(\varepsilon-1)P}\right]^{\varepsilon} \right\}^{\frac{1}{\varepsilon-1}} \tag{2.8}$$

Proposition 2.2 (cutoff productivity for domestic production): *The cutoff productivity for domestic production φ^*_{iD} is higher with a higher fixed production cost f, higher labor wage w_D or higher financing cost r.*

f and w_D measure the real cost while *r* measures the financial cost of production. Intuitively, proposition 2.2 says that higher cost requires higher productivity for firms to be able to produce. The shapes of the increasing relationships depend on elasticity of

substitution ε. For example, when ε is less than 2, the cutoff productivity is convex in f, while when ε is larger than 2, it is concave in f. As for the impact of the firm's internal fund, it only works through the bond market in aggregation. As we discussed in proposition 2.1, firms' bond holding increases with their internal funds. More aggregate internal funds could pull down the bond rate and result in a lower cutoff productivity. However, in partial equilibrium, the bond rate is exogenous for a single firm. Therefore, the internal fund is not directly related to the firm-level cutoff productivity.

2.2.2 Open Economy

In this subsection, we consider the case of an open economy in the sense that firms are interested in producing domestically as well as expanding production to a foreign country by means of FDI. Meanwhile, we introduce going-abroad-oriented bank credit as alternative financing and reconsider the above firm's investment portfolio decision. The cutoff productivity for a firm to become a multinational is also derived. Moreover, the interaction of borrowing from a bank and issuing corporate bonds and the overall effect of multiple sources of finance are discussed.

2.2.2.1 Demand

For simplicity and without loss of generality, we assume the aggregate price index and aggregate goods index in the host country are the same as those in the home country,

and are denoted again as P and Q, respectively. We impose further the assumption that when the economy shifts from autarky to openness, P and Q will not change. In other words, the new varieties coming in as the result of openness will not affect the aggregate indices. The demand function for each variety in the host country is given by:

$$q_{iF} = \left(\frac{P}{p_{iF}} \right)^{\varepsilon} Q \tag{2.9}$$

2.2.2.2 Production

Assume firm i's productivity spills over to its foreign affiliate and it produces in the foreign country with the same productivity as in the home country but it has to shoulder an extra fixed cost C_F to carry out FDI. This foreign expansion-induced fixed cost includes the expenses for building up foreign affiliates and distribution channels, collecting information about the foreign market and foreign regulations, etc. Regardless of the form of such a cost, it is independent of the firm's output and must be paid before the firm's revenue in the foreign market is generated. This cost C_F is assumed to be uncertain for the firm at the moment when a firm arranges its investment portfolio. The distribution of C_F is common knowledge and the FDI decision is made based on firm's expectation for C_F. C_F is revealed when the firm sets foot on the foreign land. FDI is successful (hence FDI profit is received) only if C_F is fully covered.

In an open economy, the domestic production function is the same as equation (2.2), whereas the production function for FDI is given as:

$$l_{iF} = \frac{q_{iF}}{\varphi_i} + f + C_F \tag{2.10}$$

where q_{iF} and l_{iF} are respectively output and labor input in the foreign country. Here assume that the extra fixed cost C_F follows a concave distribution $f(C_F)$ with support $[0, \infty]$. The $f(C_F)$ has the cumulative distribution $F(C_F)$.

2.2.2.3 Going-Abroad-Oriented Loans and Probability of FDI Success

To cover C_F, the firm can obtain finance from banks. Assume that a going-abroad-oriented bank loan is available for all FDI firms. Such loans aim to release firms' financial constraints due to the substantial upfront costs of FDI and are therefore assumed to be used only to shoulder C_F.[1] Collateral is required by banks. Firm i pledges a fraction τ, $\tau \in (0,1]$, of the overhead fixed cost f as collateral to obtain a bank loan of the amount of $\mu\tau f$, where μ is the multiplier over the collateral. Here we use μ to measure the availability of external bank credit, which is an indicator of country-specific financial development. The higher μ implies better access to bank credit and better financial development of a country. For simplicity, we further assume that borrowing from banks is costless as bankers are competitive and have no access to the bond market.

Moreover, to guarantee the sufficiency of funds to cover C_F and thus the success of

[1] By this assumption, we rule out the case that firms use this loan to pay for domestic production so that we can obtain results in an open economy that are comparable to those in a closed economy and focus on the effect of the bank loan on firms' financing strategy and FDI decisions.

FDI, firms may keep some reserve funds A besides the bank borrowing $\mu\tau f$ to pay the extra fixed cost. A could be a fraction of the internal fund or financed from the bond market. Therefore, before C_F is revealed, the firm has $A+\mu\tau f$ prepared. Hence, the probability of the FDI's success is Prob($C_F \le A+\mu\tau f$)=$F(A+\mu\tau f)$, which is endogenous decision of firms. As we shall see, for FDI firms, the more productive the firm is, the larger A is kept and the more likely that the FDI will be successful. Our model thus is related to the observation that productive multinational firms issue corporate bonds to raise capital for FDI since the profits from FDI are sufficiently large and they have higher incentive to guarantee the success.

2.2.2.4 Firms' Optimal Decision

Firm i maximizes the expected total profit from bond holding, domestic production and FDI.

$$\max_{p_{iD},p_{iF},A_i,B_i} \quad E[\pi_i] = p_{iD}q_{iD} - w_D l_{iD} + \left(p_{iF}q_{iF} - w_F l_{iF}\right)F\left(A_i + \mu\tau f\right) + rB_i$$

$$s.t. \quad w_D l_{iD} + w_F\left(l_{iF} - C_F\right) + A_i + B_i \le N_i - f_e \text{; (2.1); (2.2); (2.9); (2.10);}$$

Note that the profit from FDI is multiplied by the probability of its success. Also note that in the budget constraint, C_F is covered by A and $\mu\tau f$. Denoting the expected value of C_F as C, we have:

$$p_{iD} = \frac{\varepsilon}{\varepsilon - 1}\frac{w_D}{\varphi_i}\left(1+r\right) \tag{2.11}$$

$$p_{iF} = \frac{\varepsilon}{\varepsilon - 1}\frac{w_F}{\varphi_i}\left(1 + \frac{r}{F(A_i + \mu\tau f)}\right) \tag{2.12}$$

$$B_i = N_i - f_e - w_D l_{iD} - w_F(l_{iF} - C) - A_i \tag{2.13}$$

and A_i is determined by:

$$(p_{iF}q_{iF} - w_F l_{iF})f(A_i + \mu\tau f) = r \tag{2.14}$$

Equations (2.11)–(2.14) characterize the optimal choices of an FDI firm. We can compare the prices in the home country and the host country by comparing (2.11) and (2.12), noticing that $F(A+\mu\tau f)\leq 1$.

The price for the domestic market has the same expression as that in the closed economy benchmark (equation (2.3) in section 2.2.1.4), which means that firms do not change their pricing strategy for the home market when they start foreign business. Nevertheless, the actual nominal value of the domestic price may be different. When the economy shifts from autarky to openness, firms of high productivity adjust their investment portfolios: purchase fewer bonds (or issue more bonds) and allocate funds to FDI. The adjustment, as will be discussed in aggregation in section 2.3, induces a tougher competition in the bond market and drives the bond return rate up. Hence, the actual price in the home market under an open economy setting will be higher than in a closed economy, although they share the same mathematical expression.

As the reserve fund A is endogenously determined by firms, the probability of successful FDI is also endogenized. Hence we have a look at what affects the choice of the reserve fund. An implicit solution of A is given by equation (2.14). The simulation

results are provided in Appendix 2.1 (where propositions 2.3 to 2.6 are also simulated). We have the following proposition:

Proposition 2.3 (reserve fund for FDI): *Given that a firm maintains FDI, its reserve fund for FDI A_i is higher with higher productivity φ_i, lower credit access μ, lower production fixed cost f or lower bond financing cost r.*

The relationship between A and μ suggests a firm's substitution in multiple sources of finance. When bank credit is tighter, a firm increases A_i as the alternative source to cover C_F, so that it can maintain FDI. This finding supplements the existing literature in which firms are left helpless but exit production when bank credit is tight (Buch et al., 2009; Manova, 2007). In our model, however, firms can resort to alternative finance and keep production unaffected.

Note that borrowing from a bank has no cost but A_i has a cost of $(1+r)$, because A_i is raised either from internal funds or from the bond market. If the bond return rate is higher, it is more attractive to buy bonds rather than producing, hence the firm will cut A_i.

As for the negative relationship between fixed cost f and A, it works in two ways. On one hand, f is a real cost of FDI. The higher the cost is, the less incentive there is for firms to undertake FDI, and hence the smaller the reserve fund firms keep for FDI

projects. On the other hand, *f* could be used as collateral: firms can obtain greater bank loans against a larger *f*, so they could reduce the amount of the reserve fund.

An important finding is that more productive firms keep more reserve funds and thus have a higher probability of success in producing abroad. As FDI is more profitable with higher productivity, those firms have incentives to guarantee the FDI's success. This result differs from the previous literature, in which the probability of success or the probability of firms' default is assumed to be exogenous and independent of firm productivity (e.g. Buch et al., 2009; Manova, 2007). In Li and Yu (2009), more productive firms have a higher probability of success but such a relationship is ex ante given without a micro foundation. In our model, however, the probability is firm-specific and firms themselves choose how much to "invest" to increase the probability of success.

Proposition 2.4 (intensive margin of FDI): *The more productive a firm is (higher φ_i), the larger is its affiliate sale. The sale is also larger if the wage cost w_F is lower or the bond financing cost r is lower. If a firm can maintain FDI after a credit crunch*[2] *(decrease in credit multiplier μ), it raises working capital from issuing bonds and keeps its affiliate sale unaffected.*

[2] We will discuss the condition for firms to maintain FDI in section 2.2.2.5.

The first three arguments on φ_i, w_F and r are intuitive and easily verified through equation (2.12). Higher productivity or a lower cost, either the wage cost or the financial cost, results in more output and sales. However, the change in bank credit availability μ triggers firms' adjustment to their financing strategy and affects affiliate sales indirectly. In partial equilibrium, when bank credit suddenly becomes tight, firms raise more funds from the bond market to substitute for bank credit in order to keep their working capital. In our model, when μ decreases such that borrowings from banks are less, and if a firm can maintain FDI, it will increase A (proposition 2.3) to keep the probability of the FDI's success. Therefore, according to equation (2.12), as long as the bond return rate does not change in partial equilibrium, the affiliate sale q_{iF} will not be affected. This result is consistent with the evidence that during the recent financial crisis, a non-negligible fraction of firms reallocate more funds to finance working capital and their sales remain unchanged or even expand, especially in domestic-oriented or non-tradable sectors (World Bank Financial Crisis Survey 2010; 2010 Survey on Current Conditions and Intention of Outbound Investment by Chinese Enterprises).

2.2.2.5 Cutoff Productivity for FDI

To see how productive should a firm be profitable to do FDI, we calculate the cutoff productivity for FDI by equation (2.15), the LHS of which is the profit when the firm engages in domestic production as well as FDI while the RHS is the profit when

the firm merely serves the domestic market. The firm will expand production to the foreign country if and only if its total profit is higher than that from only serving the domestic market.

$$p_{iD}q_{iD} - w_D l_{iD} + \left(p_{iF}q_{iF} - w_F l_{iF}\right)F\left(A + \mu\tau f\right) + rB_{iF} = p_{iD}q_{iD} - w_D l_{iD} + rB_{iD} \tag{2.15}$$

B_{iF} comes from (2.13) and B_{iD} comes from (2.6). Then we derive the expression of cutoff productivity for FDI:

$$\varphi_{iF}^{*} = \left\{\frac{f(\varepsilon-1)}{Q}\left[\frac{\varepsilon w_F\left(1+r/F\right)}{(\varepsilon-1)P}\right]^{\varepsilon}\left(1+\frac{FC+rA/w_F}{(F+r)f}\right)\right\}^{\frac{1}{\varepsilon-1}} \tag{2.16}$$

where F denotes $F(A+\mu\tau f)$.

Proposition 2.5 (extensive margin of FDI)*: The cutoff productivity for FDI φ^{*}_{iF} is lower when firms face better access to credit (higher credit multiplier μ), lower bond financing cost r, lower production fixed cost f or C, and lower labor wage w_F. The expected profit of undertaking FDI is larger with a higher μ.*

With the support of better availability of bank credit, more firms are able to go abroad. Meanwhile, the induced higher expected profits make FDI more attractive to firms. This result implies that better credit conditions as a result of the financial development in a country play a positive role in facilitating firm internationalization. On

the contrary, various costs, such as the labor wage, overhead cost and financial cost, impede firms from going abroad.

Moreover, we have a look at the difference between the cutoff productivity for FDI and that for domestic production in order to investigate the question whether FDI firms are necessarily more productive than domestic firms. We have the following proposition:

Proposition 2.6 (cutoff gap)*: The gap between the cutoff productivity for FDI and the cutoff for domestic production ($\varphi^*_{iF} - \varphi^*_{iD}$) is lower facing lower bond rate r, larger credit multiplier μ and lower expected fixed cost C.*

Comparing equation (2.16) with equation (2.8), and knowing that $F(A+\mu\tau f)\leq 1$, we immediately conclude that $\varphi^*_{iF} > \varphi^*_{iD}$. Due to the existence of extra fixed costs, firms require higher productivity to attain positive profits from FDI. The two cutoffs are equal if and only if $C = 0$. In this case, the probability of a successful FDI is 1 and firms will not keep any A as it is not necessary and A is costly. Proposition 2.6 states that a better credit condition (higher μ) or lower bond financing cost (lower r) can reduce the productivity requirement for FDI and promote domestic firms' growth into multinationals. Note that when facing a lower bond return rate r, both cutoffs decrease, while that for FDI declines faster, indicating the higher sensitivity of FDI to financing

conditions compared with domestic production.

2.2.2.6 Complementarity and Substitution of Multiple Sources of Finance

FDI firms have access to two external sources of finance, i.e. borrowing from banks and issuing corporate bonds. When facing a bank credit shock, firms adjust their financing strategy and fund allocation among investment projects but firms with different productivities react differently. Take a bad credit shock as an example.

When bank credit suddenly becomes tight, i.e. μ suddenly decreases, then φ^*_{iF} increases (proposition 2.5) and hence some relatively less productive FDI firms are forced to exit. As a result of withdrawing capital from FDI, these firms issue fewer bonds. In this case, deteriorative bank credit results in shrinking bond issuance, which we call the **complementary effect** of bond issuing and bank borrowing.

In contrast, however, those firms that are productive enough to maintain FDI under a worse credit condition issue more bonds as a substitution for reduced bank credit and keep the working capital for foreign production unchanged (proposition 2.3 and 2.4), which we call the **substitution effect** of bond issuing and bank borrowing. For the existence of the possibility to issue bonds as an alternative form of finance, firms do not necessarily experience production contraction when facing credit tightness, which implies the significance of multiple sources of finance in smoothing investment.

Figure 2.1 depicts intuitively the change in A with decreased μ (from μ to μ') and

the differentiation of firms in financing. As we mentioned above, only those firms with productivities that are higher than the cutoff productivity for FDI keep reserve fund A. The more productive the firm is, the more A it raises (proposition 2.3). Therefore, A is 0 for the firms with productivities lower than $\varphi^*_{iF}(\mu)$, and A jumps to positive at the cutoff value $\varphi^*_{iF}(\mu)$ and keeps increasing with φ after that.

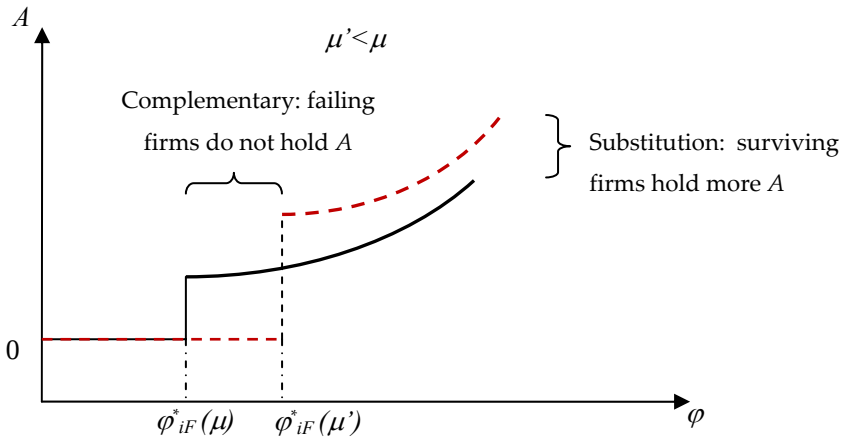


Figure 2.1 Complementary effect and substitution effect

Facing a bank credit shock (μ decreases to μ'), the cutoff of carrying out FDI increases from $\varphi^*_{iF}(\mu)$ to $\varphi^*_{iF}(\mu')$. The firms with productivities in between exit from FDI and hence do not reserve A anymore, while those firms with productivity higher than $\varphi^*_{iF}(\mu')$ maintain FDI and raise more A from issuing bonds. As the adjustment of A responding to the alteration of the bank credit condition is through bond finance, Figure 2.1 shows the complementary and substitution effect of bond finance and bank finance.

2.3 Aggregation

2.3.1 Characterization of Equilibrium in an Open Economy

In an open economy, stationary general equilibrium is characterized as follows: (1) there is an aggregate cutoff productivity for domestic production φ_D^*, which is determined by equalizing the profit from purely holding bonds and that from producing domestically; (2) there is an aggregate cutoff productivity for FDI φ_F^*, which is determined by equalizing the total profit from engaging in domestic production as well as FDI with that from merely domestic production; (3) a mass M of incumbent firms is partitioned into three groups in terms of productivity. Firms with productivity higher than φ_F^* produce domestically as well as abroad. Firms with productivity lower than φ_D^* do not produce but invest in purchasing bonds. Firms with productivity in between produce and serve the domestic market; (4) a firm's entry decision is made by equalizing the present value of the expected average profit flows $\bar{\pi}$ of all types of firms and the sunk cost for entry f_e; (5) in each period, a mass M_e of new entrants replaces the mass of δM of incumbent firms that exit, where δ is the probability of being hit by the "forced-exit" shock; (6) product markets clear such that the consumers' demand is met by the firms' supply; (7) the labor market clears to determine the wage w (we assume the inelastic supply of labor L); (8) the bond market clears in the sense that

there is no aggregate net demand for bonds, where the bond rate r is determined; (9) the resource constraint is satisfied such that the total income equals the total expenditure. The derivation of the general equilibrium is given in Appendix 2.2.

2.3.2 The Complementary Effect and Substitution Effect Revisited

As we discussed above, when an adverse shock on bank credit occurs, the complementary effect implies that firms divest from FDI and purchase more bonds, whereas the substitution effect means that firms issue more bonds to finance FDI. In general equilibrium, the complementary effect and substitution effect influence the equilibrium in the bond market and thus the bond rate oppositely. The overall outcome is a result of the relative scale of the two effects, which further relies on the distribution of firm productivity and the severity of shocks on bank credit.

In a country where the firm distribution skews towards high productivity, facing the same contractionary bank credit shock, more firms will sustain FDI and the substitution effect will be dominant. As a result, the bond rate will increase, and vice versa.

Moreover, when facing a more severe adverse shock, more firms exit from FDI and transfer internal fund to purchase bonds. On the other hand, the survivors in FDI will issue more bonds to compensate for the reduced bank finance. Consequently, both the complementary effect and the substitution effect are stronger and the overall effect is

ambiguous.

2.3.3 Selection Effect in the Bond Market and Aggregate Industry Productivity

When an economy opens, those productive firms that go abroad will issue more bonds from the parent country to finance foreign production. The increased demand in the bond market will bid up the bond return rate and thus increase the financing cost for all the producing firms, either FDI or non-FDI firms. Facing a higher financing cost, the least productive producing firms are forced to exit from production and become bond holders. Thus, the aggregate productivity of producing firms increases. Therefore, outward FDI triggers the selection effect through the bond market and brings aggregate industry productivity gains for the parent country.

As was previously discussed in Section 2.3.2, a shock to the bank credit supply can also influence the bond return rate and hence further the aggregate productivity gains. However, whether the change in bank credit conditions will intensify or weaken such gains relies on the relative importance of the above complementary effect and substitution effect. As a response to an adverse shock to bank finance, the rising bond rate as a result of the substitution effect will shuffle the deck and wash out less productive firms. However, the existence of the complementary effect pulls down the bond rate and mitigates this selection.

2.4 Conclusion

This chapter introduces the internal fund, bank finance and bond finance into a heterogeneous firm set-up and analyzes firms' adjustment among multiple sources of finance and its impact on the performance of FDI and the aggregate industry productivity. We show that with access to the bond market as an alternative source of financing, firms suffering from bank lending tightness could stabilize their financing and maintain FDI. However, only the more productive firms benefit from the substitution of bond finance for bank finance. In comparison, the less efficient firms could not afford the higher cost of bond finance due to the increased competition in the bond market when economy opens, and thus exit from production. Therefore, the rising bond rate induces the reallocation of financial resources from less efficient firms towards more efficient ones and thus increases the aggregate industry productivity of the producing firms. Nevertheless, the decreased financing demand of divesting firms helps to pull down the bond rate and thus weakens the above effect.

Our results suggest the importance of the diversification of financial channels and significance of the availability of alternative financing in smoothing foreign direct investment, which is particularly important for low-quality firms. Moreover, the selection through the bond market implies the role of the capital market in reshuffling firms, which also proposes a mechanism of FDI-induced welfare change for parent

countries.

To focus on the role of alternative financing in stabilizing investment, we did not discuss the difference between bank finance and bond finance in this chapter. However, modeling their differences in restructuring, monitoring and screening will help us to understand better the limited substitutability of the two sources of finance and might generate more fruitful results. Moreover, modeling the financing sources of bank sectors and investigating the co-movement of the bank sector and the bond market constitute another direction for future research. In addition, relaxing the perfect competition assumption for the bond market and introducing a firm-specific bond rate are also interesting extensions. This is what I do in the next chapter of the thesis.

Appendix 2.1

Numerical Simulations of the Propositions

Propositions 2.1 and 2.2 are straightforward, so here we only provide the simulation results for propositions 2.3, 2.4, 2.5 and 2.6.

Distribution of the fixed cost for FDI: Assume C_F follows Pareto distribution

$$F(x) = \Pr(C_F \le x) = 1 - \left(\frac{b}{x}\right)^k \tag{A.2.1}$$

with the support of $[b,\infty]$, where b and k are parameters of the distribution. The probability density function of C_F is therefore given by

$$f(x) = \frac{kb^k}{x^{k+1}} = \frac{k}{x}\left(\frac{b}{x}\right)^k \tag{A.2.2}$$

Denote the mean of C_F as c, then $c = E(C_F) = \frac{kb}{k-1}$.

A.2.1.1 Simulation of Proposition 2.3

The optimal reserve fund A for an FDI firm is given by equation (2.14):

$$(p_{iF}q_{iF} - w_F l_{iF}) f(A_i + \mu\pi) = r$$

By inserting equations (2.9), (2.10), (2.12), (A.2.1) and (A.2.2) into equation (2.14) we obtain equation A.2.3 for the simulation.

$$\left\{\left[\frac{\varepsilon}{\varepsilon-1}\frac{w_F}{\varphi_i}\left(1+\frac{r}{1-\left(b/\left(A_i+\mu f\right)\right)^k}\right)\right]^{1-\varepsilon}P^{\varepsilon}Q\left[1-\frac{\varepsilon-1}{\varepsilon}\frac{1}{1+\frac{r}{1-\left(b/\left(A_i+\mu f\right)\right)^k}}\right]-w_F\left(f+c\right)\right\}\frac{k}{A_i+\mu f}\left(\frac{b}{A_i+\mu f}\right)^k=r \tag{A.2.3}$$

Figures A.2.1.1–A.2.1.4 depict the change in A with μ, r, f and φ, respectively.

