

HEC MONTREAL

An Empirical Study on the Relationship between Financial
Development and Industry Export Structures

By

Cheng PENG

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Summary

An uprising literature in international trade points out that financial development is a major source of industry specialization and comparative advantage. This thesis investigates the finance-trade relationship in more detail with a larger sample and different measures for financial development. We use an estimation model by regressing industry export shares on the interaction between an industry's external financial dependence and a country's financial development, after controlling for industry and country specific factors. By studying a sample covering 100 countries and 30 industries and using the latest data from 2006 to 2015, we find that countries with higher level of financial system have higher export shares in industries that require more external finance. This is consistent with the existing finance-trade literature. In addition, the development of financial intermediaries is found to have a more significant impact than the development of financial markets. When tested with measures that focus on the financial legal framework, however, the finance-export relationship becomes less significant among industries with relatively high dependence but remains significant among industries with relatively low dependence. Such pattern has not been mentioned in previous studies and may imply that different industries demand different attributes of financial system through different channels. The results also suggest that an inverted U-shaped relationship between financial development and exports exists among industries with high dependence. But this inverted U-shaped relationship does not exist when tested with measures for financial development that capture legal factors in the financial system. This thesis enriches the current literature by providing the latest empirical support for the observed finance-export relationship. It also provides meaningful information to policy makers who want to reform their domestic industry and trade structures and increase the country's competitiveness in today's world.

Key words: financial development, industry structure, international trade

1. INTRODUCTION

There has been a widely established literature discussing the role of the financial system in economic activities (e.g. Levine, 1997). One segment of this literature is to study the relationship between development in financial system and patterns of international trade. This research area seems to be of great relevance to the global economy when we consider what happened during the recent global financial crisis: According to the World Bank database, while the world's aggregate Gross Domestic Product (GDP) in 2009 declines by 1.7%, the total merchandise trade in the year slashes by 19.7%. The slump in world trade as a result of the crisis appears to be much stronger than the decrease in GDP. The World Trade Organization (WTO) mainly attributes such trade collapse to dis-functioning financial system worldwide¹. More interestingly, the impacts of the financial crisis on exports are different across industries. Calculation based on the International Trade Center database shows that: from 2008 to 2009, while the export values in the motor vehicle industry reduced drastically by 31.7%, the export values in the beverage industry only decreased by 12.7% and the tobacco industry even recorded a slight increase (0.74%) in its export values. Such different impacts of financial system on industry's international trade may underline important implications for scholars and policy makers. Therefore, it is particularly interesting to investigate the relationship between financial development and international trade patterns.

The existing literature has generally agreed that, a country with a more developed financial system tends to have a comparative advantage in industries that require more external finance in international trade. This leads the country to possess higher export concentration and trade balance in these industries. However, some disagreements remain in areas such as: which attribute of the financial system is more significant; whether the finance-trade relationship can maintain in the trend of globalization and financial market integration; and how the finance-trade relationship is adjusted to

¹ See Auboin (2009; 2011) for more details.

different level of initial financial development. Thus, it seems necessary to further explore the finance-trade relationship under the current circumstance.

The goal of this thesis is to conduct an empirical study on the relationship between financial development and export compositions. Specifically, the thesis targets at three questions: First, tested with the latest data and a larger sample, do countries with higher level of financial system still have higher export shares in industries that require more external finance, as identified by the previous studies? Second, does this finance-export relationship exist when using different measures for financial development, and which attribute in a financial system seems to more influential? Third, is there an inverted U-shaped finance-export relationship for industries with high external finance demand?

To answer these questions, this thesis adopts Beck (2003)'s estimation equation by regressing each country's industry export shares (data from the International Trade Center) on the interaction between an industry's external financial dependence (data from Rajan and Zingales, 1998) and a country's level of financial development (data from the World Bank), after controlling for industry and country specific factors with dummy variables. The difference between our approach and Beck (2003)'s is that we choose measures for financial development based on three major views on a financial system: the bank based system which emphasizes the role of financial intermediaries (mainly banks), the market based system which focuses the importance of financial markets (especially stock markets), and the service based system which stresses the overall effectiveness of service (particularly legal framework) provided by the financial system. The initiative is that, the financial development, can mean the improvement in intermediaries, markets, or overall service quality. Thus, in addition to using traditional measures that mainly capture the size and activity of financial intermediaries and financial markets, new measures that reflect the legal and service effectiveness in financial intermediaries and markets are introduced. This enables us to compare the

relative importance of different characteristics in the financial system. Regarding the potential inverted U-shaped finance-export relationship in high financially dependent industries, squares of the interaction terms are added to the initial estimation equation.

Results from the sample which covers 100 countries and 30 industries can be summarized as follows: First, consistent with the previous findings, we find that countries with better financial development have higher export shares in industries that demand more external finance. Second, development in financial institutions has a larger size effect on industry export shares than development in financial markets. Development in legal factors is also significant positive in the finance-export relationship, but only for industries with relatively low external financial dependence. Third, for industries with relatively high external financial requirements, we report an inverted U-shaped finance-export relationship when testing with traditional indicators that mainly estimate financial resources. But when adopting new measures that capture legal effectiveness in the financial system, we do not find such pattern statistically significant.

These results have important implications both theoretically and practically. Tested with a larger sample and the newest data, the results indicate that the finance-export relationship observed by the previous studies can extend to a larger group of countries under the current circumstance. This suggests that although the global financial market becomes more integrated, a country's financial system remains deeply embedded in this country's domestic environment. Policy makers should notice that the domestic financial development is important for industry upgrade and trade structure reform, since most "advanced" industries people commonly refer to are those industries with high level of external financial dependence. Functional financial intermediaries seem to be more effective in improving export performance of these industries than booming financial markets. In addition, the results imply that for highly dependent industries, providing sufficient financial resources is critical for their exports; for lowly dependent industries,

providing effective legal framework may be more relevant for their exports. Further study can be carried out in a more detailed context. Concerning countries that already have a high level of financial system, they may pay more attention to improving legal factors in the financial system to maintain their competitiveness. Therefore, it is argued that financial development is not only about giving out more financial resources, such as issuing more loans, but also about providing effective service and legal frameworks, such as protecting creditors and minority shareholders.

The remaining thesis is organized as follows: Section 2 provides a comprehensive literature review, including: discussion on the roles of financial system in economic activities; some classical international trade models giving rise to comparative advantage in international trade; previous findings on the finance-trade relationship from perspective of countries, sectors, and firms; the three major views on the financial system and measures for financial development that usually appear in existing studies; and the assumption on the mobility of capital. In Section 3 where methodology and data are explained, we first introduce Beck (2003)'s estimation regression model and the additional regression model with squared terms, then we explain our measures for financial development to be used in this thesis. The remaining of this section describes sources from which we obtain our data. Section 4 presents and discusses the test results. We first interpret the basic results using Beck (2003)'s equation, then discuss the results when we separate the sample into two sub-samples based on level of external financial dependence. We finally deliver our test results on the additional regression model with the squared terms. Possible explanations are given to major findings. Section 5 concludes this thesis, summarizing key findings, and highlighting implications and limitations.

2. LITERATURE REVIEW

2.1 Functions of the Financial System

In his seminal paper, Levine (1997) summarized five basic functions of the financial sector in a world of transaction costs²: mobilize savings, allocate resources, exert corporate control, facilitate risk management, and ease trading of goods, services and contracts³. Literature has demonstrated that all these functions are of great importance for economic growth.