Parameter values

Figure A.2.1.1: $r=0.05$, $\varphi_i=0.5$, $f=10$, $\varepsilon=2$, $w_F=1$, $P=10$, $Q=10$, $\tau=0.5$, $b=k=3$, $c=4.5$.

Figure A.2.1.2: $\mu=1.4$, $\varphi_i=0.5$, $f=10$, $\varepsilon=2$, $w_F=1$, $P=10$, $Q=10$, $\tau=0.5$, $b=k=3$, $c=4.5$.

Figure A.2.1.3: $r=0.05$, $\mu=1.4$, $\varphi_i=0.5$, $\varepsilon=2$, $w_F=1$, $P=10$, $Q=10$, $\tau=0.5$, $b=k=3$, $c=4.5$.

Figure A.2.1.4: $r=0.05$, $\mu=1.4$, $f=10$, $\varepsilon=2$, $w_F=1$, $P=10$, $Q=10$, $\tau=0.5$, $b=k=3$, $c=4.5$.

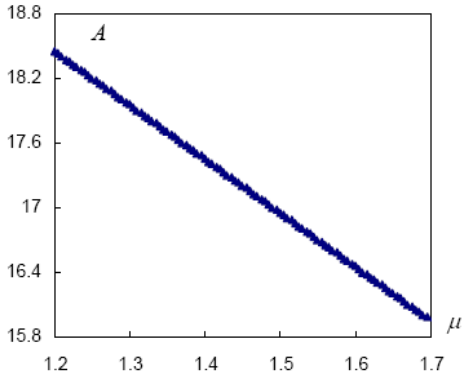


Fig. A.2.1.1

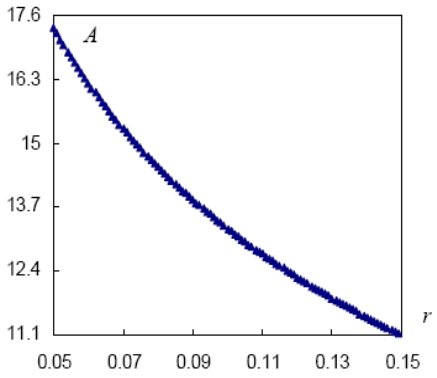


Fig. A.2.1.2

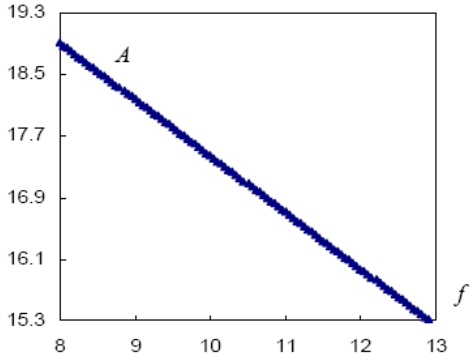


Fig. A.2.1.3

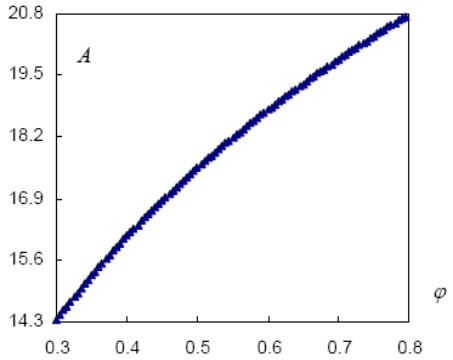


Fig. A.2.1.4

A.2.1.2 Simulation of Proposition 2.4

We derive the solution for q_{iF} (A.2.4) by inserting equation (2.12) and the distribution of C_F into equation (2.9), where variable A is determined by equation (A.2.3).

$$q_{iF} = P^{\varepsilon} Q \left\{ \frac{\varepsilon}{\varepsilon - 1} \frac{w_F}{\varphi_i} \left[1 + \frac{r}{1 - \left(\frac{b}{A + \mu \tau f} \right)^k} \right] \right\}^{-\varepsilon} \tag{A.2.4}$$

Figures A.2.2.1–A.2.2.4 show the change in q_{iF} with r, w_F, φ and μ, respectively.

Parameter values

Figure A.2.2.1: $\mu = 1.4$, $\varphi_i = 0.5$, $w_F = 1$, $\varepsilon = 2$, $f = 10$, $P = 10$, $Q = 10$, $\tau = 0.5$, $b = k = 3$, $c = 4.5$.

Figure A.2.2.2: $r = 0.05$, $\mu = 1.4$, $\varphi_i = 0.5$, $\varepsilon = 2$, $f = 10$, $P = 10$, $Q = 10$,

$\tau = 0.5$, $b = k = 3$, $c = 4.5$.

Figure A.2.2.3: $r = 0.05$, $\mu = 1.4$, $w_F = 1$, $\varepsilon = 2$, $f = 10$, $P = 10$, $Q = 10$,

$\tau = 0.5$, $b = k = 3$, $c = 4.5$.

Figure A.2.2.4: $r = 0.05$, $\varphi_i = 0.5$, $w_F = 1$, $\varepsilon = 2$, $f = 10$, $P = 10$, $Q = 10$,

$\tau = 0.5$, $b = k = 3$, $c = 4.5$.

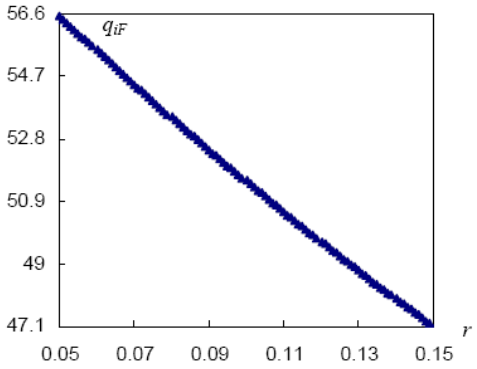


Fig. A.2.2.1

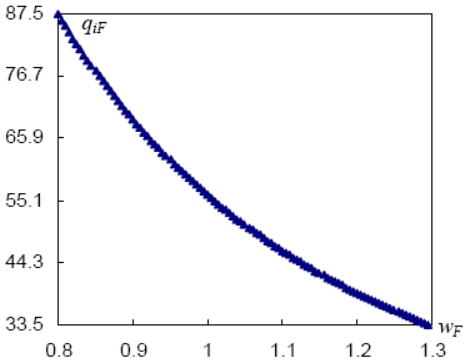


Fig. A.2.2.2

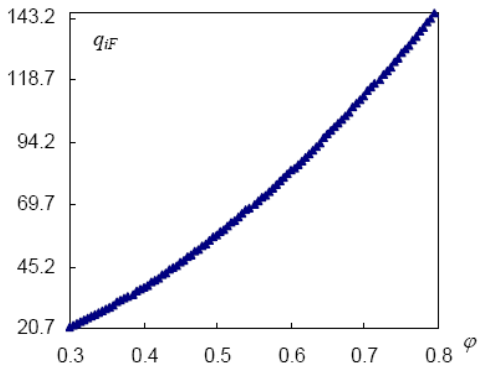


Fig. A.2.2.3

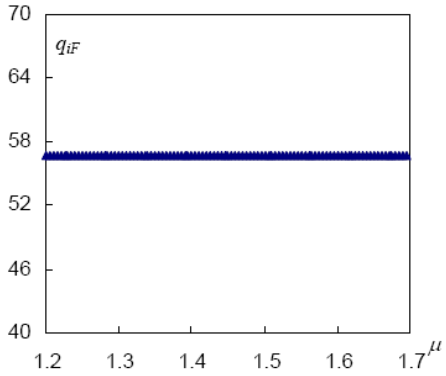


Fig. A.2.2.4

A.2.1.3 Simulation of Proposition 2.5

Inserting $F = 1 - \left(\frac{b}{A + \mu \tau f} \right)^k$ into equation (2.16), we obtain equation (A.2.5) for

simulation relating to φ_{iF}^{*}. Variable A in equation (A.2.5) is determined by equation (A.2.3) in which φ_i takes the value of φ_{iF}^{*}. Hence the result is the solution to the simultaneous equations (A.2.3) and (A.2.5).

$$\varphi_{iF}^{*}=\left\{\frac{f(\varepsilon-1)}{Q}\left[\frac{\varepsilon w_F\left(1+\dfrac{r}{1-\left(\dfrac{b}{A+\mu\tau f}\right)^{k}}\right)}{(\varepsilon-1)P}\right]^{\varepsilon}\left[1+\frac{1-\left(\dfrac{b}{A+\mu\tau f}\right)^{k}c+\dfrac{rA}{w_F}}{\left(1-\left(\dfrac{b}{A+\mu\tau f}\right)^{k}+r\right)f}\right]\right\}^{\frac{1}{\varepsilon-1}} \tag{A.2.5}$$

The total profit of FDI firms is

$$\pi_i = p_{iD}q_{iD} - w_D l_{iD} + (p_{iF}q_{iF} - w_F l_{iF})F(A_i + \mu\tau f) + rB_i \tag{A.2.6}.$$

Inserting the optimal solutions of firms' profit maximization problem given by equations (2.1), (2.2), (2.9), (2.10), (2.11), (2.12) and (2.13) into (A.2.6) and rearranging, we obtain the final simulation equation for π.

$$\pi_i=\left[\frac{\varepsilon}{\varepsilon-1}\frac{w_D}{\varphi_i}(1+r)\right]^{1-\varepsilon}P^{\varepsilon}Q-(1+r)w_D\left\{\left[\frac{\varepsilon}{\varepsilon-1}\frac{w_D}{\varphi_i}(1+r)\right]^{-\varepsilon}P^{\varepsilon}Q\varphi_i^{-1}+f\right\}$$

$$+r\left(N-f_e+w_F c-A\right)+\left[\frac{\varepsilon}{\varepsilon-1}\frac{w_F}{\varphi_i}\left(1+\frac{r}{1-\left(\frac{b}{A+\mu\tau f}\right)^k}\right)\right]^{1-\varepsilon} P^{\varepsilon} Q\left[1-\left(\frac{b}{A+\mu\tau f}\right)^k\right]$$

$$-\left[1-\left(\frac{b}{A+\mu\tau f}\right)^k+r\right]w_F\left\{\left[\frac{\varepsilon}{\varepsilon-1}\frac{w_F}{\varphi_i}\left(1+\frac{r}{1-\left(\frac{b}{A+\mu\tau f}\right)^k}\right)\right]^{-\varepsilon} P^{\varepsilon} Q\varphi_i^{-1}+f+c\right\}$$

(A.2.7)

Variable A in equation (A.2.7) is determined by equation (A.2.3).

Figures A.2.3.1–A.2.3.4 show the change of φ_{iF}^* with μ, r, f and w_F, respectively. Figure A.2.3.5 depicts the increasing relationship of π with μ.

Parameter values

Figure A.3.1: $r=0.05$, $f=10$, $w_F=1$, $\varepsilon=2$, $\varphi_i=0.5$, $P=10$, $Q=10$, $\tau=0.5$, $b=k=3$, $c=4.5$.

Figure A.3.2: $\mu=1.4$, $f=10$, $w_F=1$, $\varepsilon=2$, $\varphi_i=0.5$, $P=10$, $Q=10$, $\tau=0.5$, $b=k=3$, $c=4.5$.

Figure A.3.3: $r=0.05$, $\mu=1.4$, $w_F=1$, $\varepsilon=2$, $\varphi_i=0.5$, $P=10$, $Q=10$, $\tau=0.5$, $b=k=3$, $c=4.5$.

Figure A.3.4: $r=0.05$, $f=10$, $\mu=1.4$, $\varepsilon=2$, $\varphi_i=0.5$, $P=10$, $Q=10$, $\tau=0.5$, $b=k=3$, $c=4.5$.

Figure A.3.5: $r=0.05$, $f=10$, $\varepsilon=2$, $\varphi_i=0.5$, $P=10$, $Q=10$, $\tau=0.5$,

$b = k = 3$, $c = 4.5$, $w_D = w_F = 1$, $f_e = 10$, $N = 500$.

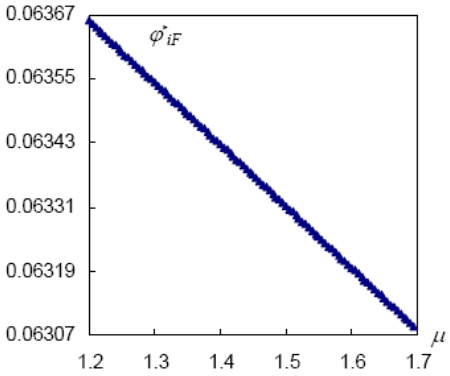


Fig. A.2.3.1

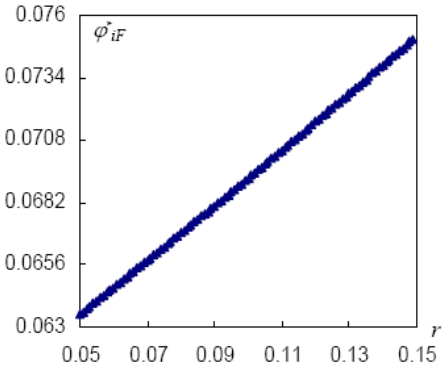


Fig. A.2.3.2

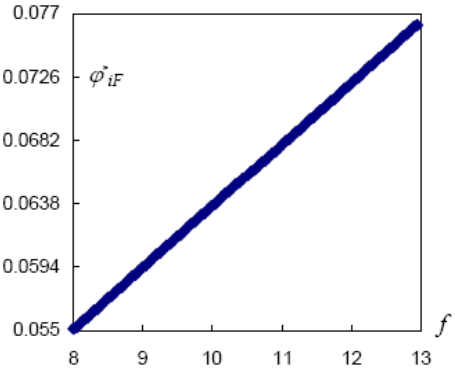


Fig. A.2.3.3

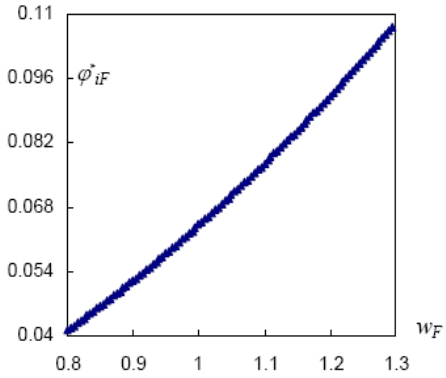


Fig. A.2.3.4

A.2.1.4 Simulation of Proposition 2.6

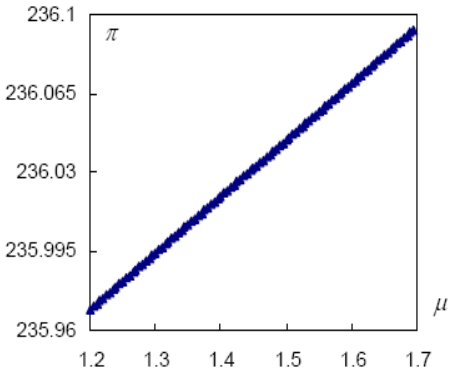


Fig. A.2.3.5

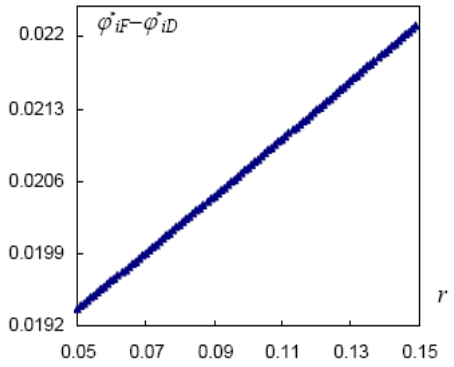


Fig. A.2.4.1

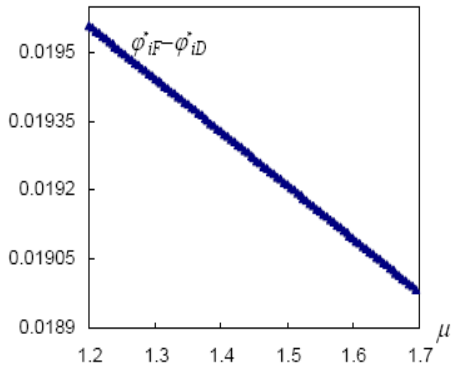


Fig. A.2.4.2

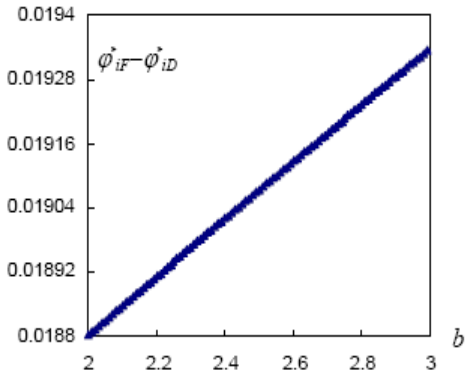


Fig. A.2.4.3

The simulation equation for $\varphi_{iF}^{*}-\varphi_{iD}^{*}$ is derived by equation (A.2.5) minus equation (2.8). Figures A.2.4.1–A.2.4.3 describe the change in the cutoff gap $\varphi_{iF}^{*}-\varphi_{iD}^{*}$ with *r*, μ and *c*, respectively. Note that given *k*, the relationship of $\varphi_{iF}^{*}-\varphi_{iD}^{*}$ and *c* is indirectly represented by the change in $\varphi_{iF}^{*}-\varphi_{iD}^{*}$ with *b*.

Parameter values

Figure A.4.1: $\mu=1.4$, $f=10$, $\varepsilon=2$, $\varphi_i=0.5$, $P=10$, $Q=10$, $\tau=0.5$, $b=k=3$, $c=4.5$, $w_D=w_F=1$.

Figure A.4.2: $r = 0.05$, $f = 10$, $\varepsilon = 2$, $\varphi_i = 0.5$, $P = 10$, $Q = 10$, $\tau = 0.5$, $b = k = 3$, $c = 4.5$, $w_D = w_F = 1$.

Figure A.4.3: $r = 0.05$, $\mu = 1.4$, $\varepsilon = 2$, $\varphi_i = 0.5$, $P = 10$, $Q = 10$, $\tau = 0.5$, $k = 3$, $w_D = w_F = 1$.

Appendix 2.2

Sketch of the General Equilibrium in an Open Economy

Following Melitz (2003), we assume that there is an unlimited number of prospective firms waiting to enter our model. Each firm was born with an initial fund *N*. To enter, they first have to pay entry cost f_e with their initial fund to draw their own productivities from a common distribution $g(\varphi)$. $g(\varphi)$ is Pareto distribution with cumulative density function $G(\varphi)$ and the support of $[b,\infty]$ (Helpman et al., 2004). Firms with high productivity produce, among which the higher ones also engage in FDI, while those with low productivity hold bonds only. All the firms face a constant probability δ of forced exit in each period. The forced exit firms can pay f_e to draw new productivity again.

Denotations of endogenous variables: M number of incumbent firms; M_e number of new entrants in each period; $\bar{\pi}$ average profit across all types of firms; φ_D^* cutoff productivity for domestic production; φ_F^* cutoff productivity for FDI; P price index; Q aggregate goods; w wage; and r bond rate.

The steady-state equilibrium is characterized by the following equations.

Zero cutoff profit for domestic production:

$$\varphi_D^* = \left\{ \frac{f(\varepsilon-1)}{Q} \left[\frac{\varepsilon w (1+r)}{(\varepsilon-1)P} \right]^{\varepsilon} \right\}^{\frac{1}{\varepsilon-1}} \tag{A.2.8}$$

Zero cutoff profit for FDI:

$$\varphi_F^* = \left\{ \frac{f(\varepsilon-1)}{Q} \left[\frac{\varepsilon w\ (1+r/F)}{(\varepsilon-1)P} \right]^{\varepsilon} \left(1+\frac{FC+rA/w}{(F+r)f} \right) \right\}^{\frac{1}{\varepsilon-1}} \qquad \text{(A.2.9)}$$

Expected average profit:

$$\bar{\pi} = G(\varphi_D^*) r(N-f_e) + \left[G(\varphi_F^*) - G(\varphi_D^*) \right] \int_{\varphi_D^*}^{\varphi_F^*} \pi_D u_D(\varphi) d_\varphi + \left[1-G(\varphi_F^*) \right] \int_{\varphi_F^*}^{\infty} \pi_F u_F(\varphi) d_\varphi \quad \text{(A.2.10)}$$

where $\pi_D = p_D q_D - w l_D + r B_D$, $\pi_F = p_D q_D - w l_D + (p_F q_F - w l_F) F(A+\mu tf) + r B_F$

Free entry condition:

$$\frac{\bar{\pi}}{\delta} = f_e \qquad \text{(A.2.11)}$$

Firm entry equals firm exit:

$$M_e = \delta M \qquad \text{(A.2.12)}$$

Labor market clearing condition:

$$L = M\left[G(\varphi_F^*) - G(\varphi_D^*) \right] \int_{\varphi_D^*}^{\varphi_F^*} l_D u_D(\varphi) d_\varphi + M\left[1-G(\varphi_F^*) \right] \int_{\varphi_F^*}^{\infty} l_D u_F(\varphi) d_\varphi + M\left[1-G(\varphi_F^*) \right] \int_{\varphi_F^*}^{\infty} l_F u_F(\varphi) d_\varphi$$

(A.2.13)

where L is the exogenous total supply of the economy, and labor demands for domestic production and FDI are given by:

$$l_D = \varphi^{\varepsilon-1} \left[\frac{(\varepsilon-1)P}{\varepsilon w\ (1+r)} \right]^{\varepsilon} Q + f \quad \text{and} \quad l_F = \varphi^{\varepsilon-1} \left[\frac{(\varepsilon-1)P}{\varepsilon w \left(1+\frac{r}{F(A+\mu tf)} \right)} \right]^{\varepsilon} Q + f + c$$

Bond market clearing condition:

$$MG(\varphi_D^*)(N-f_e) + M\left[G(\varphi_F^*) - G(\varphi_D^*) \right] \int_{\varphi_D^*}^{\varphi_F^*} B_D u_D(\varphi) d_\varphi + M\left[1-G(\varphi_F^*) \right] \int_{\varphi_F^*}^{\infty} B_F u_F(\varphi) d_\varphi = 0$$

(A.2.14)

where $B_D = N - f_e - wl_D$ and $B_F = N - f_e - wl_D - w(l_F - c) - A$

Price index:

$$P = \left[M\left[G(\varphi_F^*) - G(\varphi_D^*)\right] \int_{\varphi_D^*}^{\varphi_F^*} p_D^{1-\varepsilon} u_D(\varphi) d_\varphi + M\left[1 - G(\varphi_F^*)\right] \int_{\varphi_F^*}^{\infty} p_D^{1-\varepsilon} u_F(\varphi) d_\varphi + M\left[1 - G(\varphi_F^*)\right] \int_{\varphi_F^*}^{\infty} p_F^{1-\varepsilon} u_F(\varphi) d_\varphi \right]^{\frac{1}{1-\varepsilon}} \tag{A.2.15}$$

Resource constraint:

$$(N - f_e) M_e + PQ = wL \tag{A.2.16}$$

We thus have 9 equilibrium conditions as well as 9 unknowns.

In equation (A.2.8)–(A.2.16),

$$u_D(\varphi) = \frac{g(\varphi)}{G(\varphi_F^*) - G(\varphi_D^*)} \text{ if } \varphi \geq \varphi_D^* \text{ and } u(\varphi) = 0 \text{ if } \varphi < \varphi_D^*.$$

$$u_F(\varphi) = \frac{g(\varphi)}{1 - G(\varphi_F^*)} \text{ if } \varphi \geq \varphi_F^* \text{ and } u_F(\varphi) = 0 \text{ if } \varphi < \varphi_F^*.$$

$$G(\varphi) = 1 - \left(\frac{b}{\varphi}\right)^k$$

$$g(\varphi) = \frac{k}{\varphi}\left(\frac{b}{\varphi}\right)^k$$

and A is an implicit function of φ, which is determined by equation (2.14):

$$(p_{iF} q_{iF} - w_F l_{iF}) f(A_i + \mu\tau f) = r.$$

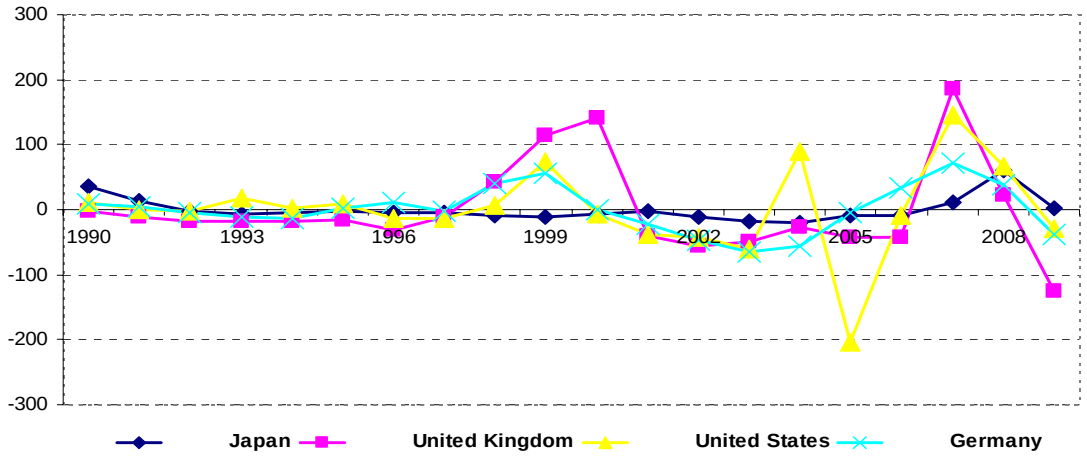
Chapter 3

Financial Structure, Productivity and Risk of FDI

3.1 Introduction

Risk is an important element in the theory of capital structure. Firms have incentives to reduce the costs associated with various risks by adjusting their capital structure (Desai et al. 2008). Meanwhile, risk is a key driving force for the volatility of investments and returns, which is particularly the case for FDI comparing to domestic investment. When comparing the FDI performances in countries with different financial systems, we find that outward FDI flows from countries with the market-based financial system like U.S. and U.K. are more volatile than those from countries with bank-based financial system like Germany and Japan (see Figure 3.1). Hence in this chapter, we investigate the question that facing business risks in foreign direct investment, how multinational firms choose their sources of financing and whether financial structure influences the volatility of foreign direct investment. Answering this question will illuminate the potential link of financial system and volatility of FDI, and further provide policy implications about how to structure the financial system to stabilize FDI and assist firms' internationalization.

Figure 3. 1 Financial Structure and Volatility of Outward FDI



Note: This graph shows the annual outward FDI flow (deviations from trend) of Japan, United Kingdom, United States and Germany over 1990-2009. Standard deviation: Japan 18.7; United Kingdom 72.1; United States 68.6; and Germany 35.8. The data is in billions of US dollars at current prices and current exchange rates. Data source: UNCTAD.

In this chapter, we develop a partial equilibrium model based on information asymmetry. The hidden information is the productivity shock, which happens when firms engage in FDI. A firm enters the model with a given amount of initial wealth as internal fund and draws its productivity. After knowing its own productivity, the firm makes two decisions, one is on whether investing abroad or not and the other is on the mean of financing if it does invest. There are two types of external finance: borrowing from bank or issuing corporate bonds from a group of bondholders.

The productivity shock of FDI is ex ante unknown to all the parties (either banks, bondholders or firms) and it is only freely observable by the firm ex post. However,

banks are willing to spend some resources to monitor the risk and convey the information to the borrowing firms after they pay an information acquisition fee (Fiore and Uhlig 2005). The role of banks as delegated monitors is also assumed by Diamond (1984), Holmstrom and Tirole (1997). The underlining motivation for banks to actively participate in monitoring the investment is their private relationships with lenders. The bondholders, in contrast, have no incentive to do so since the risk is shared by each individual holder.

If the firm borrows from a bank, it can acquire the information about the potential shocks before making production decision. If the bank tells that a good shock will happen, the firm will engage in FDI and get positive profit. While if a bad shock is coming such that FDI is not profitable, the firm has the option to abstain from FDI trial. Thus, when firms choose bank financing, they pay an extra fee to protect themselves from the risk of productivity shock. In contrast, if the firm uses bond financing, it saves the information acquisition fee but expose itself to the risk. When facing a good shock, the firm gets positive net profit from FDI abstracting a fixed repayment to bondholders. However, it could happen that the firm is not able to repay the bondholders when suffering from a bad shock. In this case, the firm defaults and gets nothing whereas the bondholders completely seize all the generated revenues in the hands of the firm.

The first result the model delivers is firms' partition in financing in terms of productivity. Those firms trying to carry out FDI but with relatively low productivities

use bank finance to reveal the information on productivity shock ex ante and reduce the cost associated with potential risks, which is similar to purchasing insurance. In comparison, those firms with high productivities and thus able to resist against bad productivity shocks prefer to skip the costly middleman and issue bond directly.

Secondly, the variance of productivity shocks (the indicator of risks) also impacts firms' financing choices. Firms investing in low-risk host countries prefer bond finance since in this case the insurance from banks is not worthwhile. By contrast, firms who engage in FDI in more risky locations are more likely to use bank finance. This result links the financial structure of FDI sourcing country with the characteristics of its host countries as well as the volatility of its FDI flows. Higher ratio of bond finance relative to bank finance is associated with safer and less volatile foreign investment.

Thirdly, the relative cost of bank finance and bond finance matters for firms' financing decision. Intuitively, firms are inclined to use relatively cheaper finance. Moreover, decreasing the cost helps reduce the productivity threshold of FDI and product price in foreign market as a result of reduced financial cost.

This chapter contributes to the rare research on the impact of financial development on FDI. What distinguishes us is the investigation on the structure effect of financial development. Besides reproducing the results that reduction of financing cost facilitates FDI as discussed in existing literatures, we set up a link between financial structure and FDI locations as well as volatilities based on the fact that foreign

investment faces significant risks and firms have incentive to reduce such risks by choosing different financing instruments. By doing so, we suggest a new direction of policy on reforming the structure of financial systems to promote firms' internationalization.

It also contributes to a huge body of capital structure literature in the following two aspects: first, we use productivity as a reference to segment firms in the choice of financing. We argue that productivity, besides leverage, size or cash flow focused in previous literatures, could be a key indicator for firm's profitability and default probability, and affect its financing choices. Second, we incorporate product market into a financial structure model. Instead of calculating return of investment as in prior studies, we derive firms' pricing and the revenues generated in product market such that the impact of financing on the intensive margin of FDI is discussed. In addition, we introduce the continuous stochastic states to calculate the cutoff productivities and derive the aggregation results for the whole economy.

The remainder of this chapter is organized as follows. Section 3.2 derives the model and firm-level predictions. Section 3.3 derives the aggregation results and discusses the relationships between financial structure, productivity and FDI risks. Section 3.4 provides some facts and evidences. Section 3.5 concludes.

3.2 The Model

Consider a world with two countries, one home country and one potential host country for FDI.[1] We focus on the behavior of firms from home country.

A continuum of firms is born with internal fund n, and they are heterogeneous in terms of productivity φ_1. Following Melitz (2003), we assume that firm i draws its idiosyncratic productivity φ_{1i} from a common distribution $G(\varphi_1)$. After the productivity is revealed, the firm decides whether to engage in FDI or not. If it does not invest in foreign country, the firm can invest all its funds in a safe asset to get gross return of Rn where R is the exogenous safe return rate in the economy. Instead, if the firm decides to carry out FDI, it faces a productivity shock φ_2, which brings uncertainty for the FDI revenue. The property of the shock will be specified in details when we introduce production.

Assume that labor is the only input in production, which must be prepaid. Also assume that firms' internal funds are not enough to fully finance the production, hence they need to borrow.

There are two types of external creditors: one is banks and the other is a group of bondholders. Both of them have access to the safe return R, but they differ in the following aspects:

[1] When we look at the data later in section 3.4, particularly when we examine the relationship between financial structure and average risk of FDI per destination country, we extend the model to multiple host countries setting.

As the delegated monitor of investors (Diamond, 1984), banks are willing to collect information on investment projects of their borrowers. In our model, we assume that banks spend resources to acquire information about the productivity shock φ_2. Then conditional on the information obtained, banks offer firms the option to get loans and do FDI or abstain from FDI and keep their initial wealth. However, the reduced uncertainty comes at a cost, namely that an information acquisition fee is paid by firms to banks, which is assumed to be a share of the internal fund: τn.

In comparison, the bondholders also offer the firms options to obtain funds, but there is no ex ante information acquisition about the risk of FDI. This assumption can be justified by the idea that there might be free-riding problems among bondholders since the risk is shared. As a consequence, bond finance saves the intermediary cost but it is a more risky choice because in a situation of financial distress (a very low φ_2 is realized), firms will be fully liquidized by bondholders and completely lose their initial wealth.

Intuitively, firms that have bad draws of initial productivities earn no more profit in FDI with either type of external finance than the safe return, and these firms immediately choose no FDI option. Firms with intermediate productivities go to banks and spend some initial wealth to “buy security” as they are more likely to suffer from financial distress even under the same risk. Those most productive firms would rather skip the costly middleman and issue finance from bondholders directly. The structure is summarized in Figure 3.2:

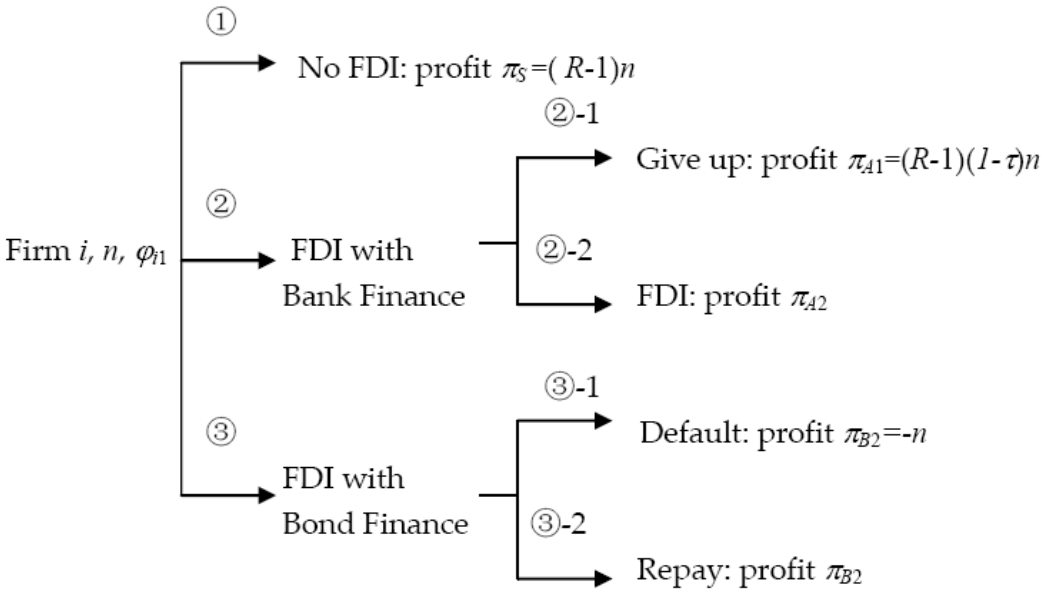


Figure 3.2 Production and Financing Choices

3.2.1 Demand

The utility function of a representative household in host country is:

$$U = \left[\int_{i \in \Omega} q_{iF}^{\frac{\varepsilon-1}{\varepsilon}} di \right]^{\frac{\varepsilon}{\varepsilon-1}}$$

where the set Ω denotes the mass of available varieties and ε denotes the elasticity of substitution between any two varieties. Defining the aggregate good $Q \equiv U$ with aggregate price

$$P = \left[\int_{i \in \Omega} p_{iF}^{1-\varepsilon} di \right]^{\frac{1}{1-\varepsilon}}$$

and solving the expenditure minimization problem of the consumer, we have the demand function for every variety i:

$$q_{iF} = \left(\frac{P}{p_{iF}} \right)^{\varepsilon} Q \tag{3.1}$$

3.2.2 Production

Each firm *i* produces a distinct variety in FDI, and labor is the only input. The cost function is given as:

$$l_{iF} = \frac{q_{iF}}{\varphi_{1i}\varphi_2} + f \tag{3.2}$$

where l_{iF} is the labor input, q_{iF} output and f the fixed cost for production (measured in units of labor). The labor wage is normalized to 1.

φ_2 is the productivity shock coming from a distribution $F(\varphi_2)$. F has a non-negative support and without loss of generality, we assume $E[\varphi_2]=1$. Following Bernanke, Gertler and Gilchrist (1999)'s proof for the interior solution, we also require that the hazard rate of $F(\varphi_2)$ is non decreasing in φ_2:

$$\frac{\partial h(\varphi_2)}{\partial \varphi_2} \geq 0$$

where $h(\varphi_2) = \frac{dF(\varphi_2)}{1-F(\varphi_2)}$. We take uniform distribution as an example.

$$F(\varphi_2) = \frac{\varphi_2 - (1-C)}{2C}, \quad \varphi_2 \in [1-C, \quad 1+C]$$

The mean of $F(\varphi_2)$ is 1 and the variance is $(1/3)C^2$. This variance, indicated by parameter C, is the measure of the potential risk of FDI.

3.2.3 No FDI

The firm is unlucky to draw a very low productivity such that FDI is not profitable. In this case, the firm chooses route ① and deposits all its internal fund to get a safe return Rn. The profit of this route is $\pi_S=(R-1)n$.

3.2.4 FDI with Bank Finance

The firm has an intermediate productivity such that it could make more profit in FDI than that from route ①. FDI has an additional risk φ_2 due to, for example, unanticipated institution or policy change or systematic risk in foreign economy. As we mentioned above, when a firm goes to a bank, the bank is willing to spend resources on monitoring the productivity shocks. For simplicity, we assume that bank monitoring is so efficient such that the uncertainty in FDI could be completely eliminated[2]. The bank then conveys the information about φ_2 to the borrower, allowing the firm to decide whether to continue with FDI or abstain from it. However, the firm has to pay a fee for the monitoring. Here we assume the information acquisition fee is a fixed share of its internal fund. Denote the share for the fee as τ so that after the payment, the firm has disposable fund $(1-\tau)n$ left. Assume banks have access to the safe return rate R and they are perfectly competitive.

[2] Relaxing such assumption does not change our results. What we are emphasizing is the role of banks' monitor compared to bond finance.

3.2.4.1 Abstain from FDI

If it is told that a bad shock will happen, i.e., φ_2 is below some threshold value, the firm will abstain from FDI and invest its remaining internal funds to get the safe return. In this case, the firm ends up with the profit in route ②-1:

$$\pi_{A1} = (R-1)(1-\tau)n \tag{3.3}$$

3.2.4.2 Engage in FDI

If it is told that a good shock will happen, i.e., φ_2 is above a certain threshold value and FDI is profitable, the firm will engage in FDI and end up in route ②-2. After paying the information acquisition fee, the firm needs to borrow:

$$X_A = l_{iF} - (1-\tau)n \tag{3.4}$$

As there is no uncertainty for bank finance anymore, the participation constraint of banks is given by:

$$M_A = RX_A \tag{3.5}$$

where M_A denotes the amount of repayment. The profit of the firm in route ②-2 is:

$$\pi_{A2} = p_{iF} q_{iF} - l_{iF} + X_{A2} - M_{A2}$$

The firm maximizes π_{A2} subjected to the demand (3.1), technology (3.2), borrowing (3.4) and repayment (3.5), which gives the optimal price:

$$p_{iF} = \frac{\varepsilon}{\varepsilon - 1} \frac{R}{\varphi_{1i}\varphi_2} \tag{3.6}$$

The price is composed with markup and marginal cost where R is financing cost

and labor wage is normalized to 1. The optimal output, labor input, borrowing and repayment can be calculated with this price.

3.2.4.3 Expected Profit of Route ②

The expected profit of route ② depends on both payoffs in sub-route ②-1 and ②-2 and the corresponding probability of ending up with each route. Firms with different initial productivities φ_{1i} have different corresponding probabilities. Precisely, firm φ_{1i} choose sub-route ②-2 instead of ②-1 if and only if:

$$\pi_{A2} \geq \pi_{A1}$$

which gives a threshold value of the productivity shock φ_2:

$$\varphi_2^* = \left\{ \frac{(\varepsilon-1)f}{Q} \left(\frac{R\varepsilon}{(\varepsilon-1)P} \right)^{\varepsilon} \right\}^{\frac{1}{\varepsilon-1}} \varphi_{1i}^{-1} \tag{3.7}$$

The firm will actually do FDI only if the realization of φ_2, told by the bank, is greater than φ_2^*,. Note that φ_2^* is inverse in φ_{1i}, which implies that more productive firms are able to bear worse shocks and thus more likely to engage in FDI.

In our example distribution of φ_2 , we require that $\varphi_2^* \in [1-C, 1+C]$. Accordingly, we derive the range of φ_{1i} from (3.7) and define the lower and upper bound of φ_{1i} as A_L and A_H respectively.

$$A_L \equiv \frac{1}{1+C} \left\{ \frac{(\varepsilon-1)f}{Q} \left(\frac{R\varepsilon}{(\varepsilon-1)P} \right)^{\varepsilon} \right\}^{\frac{1}{\varepsilon-1}} \leq \varphi_{1i} \leq \frac{1}{1-C} \left\{ \frac{(\varepsilon-1)f}{Q} \left(\frac{R\varepsilon}{(\varepsilon-1)P} \right)^{\varepsilon} \right\}^{\frac{1}{\varepsilon-1}} \equiv A_H$$

For a firm with initial productivity $\varphi_{1i}<A_L$, even the best shock $\varphi_2=1+C$ can not bring it profit in FDI, hence the firm will definitely end up with route ②-1. On the contrary, if its initial productivity $\varphi_{1i}>A_H$, then even the worst shock $\varphi_2=1-C$ can not stop the firm from doing FDI (end up with route ②-2). Only those firms whose productivities are between A_L and A_H might end up with either route ②-1 or ②-2. Therefore the ex ante expected profit of route ② is derived in the following three cases:

$$E[\pi_A]\begin{cases} =\int_{1-C}^{1+C}\pi_{A1}dF(\varphi_2)=\pi_{A1} & if \quad \varphi_{1i}<A_L \\ =\int_{1-C}^{\varphi_2^*}\pi_{A1}dF(\varphi_2)+\int_{\varphi_2^*}^{1+C}\pi_{A2}dF(\varphi_2) & if \quad A_L\le\varphi_{1i}\le A_H \\ =\int_{1-C}^{1+C}\pi_{A2}dF(\varphi_2) & if \quad \varphi_{1i}>A_H \end{cases}$$

Substituting π_{A1} and π_{A2} by previous results, and using the uniform distribution of F, we have:

$$E[\pi_A]\begin{cases} =(R-1)(1-\tau)n & if \quad \varphi_{1i}<A_L \\ =(R-1)(1-\tau)n-\frac{1+C}{2C}Rf+A_1\varphi_{1i}^{\varepsilon-1}+A_2\varphi_{1i}^{-1} & if \quad A_L\le\varphi_{1i}\le A_H \\ =(R-1)(1-\tau)n-Rf+A_3\varphi_{1i}^{\varepsilon-1} & if \quad \varphi_{1i}>A_H \end{cases} \tag{3.8}$$

where

$$A_1=\frac{(1+C)^{\varepsilon}QR}{2C\varepsilon(\varepsilon-1)}\left(\frac{(\varepsilon-1)P}{\varepsilon R}\right)^{\varepsilon},$$

$$A_2=\frac{(\varepsilon-1)Rf}{2C\varepsilon}\left\{\frac{(\varepsilon-1)f}{Q}\left(\frac{R\varepsilon}{(\varepsilon-1)P}\right)^{\varepsilon}\right\}^{\frac{1}{\varepsilon-1}}$$

$$A_3 = \frac{\left[(1+C)^{\varepsilon} - (1-C)^{\varepsilon}\right]QR}{2C\varepsilon(\varepsilon-1)}\left(\frac{(\varepsilon-1)P}{\varepsilon R}\right)^{\varepsilon}$$

are positive constants that determine the "slope" of the expected profit as a function of initial productivity φ_{1i}.

3.2.4.4 Cutoff Productivity of Route ②

The firm will choose route ② rather than route ① if and only if the expected profit of route ② is larger than that of route ①:

$$E[\pi_A] \geq \pi_S \tag{3.9}$$

When condition (3.9) is binding, a unique cutoff productivity φ_{1A}^{*} is determined. Firms with initial productivity $\varphi_{1i}<\varphi_{1A}^{*}$ will not do FDI with bank finance considering a high probability of failing besides the information acquisition fee charged by banks. Therefore, we have the following proposition:

Proposition 3.1*: the cutoff productivity for firms to do FDI with bank finance* φ_{1A}^{*} *is increasing with the bank cost* τ *and firm size n.*

Proof: see Appendix A.3.1

τ is the share of firm's initial wealth that is paid for monitoring. A higher τ means a higher cost for bank finance, which leads to a higher threshold for firms to access bank

loans. Moreover, the cutoff φ_{1A}^{*} is increasing with firm size n since larger firms pay higher information fee τn with a given τ. Therefore, bank finance is less attractive for larger firms. This result is consistent with the one delivered by capital structure literature (Cantillo& Wright, 2000).

Proposition 3.2*: the cutoff productivity for firms to do FDI with bank finance* φ_{1A}^{*} *is decreasing with the uncertainty in foreign investment C.*

Proof: see Appendix A.3.1.

When a firm goes to a bank, it pays a fee to eliminate the uncertainty in future investment, which is similar to purchasing insurance with a fixed payment. If the investment is not risky (lower C and lower variance of φ_2), it is not worth for the fixed fees. Hence going to banks is a less attractive choice; on the other hand, if the investment is risky, (higher C and higher variance of φ_2), it is more worthwhile to pay a fixed fee to reduce the risk in foreign production.

3.2.5 FDI with Bond Finance

A large number of bondholders provide direct finance for firms. They have no incentive to monitor the risk of FDI as a result of free riding problem. Therefore, if

firms borrow from bondholders, they save the intermediation cost but keep unknown ex ante about the potential shocks. When a firm draws a high productivity φ_{1i} such that it feels "confident" to overcome possible bad shocks, it would rather borrow from bondholders directly.

Firms are assumed to be risk-neutral and the optimal lending contract is similar to debt contract where firms take all the risk. The firm and bondholders negotiate the amount of lending and corresponding repayment. The productivity shock is realized after conducting production and it is only observable by the firm. If the profit after repayment to bondholders is non-negative, the firm repays the borrowing and collects the remained profit. Otherwise, the firm defaults and its revenue from FDI is completely liquidized and taken by bondholders. Similar to banks, bondholders also have access to the safe return rate *R* and they are perfectly competitive.