Regarding the function of resource allocation, Greenwood and Jovanovic (1989) argued that because financial intermediaries are better identifying the most promising firms than individuals, financial intermediation enhances growth by allowing a higher rate of return on capital, and the growth in turn supplements financial structures. Concerning the effect of financial institution on corporate control, Von Thadden (1995) presented a model of firm behavior caused by the fear of early project termination by outside investors. Considering asymmetric information problems between investors and firms, the author proposed that finance intermediaries can act as “delegated monitors” of investment projects to collect information and at the same time economize on overall monitoring costs, overcoming the short-term bias of investment and therefore lengthening the firm’s planning horizon. By stating that economic growth depends on the

² The concept of transaction costs first appears in a seminal article by Coase (1937), who used it to develop a theoretical framework to explain why firm exists in market where there is the cost of using price mechanism. There are two literatures simultaneously using the term “transaction costs”: the “neoclassical” definition rests on the costs of trading across a market, while the “property rights” definitions centers on the costs of establishing and enforcing property rights (Allen, 1999). This paper follows Dahlman’s (1979) concept by generally treating transaction costs as resources losses due to lack of information. According to Dahlman (1979), there are three major types of transaction costs: search and information costs, bargaining and decision costs, policing and enforcement costs. Search and information costs occur when searching relevant information necessary for exchange taking place (e.g. existence and location of trading opportunities, quality or other characteristics of items available for trade); Bargaining and decision costs represent resources spent in finding out the desire of economic agents to participate in trading at certain prices and conditions (e.g. negotiate and draw a contract); Policing and enforcement costs are related to supervising the fulfillment of the contract and taking appropriate action if one (or both) party involved in the transaction violates his part of the bargain. For a comprehensive discussion on the history, use and significance of the term transaction costs, see Allen (1999).

³ Levine (1997, p.680) pointed out: financial markets and institutions may arise to ameliorate the problems created by information and transactions frictions. Different types and combinations of information and transaction costs motivate distinct financial contracts, markets, and institutions.

availability of an ever-increasing array of specialized, hence inherently risky, production inputs, Obstfeld (1994) pointed out that global financial development eases risk diversification and thus, induces portfolio to shift from safe low-yield capital to riskier high-yield capital, generating more economic welfare. Furthermore, King and Levine (1993b) constructed a growth model in which financial systems evaluate prospective entrepreneurs, mobilize savings to finance the most promising productivity-enhancing activities, diversify risks associated with these innovative activities, and reveal expected profits from engaging in innovation than the production of existing goods using existing methods. Consequently, a better developed financial system improves the probability of successful innovation and accelerate economic growth.

Among above functions, this paper will mainly focus only on one major channel through which financial development can exert influence: financial markets and institutions reduce the cost of external finance and credit constraints for firms, enabling these firms to exploit economically efficient scales, conduct expensive but rewarding innovations, and make investment decisions (e.g. export). External finance is commonly believed to be more expensive than the cost of internal finance, because lenders have less control over the borrower's actions, or because they know less about what the borrower will do with the funds (Myers & Majluf, 1984). Financial development, as pointed out by Rajan and Zingales (1998), will reduce the wedge⁴ between the cost of internal and external finance, through better accounting and disclosure rules. By economizing on the costs of acquiring and processing information about firms and monitoring managers, financial institutions and markets can help overcome the problems of moral hazard and adverse selection, therefore reducing the cost of external finance for firms (Beck, 2003, p.298). This will help firms to overcome credit constraints and allows the firm to increase their productivity through scale economies and innovations.

⁴ As Bernanke and Gertler (1995, p.28) pointed out: The size of the external finance premium reflects imperfections in the credit markets that drive a wedge between the expected return received by lenders and the costs faced by potential borrowers.

Based on the above theoretical models, scholars have identified a large amount of empirical evidence highlighting the positive impact of a country's financial development on its economic growth. For example, King and Levine (1993a) observed that the predetermined component of financial development is robustly correlated with future rates of economic growth, physical capital accumulation, and economic efficiency improvements, using data on 80 countries over the 1960-1989 period. While skepticism argues that these studies may not control country-specific factors or other factors influencing economic growth, researcher have taken steps to address these weaknesses (Levine, 1997). Focusing on the regional level, Jayaratne and Strahan (1996) studied the relaxation of bank branch restrictions in the United States over a 25-year-period, and found that branch reform has significant positive influence on a state's economic growth. Using firm-level data, Demirguc-Kunt and Maksimovic (1996) observed that stock market liquidity and law enforcement are positively associated with faster than predicted rates of firm growth while government subsidies are not. Regarding sectors across countries, Rajan and Zingales (1998) constructed the industry's needs for external finance⁵ from a sample of U.S firms, and found that industrial sectors that are relatively more in need of external finance develop disproportionately faster in countries with more-developed financial markets. Reverse causality alone is not driving this relationship⁶.

2.2 Comparative Advantage and International Trade

Apart from existing studies on the relationship between financial development and economic growth, recent literature begins studying the relationship between financial development and patterns of international trade, which is also the focus of this paper. As pointed out by Rajan and Zingales (1998) in their conclusion: "the existence of a

⁵ Their measure is capital expenditures, minus cash flow generated from operations, divided by capital expenditures.

⁶ For a recent comprehensive discussion, see Levine (2005) who reviewed, appraised, and critiqued theoretical and empirical research on the connections between finance and growth.

well-developed financial sector⁷ in a certain country represents a source of comparative advantage⁸⁹ for that country in industries that are more dependent on external finance” (p.584). Whether the development of the financial system can emerge as a source of comparative advantage of a country in international trade becomes an interesting research agenda.

In the classical international trade theory, if a country has a comparative advantage in a given commodity, then it is relatively more productive in it compared to other countries and to other commodities (Leamer, 1984, p.1). More specifically, Maneschi (1999, p.2) referred comparative advantage as supply-side differences between countries in their technologies (as in the Ricardian model) or in their factor endowments (as in the Heckscher-Ohlin theory).

According to Suranovic (2010), the modern version of the Ricardian model assumes that there are two countries, producing two goods, using one factor of production, usually labor. All features other than production technologies (productivity of labor) are identical across the two countries, making relative prices (opportunity costs) of the two goods differ between the two countries. The only factor of production, labor, is assumed¹⁰ to be immobile across countries, but can freely move between industries within a country. The price of each country’s comparative advantage good will be lower than the price of the same good in the other country. Such initial differences in relative prices of the goods between two countries will stimulate trade between the countries.

⁷ In this paper, the phrase “financial industry”, “financial sector”, and “financial system” are used interchangeably.

⁸ For a comprehensive discussion of the Ricardian model of comparative advantage, see Suranovic’s (2010) *International Trade: Theory and Policy, Chapter 2*.

⁹ For a comprehensive discussion of the H-O model, see Suranovic’s (2010) *International Trade: Theory and Policy, Chapter 4*.

¹⁰ Suranovic (2010, ch2) also mentioned some other important assumptions in the Ricardian model: “The model is a general equilibrium model in which all markets (i.e., goods and factors) are perfectly competitive. The goods produced are assumed to be homogeneous across countries and firms within an industry. Goods can be costlessly shipped between countries (i.e., there are no transportation costs). Full employment of labor is also assumed. Consumers (the laborers) are assumed to maximize utility subject to an income constraint.” For a more complete description of each assumption along with a mathematical formulation of the model, see Suranovic’s (2010) *International Trade: Theory and Policy, Chapter 2*.

Trade flows would increase until the price of each good is equal across countries, leading each country specializing and exporting in the good it has comparative advantage on. Suranovic (2010) has highlighted three important implications from the Ricardian model: trade occurs due to differences in production technology; trade is advantageous for everyone in both countries, and; even a technologically disadvantaged country can benefit from free trade.

As summarized by Suranovic (2010), the standard Heckscher-Ohlin (H-O) model¹¹ refers to the case of two countries, two goods and two factors of production (capital and labor). In production, different industries require different input level of capital and labor. By assuming¹² that the only difference across countries are variations in capital and labor, the H-O model demonstrates that trade will occur and be nationally advantageous, when nations differ in their relative factor endowments and when different industries use factors in different proportions. Thus, the H-O theorem developed from the H-O model states that the pattern of trade between countries based on the characteristics (resource abundance) of the countries. More specifically, the capital-abundant country will export the capital-intensive good while the labor-abundant country will export the labor-intensive good. However, it should be noted that the H-O theorem has been criticized for failing to explain booming trade flows that is intra-industry in nature and between countries with similar characteristics after the World War II. Partly because of this, the H-O theory has been challenged in the past two decades by a “new trade theory” focusing on the role of increasing returns to scale and network effects (Maneschi, 1999, p.1).