3.2.5.1 Optimal Contract with Bond Finance

As labor must be prepaid, the firm with φ_{1i} decides how much labor l_{iF} to hire for FDI ex ante. According to the cost function (3.2), with input l_{iF}, the actual output of FDI will be:

$$\tilde{q}_{iF} = \varphi_1 \varphi_2 (l_{iF} - f) \tag{3.10}$$

And the firm's expectation of output (ex ante target output) is:

$$q_{iF} = E[\tilde{q}_{iF}] = \varphi_1 (l_{iF} - f) \tag{3.11}$$

Thus, we have

$$\tilde{q}_{iF} = \varphi_2 q_{iF} \tag{3.12}$$

and the actual price (ex post realized price) is given by the inverse demand function (3.1):

$$\tilde{p}_{iF} = \left(\frac{Q}{\tilde{q}_{iF}} \right)^{\frac{1}{\varepsilon}} P = p_{iF} \varphi_{2i}^{-\frac{1}{\varepsilon}} \tag{3.13}$$

where p_{iF} denotes the ex ante target price.

To finance FDI, the firm needs to borrow

$$X_B = l_{iF} - n \tag{3.14}$$

Denote the repayment as M_B, which is negotiated by the firm and bondholders. Then the actual profit of the firm after repayment to bondholders is given by:

$$\pi_B = \tilde{p}_{iF} \tilde{q}_{iF} - l_{iF} + X_B - M_B \tag{3.15}$$

The firm will repay M_B if and only if $\pi_B \geq 0$.

The optimal lending contract specifies borrowing X_B and repayment M_B and the payoffs are distributed according to the following plan:

- If $\pi_B \geq 0$, the firm gets π_B and bondholders get M_B.
- If $\pi_B < 0$, the firm defaults and get 0 while bondholders get liquidized value of FDI total revenue.

Note that $\pi_B = 0$ determines a threshold level of shock φ_2^{B*} shown in expression (3.16) such that if the firm encounters a shock $\varphi_2 < \varphi_2^{B*}$, it will default.

$$\varphi_2^{B^*} = \left(\frac{M_B + n}{p_{iF} q_{iF}} \right)^{\frac{\varepsilon}{\varepsilon - 1}} \tag{3.16}$$

The threshold level of shock $\varphi_2^{B^*}$ depends on the repayment, firm initial wealth as well as target price and output, which are further positively determined by the firm's initial productivity φ_{1i}. Hence $\varphi_2^{B^*}$ is decreasing with φ_{1i}, implying that the more productive firms are less likely to default.

Similarly, we require $\varphi_2^{B^*} \in [1\text{-}C,\ 1\text{+}C]$, which gives some partitions on φ_{1i}. Analogous to the case in bank finance, if $\varphi_2^{B^*} > 1\text{+}C$, i.e., φ_{1i} is below some certain level B_L, this firm will default even if it has the best productivity shock when the firm borrows from bondholders; on the other hand, if $\varphi_2^{B^*} < 1\text{-}C$, i.e., φ_{1i} is above some level B_H, this firm will never default even if it encounters the worst shock. Only those firms whose productivities are between B_L and B_H have both possibilities.

If $\varphi_2^{B^*} \in [1\text{-}C,\ 1\text{+}C]$, the expected profit of FDI with bond finance is:

$$E[\pi_B] = \int_{\varphi_2^{B^*}}^{1+C} \tilde{p}_{iF} \tilde{q}_{iF} - n - M_B dF(\varphi_2) \tag{3.17}$$

The participation constraint of bondholders is given by:

$$\int_{\varphi_2^{B^*}}^{1+C} M_B dF(\varphi_2) + \int_{1-C}^{\varphi_2^{B^*}} \tilde{p}_{iF} \tilde{q}_{iF} - n dF(\varphi_2) = R X_B \tag{3.18}$$

Maximizing (3.17) subject to (3.18) gives the ex ante target price of FDI

$$p_{iF} = \frac{\varepsilon}{\varepsilon - 1} \frac{R}{\varphi_{1i}} \frac{1}{\kappa} \tag{3.19}$$

and the optimal amount of lending:

$$X_B = \left(\frac{\kappa(\varepsilon - 1)P}{\varepsilon R} \right)^{\varepsilon} Q \varphi_{1i}^{\varepsilon - 1} + f - n \tag{3.20}$$

where $\kappa = \dfrac{\varepsilon\left[(1+C)^{1+\frac{\varepsilon-1}{\varepsilon}} - (1-C)^{1+\frac{\varepsilon-1}{\varepsilon}}\right]}{2C(2\varepsilon-1)}$

Compared to (3.6), the optimal price includes an extra cost $1/\kappa$ induced by potential risk. Note that κ is decreasing in *C*, meaning that a higher potential risk results in a higher price.

Meanwhile, the optimal repayment is given by:

$$M_B = \left\{ \frac{\varepsilon p_{iF} q_{iF} (1-C)^{1+\frac{\varepsilon-1}{\varepsilon}} + 2C(2\varepsilon-1)(Rl_{iF} - (R-1)n)}{(3\varepsilon-1)(p_{iF} q_{iF})^{-\frac{\varepsilon}{\varepsilon-1}}} \right\}^{\frac{\varepsilon-1}{2\varepsilon-1}} - n \qquad (3.21)$$

Hence the repayment rate on bond finance is:

$$R_B = M_B / X_B \qquad (3.22)$$

Proposition 3.3*: the repayment rate on bond finance R_B is decreasing in productivity φ_{1i}, and increasing in FDI risk C.*

Proof: see Appendix A.3.1.

Comparing to the constant cost of bank finance (fixed monitor cost as well as fixed marginal cost), the cost of bond finance is firm-specific, which is increasing with firm's default probability and thus decreasing with firms' own productivity (See Figure 3.3). When FDI is more risky (higher *C*), the firm has a higher default probability, therefore bondholders charge a higher bond rate. On the other hand, if the firm has a higher

productivity, it is less likely to default facing the same risk, thus its repayment rate is lower.

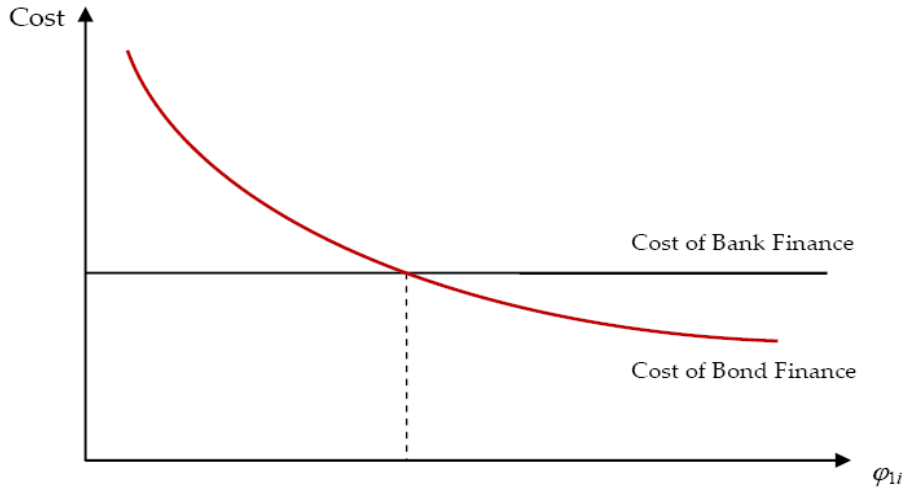


Figure 3.3 Financing Cost and Firm Productivity

3.2.5.2 Expected Profit of Bond Finance

The expected profit in route ③ is given by equation (3.17) if $\varphi_{1i} \in [B_L, B_H]$. Moreover, if $\varphi_{1i} < B_L$, regardless of how high φ_2 is, the firm will default. If $\varphi_{1i} > B_H$, the firm will never default and bondholders charge the repayment rate $R_B = R$. The result is summarized by equation (3.23):

$$E[\pi_B] \begin{cases} = -n & if \quad \varphi_{1i} < B_L \\ = (R-1)n - Rf + B_1 \varphi_{1i}^{\varepsilon-1} & if \quad B_L \le \varphi_{1i} \le B_H \\ = (R-1)n - Rf + B_2 \varphi_{1i}^{\varepsilon-1} & if \quad \varphi_{1i} > B_H \end{cases} \tag{3.23}$$

where

$$B_1 = B_2 = \frac{QR}{\varepsilon - 1}\left(\frac{(\varepsilon-1)\kappa P}{\varepsilon R}\right)^{\varepsilon}$$

are positive constants that determine the slope of the expected profit of bond finance.

3.2.6 The Choice between Bank Finance and Bond Finance

Based on the results derived above, we summarize the relationships between expected profits and firm's initial productivity φ_{1i} in route ① (green dashed line), ② (red curve) and ③ (black curve) in Figure 3.4.

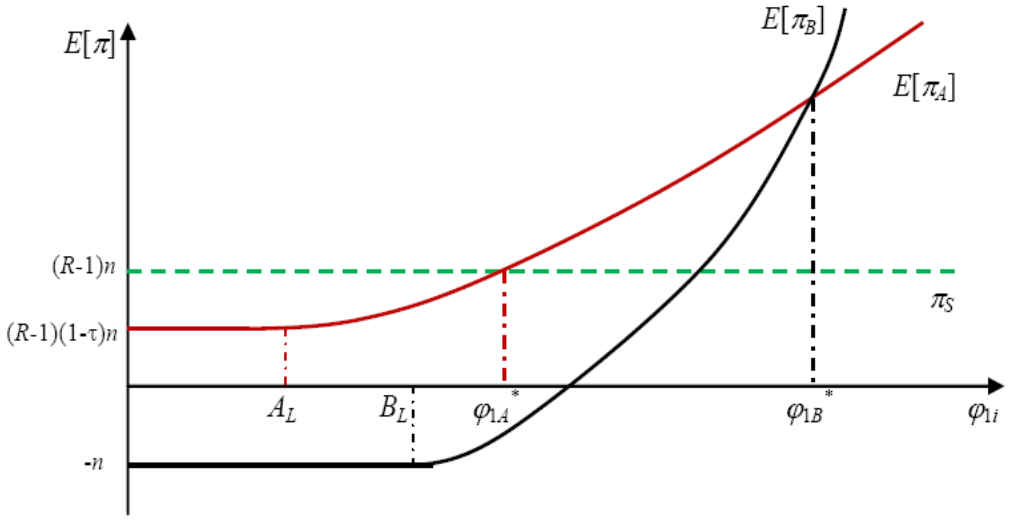


Figure 3.4 Comparisons of Expected Profits

Three things are worth mentioning in this figure. First, if productivity φ_{1i} is sufficiently low (lower than φ_{1A}*), the profit of FDI trial with either bank finance or bond finance is lower than safe return π_S due to the monitor cost and existence of risk respectively. When $\varphi_{1i}<B_L$, firms using bond finance will lose all their initial wealth n because of the liquidation under default. These can be seen from the equations (3.8) and (3.23).

Second, when productivity is above certain value (A_L and B_L for bank finance and bond finance respectively), the expected profits with both bank finance and bond finance are increasing with productivity and that with bond finance $E[\pi_B]$ increases faster. This is because the cost of bank finance is constant while the cost of bond finance is decreasing with productivity, as figure 3.3 shows. Note that B_L needs not to be higher than A_L. For example, $B_L < A_L$ when $C=0$, i.e., there is no risk associated with FDI. In this case, no firm uses bank finance. We rule out this uninteresting case by assuming a certain level of risk.

Third, firms make their decisions on production and financing choice by comparing the expected profits of each route. Finally, firms are segmented into three types by the two cutoff productivities φ_{1A}^* and φ_{1B}^*. Those firms whose initial productivities are below φ_{1A}^* will not engage in FDI but get safe return as in route ①. Those whose productivities are between φ_{1A}^* and φ_{1B}^* borrow from banks and do FDI trials since the expected profit is higher than safe return (red curve is above the green dashed line). And those whose productivities are higher than φ_{1B}^* borrow from bondholders and engage in FDI as now the black curve is above the red curve.

3.3 Aggregation

After specifying firm-level decisions, we now aggregate over individual firms to

form country-wide predictions and take them to the data in next section.

3.3.1 Financial Structure of FDI Sourcing Country

In the economy, a continuum of firms (the total number is normalized to 1) draws productivity φ_{1i} from a common distribution $G(\varphi_1)$. Denote the number of firms who do not engage in FDI, borrow from banks and borrow from bondholders on the aggregate level as N^S , N^A and N^B respectively. Then we have

$$N^S + N^A + N^B = 1, \quad N^S = G\left(\varphi_{1A}^*\right),$$
$$N^A = G\left(\varphi_{1B}^*\right) - G\left(\varphi_{1A}^*\right), \quad N^B = 1 - G\left(\varphi_{1B}^*\right) \tag{3.24}$$

We define the financial structure of the economy as the ratio of total bond finance over total bank finance:

$$FinStr = \frac{BOND_T}{BANK_T} \tag{3.25}$$

To calculate the financial structure, we integrate firms' borrowings from banks and from bondholders respectively based on their productivities. First we derive the total amount of bank finance. Note that not all the firms whose productivities are between φ_{1A}^* and φ_{1B}^* borrow from banks. Some of them, upon with a bad luck of productivity shock, abstain from FDI and do not borrow (route ②-1). Only those firms with productivity shock $\varphi_2 > \varphi_2^*$ will borrow X_A. As X_A is given by (3.4), which further depends on the realization of productivity shock φ_2, we have the ex post amount of borrowing (substituting the labor demand by the optimal price (3.6) and the

corresponding demand (3.1)):

$$X_A = \left(\frac{P(\varepsilon - 1)}{\varepsilon R} \right)^{\varepsilon} \varphi_{1i}^{\varepsilon - 1} \varphi_2^{\varepsilon - 1} + f - (1 - \tau)n$$

Hence the ex ante conditional expected amount of borrowing from banks by firm with productivity φ_{1i} is given by:

$$E[X_A] = \frac{1}{1 - F(\varphi_2^*)} \left(\frac{P(\varepsilon - 1)}{\varepsilon R} \right)^{\varepsilon} \varphi_{1i}^{\varepsilon - 1} \int_{\varphi_2^*}^{1+C} \varphi_2^{\varepsilon - 1} dF(\varphi_2) + [f - (1 - \tau)n]$$

By integration on φ_{1i}, the total amount borrowed from banks (expected value) is given by:

$$BANK_T = \int_{\varphi_{1A}^*}^{\varphi_{1B}^*} N^A E[X_A][1 - F(\varphi_2^*)] dG(\varphi_1) \tag{3.26}$$

where φ_2^* is given by (3.7), and 1-$F(\varphi_2^*)$ is the probability of borrowing.

Similarly, the total amount borrowed from bondholders is

$$BOND_T = \int_{\varphi_{1B}^*}^{\infty} N^B X_B dG(\varphi_1) \tag{3.27}$$

where X_B is given by (3.20).

As we can see from (3.26) and (3.27), the aggregate financial structure depends on the two cutoff productivities φ_{1A}^* and φ_{1B}^* as well as the distribution of $G(\varphi_1)$, which is intuitively depicted in Figure 3.5. Given distribution of initial productivity $G(\varphi_1)$, the aggregate financial structure is determined by the relative position of the two cutoffs, since the integration is simply the area between the distribution and the horizontal axis.

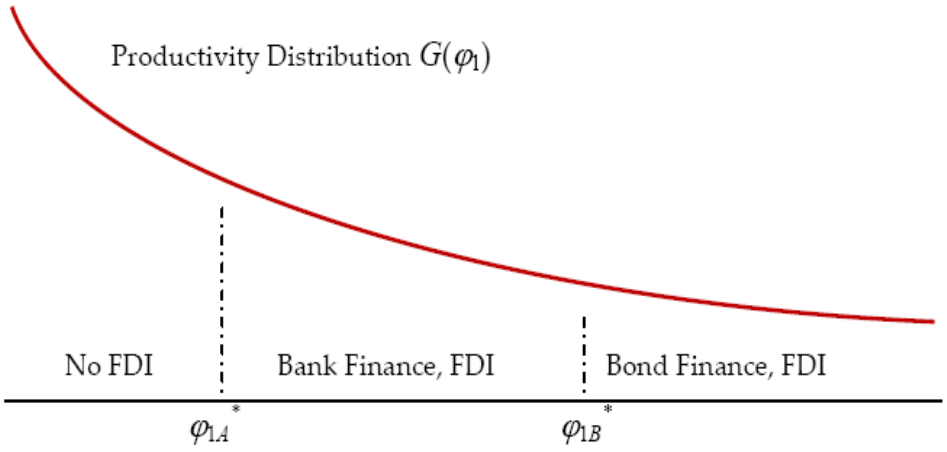


Figure 3.5 Segmentation of Firms in Production and Finance

3.3.2 Financial Structure and Risk of FDI

According to the above argument, the aggregate financial structure depends on the cutoff productivities for bank finance and bond finance. Therefore, we derive the relationship between FDI risk and financial structure by examining the impact of risks on two cutoff productivities. Note that φ_{1A}^* is calculated by equalizing $E[\pi_A]$ and π_S while φ_{1B}^* is derived by equalizing $E[\pi_A]$ and $E[\pi_B]$ (see Figure 3.4). We have the following lemma:

Lemma 3.1*: if* $C > 1/(\varepsilon - 1)$*, in the expression for the expected profit from bank finance (3.8),* A_1 *is increasing in C,* A_2 *is decreasing in C and* A_3 *is increasing in C. In the expression for the expected profit from bond finance (3.23),* B_1 *and* B_2 *are decreasing in C.*

Proof: see Appendix A.3.1.

Lemma 1 says that with a higher risk of FDI (higher C), the slope of $E[\pi_A]$ as a function of initial productivity is steeper while the slope of $E[\pi_B]$ is flatter (see respectively the expressions (3.8) and (3.23)). Therefore with a higher risk, Figure 3.4 changes to Figure 3.6.

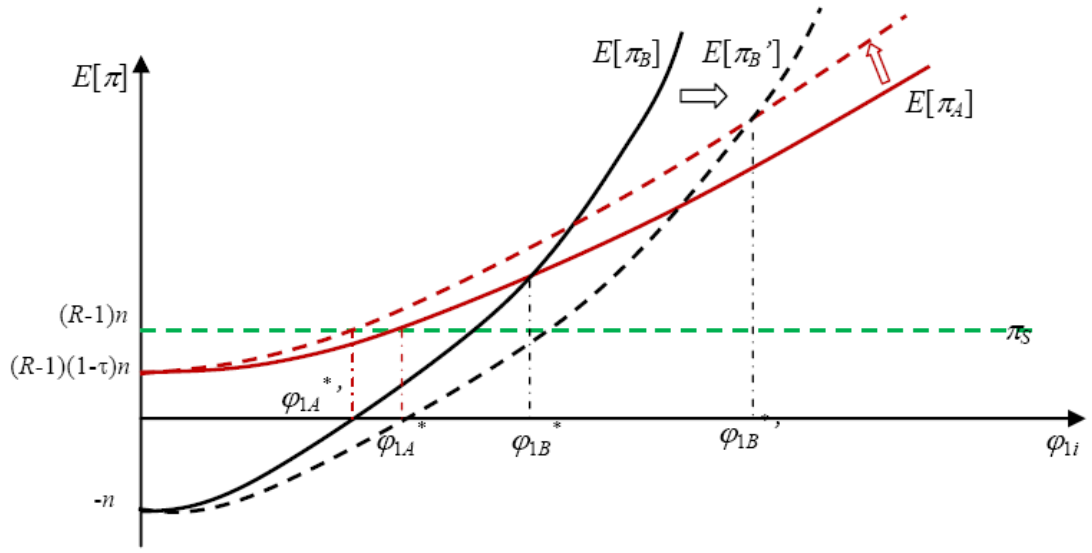


Figure 3.6 The Effects When Risk Increases

When the risk is higher, bank finance becomes more attractive since bank monitoring largely reduces the uncertainty and the expected profit of bank finance is therefore higher, resulting in a lower cutoff φ_{1A}^*. On the contrary, bond finance is more expensive as bondholders charge higher risk premiums. In comparison to bank finance, an increase in risk results in a much higher cutoff φ_{1B}^*. This result is driven by the slopes change of expected profits of both types of financing and it is independent of the

initial positions of the two curves. We therefore make the following proposition:

Proposition 3.4*: other things equal, the higher risk of FDI, the lower financial structure of the economy.*

Proof: by Figure 3.6 and Lemma 1.

3.3.3 Financial Structure and Productivity

As Helpman et al. (2004), we assume firms' productivities in an economy follow Pareto distribution. Comparing the distribution of $G(\varphi_1)$ and $G(\varphi_1)$' in Figure 3.7, we see that the average productivity of $G(\varphi_1)$' is higher than $G(\varphi_1)$. Meanwhile, fixing the two cutoffs φ_{1A}^* and φ_{1B}^*, more firms use bond finance in the economy with $G(\varphi_1)$'. Hence we expect a higher financial structure under $G(\varphi_1)$' than $G(\varphi_1)$.

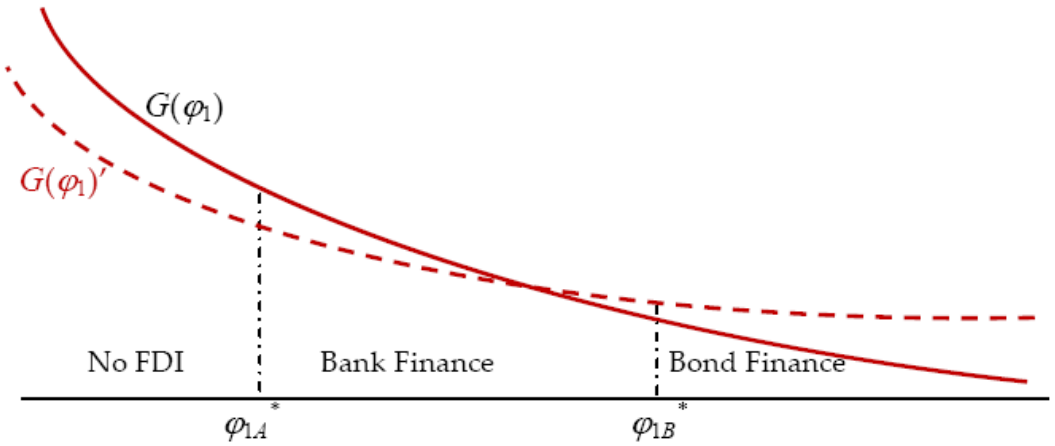


Figure 3.7 Financial Structure and Productivity Distribution

Proposition 3.5*: other things equal, the higher productivity of the home economy, the more bond finance relative to bank finance is used.*

With proposition 3.5, we extend our discussion to multiple destination countries case. Assuming country-specific risk *C*, it is easily to conclude a pecking order of FDI destinations, that is, firms start FDI in countries with lower risks and then go further to countries with higher risks. The more productive the firm is, the more destinations it can invest and hence the average risk per destination is increasing. On aggregate level, with the increase of productivity, a country invests in more destinations, which brings higher risks. We thus observe a positive relationship between the financial structure (bond finance over bank finance) and the risk of FDI. Importantly, the risk of FDI in current discussion is the average risk per destination rather than the risk of one particular destination portfolio. Hence this result does not contradict proposition 3.4. Interestingly, both proposition 3.4 and 3.5 are supported by our empirical analysis, with risk measured by “per-portfolio” and “per-destination country” respectively.

3.4 Facts and Evidences

3.4.1 Data

In the section, we examine the relationship of financial structure with productivity, outward FDI performance at aggregate country level using the panel data including 24 countries (Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea Republic, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States) over 1990-2009 period. The share of outward FDI flow of the 24 countries in the total world amounts to 80% in 2006. All the relevant variables are summarized in Table 3.1.

Table 3.1 Summary Statistics

Variables	Label	Obs.	Mean	Std. Dev.	Min	Max
FS^{FDI}	Financial Structure	377	.491823	.5307063	.0034382	3.414207
Prod	Productivity	372	35.82607	15.38012	5.585721	97.71676
Agg.Risk	Aggregate Risk of FDI Portfolio	384	.0159558	.0061285	.0053529	.0451376
FDI Vol.	FDI Volatility	377	12826.95	23432.59	17.01059	203895.4
Nr.of Dest.	Number of Total Destinations	384	44.65885	29.54044	2	155
Ave_Risk_per_Dest.	Average Risk per Destination	384	.0159541	.0023777	.0117178	.0237073

Note: Financial structure is measured as the ratio of bond finance over bank finance. Productivity is measured by GDP per hour. Aggregate risk is the grade for destination country risk weighted by its share in a sourcing country's total outward FDI flow. FDI volatility is the absolute value of deviation from trend (HP-Filtered). Number of destinations is counted by authors. Average risk per destination is the sum-up risk of all destination countries divided by the number of destinations. Risk data is from Euromoney

Country Risk Dataset. We take the reverse of the original data, and therefore higher value indicates higher risk. Original data for calculating financial structure is from Beck (2010). The data of FDI flows is from UNCTAD dataset. All other data are from OECD Dataset. For the calculation of financial structure and aggregate risk see the appendix.

3.4.2 Productivity and Location Pecking Order of FDI

Evidence 1: *Countries tend to invest in more destinations over time and the average risk per destination of outward FDI increases.*[3]

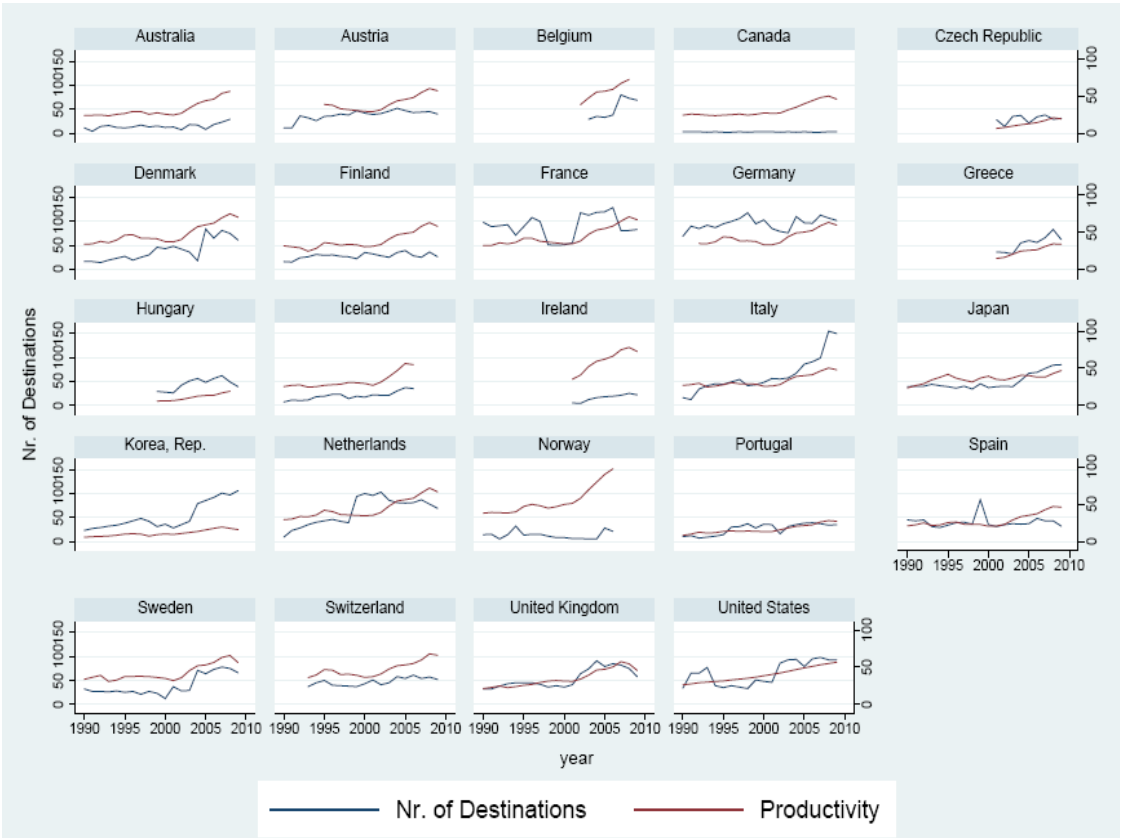


Figure 3.8 The Evolution of Number of Destinations and Productivity

[3] Alternatively, we take the distance between FDI sourcing country and its destination country into account and calculate the average risk per distance, and we find similar pattern, namely, with the increase of the total distance of all destinations, the average risk per distance increase as well.

With the productivity growing over time, countries invest in more foreign destinations. As depicted in Figure 3.8, productivity and number of FDI destinations of a country are increasing simultaneously. They are significantly positively correlated except for Austria, Canada, Czech Republic, Norway, Spain. The correlation coefficient is higher than 0.9 for Belgium, Finland, France, Greece, Ireland, Italy, Korea, Sweden. The average correlation of the 24 countries is 0.61.

With investing in more destination countries, the average risk per destination is increasing (see Figure 3.9), which implies a pecking order of countries in choosing FDI destinations from low risk countries to high risk countries.

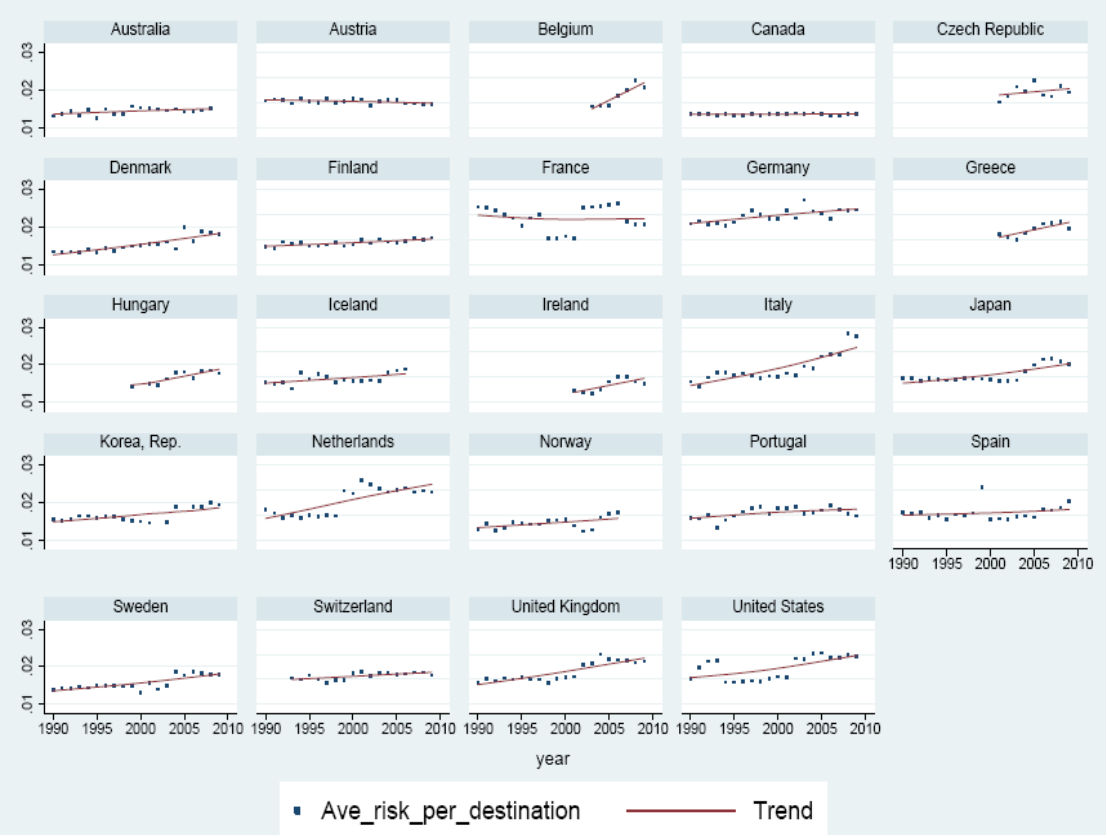


Figure 3.9 The Rising Average Risk per Destination of FDI

3.4.3 Aggregate Risk and Financial Structure of FDI

From the original country-pair FDI data, we find that the amount of investment varies across destinations that have different level of risks. FDI sourcing country adjusts its investment in each destination to reduce the aggregate risk of the portfolio. We therefore define the aggregate risk of FDI as the weighted risk of all the destinations by the share of outward FDI flow to each destination in the total outward FDI flow of the sourcing country. When linking it to the financial structure of the sourcing country, we have the following observation:

Evidence 2*: The higher FDI aggregate risk, the less bond finance relative to bank finance is exploited.*

As our model predicts, facing higher risk in foreign investment, bank finance is more preferred. In reality, the sourcing country divests from more risky country and invests more in safer locations. In aggregation across all the destinations, the negative relationship between aggregate risk and financial structure ratio holds (see Figure 3.10).

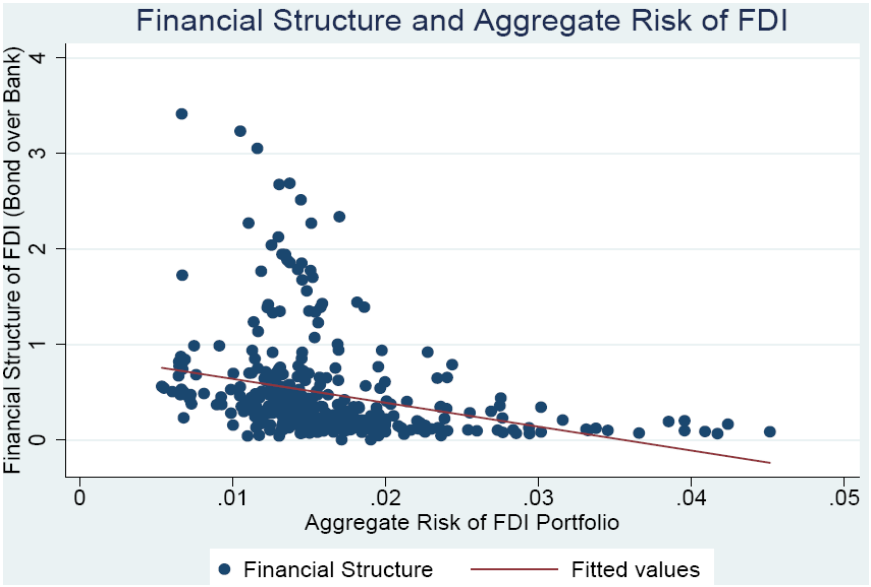


Figure 3.10 Financial Structure and Aggregate Risk of FDI Portfolio

Note: This graph shows the relationship between a country's financial structure for FDI and its aggregate risk of FDI location portfolio. The aggregate risk is the grade for destination country risk weighted by its share in a sourcing country's total outward FDI flow. It is the pooled data for 24 FDI sourcing countries over 1990-2009. Number of observation = 377. corr.= -0.29, coeff. = -24.99***

3.4.4 Financial Structure and Productivity

The impact of productivity on financial structure works in two ways. When the productivity distribution skews towards higher productivity, more firms will use bond finance, leading to a higher ratio of bond finance over bank finance. Nevertheless, as evidence 1 shows, more firms will tap more risky countries and in that case bank finance is more preferred by some firms to reduce uncertainty. The data shows a positive relation between productivity and financial structure of FDI, meaning the first effect dominates the second one.

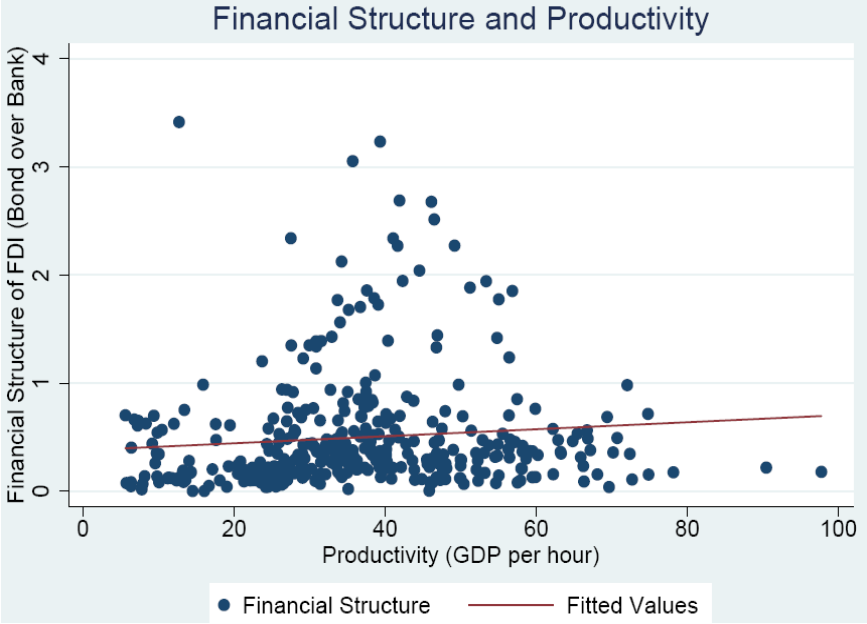


Figure 3.11 Financial Structure and Productivity

Note: This graph shows the relationship between a country's financial structure for FDI and its productivity. Financial structure is measured as the ratio of bond finance over bank finance. The x-axis gives the GDP per hour as a country-level measurement of productivity. It is the pooled data for 24 countries over 1990-2009. Number of observation = 388, coeff. = .0032409*.

3.4.5 Financial Structure and Volatility of FDI

We implement simple regressions of FDI volatility on financial structure. The coefficient of financial structure is positive and significant before and after controlling for productivity and average risk of FDI (see Table 3.2), which implies the advantage of bank-based financial system in reducing FDI volatility and is consistent with the pattern showed in Figure 3.1.

Table 3.2 Financial Structure and Volatility of FDI

Dependent Variable: FDI Volatility						
	(1)	(2)	(3)	(4)	(5)	(6)
FS^{FDI}	6134.194***	6791.108**	5237.271**	6917.573**	3639.772*	6987.342**
	(2203.4)	(3086.663)	(2242.533)	(3113.537)	(2176.519)	(3116.114)
Prod			213.4965**	134.8542	219.2699**	146.6575
			(91.67678)	(235.9321)	(88.16749)	(236.4667)
Ave_risk_per_dest.					2806907***	631262.9
					(517045.4)	(757556.7)
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effect	No	Yes	No	Yes	No	Yes
R^2	0.1368	0.4469	0.1476	0.4471	0.2140	0.4483
Obs.	377	377	372	372	372	372

Note: FDI volatility is the absolute value of deviation from trend. Financial structure is the ratio of bond finance over bank finance.*p<0.1, ** p<0.05, *** p<0.01. Standard errors are in parentheses. Year dummies and country dummies are not reported.

3.5 Conclusion

Countries with different financial structures vary in the performance of FDI, especially in volatility and locations. We develop a theory on how heterogeneous firms choose financing instrument between borrowing bank loans and issuing corporate bonds to finance FDI, and investigate the link of financial structure and country-level FDI performance. We establish an asymmetric information model where the hidden information is the productivity shock that happens when the firms engage in FDI. As the

delegated monitors, banks are willing to spend resources to acquire information about the coming shocks while bondholders are not motivated to do so as a result of free riding problem. Our model predicts that firms with higher productivity, hence with more resistance to bad shocks, are more likely to use corporate bonds whereas firms with lower productivities resort to bank finance since banks help reduce the uncertainty ex ante. On the other hand, the risk expectation in potential FDI host countries is a key determinant on firm's financing choice. Firms investing in more risky countries prefer bank finance to bond finance.

We test the theory with the panel data including 24 large FDI sourcing countries over 1990-2009. We find that countries with higher aggregate productivity, less risky investment portfolio of locations have higher ratio of bond finance over bank finance, which are consistent with the model's predictions. Meanwhile, after controlling for productivity and risk, more employment of bond finance relative to bank finance leads to higher volatility of FDI.

This research contributes to the emerging literature on financial development and firms' internationalization with emphasis on the impact of the type other than the availability of external financial resources on FDI. It also differs from the existing capital structure literatures by proposing productivity as a determinant of financing choices.

Appendix 3.1

Proofs of Proposition 3.1, 3.2, 3.3 and Lemma 3.1

We begin with proof of lemma 3.1. Note that

$$A_1 = \frac{(1+C)^{\varepsilon} QR}{2C\varepsilon(\varepsilon-1)}\left(\frac{(\varepsilon-1)P}{\varepsilon R}\right)^{\varepsilon}, \quad A_2 = \frac{(\varepsilon-1)Rf}{2C\varepsilon}\left\{\frac{(\varepsilon-1)f}{Q}\left(\frac{R\varepsilon}{(\varepsilon-1)P}\right)^{\varepsilon}\right\}^{\frac{1}{\varepsilon-1}}$$

$$A_3 = \frac{\left[(1+C)^{\varepsilon} - (1-C)^{\varepsilon}\right]QR}{2C\varepsilon(\varepsilon-1)}\left(\frac{(\varepsilon-1)P}{\varepsilon R}\right)^{\varepsilon}$$

Denote $\Delta = \frac{QR}{2\varepsilon(\varepsilon-1)}\left(\frac{(\varepsilon-1)P}{\varepsilon R}\right)^{\varepsilon}$, then $A_1 = \frac{(1+C)^{\varepsilon}}{C}\Delta$. Hence:

$$\frac{\partial A_1}{\partial C} = \Delta\frac{(\varepsilon-1)(1+C)^{\varepsilon} - \varepsilon(1+C)^{\varepsilon-1}}{C^2}$$

$$(\varepsilon-1)(1+C)^{\varepsilon} - \varepsilon(1+C)^{\varepsilon-1} > 0 \quad \Leftrightarrow \quad C > \frac{1}{\varepsilon-1}$$

Therefore, when $C > \frac{1}{\varepsilon-1}$, A_1 is increasing in *C*.

Secondly, it is obvious that A_2 is decreasing in *C*.

Thirdly, $A_3 = \Delta\frac{(1+C)^{\varepsilon} - (1-C)^{\varepsilon}}{C}$, and

$$\frac{\partial A_3}{\partial C} = \Delta\left[\frac{(\varepsilon-1)(1+C)^{\varepsilon} - \varepsilon(1+C)^{\varepsilon-1}}{C^2} + \frac{\varepsilon(1-C)^{\varepsilon-1}C + (1-C)^{\varepsilon}}{C^2}\right]$$

As $\frac{\varepsilon(1-C)^{\varepsilon-1}C + (1-C)^{\varepsilon}}{C^2} > 0$ because *C* is between 0 and 1, then $C > \frac{1}{\varepsilon-1}$ is also sufficient to guarantee that $\frac{\partial A_3}{\partial C} > 0$, using the result from $\frac{\partial A_1}{\partial C}$. Hence we complete the proof that A_1 is increasing in *C*, A_2 is decreasing in *C* and A_3 is increasing

in *C*.

Meanwhile, note that

$$B_1 = B_2 = \frac{QR}{\varepsilon - 1}\left(\frac{(\varepsilon - 1)\kappa P}{\varepsilon R}\right)^{\varepsilon}, \text{ where } \kappa = \frac{\varepsilon\left[(1+C)^{1+\frac{\varepsilon-1}{\varepsilon}} - (1-C)^{1+\frac{\varepsilon-1}{\varepsilon}}\right]}{2C(2\varepsilon - 1)}$$

Since

$$\frac{\partial \kappa}{\partial C} = \left[\frac{\frac{\varepsilon-1}{\varepsilon}(1+C)^{1+\frac{\varepsilon-1}{\varepsilon}} - \left(1+\frac{\varepsilon-1}{\varepsilon}\right)(1+C)^{\frac{\varepsilon-1}{\varepsilon}}}{C^2} + \frac{\left(1+\frac{\varepsilon-1}{\varepsilon}\right)(1-C)^{\frac{\varepsilon-1}{\varepsilon}} - \frac{\varepsilon-1}{\varepsilon}(1-C)^{1+\frac{\varepsilon-1}{\varepsilon}}}{C^2}\right]\frac{\varepsilon}{2(2\varepsilon-1)}$$

then $\frac{\partial \kappa}{\partial C} < 0$ if and only if $-\frac{\varepsilon}{\varepsilon - 1} < C < \frac{\varepsilon}{\varepsilon - 1}$. As ε is the elasticity of substitutions which is greater than 2, (and the empirical analysis shows $\varepsilon = 3.8$, Bernard, Eaton, Jensen and Kortum, 2003), and *C* is between 0 and 1, condition $-\frac{\varepsilon}{\varepsilon - 1} < C < \frac{\varepsilon}{\varepsilon - 1}$ is satisfied. Therefore B_1 and B_2 are decreasing in *C*.

With the result of Lemma 3.1, proposition 3.2 that φ_{1A}^{*} is decreasing in *C* can be shown by Figure 3.6.

Proposition 3.1 can be seen from the expression of the profit (3.8). When τ is higher, ceteris paribus, the expected profit curve of bank finance in figure 3.4 (the red curve) is moved down while the expected profit of no FDI (the green line) is intact. Hence the cutoff productivity for bank finance is higher. When the initial wealth *n*

increases, both the green line and the red curve move up but the green line moves more due to the fact that τn is paid as monitoring cost. Hence the cutoff productivity φ_{1A}^{*} is also higher.

Proposition 3.3 discusses the cost of bond financing. Substitute M_B and X_B by the results from optimal contract and optimal target price and labor demand, and take the partial derivatives with respect to φ_{1i} or C to complete the proof.

Appendix 3.2

Calculation of Financial Structure of FDI

We have financial structure data for the whole economy of each FDI sourcing country which includes the finance for FDI as well as for domestic investment. Remember that we are trying to build a relationship between the financial structure and FDI risk where the financial structure is the one for FDI only. Therefore, we need to isolate the finance for FDI from that for domestic investment and figure out the financial structure of only FDI firms (aggregate FDI firms' financial structure). Our data remains at macro level.