¹¹ Due to the contribution made by Jaroslav Vanek, sometimes the model is also called the Heckscher-Ohlin-Vanek (H-O-V) model.

¹² It should be noted that while the Ricardian model assumes that production technologies differ between countries, the H-O model assumes that production technologies are the same. As Suranovic (2010, ch.4) mentioned: “The reason for the identical technology assumption in the H-O model is perhaps not so much because it is believed that technologies are really the same; although a case can be made for that. Instead the assumption is useful that it enables us to see precisely how differences in resource endowments is sufficient to cause trade and it shows what impacts will arise entirely due to these differences.”

This paper does not intend to conduct a comprehensive literature discussion on comparative advantage under the Ricardian model or the H-O model, but adopts a basic principle from these classical models of international trade¹³: different production technology or factor endowments across countries are the source of comparative advantage. This leads countries to specialize and export in industries on which they have comparative advantages over their counterparts. The following gives a review on theoretical and empirical study to explore whether the cross-country variance in financial development serves as a country's comparative advantage in trading with others, and therefore helps us to predict international trade patterns.

2.3 Financial Development and International Trade: from a Comparative Advantage Perspective

Inspired by the related papers on trade and industrial policy, which show that the use in East Asian countries of selective allocation of credit to achieve targets of trade and industrial restructuring has been cited as more effective than the more standard practice of direct subsidies or low interest rates¹⁴. Kletzer and Bardhan (1987) made the first attempt¹⁵ to explore the impact of financial markets on merchandise trade by integrating the traditional H-O trade theory with the growing theoretical literature on credit markets under imperfection. In their simple two-country, two-sector, two-factor general

¹³ For a recent review of international trade literature, see Sen (2010).

¹⁴ For example, in one of six themes he concludes for the East Asian miracle, Stiglitz (1996, p.173) pointed out that "Governments played an active role in creating market institutions, such as long-term development banks and capital markets to trade bonds and equities... These institutions and markets help ensure that high volume of savings was invested efficiently. Governments also used their control of financial markets to help direct resources in ways that stimulated economic growth. This control was probably more important than direct subsidies or low interest rates."

¹⁵ While the model developed by Barhan and Kletzer (1987) focuses on the function of financial systems which is to mobilize savings and allocate funds to promising projects, the model developed by Baldwin (1989) also considered another function of financial systems which is to diversify risk. In his model, Baldwin (1989) assumed that one of the two sectors in each country faces demand shocks while the other sector does not. The risky nature of the former sector requires access to financial system to diversify risk while the latter one does not. Therefore, a high level of financial development allowing for a decreased risk premium and therefore lower marginal costs benefits the risky sector. This indicates that the structure of trade between two countries primarily depends on differences in the two countries' financial development. Baldwin (1989) then argued that having a relatively strong financial system allows a country to specialize in the risky good while having a relatively weak financial system results in specialization in the non-risky good. Here, we restate that this paper mainly focuses on the financial system's function to channel external finance to firms that are in need of it.

equilibrium model, technology, factor endowments, and consumer preferences are treated to be identical across countries. In each country, one sector produces an intermediate good, while the other sector produce a final good which requires the input of the intermediate good and committing the resource one period before the output becomes available. This implies that the final good sector requires external funds to finance its working capital. As the intermediate good sector does not need external finance, a flourishing credit market seems to be only beneficial to the final good sector.

Kletzer and Barhan (1987) then explored two different but complementary types of credit market imperfection. In one situation under sovereign risk, the country with a poorer reputation will be charged a higher equilibrium interest rate in international lending. This higher interest rate faced by firms in the poor-reputation country drives the country away from specializing in sophisticated manufactured products that need more working capital, selling costs and trade finance. In the other situation, countries differ in their domestic credit market institutions and there is a lack of global contract enforcement mechanism. Some countries thus face tighter credit rationing¹⁶ which will lead to a similar production and trade result as the higher interest rate. Because of this, even with identical technology or endowments between countries, comparative costs will differ in a world of credit market imperfection, when credit for working capital or trade finance is needed to cover the pre-commitment of inputs before the accrual of output revenues, leading to the relatively more financially developed country enjoying a comparative advantage in the more sophisticated sector (Kletzer & Barhan, 1987).

Building on Kletzer and Barhan (1987)'s theoretical work, Beck (2002) extended the theoretical model by allowing both sectors to use external finance, one being more credit intensive due to increasing returns to scale, and tested the hypothesis derived from

¹⁶ Stiglitz and Weiss (1981, p.394-5) defined credit rationing as follows: "we reserve the term credit rationing for circumstances in which either (a) among loan applicants who appear to be identical, some receive a loan and others do not, and the rejected applicants would not receive a loan even if they offered to pay a higher interest rate; or (b) there are identifiable groups of individuals in the population who, with a given supply of credit, are unable to obtain loans at any interest rate, even though with a larger supply of credit, they would."

Kletzer and Bardhan (1987) by exploring the impact that financial development has on patterns of international trade, particularly, on the export share and trade balance in manufactures. In Beck (2002)'s model with two production technologies, one sector has constant returns to scale (food) and the other has increasing returns to scale (manufacturing). Entrepreneurs in both sectors will augment their capital through borrowing from lenders. Financial intermediaries¹⁷ will incur search costs when channeling savings to producers. Financial development is modeled as lowering the search costs and increasing available external finance in the economy, meaning that producers of the good with increasing returns to scale tend to benefit more from a higher level of financial development than producers of the other good with constant returns. Because the financial development shifts incentives of the producers towards the good with increasing returns to scale, Beck (2002) pointed out that the production specialization and the structure of trade flows is determined by the relative level of financial intermediation. The author studied a sample of 65 countries over the period 1966-1995. Using both cross-country and panel estimations and controlling for country-specific effects and possible reverse causality, Beck (2002) found that the financial development exerts a significant positive impact on the level of both exports and the trade balance of manufactured goods that have increasing returns to scale.

Apart from studying the impact of financial development on total manufacturing goods at country level, Beck (2003) went in more detail to assess whether a high level of financial development translates into a comparative advantage in industries that rely more on external finance, in terms of export shares and trade balances. To test the hypothesis empirically, Beck (2003) followed a technique proposed by Rajan and Zingales (1998). But different from Rajan and Zingales (1998) who assessed whether

¹⁷ As shown above, an important assumption in both the Ricardian model and the H-O model is that the production technology/ factor giving rise to comparative advantage to a country is immobile across countries. Jayaratne and Strahan (1996) has demonstrated that the services provided by the financial intermediaries are highly immobile geographically, even within the US. It should also be noted that "if capital markets were indeed well integrated, the level of domestic financial development would be of little importance for local growth opportunities" (Svaleryd and Vlachos, 2005, p.116).

different levels of financial development have different impacts on the growth of industries with higher or lower external financing needs, Beck (2003) studied if economies with better financial development have higher export shares and trade balances in industries that demand more external finance. Using Rajan and Zingales (1998)'s data on external dependence for 36 industries and measurement for financial development for 56 countries, Beck (2003) recorded robust evidence for the hypothesis that countries with better developed financial systems have higher export shares and trade balances in industries that use more external finance. Tested with alternative measures of financial development across countries and the reliance on external finance across industries, the results are consistent in showing a significant positive relationship between the financial development and highly dependent industry exports. Using instrumental variables to control for possible reverse causality or simultaneity bias, Beck (2003) found that these results remain robust.

Beck (2003) also offers an alternative test of Kletzer and Bardhan (1987)'s model. By adopting the logic behind the H-O theorem, which states that countries export the commodity that uses intensively its relatively abundant resource, Beck (2003) conducted a simplified variation of the factor-content studies of trade flows. Specifically, Beck (2003) calculated the weighted-average external dependence for a country's exports and trade balance, and explore correlations between these averages of dependence and indicators of financial sector development. The significant positive correlation indicates that countries with higher levels of financial development are net exporters of goods that are produced by industries that rely more on external finance (Beck, 2003). The difference between this alternative test and the test discussed above is that the alternative test focuses on the weighted-average external dependence of total exports and trade balance at country level and does not control for other industry-specific and country-specific characteristics.