Since we have assumed that all firms raise their finance at their home countries, the investment that has impact on S of home country is just D while Inward FDI I is financed from foreign country. Remember D includes investment in home country as well as in foreign country. Hence, the financial structure S is the overall outcome of S_D and S_F where the weight on S_D is $(T\text{-}I)/D$ and the weight on S_F is F/D. We then have:

$$\frac{T-I}{D}S_D + \frac{F}{D}S_F = S \tag{A.3.1}$$

The relationship between S_D and S_F is tricky. According to the model and theories on financial structure, the higher the investment risk is, the more bank finance will be used compared to bond finance, which suggests an inverse relationship between risk and financial structure where financial structure means the ratio of bond finance over bank

finance. For simplicity, we assume the relationship follows equation (A.3.2):

$$S_D R_D = S_F R_F \tag{A.3.2}$$

Inserting it into equation (A.3.1) we have the financial structure for FDI

$$S_F = \frac{S}{\frac{T-I}{D}\frac{R_F}{R_D} + \frac{F}{D}}$$

Table A.3.1 Variable Denotations

Variable	Label	Description
T	national total investment	Gross Capital Formation as proxy, data available directly
F	total outward FDI flow	data available directly
I	total inward FDI flow	data available directly
D	domestic firms' total investment	$D = T - I + F$, investment of domestic firms, both FDI firms and non FDI firms, in both home country and foreign country, data available by calculation
R_F	risk of outward FDI	*Agg.Risk* data available by calculation
R_D	risk of domestic production	sourcing country risk, data available directly
S_F	financial structure of OFDI firms	variable of interest
S_D	financial structure of non FDI firms	intermediate variable
S	financial structure of the whole economy	data available directly

Appendix 3.3

Calculation of Aggregate Risk of FDI

We get the country-specific risk rating data in grade ranging from 0 to 100, which takes four categories of risk including economic, political, structural and credit access risk into account. Higher grade implies lower risk.

Consider a country *i* investing in *N* foreign countries. Its risk in FDI is the aggregate risk of location portfolio. To assess the aggregate risk, we construct an index for FDI sourcing country which is the weighted average risk of its host countries, the weight being the share of outward FDI flow of each host country in the total outward FDI flow of the sourcing country.

For example, consider country *i* as an FDI sourcing country which invests in *N* foreign countries. Denote the outward FDI flow to each foreign country as F_1, F_2, …, F_N and the risk grade of each corresponding destination as R_1, R_2,…, R_N. Then the aggregate FDI risk for country *i* is

$$Agg.Risk_i = \sum_{j=1}^{N} R_j \frac{F_j}{\sum_{j=1}^{N} F_j}$$

Assume country risk grade R_j is constant over time during the period we examine. Because of the change of the share $\frac{F_j}{\sum_{j=1}^{N} F_j}$, the weighted average risk is time variant. Also note that although $R_j \in [0,100]$, it is not necessary that $AggRisk_i \in [0,100]$ because FDI flow can be negative.

Chapter 4

Financial Underdevelopment, Distortional Lending, and Export Market Survival: Evidence from Chinese Manufacturing Firms

4.1 Introduction

Compared to enterprises engaging in domestic businesses only, exporters are more dependent on a stable and strong financial support for working capital and risk insurance (Amiti and Weinstein, 2009). In the downturn of international trade during the recent global financial crisis, exporters have been forced to contract exports or even exit from foreign market due to rising cost and limited availability of external credit, apart from the shrinking market demand (Auboin, 2009; Chor and Manova, 2011). As the incumbent exporters play a dominant role in country-level export performances (Bernard and Jensen, 2004; Eaton et al., 2008; Manova and Zhang, 2009), how to support their survival and operations in foreign market is a topic of vital importance.

An emerging stream of literature focuses on the role of finance in fueling trade performance. While it is well recognized that finance is a key determinant of firms' export participation and trade volumes (Beck, 2002; Beck, 2003; Muuls, 2008; Berman and Hericourt, 2010; Manova, 2007; Demir and Dahi, 2011), the impact of finance on exporter's survival is largely neglected. In reality, exporters' failures in foreign markets can be affected by the development of domestic financial system due to the following intrinsic disadvantages of exporters in financing. Exporting requires more external finance to cover additional fixed cost and variable cost, however due to longer shipment

time and higher risks involved in international businesses, exporters generally find it more difficult to obtain sufficient funding. Therefore, they are more financially constrained and more sensitive to financial environment. (Chor and Manova, 2011; Feenstra et al., 2011; Manova et al., 2011). Moreover, compared to pure domestic businesses, cross-border activities have to endure additional negative shocks such as demand downturn in overseas markets or unexpected exchange rate fluctuations, all of which could induce a liquidity problem in the short run for exporters. Therefore, timely liquidity provision as a result of financial development is more favorable for exporters (Beck, 2002; Raddatz, 2006). Since exporters, in contrast to multinational firms, are more reliant on domestic finance, the development of domestic financial system is a crucial determinant of exporters' survival. With the development of domestic financial system, exporters can have better access to external finance, especially long-term finance, consequently, they are less likely to encounter a financial problem and exit foreign market.

This chapter aims to fill the research gap of linking domestic financial development and export market survival. We use the data for Chinese manufacturing exporters during 1998-2008 to examine how the Chinese financial system, in transition toward a marketized one, shapes the dynamics of Chinese exporters in foreign markets. Although Chinese stock market and bond market have developed rapidly in recent years,

bank credit is still a dominant source in firms' external financing[1]. Therefore, in this research we focus on the development of banking system as the proxy indicator of financial development. We label the Chinese financial system as 'underdeveloped' from the perspective of fostering businesses. Firstly, China was among the countries that had the highest financing obstacles and most limited access to bank loans (World Economic Forum, 2010; Huang, 2006), which meant that Chinese firms faced severe credit constraints (Claessens and Tzioumis, 2006). Secondly, the financial system of China has been heavily state-dominated, which has not been always profit-oriented or efficient in lending (Allen et al., 2005; Guariglia and Poncet, 2008; Hasan et al., 2009; Lin and Zhang 2009). State-owned banks (SOBs), as the channel of state-owned enterprises' budget allocation, accumulated a significant amount of non-performing loans (NPLs) that hindered their operations on a market rule. Although the NPL problem had been virtually dissolved under the direct intervention of Chinese government during the five-year interim period after China's accession into the World Trade Organization (WTO) in 2001 (Deng et al., 2011), and the five major SOBs ("Big Five"[2]) have

[1] The domestic raised capital in stock market is 5.27% of the amount of bank loan in 2009. Domestic and foreign raised capital in stock market is only 2.72% of fixed assets investment. Source: National Bureau of Statistics of China, The People's Bank of China, and China Securities Regulatory Commission.

[2] Traditionally, there were four mega-sized state-owned banks, which were referred to as "Big Four". After 2006, China Banking Regulatory Commission added the Bank of Communications to the list of "large-sized state-controlled banks", after which "Big Five" replaces "Big Four" as the jargon employed in the Chinese banking sector to denote the top five mega-sized state-owned banks.

become listed public companies, strong state presence still influences the decision mechanism of the whole banking system (Huang, 2009). Thirdly, due to the high level of state intervention in financial resources allocation, financial resources are distributed disproportionally among different types of firms and regions, SOBs have a strong "political pecking order" bias in issuing credit towards SOEs and foreign-invested enterprises over private enterprises, so that the private firms are most credit constrained (Huang, 2003; Linton, 2006; Poncet et al., 2010). Moreover, bank credit policy differentiation as an important means of implementing state support for regional economic development, together with the difference in foreign capital presence and liberalization in bank sectors and financial resources immobility across regions (World Bank, 2005; Guariglia and Poncet, 2008; Boyreau-Debray and Wei, 2005), results in financial development variation across provinces, which will be discussed in the later part of this chapter.

We study whether the financial development as a result of financial system reform unleashes Chinese exporters' financial constraints and facilitates their survivals in foreign markets as well as whether this effect is homogeneous across industries, regions and different types of firms. In line with our discussion on 'financial underdevelopment' and relevant literature, we measure the level of provincial financial development with four indicators, namely size, efficiency, term structure of bank credit and the level of state intervention in funding investment. We find that financial development, either

better availability of bank loans or higher efficiency of bank lending, increases exporter survival. These effects are augmented in industries with greater SOE presence, manifesting the prevailing financial distortion against non-state enterprises in these industries. The term structure of bank credit also matters but in a way that is contrary to a generalized case. The increasing ratio of medium and long term credits relative to short term ones expropriates the survival of exporting manufacturing firms, mainly due to the fact that more and more medium and long term credits have been directed to non-manufacturing investments during the sample period. Finally lower level of state intervention in financial resources allocation is favorable for exporter survival but the effect could be dampened or even offset by high SOE presence. Moreover, financial development impacts different types of firms unevenly. It benefits domestic private firms significantly but has almost no effect on SOEs. For foreign-invested exporters, only the degree of state intervention and bank lending efficiency matter. Finally, in contrast to the negative effect of financial distortion in the eastern and coastal provinces, government participation plays a positive role on export survival through providing funds and public services in the western region.

The main contribution of this study is that it complements the quickly growing body of literature on finance and export by firstly exploring the relationship between financial development and exporter survival. The role of finance in fostering international trade has been confirmed by firm-level analyses (e.g. Muuls, 2008;

Berman and Hericourt, 2010; Manova et al., 2011). Although the impact of finance on export participation and volumes has drawn due attention, its relationship with firms' sustainability in foreign market has been untouched. Moreover, few of the existing literature examine the effect of macro-level financial development on exporters' firm-level performance.[3] Our work builds a direct link between them and provides evidences of benefit of financial development in supporting exporter survival.

In addition, taking China as the subject for finance-trade nexus study generates more fruitful results. What makes China an interesting case is that China has achieved exceptional performance in export, measured either by volume or growth, with the support of a defective financial system and sizeable foreign capital. Comparing to the well documented function of foreign capital in partly compensating domestic financial market imperfection and fostering trade (Hericourt and Poncet, 2009; Li and Yu, 2009; Egger and Kesina, 2010; Jarreau and Poncet, 2011; Manova et al., 2011), our results illustrate the mixed moderating role of government in the impact of financial development on export. On one hand, due to the absence of high quality legal and financial institutions, the government, acting as an implicit credit guarantor for SOEs, aggravates the financial distortion against non-state firms and worsens their export survival. On the other hand, in regions that are less developed and lack good financial

[3] Manova (2011), Jarreau and Poncet (2011) examine the impact of financial development and liberalization on export at sector level. Berman and Hericourt (2010) investigate how the effects of productivity and firm collateral are magnified by financial development.

infrastructure, the government plays a positive role in mobilizing financial resources to satisfy enormous financing needs (Rajan and Zingales, 2001), and thus facilitates exporter survival. These evidences extend the line of research on financial development and trade by proposing the significance of government activity, especially for countries with underdeveloped financial system and low quality of financial and legal institutions.

The remainder of this chapter is organized as follows. Section 2 introduces the baseline model and data. Section 3 describes variable constructions and summary statistics. Section 4 presents our results on financial development and export market survival, including the general results and results of sub-sample regressions broken down by firm ownership and region. The last section concludes.

4.2 Data and Empirical Model

4.2.1 Data

For this study of the relationship between financial development in China and the survival of Chinese manufacturing firms in international markets, we employ and integrate firm- and province-level data from three sources, namely National Bureau of Statistics of China (NBS), China Statistical Yearbooks (CSY), and Almanac of China's Finance and Banking (ACFB).

The main body of the integrated data is firm-level panel data of 30 Chinese

manufacturing industries for the period 1998 to 2008. The data are originally obtained from the Annual Report of Industrial Enterprise Statistics (ARIES), which is compiled by NBS. This report provides detailed firm-level financial and operational information for all state-owned enterprises and large non-state firms with annual turnover above five million RMB (over $600,000 if exchange rate was 8.27 RMB/USD). The ARIES is the most comprehensive firm-level dataset ever edited by the NBS, accounting for about 90% of the total output in most industries. The dataset covers all 30 two-digit manufacturing industries (i.e. 580 four-digit sectors) throughout all 31 provinces, autonomous regions and municipalities ("provinces" henceforth) in China. This dataset has been employed by various Chinese studies in the literature (e.g. Li and Yu, 2009; Egger and Kesina, 2010; Feenstra et al., 2011).

As the focus of this study is to examine the impact of financial development on export market survival, we drop the firms without any international presence during the entire sample period. Due to omissions in data collection, NBS does not include export value in the survey in 2004. Therefore we drop that year and are left with ten years. We also delete some observations during the adjustment of industrial codes and remove missing values from the data. In addition, we pay particular attention to possible organizational changes, including restructuring, mergers and acquisitions by undertaking extensive checks of firm name, founding year, geographic code and industry code. These cleaning processes result in a final sample of 170,396 firms.

Another stream of data is province level data on financial development as main independent variable and factor endowments as additional control variables. These data are collected from annual issues of CSY and ACFB and they are commonly used in literature on financial development in China (e.g. Guariglia and Poncet, 2008; Berger et al., 2009; Hasan et al., 2009).

4.2.2 Empirical Model

In estimating the hazard rate of exiting export market, we use the Cox proportional hazards model (Cox, 1972), an advantage of which is that it does not rely on assumptions about the form of the baseline hazard, e.g. Weibull distribution. Indeed the hazard during the whole process of export, rather than the baseline hazard of export, is our primary focus. Cox model has been widely adopted in business event history analysis (e.g. Disney et al., 2003). The termination of the export constitutes the event to be empirically tested with Cox model. The dependent variable was a dichotomous variable, coded 1 if the final export behavior was observed before the end of the sample 2008, and 0 otherwise[4]. The survival of each firm's export is assumed to follow its own hazard function, $h(t)$, expressed as:

$$h(t) = h_0(t)e^{(\beta X)} \tag{4.1}$$

[4] A firm that stops doing international business may still survive in domestic market. As the focus of this paper is to examine the firm dynamics in international markets, we do not analyze the firm survival in domestic markets.

where $h(t)$ is a conditional hazard at year t given that firm exports in the previous year. $h_0(t)$ is baseline hazard without any prior assumption of function forms. $\boldsymbol{X}$ is a collection of variables that might affect the export hazard of firms. Collectively $\boldsymbol{\beta}$ denotes the coefficients for each variable in $\boldsymbol{X}$. When all variables in $\boldsymbol{X}$ take values of zero, $h(t)=h_0(t)$, i.e. the conditional hazard equals the baseline hazard. $\boldsymbol{X}$ includes the following variables presented in next section.

4.3 Variable Constructions and Summary Statistics

4.3.1 Province- and Industry-level Variables

Financial Development

We construct several variables to indicate the dynamics of financial development based on the data from CSY and ACFB. In the literature, country-level financial development indicators are usually employed for cross-country panel studies (e.g. Tsoukas, 2011). However, as the current research is focusing on the effectiveness of financial development on the firm survival in a single country, it is ideal to construct province-level indicators to capture the vast regional variations (Guariglia and Poncet, 2008). This can also be justified by the facts that the majority of Chinese bank loans are granted within provinces and the capital market within China is relatively segmented (Boyreau-Debray, 2003; Boyreau-Debray and Wei, 2005).

As China's financial system is dominated by the five mega-sized state banks that direct a considerably high volume of financial resources to generally inefficient state-owned enterprises, traditionally used indicators of financial intermediary development for the developed economies might not be able to reflect the full situation of the Chinese financial development (Guariglia and Poncet, 2008). In light of the above considerations, we construct a bundle of four complementary province-level indicators to demonstrate different aspects of "financial development" for each year of the observation period, 1998-2008.

FD1 is the ratio of total loans issued by banks and financial institutions to GDP, which measures the size of financial system and financial depth. *FD1* denotes the most important function of financial intermediaries in credit allocation, and its magnitude quantifies the financial resources available for investment.

FD2 is defined as total loans divided by total deposits. Traditionally, the loan-deposit ratio has two layers of implications. Firstly, it is a measurement of efficiency of financial sector in intermediating savings and investments. Higher ratio indicates higher efficiency. Secondly, *FD2* also implies the funding source of loans. A ratio above 1 implies that loans come from non-deposit sources, e.g. money market or capital market (Beck et al., 2010). Lower loan-deposit ratio indicates a prudent and healthier financial system with higher profit potential, as customer deposits are viewed as the safest and cheapest funding compared to the borrowings from alternative sources

(Deng et al., 2011).

FD3 is the ratio of medium- and long-term loans over short-term loans. Debt structure matters since the mismatch of debt maturity with timing of cash flow generation may induce refinancing problem and liquidity risk. Thus, long-term debt is preferred, especially for firms whose credit rating is not high enough (Diamond, 1991a) and firms in mature legal societies (Demirguc-Kunt and Maksimovic 1998). We include *FD3* to capture the compositional change of financial development and complement the size effect of *FD1*.

FD4 is calculated as the ratio of fixed asset investments financed by domestic loans relative to those financed by state budgetary appropriation, which reversely measures the extent of state intervention in financial development. Higher ratio implies higher level of substitution of domestic loans for state budget and less state intervention.

Industry SOE Presence

To examine the heterogeneous effect of financial development on exporter survival across industries, we design regressions including interaction terms of the above *FDs* with industry-specific SOE presence (*SOE Pre*) which proxies the degree of lending distortion between state and non-state firms in each of the 580 four-digit manufacturing sectors.

As discussed above, Chinese banks exhibit an ownership bias towards SOEs in granting credit due to the prevailing political pecking order in China (Huang, 2003).

This bias has witnessed a significant decline with massive SOE privatization and SOB reform in the recent decade. However, such ownership discrimination still prevails, not only as a result of direct government intervention, but also due to the rational decision making of commercial banks. A body of empirical evidence suggests that financial development depends on the quality of law institutions including the protection of investors, contract enforcement, accounting standards and information disclosure etc. (La Porta et al., 1997, 1998; Demirguc-Kunt and Maksimovic, 1998). Due to the absence of high quality institutions in China, banks consider firms' political connection as a signal of good credit and strong solvency. Therefore, SOEs usually have the strongest financing power while private firms find it much harder to get finance from the banks (Cull and Xu, 2005; Faccio 2006). Private enterprises have to build good connections with the state sector, e.g. becoming "red capitalists", so that they can obtain a larger volume of bank loans (Li et al., 2008; Du and Girma, 2010).

Since SOEs and private firms are competing for limited credit resources in domestic credit markets, the heavy presence of SOEs in an industry could restrict private firms from tapping financial resources from banking sectors and exacerbate their credit constraints. Therefore, other things being equal, we expect that domestic private enterprises in industries with high SOE presence are in more desperate need of external financial resources, so that the marginal benefit of any additional financial development that can be possibly received by private enterprises will be higher in these industries.

In addition, heterogeneous industrial SOE presence could influence exporter survival from non-financial aspects. Although China has privatized and liberalized most of industries after radical SOE reforms, the government is still in tight grip on some strategic industries, e.g. coal, tobacco, petroleum, transport equipment (*The Economist*, 2011), which are generally highly monopolistic. Relatively high industry concentration and low export intensity in these industries weaken firm competitiveness in foreign markets (Egger and Kesina, 2010). Thus, we predict that the prevalence of SOE might be disadvantageous for exporter survival.

We measure industry-level SOE presence with output share, i.e., the total output of SOEs in every four-digit industry over the total output of the whole industry based on the NBS firm-level data[5]. To smooth temporary fluctuations in output, we take the average over time for each industry (Rajan and Zingales, 1998). *SOE Pre*, as a result of industrial strategy and SOE reform, is largely exogenous to financial development.

Other Control Variables

To ensure that the effect of financial development is not intertwined with that of other provincial factors, we also include interaction terms of provincial factor abundance with industrial factor intensity to account for traditional sources of comparative advantages that might impact exporter survival in foreign markets. We measure province level physical capital abundance *K/L* with fixed asset investment per

[5] We also try the SOE share in terms of employment and total assets. The results are highly consistent for all the measurements.

capita, and human capital abundance *H/L* with the share of college graduates in the population aged over six. These two variables vary across provinces and change along time. As for the factor intensities in each industry, we proxy capital intensity (*CapInt*) with fixed asset per employee of the median firm, and proxy human capital intensity (*HumInt*) with the average wage of the median firm in that industry. Both *CapInt* and *HumInt* are ratios aggregated over time and across provinces, which capture the natural characteristics of each industry. Similar variables have been employed in the literature to control for endowment abundance and factor intensity (Braun, 2003; Hur et al., 2006; Manova, 2007). The factor intensity variables are calculated using the NBS firm-level data based on the following formulas:

$$CapInt_j = Median_j \left\{ \sum_t FixedAsset_{ijt} \Big/ \sum_t Employee_{ijt} \right\}$$

$$HumInt_j = Median_j \left\{ \sum_t TotalWage_{ijt} \Big/ \sum_t Employee_{ijt} \right\}$$

where the subscripts denote firm *i* in industry *j* in year *t*. Finally we also include province, industry, and year dummy variables to control for other unobservable factors.

4.3.2 Firm-level Variables

We construct several firm-level variables to control firm financial performance, vulnerability and other characteristics which are widely documented by theoretical and empirical literature as important determinants of firm survival. More importantly, they

act as the channels through which province-level financial development affects firm-level survival in international businesses.

Age. Age is an important factor affecting firm survival (e.g. Dunne et al., 1989; Albuquerque and Hopenhayn, 2004; Clementi and Hopenhayn, 2006). It is measured by the length between the year of firm foundation and the current year. We include *Age* and a squared term of *Age* to measure potential curvilinear relationship (Esteve-Perez and Manez-Castillejo, 2008). Young firms are more likely to encounter financial distress because of their huge demand of development funds, e.g. for advertisements, R&D in new product and exploiting new market etc. Meanwhile, younger firms are generally not able to build up good reputations, based on which to obtain sufficient finance from investors. This financing dilemma becomes more pronounced for exporters as they are facing higher fund requirements and more risks relative to domestic producers. In comparison, older firms are more likely to accumulate large amount of internal funds. Moreover, the declining information asymmetry with outsiders eases external financing difficulty. In addition, a firm with a long history of export has acquired sufficient knowledge of the international market and has a strong capability to adjust to market adversaries.

Size. Firm size can be positively related with the survival rate of firms. First of all, a larger firm is more likely above the average scale of other firms in its industry, and can therefore benefit from the economies of scale and cost advantage. Moreover, a

larger firm tends to have more diversified product portfolio and can effectively hedge the uncertainty facing any individual product. In addition, larger firms, typically more collateralized compared to smaller ones, are less affected by lower liquidity and higher short-term interest rates, and therefore, less sensitive to the tightening of monetary policy and worsening credit conditions (Gertler and Gilchrist, 1994; Perez-Quiros and Timmermann, 2000). We measure firm size with natural logarithm of total assets.

Leverage. We measure leverage as firm total loans divided by its total assets, which is an indicator of firm financial health condition and has a negative effect on firm survival from a traditional point of view (Myers, 1977; Zingales, 1998). However it is not necessarily the case in China. Chinese SOEs are generally over-leveraged as a result of soft budget constraint, as they are able to obtain bank loans and other forms of financial supports from the government relatively easily. In contrast, private firms are more reliant on internal funds and their leverages are under the optimal level due to widely existing financing discrimination under a state dominant financial system. Therefore high leverage could be a burden for SOEs, while it could be an indicator of capability of private firms to break their financial constraint and exploit external finance. Thus, we expect that the effect of leverage on firm hazard rate for SOEs is positive while that for private firms could be negative.

Profitability. We use total profit divided by sales to measure a firm's profitability. Firms with high profitability are less likely to suffer from financial distress and exit due

to two reasons. Firstly, they can accumulate internal funds and are less dependent on external finance. Secondly, good performance increases firm value so that they can get external finance more easily. Therefore, we expect a negative sign of profitability on hazard rate.

Export intensity. We also include *Export intensity* as a control variable. It is measured using export divided by total output. A higher export intensity denotes a higher degree of exposure to the knowledge pool in the international market, and is therefore associated with a higher possibility of receiving knowledge spillover (Zhang and Li, 2010). Moreover highly export-oriented enterprises in export-oriented countries like China can obtain more trade credit and financial support from the government, trade partners or their parent company (Ianchovichina, 2007; Girma et al., 2009). In the literature, evidence has been found to support the positive relationship between export intensity and firm survival rate for Chinese SOEs (Girma and Gong, 2008).

4.3.3 Descriptive Statistics

Firm Failure in Export Market

170,396 firms that appear at least one year in the sample during 1998 to 2008 are kept for survival analysis. There are averagely 9,216 firms exiting from the international market every year. By the end of the sample, 92,159 firms quit doing international business, accounting for 54.1% of the whole sample. The ownership composition of

market failures is shown in Table 4.1. The number of failures soared up one year after China's accession into WTO in the end of 2001, indicating a reshuffling effect of the trade liberalization. Table 4.1 also reports the ownership structure of exiting exporters. The portion of SOEs decreased from 36.4% in 1998 to 1.6% in 2007. That sharp decline was mainly caused by three factors. Firstly, when Premier Zhu Rongji was in power during 1998 and 2003, his cabinet implemented a radical SOE reform, and closed down a considerable number of poorly performing and small-sized SOEs (Zweig, 2001; *The Economist*, 1997). These SOEs disappeared from international markets too. Secondly, during the market liberalization process, the private sector boomed rapidly. The NBS firm data show that the private sector had only 49.2% of total firms, while the SOEs accounted for 34.8% in 1998. By the end of the sample period, domestic private enterprises accounted for 78.9% of all firms, while the SOEs shrank to 2.6%. It is therefore natural to expect a much lower portion of SOEs in the exporters that failed in international markets. Thirdly, after the SOE reform, the remaining SOEs are productive and subtantial enough to sustain in international business (Woetzel, 2008), and thus maintain a rather small portion of all firm exits.

Following Chen and Groenewold (2010), we dichotomize 31 provinces into two groups, namely the eastern and western regions. The eastern region includes the 11 coastal provinces and capital Beijing, while the western region refers to the rest of China, i.e. the other 20 inland provinces. The eleven eastern provinces contributed to

more than 90% of total export in China during 2003-2008. Table 4.2 reports the failure rates for exporters in different locations and with different ownership types, which shows that exporter failure is systematically lower in the eastern region, 49.4% comparing to 66.9% in the western region.

Table 4.1 Exporter Exits: Total Number and Breakdown by Firm Type

Year	Total		SOEs		Foreign-invested enterprises		Domestic private enterprises	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
1998	11	100%	4	36.4%	3	27.3%	4	36.4%
1999	5,833	100%	776	13.3%	2,129	36.5%	2,922	50.1%
2000	4,845	100%	601	12.4%	2,001	41.3%	2,248	46.4%
2001	1,855	100%	245	13.2%	774	41.7%	837	45.1%
2002	5,651	100%	384	6.8%	1,956	34.6%	3,311	58.6%
2003	20,777	100%	872	4.2%	7,833	37.7%	12,072	58.1%
2005	15,128	100%	454	3.0%	5,189	34.3%	9,470	62.6%
2006	18,084	100%	506	2.8%	5,624	31.1%	11,954	66.1%
2007	19,975	100%	320	1.6%	8,909	44.6%	10,727	53.7%
Total	92,159	100%	4,147	4.5%	34,375	37.3%	53,545	58.1%

Note: Due to omissions in data collection, NBS does not include export value in the survey in 2004. The final year of the sample, i.e. 2008, does not have any firm failure, which is called “right censoring”.

Moreover, in each region, foreign enterprises have lower failure rate than SOEs and private enterprises. The above-average survival performance of foreign enterprises can be largely explained by their relatively stronger international linkage with upstream suppliers and downstream buyers. The data from Chinese Customs[6] show that the export value of foreign enterprises contributed 50-55% to the total export in China

[6] Calculated by the authors based on the monthly data retrieved from China Economic Information Database (http://www.cei.gov.cn/).

every year from 2001 until 2010. Such high export contribution is caused by the strong export orientation of foreign enterprises driven by their resource-seeking strategic positioning (United Nations Conference on Trade and Development, 1998). The assembly trade export, i.e. original equipment manufacturing (OEM), conducted by foreign enterprises accounted for 77% of total export of foreign enterprises, and 78% of all assembly trade export conducted by all types of enterprises in China during 2006 and 2010[7]. Possessing relatively advanced technology and management, multinational enterprises do have advantage compared to their counterparts in host market, which is consistent with the "ownership, location, and internalization" hypothesis proposed by Dunning (1977; 1981).

Table 4.2

Average Failure Rate of Exporters in the Eastern and Western Regions during 1998-2008 (%)

	Eastern region	Western region
Private Enterprises	52.2	70.4
SOE	73.1	78.0
Foreign Enterprises	43.4	52.9
Overall	49.4	66.9

[7] Same data source as indicated in Footnote 6.

Figure 4.1 Financial Development across Regions and Evolution over Time 1998-2008

Note: The value reported is the average for each region at a certain year.

Figure 4.1 show the dynamics of financial development of eastern and western regions respectively through 1998-2008. In either region, *FD1* uniformly exhibited an upward trend between 1998 and 2003, and declined since 2004. This pattern is a direct outcome of government policy. To fight the negative effect of Asian financial crisis, Chinese government took measures to loosen credit expansion and stimulate investment in 1998 and 1999, including reduction of reserve requirement, elimination of credit

quotas for commercial banks and other administrative tools to increase credit supply, which resulted in the substantial financial deepening during 1998 to 2003. Facing the increasingly apparent economic overheating, a new round of tightening credit policies was implemented in 2003 and 2004, including increase of deposit reserve ratio, together with some administrative and legal interventions on credit grant. The co-movement of *FD1* and government policies indicates the great importance of credit allocation, as a countercyclical policy instrument, for investment-driving Chinese economy.

FD2 decreases throughout the entire sample period. As we discussed above, although a higher loan-to-deposit ratio indicates a higher operational efficiency of financial intermediates, a lower *FD2* does not necessarily represent efficiency loss in the Chinese economy context. For example, Deng et al. (2011) find that the competition from foreign banks significantly leads to contraction of lending from Chinese banks, suggesting the banking system has become more prudent in granting loans after China' accession into WTO in 2001. The extraordinarily high *FD2* (greater than 1) in the western region before 2000 was caused by the central bank relending as a special form of subsidy. To support the economic development in less developed provinces, Chinese central bank used to assign higher credit quotas for banks in those provinces and provided them additional funds to meet the lending quotas which could not be sufficiently financed by local deposits (Boyreau-Debray, 2003; Guariglia and Poncet, 2008). However, such government-dominated financial resource allocation pursues

more social objectives such as poverty reduction rather than pure economic objectives (Boyreau-Debray and Wei, 2005). Therefore, the decrease of *FD2* resulting from the dilution of government direct intervention in the western region may also imply a higher efficiency of banking system based on market rules.

FD3 has been increasing since 1998, and the regional difference is modest. While the increase of medium and long term loans relative to short term loans is generally viewed as a result of development of financial institution (Demirguc-Kunt and Maksimovic, 1999), it is also affected by government intervention in China. Sun et al. (2005) have shown that the share of long term loans is significantly higher in provinces with more state intervention. Governments can facilitate long term loan issuance through granting implicit loan guarantees (Demirguc-Kunt and Maksimovic, 1999). Therefore, state firms can take the advantage of connection with governments to obtain long term loans. Non-state firms instead mainly depend on short term borrowing and rollover of short term debt claims. Besides, long term loans, as one of policy instruments to boost industrial development and alleviate regional disparity, usually concentrate on state monopoly non-tradable sectors, strategic industries, especially in economically backward provinces. For example, the top industries receiving medium and long term loans were real estate, electricity power, public transportation etc in the first quarter of 2006, and those loans mainly went to real estate in the eastern region in contrast to infrastructure and energy in the west (Wang et al., 2006).

FD4 reversely reflects the degree of state intervention and financial distortion. It increased from 1999 in the eastern provinces, suggesting gradual withdrawal of government. In stark contrast, *FD4* illustrates a declining trend in the western region, which implies governments still play an important role in financing investment. *FD4* exhibits a stronger correlation with the level of economic development in each province.

All four indicators of financial development as well as GDP per capita for each province are reported in Table 4.3. The provinces in each group are ranked by their arithmetic average GDP per capita over 1998-2008. The data reveal obvious variations across provinces. While the eastern provinces observe a higher average *FD*1 (117.978), and *FD*4 (8.692), the western provinces host a higher *FD*2 (0.840) and *FD*3 (0.657). As discussed above the contrast between the eastern and western provinces reflects the different roles of government in these two regions, which are highly associated with provincial economic development. For example the highest *FD4* is observed in Tianjin, Shanghai and Jiangsu, all of which are the most developed provinces in China, while the lowest *FD4* is observed in Qinghai, Xinjiang and Tibet, all of which are relatively backward provinces.

Table 4.3 Variation across Provinces

Province	*FD1*	*FD2*	*FD3*	*FD4*	GDP per capita
		Eastern region			
Shanghai	155.250	0.707	0.623	14.378	427.048
Beijing	233.059	0.543	0.840	6.374	329.162
Tianjin	127.536	0.837	0.555	15.650	283.932
Zhejiang	111.349	0.789	0.410	9.048	226.835
Jiangsu	81.508	0.728	0.394	11.254	203.202
Guangdong	116.968	0.660	0.540	9.800	201.640
Fujian	73.868	0.756	0.576	8.878	169.138
Liaoning	110.881	0.801	0.470	6.335	166.709
Shandong	75.329	0.834	0.383	6.616	166.504
Hebei	74.693	0.691	0.486	6.076	123.877
Hainan	132.417	0.822	1.038	2.822	96.026
Eastern region average	117.978	0.749	0.610	8.692	213.102
		Western region			
Inner Mongolia	87.825	0.985	0.682	2.614	131.233
Heilongjiang	83.910	0.800	0.415	4.786	127.102
Jilin	124.461	1.049	0.449	4.083	115.325
Xinjiang	101.503	0.771	0.572	1.979	110.588
Hubei	88.355	0.895	0.667	2.804	105.669
Shanxi	120.183	0.721	0.526	8.977	96.927
Henan	80.672	0.863	0.419	4.675	94.491
Chongqing	114.243	0.871	0.669	3.923	89.407
Hunan	72.373	0.845	0.547	4.977	88.986
Qinghai	137.415	1.103	1.286	1.994	86.864
Ningxia	146.000	0.936	0.864	3.228	84.749
Shaanxi	124.563	0.753	0.658	2.773	83.832
Jiangxi	82.886	0.811	0.541	4.665	79.278
Sichuan	98.787	0.828	0.662	6.000	77.961
Anhui	80.602	0.862	0.463	4.487	76.455
Tibet	74.311	0.482	0.756	0.078	75.786
Guangxi	79.588	0.760	0.876	4.457	73.924
Yunan	109.234	0.792	0.686	4.452	68.579
Gansu	115.804	0.805	0.662	2.716	62.878
Guizhou	115.911	0.932	1.132	6.228	44.146
Western region average	101.687	0.840	0.657	4.076	91.207

Note: (a) The data are mean values covering period of 1998-2008. (b) Data source include various issues of Almanac of China's Finance and Banking and China Statistics Yearbooks. (c) "Eastern region" refers to the 11 coastal provinces and capital Beijing, while "Western region" refers to the rest of China, i.e. the other 20 inland provinces. (d) *FD1*: loans/GDP; *FD2*: loans/deposits; *FD3*: long loans/short loans; *FD4*:

Domestic loans for fixed asset investment / fiscal budget financed fixed asset investment.

Industry SOE Presence

Table 4.4 Ownership Composition across Industries
(Measured by Output %)

Code	Name	SOEs	Foreign-invested enterprises	Domestic private enterprises
13	food processing	2.4	27.8	69.8
14	food	5.0	38.5	56.5
15	beverage	7.3	37.2	55.5
16	tobacco	94.4	0.3	5.3
17	textile	2.3	24.5	73.2
18	garments	1.1	45.0	53.9
19	leather	0.4	52.8	46.8
20	wood	4.2	21.1	74.7
21	furniture	0.4	51.0	48.6
22	papermaking	3.0	35.2	61.9
23	printing	11.4	31.8	56.7
24	culture & sport goods	0.6	61.2	38.3
25	petroleum	13.9	10.9	75.3
26	chemical materials	8.9	26.6	64.5
27	pharmaceutical	6.6	25.3	68.1
28	chemical fibers	7.4	29.3	63.3
29	rubber	7.1	36.6	56.3
30	plastic	1.7	41.3	57.0
31	non-metal mineral products	3.6	18.3	78.1
32	ferrous metals	23.7	14.4	61.9
33	nonferrous metals	15.5	16.2	68.3
34	metal products	3.0	34.9	62.1
35	general equipments	8.2	27.3	64.5
36	special equipments	13.9	26.1	60.0
37	transport equipments	13.5	46.1	40.4
39	electric machinery	3.2	37.6	59.2
40	electronic equipments	2.6	82.1	15.3
41	instruments	4.0	65.0	31.0
42	art work	3.1	41.2	55.7
43	recycling	0.6	30.5	68.9
All	**average**	**9.1**	**34.5**	**56.4**

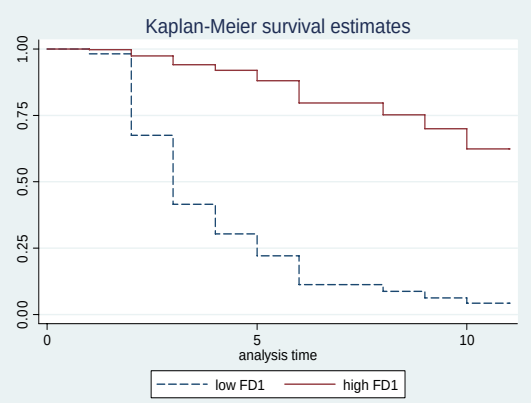
Note: The data for average output share are actually calculated for each of the 580 four-digit industries for 1998-2008. Aggregated data of the 30 two-digit industries only are reported here for brevity.

Table 4.4 reports the SOE share for different industries. The industries, including tobacco, ferrous and non-ferrous metals, petroleum, are with highest SOE presence; Whereas leather, furniture, recycling, culture and sports goods are with the lowest.

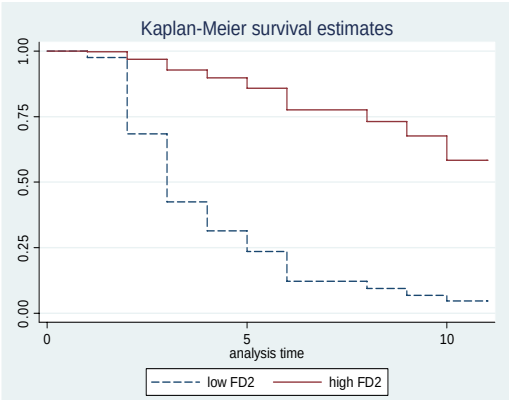
Financial Development and Exporter Survival

Figure 4.2 Financial Development and Export Firm Survival

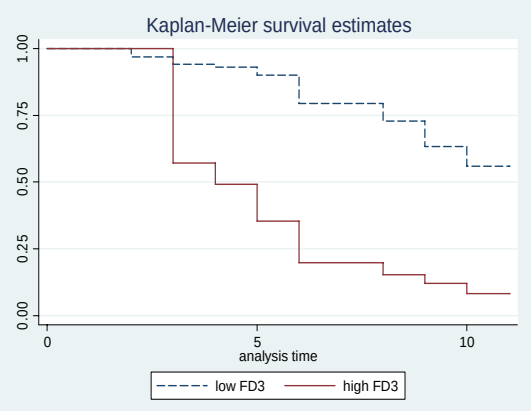
(a) A comparison between high and low *FD1*



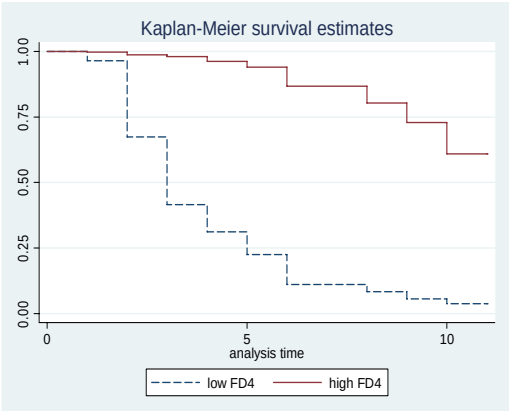
(b) A comparison between high and low *FD2*



(c) A comparison between high and low *FD3*



(d) A comparison between high and low *FD4*



Note: Observations are dichotomized into low and high FD groups by their mean values.

Figure 4.2 intuitively illustrates the impacts of four financial development indicators on manufacturing exporter survivals. We can see that larger scale of bank loans (high *FD1*), higher banking sector efficiency (high *FD2*) and more domestic loan substitution for state budget and less state intervention (high *FD4*) are accompanied with higher exporter survival, while a higher ratio of medium and long term loans (high *FD3*) is negatively associated with manufacturing firms survival in exporting market.

The relationship of *FD3* and manufacturing exporter survival suggests that although better availability of long term loans could benefit business operation through reducing the maturity mismatch of financing and investment, it might also have negative effect in China where a large variation exists across types of firms and industries in access to long term loans. Firstly, excess access to long term finance in certain industries could result in overinvestment and overcapacity (Myers, 1977; European Chamber, 2009; D'Mello and Miranda, 2010). Secondly, strong state intervention will guide a high portion of long term loans into limited industries, which restricts the ability of firms in more privatized and competitive industries to obtain external finance. Taking manufacturing as an example, based on the NBS firm data, we calculate that 95.0% firms had short-term liabilities and 51.5% firms had long-term liabilities in 1998. While the share of firms with short-term liabilities increased to 97.6%, the figure of long-term ones rapidly declined to 28.7% in 2008. Similarly,

among exporters, 46.6% have long-term liabilities in 1998 while this figure dropped to 23.5% in 2008, suggesting both general firms and exporters found it more difficult to get long term bank loans. This fact, coupled with the increasing long over short term loan ratio, implies that more and more long term loans are directed to non-manufacturing sectors. Hence the financial development indicated as increasing *FD3* has been actually crowding out exporters in the recent years in China.

Table 4.5 reports the mean value of the firm-level control variables in our regression, for the full sample and breakdown by ownership and by region. SOEs are larger, more leveraged, less profitable and less export-oriented compared to their private and foreign counterparts. The exceptionally high age of SOEs indicates their long heritage in Chinese economy. Foreign invested firms have the higher export intensity, consistent with their OEM trading pattern.

Table 4.5 Mean Value of Firm-level Control Variables

Variable	All firms	Breakdown by ownership			Breakdown by region	
		SOE	Foreign	Private	East	West
Age	8.704	28.214	7.174	9.054	8.348	10.296
Size	10.108	11.751	10.354	9.791	10.061	10.317
Leverage	0.566	0.751	0.517	0.602	0.57	0.547
Profitability	0.014	-0.31	0.012	0.034	0.019	-0.008
Export intensity	0.597	0.284	0.683	0.534	0.623	0.480

The correlation coefficients of the main regressors are listed in Table 4.6. The correlation coefficients between control variables are lower than 0.45, indicating a low risk of multicollinearity. *SOE Pre* is constructed based on four-digit industry-level data, and has a low correlation with *FDs* which are calculated based on province-level data.

The interaction terms of *FDs* with *SOE Pre*, i.e. *FD* SOE Pre* also has very low correlation with *FDs* or *SOE Pre*, with absolute values all lower than 0.10. Due to space limitation, these coefficients are not reported here.

Table 4.6 Correlation Coefficient Matrix

	1	2	3	4	5	6	7	8	9	10	11
1. Age	1.000										
2. Size	0.234	1.000									
3. Leverage	0.090	0.003	1.000								
4. Profitability	-0.071	-0.018	-0.116	1.000							
5. Export intensity	-0.154	-0.268	-0.009	0.018	1.000						
6. K/L*CapInt	-0.016	0.076	-0.026	0.014	-0.043	1.000					
7. H/L*HumInt	-0.007	0.067	-0.017	0.004	-0.063	0.428	1.000				
8. *FD1*	-0.035	0.011	0.042	-0.012	0.050	0.035	0.196	1.000			
9. *FD2*	0.020	-0.079	0.048	-0.027	0.007	-0.064	-0.096	0.115	1.000		
10. *FD3*	-0.064	0.107	-0.082	0.035	-0.014	0.037	0.112	0.052	-0.591	1.000	
11. *FD4*	-0.038	0.023	0.027	0.014	0.021	0.077	0.132	0.263	-0.166	0.193	1.000
12. SOE Pre	0.166	0.226	0.030	-0.023	-0.251	0.012	0.004	-0.046	0.034	-0.039	-0.059

4.4 Empirical Results

4.4.1 Financial Development and Exporter Survival: Baseline Results

Table 4.7 reports baseline regression results of equation 4.1. We first regress exporter hazard rate on *FD1* to *FD4* respectively, then add interaction term of *FD*s with industry SOE presence to accounting for the heterogeneous effect on different industries. Consistent with the pattern observed in Figure 4.2, the coefficients of *FD1*, *FD2* and *FD4* are negative and statistically significant at 1% level, which suggests that financial development in China, either increasing provision of bank loans, improvement of banking sector efficiency or reduction of government intervention in financial resources allocation, favors Chinese exporter survival in foreign market. In contrast, the coefficient of *FD3* is significantly positive, revealing that the relatively faster growing issuance of long term loans negatively affects exporter survival. This result confirms our conjecture that the increasing long term loan issuance and its concentration in few industries squeeze the financial resources in manufacturing and exacerbate exporter survival.

Table 4.7 Baseline Models with Four Alternative Definitions of Financial Development

Models	*FD1*	*FD2*	*FD3*	*FD4*	*FD1*	*FD2*	*FD3*	*FD4*
FD	-0.001***	-0.515***	0.205**	-0.009***	-0.001***	-0.494***	0.232**	-0.009***
	(1e-4)	(0.068)	(0.010)	(0.001)	(1e-4)	(0.069)	(0.100)	(0.001)
*FD*SOE Pre*					-0.004***	-1.630***	2.645***	0.155**
					(0.001)	(0.408)	(0.359)	(0.008)
Age	0.297***	0.297***	0.297***	0.297***	0.297***	0.297***	0.297***	0.297***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Age squared	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***
	(1e-4)	(1e-4)	(1e-4)	(1e-4)	(1e-4)	(1e-4)	(1e-4)	(1e-4)
Size	-0.160***	-0.160***	-0.160***	-0.160***	-0.160***	-0.160***	-0.161***	-0.160***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Leverage	0.100***	0.100***	0.100***	0.100***	0.099***	0.101***	0.100***	0.102***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Profitability	-0.059***	-0.060***	-0.059***	-0.059***	-0.059***	-0.061***	-0.060***	-0.059***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Export intensity	-0.656***	-0.654***	-0.657***	-0.656***	-0.656***	-0.655***	-0.657***	-0.655***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
*K/L*CapInt*	-4e-5	-2e-4	-3e-4	-3e-4	-4e-5	-2e-4	-3e-4	-3e-4
	(-2e-4)	(2e-4)	(2e-4)	(3e-4)	(-2e-4)	(2e-4)	(2e-4)	(3e-4)
*H/L*HumInt*	0.061	0.071*	0.062	0.084**	0.073*	0.060	0.070*	0.086**
	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)	(0.039)	(0.039)	(0.039)
No. of firms	170,396	170,396	170,396	170,396	170,396	170,396	170,396	170,396
No. of exits	92,159	92,159	92,159	92,159	92,159	92,159	92,159	92,159
No. of obs.	408,097	408,097	408,097	408,097	408,097	408,097	408,097	408,097
LR Chi2	58776.82 ***	58804.82 ***	58752.10 ***	58816.15 ***	58790.76 ***	58820.96 ***	58806.15 ***	58820.16 ***

Note: (a) Proportional hazard model results are reported. The dependent variable is a dummy equal to one if the firm fails, and zero otherwise. (b) Robust z-statistics are presented in the parentheses. (c) *, **, and *** denote significance at the 10%, 5% and 1% levels respectively. (d) *SOE Pre* is the output share of SOEs in each 4-digit industry. Robustness checks are performed using total assets and employment of SOEs as alternative measurement. Highly consistent results are obtained. (e) Further controlling *SOE Pre* as an individual variable generates qualitatively similar results for *FDs and FDs*SOE Pre*, which are available upon request. (f) Dummy variables for provinces, industries and years are included in all models.