The two studies conducted by Beck (2002; 2003) firmly demonstrate that an increase in the level of financial development has a significant impact on the international trade structures. Following Beck's study, more scholars began providing empirical evidence on the finance-trade pattern. By treating financial markets and intermediaries as factors in the production of goods and services and studying OECD countries, Svaleryd and Vlachos (2005, p.114) found that: ".....we find that well-developed financial intermediaries and markets have a positive effect on the content of external financing in net trade. In other words, the financial sector is a source of comparative advantage in a way consistent with the Heckscher-Olin-Vanek (HOV) model." More specifically, among the 9 indicators Svaleryd and Vlachos (2005) used to measure the financial development, stock market size (stock market capitalization to GDP) and activity (stock market trade to GDP), as well as liquidity (liquid liabilities to GDP) and bank sector concentration (three largest banks' assets to total banking assets) are the four indicators that have the most significant influence on the comparative advantage in trade. Two other indicators regarding functioning of the banking sector (private credit offered by financial institutions and banks net interest margin) are not statistically significant. The surprising finding in this paper is that legal variables (accounting standards, minority shareholders' protection, and creditors protection) seem to have no significant impact on a country's comparative advantage even though they are found to significantly affect the country's industrial specification. This differs with Beck (2003)'s finding where additional measurements for financial development are also positively significant. Furthermore, Svaleryd and Vlachos (2005) expected such specialization and trade patterns to disappear overtime, because multinational corporations (MNCs), which are believed insensitive to local financing conditions, are increasing their role in international trade, and at the same time, global financial markets are integrating gradually.

Unlike Beck (2003) and Svaleryd and Vlachos (2005), who adopted the

measurement of external financial dependence developed by Rajan and Zingales (1998) to spot industries' financing needs, Hur, Raj, and Riyanto (2006) focused on industries' asset structures to assess industries' access to external finance: while an industry's external financial dependence evaluates the ability to rely internal cash flows on financing the investment, an industry's assets tangibility reflects the ability of the assets to act as collaterals. Hur et al. (2006) assumed both proxies are technologically determined and find that the correlation between the two proxies in their sample is only 0.013, indicating that these two proxies are independent of each other. Hur et al. (2006) then argued that, since tangible assets can be collateralized¹⁸ and serve as a protection for creditors against the risk of default, the role of collateralized tangible assets becomes more prominent in countries with under-developed financial markets than in countries with well-developed financial markets¹⁹, when firms resort to external debts. This would result in possible biased investment decisions towards allocating resources to industries with more tangible assets in countries with under-developed financial markets (Hur et al., 2006). Based on this idea, Hur et al. (2006) found empirical evidence showing that economies with higher levels of financial development have higher export shares and trade balance in industries with more intangible assets²⁰.

In a recent paper, Becker, Chen and Greenberg (2013) focused on the role of upfront investment and studied annual bilateral trade flows among a sample of more than 170 countries. Becker et al. (2013) used five different measures of upfront costs: importer-exporter distance, importer-exporter linguistic similarity, regulation of entry

¹⁸ Scott's (1977, p.270) proposed that "while benefits of secured debt depends on the borrower's probability of bankruptcy, the costs depend on the type of assets the firm can offer as security. Transactions costs are relatively low for real estate, but relatively high for accounts receivable, partly because accounts receivable are more difficult to keep track of". Although by definition, real estate and accounts receivable are both tangible assets, real estate is by nature "more tangible" and easier collateralized than accounts receivable. Almeida and Campello (2007) provided empirical evidence showing that asset tangibility positively and significantly affects the investment-cash flow sensitivities (collateralized assets support more borrowings that in turn allow for further investment in these assets) of financially constrained firms.

¹⁹ Giannetti (2003) found that it is easier for firms investing in intangible assets obtain loans in countries with more developed legal and financial system.

²⁰ Hur et al. (2006) also found that higher levels of property-rights protection lead to higher export shares and trade balance in industries with more intangible assets.

costs, degree of output differentiation in an industry, and extent of R&D and advertising in an industry. Their results show that financial development is associated with more exports in industries in which fixed costs are high as well as to importers that require high costs. Compared with Hur et al. (2006) who assessed industry financial vulnerability based on asset tangibility, Becker et al. (2013) evaluated industry external dependence by calculating upfront fixed costs incurred in exporting. Thus, apart from Rajan and Zingales (1998)'s indicators discussed previously, alternative measures for industry external financial dependence developed by Hur et al. (2006) and Berker et al. (2013) are also introduced to study the finance-trade pattern.

In another paper, Susanto, Rosson, and Costa (2011) analyzed how bilateral trade flows of two sectors with different levels of economies of scale (manufacturing and agriculture) respond to financial developments as suggested by Beck (2002). The results suggest that, financial development has a larger positive impact on bilateral trade flows for the manufacturing sector, which has a relatively large economy of scale, than the impact for the agriculture sector, which has a relatively small economy of scale. In addition, Susanto et al. (2011) categorized their data into five regions: advanced countries, emerging Asia, Latin America, Middle East and North Africa, and Sub-Saharan Africa, to account for possible differential effects of the initial level of financial development and region. The authors found that the impacts of financial development on exports in both agriculture and manufacturing sectors in developing countries are greater than those in advanced countries. This indicates that developing countries can enjoy greater increase in their exports as a result of financial development, highlighting the importance of financial reform in these countries.

2.4 Financial Development and International Trade: from a Firm's Perspective

Focusing on both firm-level and country or sector level, scholars provide more empirical evidence on the finance-trade relationship. Vaubourg (2016, p.4) pointed out

that, the principal drawback of above models of finance-trade link is that they mainly adopt a representative firm approach, ignoring the fact that within each sector, only a small portion of firms (the most productive) engage in international trade. Manova (2013) also criticized that above Ricardian models (e.g. Kletzer & Bardhan, 1987; Beck, 2002) deliver a counterfactual prediction that either all or no producers in a given sector export. Considering that this paper focuses on the function that financial development reduces liquidity constraints faced by firms, finance-trade models with heterogeneous firms will also be discussed.

In Melitz (2003)'s paper, financial frictions are introduced by assuming that exporters face specific costs such as upfront fixed costs (e.g. building overseas networks, going through administrative procedures, advertising) and variable costs (e.g. transportation, tariff), both of which must be financed. Melitz (2003) stated that while the availability to finance fixed costs determines firms' export decisions (extensive margins of trade), the availability to finance variable costs determines firms' level of export activities (intensive margins of trade). Indeed, the literature has identified a considerable amount of evidence that firms incur additional upfront costs²¹ as well as variable costs to enter foreign markets. This is intuitive by nature, as Manova (2013, p.714) pointed out: "Sunk and fixed costs include learning about the profitability of potential export markets; making market-specific investments in capacity, product customization and regulatory compliance; and setting up and maintaining foreign distribution networks. Variable trade costs comprise shipping, duties, and freight insurance." In addition, since it takes longer time to delivery products and realize revenues in export markets, exporters have to rely more on external finance for working capital requirements than their domestic counterparts. This makes exporters heavily resort to external finance (typically trade finance) from banks and other financial

²¹ For some examples, see Roberts and Tybout (1997) for Columbia firms, Bernard and Wagner (2001) for German firms, and Bernard and Jensen (2004) for US firms. According to these authors, upfront fixed costs play an important role in a firm's decision to enter an export market.

institutions or trade credit from their business partners (Manova, 2013). According to Auboin (2009), 90% of international trade involves trade finance. Therefore, Manova (2013) argued that the presence of a well-developed financial system in the exporter's country are crucial for the firm to finance international activities.

The literature has demonstrated that credit constraints restrict firms' export activities²². For some examples: Using a panel of 9352 UK manufacturing firms over the period 1993-2003, Greenway, Guariglia, and Kneller (2007) found that financially constrained firms are less likely to export. Analyzing the interaction between credit constraints and exporting behavior at firm level for Belgian manufacturing sector, Muuls (2008) noticed that firms are more likely to be export if they enjoy higher productivity levels and lower credit constraints. Using a data set of French firms, Askenzay, Caldera, Gaulier, and Irac (2011) observed that credit constraints have a negative effect on the number of newly served destinations and raise the probability of quitting from existing export markets. Through detailed survey data from Italian manufacturing firms, Minetti and Zhu (2011) calculated that probability of exporting is 39% lower for credit constrained firms, and found that credit constrains are more obstructive to export for firms operating in industries that are high-tech in nature or heavily rely on external finance. Studying detailed data from China, Manova, Wei, and Zhang (2015) have shown that foreign-owned affiliates and joint ventures have better export performance, in terms of export sales, export product scope and number of export destinations, than private domestic firms, and such advantage is greater in sectors more vulnerable to external finance or in cases where firms face higher trade costs. Rationale behind is that foreign affiliates have less credit constraints because they can receive additional funding from their parent company (Manova et al., 2015). These findings suggest that export performance could be improved by removing credit constraints on financially vulnerable firms.

²² See Vaubourg (2016) for a comprehensive review on these papers.

In Chaney (2008)'s model, there exists a productivity threshold under which firms are not able to generate enough profits abroad to cover the fixed costs of entering foreign markets. Chaney (2008) suggested that there are three types of firms: for firms with low level of productivity, they do not export regardless level of available external finance because they will lose in overseas competition; for firms with high productivity, they export as much as the level of available external finance allows; for firms with moderate level of productivity, they will export only if external finance is enough to cover their upfront costs.

By taking heterogeneity across both firms and sectors into consideration, Manova (2013) examined how credit constraints impede international trade flows through three channels: the selection of heterogeneous firms into domestic production, the selection of domestic manufacturers into exporting, and the level of firm exports. Manova (2013) found that only 20-25% of the impact of credit constraints on trade is driven by reductions in aggregate output, meaning that credit constraints decrease foreign exports disproportionately more than domestic production. This is consistent with the previous example of decrease in GDP and exports as a result of the global financial crisis. With regard to the additional trade specific effect, the author found that one-third of the effect reflects reduced firm entry into exporting, and that two-thirds are caused by lower firm-level sales abroad. These results indicate that firms face credit constraints on both their fixed and variable export costs and empirically support Melitz (2003)'s statement that credits affect both a firm's export decisions (extensive margin) and export activities (intensive margins).

In addition, similar as Chaney (2008)'s idea on productivity threshold, Manova (2013) suggested that the productivity cut-off in financially vulnerable industries is lower when the exporting country is financially more developed, and consequently, firm-level exports and aggregate trade flows are systematically higher in such sectors and countries.

The empirical results firmly illustrate that financially developed countries export significantly more in sectors that require more external capital and intangible assets, meaning that these countries enter more foreign markets (effect on extensive margin), ship more products to each destination, and sell more of each product (effect on intensive margin). This implies that financial development has measurable effects on international trade flows and can become a source of comparative advantage as what the traditional H-O theorem would suggest (Manova, 2013, p.713).

Berthou (2010) also investigated effects of financial development on intensive and extensive margins of countries' exports, at different stages of initial financial development. In his model, Berthou (2010) built a model where firms are liquidity constrained and productivity is heterogeneously distributed across firms, and assumed that most firms have a low productivity and these firms require a high level of financial development to start exporting. Berthou (2010) then predicted that marginal effects of financial development are positively related to the initial development of financial institutions, contradicting with the traditional expectation that marginal effects of financial development on exports are greater in countries with poor initial financial institutions²³ (e.g. Susanto et al., 2011). The empirical results show that financial development stimulates both the intensive and extensive margins of countries' exports, and such pattern is more significant in industries with a higher demand for external finance, complying with previous studies (e.g. Beck, 2003; Hur et al., 2006). More importantly, Berthou (2010) found that marginal effects of financial development on exports are indeed closely related to the initial development of financial institutions: In industries where demand for external finance is high, the effect of financial development is the highest in economies characterized by an intermediate development of financial institutions, and the lowest in economies with poor or advanced financial institutions; In

²³ Berthou (2010)'s logic is that, when financial institutions are poorly developed, financial development only enables few firms to start exporting, with only a small effect on aggregate exports, while when financial institutions are better developed, financial development enables more firms to start exporting, having a larger effect on aggregate exports.

industries where firms require less external finance, the marginal effects of financial development on exports are strictly diminishing as the initial level of financial development becomes higher. The results have several important practical implications, as Berthou (2010, p.28) mentioned in his conclusion: “...trade and finance are more closely related in economies with an intermediate development of financial institutions. This implies that banking and financial crises are expected to have a more negative impact on trade in these countries, while negative shocks on financial development are expected to affect exports to a lower extent in advanced economies...”

2.5 Impact of International Trade on Financial Development

The above papers present both theoretical and empirical evidence that highlight the impact of financial development on international trade patterns. There are also plenty of papers, however, showing that international trade patterns could drive financial development²⁴.

In Rajan and Zingales (2003)’s paper, the authors noticed that countries were more financially developed in 1913 than in 1980 but only recently have surpassed their 1913 levels. By introducing an “interest group” theory of financial development, Rajan and Zingales (2003) pointed out that both incumbent firms and financiers in this interest group have strong incentives to oppose financial development when their country is closed to trade. In this case, firms have to compete solely in domestic market and financial development will allow potential new entrants, leading to severer competition and reduce profits for existing firms. The higher level of transparency and contract enforcement will also make financiers more difficult to extract profits from rents and informal connections with incumbent firms. The story is different, however, when the country becomes an open economy. In this case, unproductive domestic firms face competition from foreign firms and will have lower profits, making it difficult for them

²⁴ It should be noted, however, this paper studies impact on financial development on international trade patterns, not the reverse relationship. This section only attempts to complement the review on finance-trade literature.

to attain finance from incumbent financiers. Then the firms are more willing to advocate financial development to benefit from available external finance. Rajan and Zingales (2003) predicted that the interest group's opposition to financial development will be weaker when the country allows both cross-border trade and capital flows. The authors found empirical evidence to support their hypothesis: in the initial decades of the twentieth century and the closing decades when international trade and capital flows are relatively free, a country's trade flows have significant positive correlation with the country's financial development. In the intermediate periods (from the 1930s to the 1970s) when international trade and capital movement is restricted because of the Great Depression, World War II, and the Bretton Woods agreement, trade flows did not exert a significant positive correlation with financial development (Rajan and Zingales, 2003).

Further studies have provided empirical evidence to support Rajan and Zingales (2003)'s argument. For some examples: Huang and Temple (2005) found that higher level of goods market openness (measured as the sum of exports and imports divided by GDP²⁵) can lead to significant financial development, especially for lower-income countries. By carrying out OLS and 2LS estimates on a data set of 128 countries during the 1990s, Herger, Hodler, and Lobsiger (2008) concluded that trade openness has significant positive correlation with the size of capital markets (estimated by the ratio of private credit to GDP and the ratio of market capitalization to GDP). In addition, Law (2009) used a dynamic panel GMM estimation technique and finds that trade openness and capital flows exert statically significant positive influence on financial development, through institution (upgrade institutional quality²⁶) and competition channels (foster competition as Rajan and Zingales (2003) proposes). The effect of institutional channel is found to be more significant than that of competition channel in developing countries.

²⁵ The ratio of sum of exports and imports divided by GDP is commonly used in assessing trade openness. Following Herger et al. (2008), Baltagi et al. (2009), and Law (2009) also adopt this measurement.

²⁶ Law (2009, p.410) pointed out that "the development of institutional quality that is conducive to financial development and growth is an alternative or possibly complementary to the Rajan and Zingales (2003)'s hypothesis." The literature has demonstrated that institutional qualities are essential to financial development. For details, see La Porta et al., (1997; 1998); Beck and Levine (2004).

Furthermore, evidence from Baltagi, Demetriades, and Law (2009) has shown that marginal effects of trade (financial) openness bring to banking sector development are negatively related to the degree of financial trade openness, suggesting that relatively closed economies benefit more from their opening up policy.