When we further include the interaction terms of *FD*s with SOE presence, the coefficients of *FD*s change little. The negative signs of interaction terms with *FD1* and *FD2* suggest that the benefit from financial development is intensified in those industries with higher SOE presence. As we discussed above, due to the crowding out effect of SOEs, other non-state firms in these industries are more financially constrained and thus more sensitive to the improvement of external financing conditions. The same logic applies to *FD3*, as the adverse impact of discriminatively granted long term loans to non-manufacturing industries is reinforced by SOE presence. A different result emerges for *FD4*. The interaction term has a sign opposite to that of *FD4* as an individual variable, which implies that the advantage of weakening government intervention is partly offset by the presence of SOEs.

In each of the 8 models, we include firm level determinants on survival and additional controls accounting for other sources of comparative advantage. The results

suggest that export hazard rate first increases and then decreases with firm age. The survival rate increases with firm size, which duplicates the pattern predicted by theoretical papers, e.g. Clementi and Hopenhayn (2006). As predicted, a high leverage ratio may put a firm in jeopardy while profitable firms can have a lower failure rate. Moreover, a firm with relatively high export intensity tends to have a lower failure rate, indicating the importance of international exposure. As for the role of endowment abundance, physical capital (*K/L*CapInt*) shows no impact. Nonetheless *H/L*HumInt* is unfavourable to exporters' survival. We interpret that high *HumInt*, measured by average wage rate, not only indicates high labor quality, but also is associated with high cost structure of exporters. Taking into consideration of the fact that more than half of recent Chinese export has been in the assembly trade, the positive sign of *H/L*HumInt* implies that the comparative advantage of Chinese exporters largely lies in labor cost advantage rather than labor quality.

4.4.2 The Differentiated Effect of Financial Development across Ownership

To further test our hypothesis on financial distortion among ownerships, we break down the whole sample into three ownerships, namely domestic private enterprises, SOEs and foreign-invested enterprises. The new results are reported in Panels (a), (b) and (c) of Table 4.8, respectively.

Table 4.8 Sub-sample by Ownership (a) Domestic Private Enterprises

Models	*FD1*	*FD2*	*FD3*	*FD4*	*FD1*	*FD2*	*FD3*	*FD4*
FD	-0.001***	-0.404***	0.085	-0.010***	-0.001***	-0.386***	0.093	-0.010***
	(4e-4)	(0.090)	(0.141)	(0.002)	(4e-4)	(0.090)	(0.141)	(0.002)
FD SOE Pre*					-0.005***	-1.625***	2.219***	0.006
					(0.002)	(0.624)	(0.539)	(0.010)
Age	0.219***	0.219***	0.218***	0.218***	0.219***	0.219***	0.218***	0.218***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Age squared	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***
	(1e-4)	(1e-4)	(1e-4)	(1e-4)	(1e-4)	(1e-4)	(1e-4)	(1e-4)
Size	-0.118***	-0.118***	-0.118***	-0.118***	-0.118***	-0.118***	-0.118***	-0.118***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Leverage	-0.021	-0.021	-0.022	-0.020	-0.022	-0.021	-0.022	-0.020
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Profitability	-0.058***	-0.058***	-0.057***	-0.058***	-0.057***	-0.060***	-0.058***	-0.058***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Export intensity	-0.588***	-0.587***	-0.590***	-0.588***	-0.589***	-0.588***	-0.589***	-0.588***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
*K/L*CapInt*	5e-4*	3e-4	2e-4	3e-4	5e-4*	3e-4	2e-4	3e-4
	(3e-4)	(3e-4)	(3e-4)	(3e-4)	(3e-4)	(3e-4)	(3e-4)	(3e-4)
*H/L*HumInt*	0.020	0.033	0.027	0.052	0.025	0.032	0.032	0.053
	(0.063)	(0.063)	(0.063)	(0.063)	(0.062)	(0.063)	(0.063)	(0.063)
No. of firms	92,300	92,300	92,300	92,300	92,300	92,300	92,300	92,300
No. of exits	53,726	53,726	53,726	53,726	53,726	53,726	53,726	53,726
No. of obs.	199,807	199,807	199,807	199,807	199,807	199,807	199,807	199,807
LR Chi2	33471.40 ***	33480.18 ***	33460.38 ***	33507.31 ***	33482.28 ***	33486.99 ***	33477.22 ***	33507.62 ***

Table 4.8 Sub-sample by Ownership (b) SOEs

Models	*FD1*	*FD2*	*FD3*	*FD4*	*FD1*	*FD2*	*FD3*	*FD4*
FD	-0.002*	-0.322	0.211	0.004	-0.002	-0.250	-0.070	0.007
	(0.001)	(0.291)	(0.489)	(0.005)	(0.001)	(0.302)	(0.492)	(0.006)
FD SOE Pre*					-0.003	-0.678	1.230*	-0.039
					(0.003)	(0.791)	(0.757)	(0.026)
Age	0.027	0.028*	0.027*	0.027*	0.027	0.028*	0.027*	0.027*
	(0.016)	(0.017)	(0.016)	(0.016)	(0.016)	(0.017)	(0.017)	(0.016)
Age squared	-6e-5	-7e-5	-7e-5	-6e-5	-6e-5	-7e-5	-7e-5	-6e-5
	(3e-4)	(3e-4)	(3e-4)	(3e-4)	(3e-4)	(3e-4)	(3e-4)	(3e-4)
Size	-0.148***	-0.148***	-0.148***	-0.148***	-0.149***	-0.148***	-0.149***	-0.148***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Leverage	0.137***	0.137***	0.138***	0.138***	0.136***	0.137***	0.137***	0.139***
	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)
Profitability	-0.051***	-0.052***	-0.051***	-0.051***	-0.052***	-0.052***	-0.052***	-0.051***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Export intensity	-0.368***	-0.367***	-0.369***	-0.370***	-0.368***	-0.367***	-0.370***	-0.374***
	(0.060)	(0.060)	(0.060)	(0.060)	(0.060)	(0.060)	(0.060)	(0.060)
*K/L*CapInt*	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-5e-4
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(7e-4)
*H/L*HumInt*	-0.128	-0.123	-0.118	-0.121	-0.098	-0.134	-0.103	-0.134
	(0.121)	(0.122)	(0.122)	(0.122)	(0.126)	(0.122)	(0.122)	(0.123)
No. of firms	5,154	5,154	5,154	5,154	5,154	5,154	5,154	5,154
No. of exits	3,983	3,983	3,983	3,983	3,983	3,983	3,983	3,983
No. of obs.	11,858	11,858	11,858	11,858	11,858	11,858	11,858	11,858
LR Chi2	1116.58 ***	1114.99 ***	1113.76 ***	1114.36 ***	1118.25 ***	1115.73 ***	1116.41 ***	1116.68 ***

Table 4.8 Sub-sample by Ownership (c) Foreign-invested Enterprises

Models	*FD1*	*FD2*	*FD3*	*FD4*	*FD1*	*FD2*	*FD3*	*FD4*
FD	-3e-4	-0.234*	-0.111	-0.008***	-3e-4	-0.251**	-0.075	-0.007***
	(4e-4)	(0.123)	(0.164)	(0.002)	(4e-4)	(0.123)	(0.165)	(0.002)
FD SOE Pre*					-0.001	-2.151***	2.445***	0.031**
					(0.002)	(0.872)	(0.694)	(0.013)
Age	0.823***	0.823***	0.823***	0.823***	0.823***	0.823***	0.823***	0.823***
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
Age squared	-0.014***	-0.014***	-0.014***	-0.014***	-0.014***	-0.014***	-0.014***	-0.014***
	(4e-4)	(4e-4)	(4e-4)	(4e-4)	(4e-4)	(4e-4)	(4e-4)	(4e-4)
Size	-0.170***	-0.170***	-0.170***	-0.170***	-0.170***	-0.170***	-0.170***	-0.170***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Leverage	0.103***	0.103***	0.104***	0.105***	0.103***	0.103***	0.104***	0.105***
	(0.017)	(0.017)	(0.017)	(0.016)	(0.017)	(0.016)	(0.016)	(0.016)
Profitability	-0.091***	-0.091***	-0.091***	-0.091***	-0.091***	-0.091***	-0.091***	-0.091***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Export intensity	-0.563***	-0.563***	-0.563***	-0.562***	-0.563***	-0.562***	-0.563***	-0.562***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
*K/L*CapInt*	-9e-5	-2e-4	-3e-4	-2e-4	-9e-5	-2e-4	-3e-4	-2e-4
	(3e-4)	(3e-4)	(4e-4)	(4e-4)	(3e-4)	(3e-4)	(4e-4)	(4e-4)
*H/L*HumInt*	0.177***	0.180***	0.181***	0.195***	0.179***	0.177***	0.179***	0.198***
	(0.061)	(0.061)	(0.061)	(0.061)	(0.061)	(0.061)	(0.061)	(0.061)
No. of firms	72,942	72,942	72,942	72,942	72,942	72,942	72,942	72,942
No. of exits	34,450	34,450	34,450	34,450	34,450	34,450	34,450	34,450
No. of obs.	196,431	196,431	196,431	196,431	196,431	196,431	196,431	196,431
LR Chi2	23382.25 ***	23385.45 ***	23382.26 ***	23404.49 ***	23382.46 ***	23391.52 ***	23394.62 ***	23409.80 ***

In the regressions for domestic private enterprises we discover results highly similar to those obtained in the full sample models. All coefficients of *FDs* are as expected and significant except for *FD3*, which implies that for private enterprises, the benefit of financial development are prominent in providing better access to bank loans and lessening ownership discrimination and government direct intervention while the term structure of loans is not so important. Actually in the eastern provinces that host more than 90% exporters of China, firms' business operations are heavily dependent on short term debts from informal sectors due to bad availability of bank loans (Allen et al., 2005). The high significance of *FD1, FD2* and *FD4* reflects the severity of financial constraint for domestic private firms as a result of financial discrimination, which is consistent with the negative sign (although not significant) of *leverage*, in contrast to positive ones for other types of firms. For SOEs and foreign invested firms, higher leverage indicates financial vulnerability and risks, which leads to higher firm failure risks. For private firms whose debt level is constrained by poor external financing conditions, higher leverage implies stronger social capitals and better exploitation of financing leverage to fund firm investment and growth (Ge and Qiu, 2007), and therefore, can be favorable for survival.

Compared to private enterprises, the SOEs and foreign firms have relatively more financial resources from the state, and overseas headquarters or investors respectively, they are therefore less financially constrained and perceive little marginal benefit from

domestic financial development. This finding is consistent with Poncet et al. (2010) and Guariglia et al. (2011) who show private Chinese firms are financially constrained while SOEs and foreign firms are not. As for the SOEs, only the scale of loans, *FD1*, has a modest mitigating effect on their export hazard. Differing from private and foreign firms, the sign of *FD4* for SOEs, though insignificant, changes to positive, which suggests that SOEs lose from weakened government intervention, but this loss is partly remedied in industries with more SOE presence when we use employment as an alternative measure of SOE presence in industries.

For foreign invested firms, *FD2* measuring banking efficiency also has an alleviating effect. Furthermore, the sign of *FD3* is negative comparing to the positive sign for private firms, which suggests that foreign invested firms could benefit from growing long term loans through, for example, better infrastructure. Interestingly, foreign firms significantly benefit from weaker government intervention even though this effect is partly offset by the presence of SOEs. Considering the facts that foreign firms are relatively abundant in growth funds and they are not competing directly with SOEs for domestic financial resources, this extra adverse effect of SOE presence is probably caused by non-financial factors, i.e. the limited market access during the sample period. Table 4.9 summarizes how the Chinese government's attitude toward foreign investment has evolved after 1995. The share of restricted and prohibited industries dropped from 42.9% in 1997 to 29.0% in 2002 after China's WTO accession,

and since then that share has barely declined any further. The SOE presence in our regression actually proxies the protection level of market access, therefore, higher SOE presence worsens foreign firms survival. In stark comparison to SOE and private firms, the result of *H/L*HumInt* for foreign firms is universally significant in all 8 models. This contrast, together with the previously discussed fact that 77% export businesses of foreign-invested enterprises are OEM exporting, clearly indicates that foreign-invested firms take China as production base and export platform and they are highly sensitive to wage cost adjustment.

Table 4.9 Three Types of Market Access Stated by the *FDI Directory of China*

Version	Encouraged industries		Restricted industries		Prohibited industries	
	Number	%	Number	%	Number	%
1995	172	53.9	116	36.4	31	9.7
1997	186	57.1	112	34.4	28	8.6
2002	262	71.0	75	20.3	32	8.7
2004	257	70.2	76	20.8	33	9.0
2007	351	73.4	87	18.2	40	8.4

Note: counted and calculated by authors based on the various versions of *FDI Directory of China*.

4.4.3 The Distinct Roles of Financial Development across Regions

Considering the different levels of financial development and evolution patterns in the eastern and the western region shown by Figure 4.1, we also compare the effects of financial development between regions (see Table 4.10). As the exporters located in the eastern provinces account for 80% of firm number and 90% of export value of all exporters in our full sample, it is not surprising that the results for the eastern region are

highly consistent with those for the whole country reported in Table 4.7. However, distinction does arise for the western region. The signs of *FDs* in the western region are completely opposite to those in the eastern region except for *FD1*. The coefficient of *FD1* in the western region is much higher and more significant than the eastern region, which manifests the relative lack of funds in the western region of China. Contrary to the eastern region, the sign of *FD2* is positive for the western region. This implies a higher *FD2*, associated with more financial resources allocated by government into the western region, is unfavorable for exporter survival probably due to lower efficiency of government-led lendings compared with market driven ones. This contrast is consistent with the disparity of average bank NPL ratios between the western (3.25%) and eastern regions (2.19%)[8]. Nevertheless, the manufacturing exporters in the western region can benefit from more long term loan issuing (*FD3*). According to our earlier discussion, the negative sign of *FD3* suggests a spillover effect of investment in state dominant non-manufacturing industries to manufacturing exporters instead of the crowding out effect observed in the eastern provinces. Finally, the result of *FD4* indicates, government budget in financing fixed asset investment, although inefficient, still plays a positive role for exporter survival in the western region, which should not be simply substituted by domestic private loans.

[8] Calculated with data from the 2008 Annual Report of China Banking Regulatory Commission.

Table 4.10 Sub-sample by Region (a) Eastern Provinces

Models	*FD1*	*FD2*	*FD3*	*FD4*	*FD1*	*FD2*	*FD3*	*FD4*
FD	-5e-4*	-0.561***	0.563***	-0.008***	-5e-4*	-0.566***	0.593***	-0.008***
	(3e-4)	(0.100)	(0.106)	(0.001)	(3e-4)	(0.100)	(0.106)	(0.001)
FD SOE Pre*					-0.002	-1.382**	2.031***	0.025***
					(0.001)	(0.605)	(0.481)	(0.008)
Age	0.316***	0.316***	0.316***	0.316***	0.316***	0.316***	0.316***	0.316***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Age squared	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***
	(1e-4)	(1e-4)	(1e-4)	(1e-4)	(1e-4)	(1e-4)	(1e-4)	(1e-4)
Size	-0.171***	-0.171***	-0.171***	-0.171***	-0.171***	-0.171***	-0.171***	-0.171***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Leverage	0.109***	0.109***	0.108***	0.111***	0.109***	0.109***	0.108***	0.111***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Profitability	-0.066***	-0.067***	-0.067***	-0.066***	-0.066***	-0.067***	-0.068***	-0.066***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Export intensity	-0.635***	-0.633***	-0.634***	-0.634***	-0.635***	-0.634***	-0.634***	-0.634***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
*K/L*CapInt*	3e-4	2e-4	7e-6	2e-4	3e-4	2e-4	7e-6	2e-4
	(3e-4)	(2e-4)	(ee-4)	(3e-4)	(3e-4)	(2e-4)	(ee-4)	(3e-4)
*H/L*HumInt*	0.072*	0.067	0.061	0.087**	0.077*	0.059	0.065	0.094**
	(0.043)	(0.043)	(0.043)	(0.043)	(0.043)	(0.044)	(0.043)	(0.043)
No. of firms	136,089	136,089	136,089	136,089	136,089	136,089	136,089	136,089
No. of exits	68,713	68,713	68,713	68,713	68,713	68,713	68,713	68,713
No. of obs.	334,130	334,130	334,130	334,130	334,130	334,130	334,130	334,130
LR Chi2	44815.74 ***	44844.34 ***	44841.44 ***	44858.45 ***	44817.94 ***	44849.52 ***	44859.40 ***	44867.58 ***

Table 4.10 Sub-sample by Region (b) Western Provinces

Models	*FD1*	*FD2*	*FD3*	*FD4*	*FD1*	*FD2*	*FD3*	*FD4*
FD	-0.007***	0.966***	-2.098***	0.045***	-0.006***	1.031***	-2.268***	0.047***
	(0.001)	(0.205)	(0.365)	(0.005)	(0.001)	(0.206)	(0.367)	(0.005)
FD SOE Pre*					-0.008***	-2.342***	2.786***	-0.072**
					(0.002)	(0.588)	(0.571)	(0.029)
Age	0.233***	0.234***	0.233***	0.233***	0.233***	0.234***	0.234***	0.233***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Age squared	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***
	(2e-4)	(2e-4)	(2e-4)	(2e-4)	(2e-4)	(2e-4)	(2e-4)	(2e-4)
Size	-0.131***	-0.132***	-0.131***	-0.131***	-0.132***	-0.132***	-0.132***	-0.132***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Leverage	0.089***	0.089***	0.089***	0.092***	0.089***	0.089***	0.089***	0.092***
	(0.020)	(0.020)	(0.019)	(0.020)	(0.020)	(0.020)	(0.019)	(0.020)
Profitability	-0.047***	-0.051***	-0.047***	-0.049***	-0.046***	-0.051***	-0.049***	-0.049***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Export intensity	-0.700***	-0.702***	-0.699***	-0.694***	-0.699***	-0.701***	-0.697***	-0.693***
	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
*K/L*CapInt*	-0.001	-0.001*	-0.001	-0.001	-0.001	-0.001*	-0.001	-0.001
	(4e-4)	(4e-4)	(5e-4)	(4e-4)	(4e-4)	(4e-4)	(5e-4)	(4e-4)
*H/L*HumInt*	0.239*	0.261*	0.230**	0.263*	0.206	0.287**	0.282**	0.235*
	(0.142)	(0.143)	(0.143)	(0.143)	(0.143)	(0.144)	(0.143)	(0.143)
No. of firms	34,307	34,307	34,307	34,307	34,307	34,307	34,307	34,307
No. of exits	23,446	23,446	23,446	23,446	23,446	23,446	23,446	23,446
No. of obs.	73,967	73,967	73,967	73,967	73,967	73,967	73,967	73,967
LR Chi2	11678.77 ***	11660.90 ***	11671.98 ***	11705.93 ***	11690.06 ***	11677.32 ***	11695.40 ***	11712.20 ***

In addition, the results of the interaction terms of *FD1* and *FD4* with *SOE Pre* reveal that due to political connection and priority in obtaining finance of SOEs, industries with higher SOE presence gain more from financial development in the western region. The mitigating effect of *FD2*SOE Pre* implies that even though government funding easily neglects profitability and induces to efficiency loss, its bias towards SOEs benefit those industries where SOEs prevail considering the all-round lack of funds in the western region. In contrast, the advantages of long term loan issuance *FD3* are partly offset in industries with high SOE presence, which we interpret as a result of capital misuse due to excessive abundance of long term loans in these industries.

The results for cross-region comparison further clarify the mechanism of distortional lending on exporter survival and have clear regional policy implications. In the eastern provinces where private and foreign invested exporters dominate the regional export (98.1% in terms of number of all exporters in the NBS sample we use), elimination of ownership discrimination, reduction of government intervention and increase of banking sector efficiency should be in the priority of policy makers. It includes, for example, relaxing market access restrictions on credit cooperatives, trust and investment companies, and foreign banks to diversity banking industry, intensifying bank competition and operation in a more marketized way, speeding up developing legal institutions such as investor protection, information disclosure, to reduce

information asymmetry and agency cost etc. While in the economically and institutionally lagged western region, exporters are suppressed by the widespread lack of finance, the government is indispensable in funding investment and supplying public services, including financial infrastructures.

4.5 Conclusion

This research investigates the role of financial development in fostering trade by addressing firstly its impact on exporter survival in foreign market. We explore evidences on the relationship between financial development and exporter survival using detailed Chinese firm level data. We ask, firstly if the financial development as a result of financial system reform in China facilitates its exporter survival, and furthermore, if such facilitation is biased by distortional lending across industries and different types of firms as a result of prevailing government intervention in financial resources allocation.

We find that financial development, featured by bank loan expansion, lending efficiency improvement and government withdrawal, helps promote exporter survival in foreign market. However, the relatively more issuance of long term loans decreases firm survival due to their excessive concentration on a small scope of non-tradable industries. We further show that the effect of financial development differs across the types of

firms. Private firms gain most from reduction of state interference and better accessibility to external finance. Similarly, weakened government intervention is of great importance for foreign invested enterprises. However, financial development has no significant influence on SOEs as they already have a political advantage of access to bank loans. In addition, the impact of financial development on exporters' survival could be biased with the presence of state capital in an industry and varies across regions. Although the existence of government exacerbates lending distortion and consequently worsens exporter survival, its participation through filling the capital gap and providing public services in economically lagged regions is nonetheless admirable.

Our results provide strong evidence on the positive effect of financial development on trade through supporting exporter survival. Moreover, they suggest the importance of ownership, as a new dimension of firm heterogeneity, in affecting firm financing capability and consequent trade performance in a country with underdeveloped financial system. Meanwhile, the contrastive effect of financial development across regions implies the role of government in external finance expansion through either funding investment directly or acting as an implicit credit guarantor, which is of particular significance in those countries with less developed financial sectors and low quality of financial and legal institutions. Admittedly, excessive government participation in financial resource allocation could result in financial distortion and inefficiency. To conclude, our research suggests besides relying on traditional comparative advantage in

cost of labor and raw materials, transition economies need to strategically consider promoting trade through developing domestic financial system and optimizing financial resources allocation.

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Curriculum Vitae

09/2008—12/2011, Munich Graduate School of Economics, University of Munich, Ph.D. Candidate in Economics (International Economics)

09/2007—08/2008, Munich Graduate School of Economics, University of Munich, CSC-LMU Program Student

09/2006—06/2012, School of Economics, Jilin University, P.R.China, Ph.D. Candidate in Economics (World Economy)

09/2002—07/2005, School of Economics, Jilin University, P.R.China, M.A. in Economics (International Trade)

09/1998—07/2002, School of Economics, Jilin University, P.R.China, B.A. in Economics (International Trade)

09/1995—07/1998, high school in Heilongjiang Province, P.R.China

21/07/1980, born in Heilongjiang Province, P.R.China