While the above papers studied impact of international trade on finance from the perspective of trade openness, Do and Levchenko (2007) argued that comparative advantage in trade affects a country's production pattern, and in turn its demand for external finance. In Do and Levchenko (2007)'s paper, comparative advantage implies that after trade opening, the financially intensive sector expands in one country and disappears in the other, and such change in production patterns will lead to different level of financial development across the trading countries. From a panel of 96 countries and 30 years, the authors found significant evidence showing that a country's financial development is strongly and robustly affected by external finance need of its exports. Based on the results, the most conservative coefficient estimates imply that moving from the 25th to the 75th percentile in the distribution of external finance need of exports is associated with an increase in financial development of about 0.33 standard deviations, or a 12-percentage point increase in private credit to GDP (Do & Levchenko, 2007).

2.6 Major Views on the Financial System

2.6.1 The financial sector: a close look

Among the existing studies on the relationship between export structures and financial development, one can easily find that the authors adopt various indicators to measure the financial development. Therefore, it is necessary to understand what characteristics that a financial system normally has and how the financial development can be captured. Traditionally, there are two perspectives studying the financial sector: a bank-based system and a market-based system. At the beginning of their book, Allen and

Gale (2000, p.2) showed to readers how different financial systems can be among the world's most developed economies: while the US heavily relies financial markets (organized markets for securities such as stock, bonds, futures contracts, and options) in allocating resources, Germany has a highly concentrated banking system (Deutsche, Dresdner, and Commerzbank are the three major banks) dominating the allocation of financial resources in the corporate sector. Between these two extremes are Britain, Japan, and France, which have more mixed financial systems. Therefore, to better understand what financial development means, it should be noted that the financial system is not an entity that only has one single attribute, but rather has multiple dimensions whose relative importance is discussed overtime.

2.6.2 A bank-based financial system

In his paper comparing bank-based and market-based financial systems, Levine (2002, p.2) presented three positive roles of financial institutions (mainly banks) in: (i) acquiring information about firms and managers and thereby improving capital allocation and corporate governance, (ii) managing liquidity risk and thereby enhancing investment efficiency and economic growth, and (iii) mobilizing capital to exploit economies of scale.

Regarding information gathering and corporate control, in his paper discussing credit markets and control of capital, Stiglitz (1985, p.141) pointed out that managers making decisions on how to use capital are partially controlled by both lenders and shareholders. While lenders exert control through both the formal terms of their contract and their refusal to renew a loan, shareholders exert control through both the voting process and their refusal to provide additional capital. When exercising control on the manager, the intervenors face costs in obtaining information on action of the manager and the alternatives. Thus, the author observed a basic dilemma: The sole supplier of a firm's capital has an incentive to gather information to ensure that the manager behaves

properly. The rationale behind is that the supplier faces considerable risk because all potential losses will be absorbed by himself or herself solely and the supplier may not have sufficient risk diversification in this case; Meanwhile in the case of a group of suppliers, shareholders and small lenders do not have incentive to gather information relevant to the firm's performance, because information costs incur on themselves but potential gains from the information are shared by all similar suppliers, causing to a free-rider problem. Under this scenario, Stiglitz (1985) concluded that managers are not effectively controlled because neither lenders and equity owners individually have incentives to exercise their rights to control, in a world where information costs exist. Stiglitz (1985) then proposed that banks are the most important mechanism, though not perfectly, in securing effective control. Since banks usually take large positions in a firm and these banks can diversify risks through loan portfolio, they have incentives and abilities to acquire the necessary information²⁷ and exert effective control.

In terms of risk management and investment efficiency, Bencivenga and Smith (1991) built a model with multiple assets which have different levels of liquidity and productivity. In this model, Bencivenga and Smith (1991, p.195) made following argument on the role of banks: the law of large numbers makes savers' withdrawal demand fairly predictable and banks hold a certain amount of liquid reserves against this predictable demand. This liquidity reserve allows savers to hold safe bank deposits rather than liquid (but unproductive) assets and enables banks to invest the rest amount of deposits in productive capital. Compared to the situation in an economy lacking banks where each individual must self-ensure against unpredictable liquidity risks on their investment holdings, banks can economize on liquid reserves holdings that fulfill liquidity requirements but do not contribute to capital accumulation. This helps the economy to reduce liquidity risks faced by individuals and improve resource allocation

²⁷ Stiglitz (1985, p.143) also pointed out that the nature of loan contracts leads banks to concentrate on information regarding low-probability issues associated with potential defaults and the net worth of the firm in those low-return states. This limits payoff to banks exercising very effective control.

efficiency. Thus, Bencivenga and Smith (1991) argued that development of financial intermediaries, particularly banks, reduce socially unnecessary capital liquidation and promote economic growth.

Concerning exploiting economies of scale, Sirri and Tufano (1995) emphasized the importance of banks in pooling. In a world of increasing marginal costs, to maximize profits, firms have to produce at their minimum efficient scale level which can hardly be financed by individuals. To validate this point, Sirri and Tufano (1995, p.85) first reported a cross-industry study of minimum efficient scale that details the cost disadvantages small firms face. In the industries studied, if firm size decreases by two-thirds, production costs increase an average of 6.8%, a amount that can impact net profit margin significantly. In another table, the authors figured out that large firms dominate²⁸ capital-intensive industries, such as industrial production, equipment manufacturing, and natural resources, which are believed to have larger scale economies. Therefore, increasing production scales is particularly important for firms in capital-intensive industries. Then Sirri and Tufano (1995, p.91) listed a table showing the percentage of external finance requirements that could be fulfilled by matching the richest families to firms one-to-one, broken down by the size of enterprise being funded. The table shows that, without pooling, only 11.7% of U.S firms with external capital requirements above \$1 billion could be financed by single U.S families. Though collecting individual savings and aggregating these amounts to invest in large projects, however, banks can enable firms to exploit their scale economies and, at the same time, fulfill households' investing needs (Sirri & Tufano, 1995).

²⁸ The dominance is measured by firms' share of total industry employment. Sirri and Tufano (1995, p.85) also found that small firms dominate labor-intensive service industries that may enjoy lower economies of scale, such as repair services, legal services, and building contractors. As a result, the author conclude that technological differences among industries lead to different optimal firm sizes, which in turn place varying demands upon the financial system to provide pooling.

2.6.3 A market-based financial system

Levine (2002, p.3) also highlighted three positive roles of a well-performing market-based financial system in: (i) enhancing corporate governance by easing takeovers and making it easier to tie managerial compensation to firm performance, (ii) facilitating risk management and, (iii) eliminating problems with powerful banks.

According to Jensen and Murphy (1990), if a firm's shareholders know exactly what managers are doing and the firm's investment options, they can make a detailed contract that clarifies and specifies what managers must do. In reality, however, the existence of market imperfections makes it impossible for shareholders to have complete information regarding managerial actions and investment opportunities. Instead, shareholders usually have little idea on what actions managers should conduct or which of these actions can increase their wealth. Meanwhile, managers only compare their private gains and losses when making a management decision which will have impact on shareholders' wealth. As a result, agency theory²⁹ predicts that contracts that link the managers' compensation to shareholders' wealth will provide incentives for managers to take appropriate actions. In Jensen and Murphy (1990)'s paper, the authors quantified the magnitude of the incentives provided by: performance-based bonuses and salary revision, stock options, and performance-based dismissal decisions. The results showed that CEO wealth changes \$3.25 for every \$1,000 change in shareholder wealth which is evaluated by stock market capitalization. If the stock market is not liquid or does not reflect the true

²⁹ Agency theory originated from Jensen and Meckling's (1976) seminal paper: *Theory of The Firm: Managerial Behavior, Agency Costs and Ownership Structure*. According to Jensen and Meckling (1976, p.308), agency theory is concerned with problems in an agency relationship which is defined as "a contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision-making authority to the agent". The theory suggests that if both parties in this relationship are utility maximizers, it is very likely that the agent will not always act in the best interests of the principal, because managers only consider their personal gain and cost when pursuing a particular activity. To solve this problem, the principal can set up appropriate incentives for the agent and incur costs in monitoring the agent's behavior. The conflicts between shareholders and manager is a classical agency problem, as Jensen and Meckling (1976, p.309) mentioned "since the relationship between the stockholders and manager of a corporation fit the definition of a pure agency relationship it should be no surprise to discover that the issues associated with the 'separation of ownership and control' in the modern diffuse ownership corporation are intimately associated with the general problem of agency." For a comprehensive review on agency theory, see Eisenhardt's (1990) paper: *Agency Theory: An Assessment and Review*.

future value of firms, CEOs will find increase in shareholders' wealth unattractive because it is difficult for them to realize their personal gains in this situation. As a result, it seems that a well-functioning stock market is important to ensure the effectiveness of these incentives.

Financial markets are not only important in providing incentives to managers, but also effective in diversifying investors' risks. Levine (1991) pointed out that the demand for liquidity³⁰ requires investors must decide how much to invest in assets that take a long time to produce and distribute profits, and how much to invest in less profitable but more liquid assets that pay off in a short run. In this case, investment decisions will depend on investors' risk preferences and difference in expected return between the two assets. Firms will face liquidity shocks if investors are unwilling to invest or want their resources back in advance due to uncertainty. Then Levine (1991) argued that stock markets reduce such liquidity risk by allowing investors to trade their "shares" in their invested firms. More specifically, in the stock market, investors can choose to sell their shares to fulfill liquidity requirements, if they face a liquidity shock, or purchase shares with their liquidity assets to earn higher rate of return, if they do not have liquidity concern. Although shares of a firm are traded, the firm's physical resources for production are not removed to satisfy short-run liquidity demands, so a stock market increases the amount of resources devoted to long term productive activities. Based on this argument, Levine (1991) built a mathematical model that demonstrates that stock markets naturally encourage technological innovation and economic growth through facilitating the ability to trade ownership of firms without disrupting the productive processes occurring within the firms.

In addition, the market-based view highlights some problems³¹ arising from

³⁰ Levine (1991) assumed that there is no production risk in his model: for a given level of inputs there is a given level of output.

³¹ For more discussion and literature review on problems arising from powerful banks, see Allen and Gale (2000) and Levine (2005).

powerful banks. For some examples: Through examining the effects of bank-firm relationships on firm performance in Japan, Weinstein and Yafeh (1998) found that before Japan liberalized its financial markets, firms that have main bank to support do not exhibit higher profitability level or faster growth rate than their industry peers that do not have such bank-firm relationships, even though these firms are able to borrow more capital for their production activities. In this case, underdeveloped financial markets give banks monopoly power in providing capital. These powerful banks, as suggested by the authors, squeeze firms' profitability through relatively high interest payments, and impede firms' growth through debt-holder-orientated conservative investment strategies. The close bank-firm relationships also create room for corruption, especially in countries with weak institutions: La Porta, Lopez-de-Silanes, and Zamarripa (2003) studied related lending (banks lend to firms controlled by bank's owners) in Mexico in the 1990s, and found that related lending counts 20 percent of total commercial loans and has 4 percentage lower annual interest rates than other lending. In addition, related loans are 33 percent more likely to default and have 30 percent less in recovery rates than unrelated ones. This indicates that banks are not always allocating resources to the most productive firms in the economy. In a well-functioning stock market, however, firms' performance will be finally reflected in their stock price and investors have greater incentives to search firms with higher productivity and more promising growth. Thus, Levine (2002) stated that supporters of the market-based financial system stress that markets will reduce inherent inefficiencies associated with banks and promote economic growth.

2.6.4 A service-based system

Apart from the bank-based and the market-based views on the financial system, Levine (2002) also introduced a service-based view which stresses the fact that all financial arrangements, including contracts, markets, and intermediaries, are just tools to handle with market imperfections and provide financial services. As a result, the

service-based financial system focuses in creating an environment in which intermediaries (particularly banks) and markets can provide sound financial services more effectively, ignoring the debate on relative importance of the bank-based system versus the market-based system.

According to Levine (2002), one special case of the service-based view is from legal perspective. La Porta, Lopez-de-Silanes, Shleifer, and Vishny (2000) described the legal protection of investors as a potentially useful way of studying corporate governance. In their paper, La Porta et al. (2000, p.4) held the view that the key mechanism for functioning a financial system is the protection of outside investors, whether creditors in a bank-based financial system or shareholders in a market-based financial system, through both laws and their enforcement. The reason is that, unlike employees or suppliers who are important for a firm's operation and are consequently at lower risk of being mistreated, outside investors face a risk that their returns on investments will not fully realize due to expropriation³² by the controlling shareholders or managers. This is related to the agency problem where insiders (controlling shareholders and managers) use the firm's profit to realize their personal benefits rather than return the money to the outside investors (La Porta et al., 2000). In this situation, potential shareholders and creditors only choose to finance firms when they feel that their rights are protected by law, indicating that variation in investor protection and legal enforcement are critical in understanding why firms raise more capital in some countries than in others. Without a legal system that offers protection to outside investors, corporate governance and external finance will not function well. Because of this, La Porta et al. (2000) stated that the legal approach is a more meaningful way to understand cross-country comparisons of financial system's effectiveness than traditional bank-based or market-based views.

³² La Porta et al. (2000) pointed out that expropriation of minority shareholders and creditors can take a variety of forms, such as transfer pricing, asset stripping, investor dilution, and abnormal compensation. The authors further mentioned that "In general, expropriation is related to the agency problem described by Jensen and Meckling (1976), who focus on the consumption of 'perquisites' by managers and other types of empire building." (La Porta et al., 2000, p.4)

To make a brief summary, there are three main views on the financial system: 1. the bank-based view focusing on the role of financial intermediaries (mainly banks); 2. the market-based view stressing the importance of capital markets (particularly stock markets); and 3. the service-based view concentrating the overall size and effectiveness (especially investor protection and legal enforcement) in the financial system. All these three attributes will be taken into consideration when we construct our measures for financial development in the methodology section.

2.7 Assumption on Financial Sector as a Factor Endowment

As discussed in the previous section, one important assumption in the classical international trade model is the immobility of the factor endowment leading to difference in comparative advantage among countries. In dealing with the criticism on the H-O theory which seems unable to explain soaring trade flows between countries with similar characteristics, Wood (1994) argued that many empirical tests suggesting the inaccuracy of the H-O theory have mis-specified the theory by treating capital as similar to land, when in fact capital is internationally mobile, and does not generally influence international trade patterns. Pointing out that capital mobility helps to make real interest rate among countries more or less equal, the author further suggested that capital cannot serve as a source of national comparative advantage. By excluding capital and examining trade in manufacturers between the North and the South, Wood (1994) found that the H-O theorem still provides an appropriate estimation of a large part of international trade patterns. However, Svaleryd and Vlachos (2005) criticized Wood (1994)'s argument because Wood (1994) under-evaluated the role of financial sector in the environment of information asymmetries and interest conflicts between lenders and borrowers. Svaleryd and Vlachos (2005)'s counter-argument is that, even if two countries have the same real interest rate, the difference in their financial service quality will still lead to the difference in financial capital endowment, as financial intermediaries can help to

eliminate the market imperfections and make resource allocation more effective. In addition, there are a lot of papers demonstrating the existence of frictions in international capital markets.

Following are some examples: To compare two views of international capital mobility, Feldstein and Horioka (1979) made a statistical link between saving generated in a country with the domestic investment in that country. If capital is mobile across countries, the domestic saving amount would be little related to the domestic investment in that country. If capital flows are restricted whether due to institutional rigidities or portfolio preferences, the domestic saving amount would have significant positive correlation with domestic investment. Feldstein and Horioka (1979) found that differences in domestic saving rates among sample countries have caused similar respective differences in domestic investment rates. This empirical evidence supports that capital flows are immobile. One decade later, French and Poterba (1991) constructed estimates of the international equity portfolio of investors in the US, Japan, and Britain, three countries thought to have highly integrated with international capital markets. They found that percentage of domestic holdings in the equity portfolio in the three countries are 94%, 98%, and 82% respectively, indicating that investors still prefer invest in their home countries, though integration in global capital markets allows them to benefit from international diversification. Bekaert and Harvey (1995) even found that while some countries appear more integrated with global capital markets, some other countries seem to stay segmented even though foreigners have relatively free access to their local capital markets, suggesting that global capital markets are not always becoming more integrated. Jayaratne and Strahan (1996)'s study shows that, even within a country, regional difference in liberalization of the banking sector can lead to different regional growth rates, suggesting that financial services are highly embedded in local economy and difficult to move geographically.

Nevertheless, considering the trend in financial globalization, Rajan and Zingales (1998, p.573) still made an assumption regarding the immobility of capital: "... note that for a country's financial development to have any effect on industrial growth in that country we have to assume that firms finance themselves largely in their own country. In other words, only if world capital markets are not perfectly integrated can domestic financial development affect a country's growth... We have little else to say about this assumption other than noting that its failure would weaken the power of our test but not necessarily bias our findings." Furthermore, in their conclusion, Svaleryd and Vlachos (2005) expected impacts of local financial markets on the country's international trade patterns to become smaller or even disappear over time, because multinational corporations (MNCs) which are believed insensitive to local financing conditions are increasing their share of international trade, and global financial markets are gradually integrating across countries. The mobility of capital overtime may even partially explain Susanto et al. (2011)'s finding which shows that impacts of financial development on exports in both agriculture and manufacturing sectors in developing countries are larger than those in developed countries, where capital flows are freer³³. This arises the importance to extend the analysis along the time dimension to the current stage, not only as a retest of finance-trade relationship recorded by previous studies, but also as a supplementary test of capital mobility.

In line with Rajan and Zingale (1998)'s study, this paper assumes that firms exporting depend external finance provided by the domestic financial system and global financial market is not perfectly integrated. This suggests that a country's financial system maintains deeply embedded in the domestic environment as an immobile factor endowment of production and can be a source of that country's comparative advantage

³³ In Chinn and Ito's (2008) paper, a new index that measures the extent of openness in capital account transactions was developed from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). The data covers 181 countries for the 1970-2005 period. Based on the index, industrial countries scored twice as emerging countries and less developed countries do in terms of financial openness. This indicates that in developed countries, capital flows are freer and financial markets are more integrated globally.

over other countries.

2.8 Summary of Literature Review

To sum up the literature review, a financial system includes financial intermediaries, financial markets, and overall regulatory framework which facilitates the operation of both intermediaries and markets (Levine, 2002, p.401). Although the ongoing globalization is removing barriers of capital flows and provides firms with access to foreign financial services, it is assumed that exporters still rely heavily on domestic finance which is an immobile factor endowment.

Through the channel of reducing external financing costs and eliminating firms' financial constraints, a higher level of financial development enables a country to specialize and build up comparative advantage in industries relying more on external finance. Kletzer and Bardhan (1987) developed the first theoretical model showing that even with identical technology or endowments between countries, comparative advantage may emerge in a world of credit market imperfection. Inspired by this theoretical framework, scholars have been recorded empirical evidence showing that a higher level of financial development translates into a comparative advantage in industries that require more external finance: Beck (2002) found that financial development has a significant causal impact on the level of both export shares and trade balance of manufactured goods which are believed to be more capital intensive; Beck (2003) and Slaveryd and Vlachos (2005) are the earliest ones to provide empirical examination on the link between financial development and international trade patterns at industry level. Both papers used industry-level data on external financial dependence developed by Rajan and Zinagales (1998) and stated that countries with higher level of financial development enjoy higher export shares and trade balances in industries with higher external financial dependence. Further studies also observed similar results (e.g., Hur et al., 2006; Susanto et al., 2011).

While some studies basically follow a classical Ricardian or a H-O (representative firm) approach, some other scholars considered firm heterogeneity into their analysis. The heterogeneity mainly refers to different level of productivity across firms. Following the classical treatment of firm heterogeneity in trade proposed by Melitz (2003), some scholars such as Berthou (2010) and Manova (2013) identified and quantified detailed mechanisms through which credit constraints affect trade patterns, both at firm level and industry level. According to these authors, there exists a productivity threshold for firms to export and not all firms will export even with sufficient external finance. Credit constraints not only affect a firm's export decision, but also influence the firm's extent of export activities. In addition, Rajan and Zingales (2003) suggested that trade flows may also stimulate financial development through a competition channel. This is validated by empirical studies which expanded the impact of trade through institutional quality channel. Furthermore, Do and Levchenko (2007) empirically demonstrated that a country's trade patterns causing different needs for external finance will also significantly affect the level of financial development in that country.

These findings have several important theoretical underpinnings: First, they demonstrate how financial development helps to eliminate credit constraints and promote export activities for firms. Second, they enrich international trade theory by showing that financial development can be a source of comparative advantage, in industries that are highly dependent on external finance, either as part of production technology in the Ricardian model or as capital resource in the H-O model. Third, they also complement the empirical growth literature by underlining the importance of financial sector as an important factor for industry development and economy reform. As most highly dependent industries, such as motor industry and machinery industry, are the industries that are more technological intensive. These theoretical implications are very practical and meaningful for policy makers who want to reform their domestic industrial and trade structures and enhance the country's competitiveness in today's world. As Beck (2002,

p.108) mentioned in his paper, this increases the priority that financial sector reform should have on policy makers' agendas.

Although the literature has generally agreed that financial development has positive impact on highly dependent industries in international trade, some interesting questions can be raised from the above papers.

First, Beck (2003) and Hur et al. (2006) observed that, all being significant, development in financial intermediaries seems to be more significant and have larger quantitative impact on increasing export shares of highly dependent industries than development in financial markets or accounting standards. Slaveryd and Vlachos (2005) only found one out of three indicators of the banking sector statistically significant, compared to the result showing that two indicators for the stock market are both significant. More surprisingly, Slaveryd and Vlachos (2005) noticed that legal factors and accounting standards do not have significant effect on country's competitiveness in industries that are heavily dependent on external finance. Thus, some inconsistencies exist regarding which attribute of financial system is more significant in the finance-trade relationship.

Second, while Susanto et al. (2011) found that developing countries' exports in financially intensive industries can enjoy greater increase as a result of financial development, Berthou (2010) pointed out that for these industries, such effect is the highest in middle income economies, and low otherwise. It is worthy clarifying different marginal impacts of financial development on industry exports. Because based on Berthou (2010, p.28)'s argument, new financial resources may only end up with using for domestic-orientated projects or export in sectors that require little external finance, when financial institutions are underdeveloped. This would result in different political implications compared to what Susanto et al. (2011) would propose.

Third, it should be noted that the earliest empirical studies on the finance-trade relationship were based on data two decades ago, after which the world experienced ongoing global financial market integration and increasing international capital flows. As mentioned by Svaleryd and Vlachos (2005, p.136) in their conclusion, the globalization and rising power of multinational firms may weaken the finance-trade pattern because finance can become mobile across countries. As a result, the assumption on the immobility of the factor endowment (finance resources) leading to comparative advantage does not hold. Stating that the finance-trade relationship may disappear overtime, Svaleryd and Vlachos (2005) anticipated future study to extend the analysis.

3. METHODOLOGY AND DATA

3.1 Estimation Equations

The above literature review suggests that financial development can give a country comparative advantage in financially intensive industries and points out three interesting questions for future research. This paper mainly adopts Beck (2003)'s approach to respond to the above three questions. In Beck (2003)'s paper, the author developed a following estimation equation:

$$y_{i,k} = \sum_i \alpha_i \text{Country}_i + \sum_k \beta_k \text{Industry}_k + \delta (\text{Extfin}_k * \text{Finance}_i) + \varepsilon_{i,k}$$

In the above equation, $y_{i,k}$ stands for industry k 's share of country i 's total exports over the period 2006 to 2015. A higher industry export share ratio indicates that the country is more specialized in this industry and has the comparative advantage over other countries in international trades. Country_i are country dummy variables and Industry_k are industry dummy variables. These two dummy variables are introduced to control for country-specific (such as size of economy or GDP growth) and industry-specific (some industries may be more open to trade by nature) effects that affect industry export shares. Extfin_k is the external financial dependence of industry k . This variable is constructed by Rajan and Zingales (1998) from a sample of US firms from 1980 to 1989. Finance_i represents the level of financial development in country i during the period and it can be evaluated by varies of indicators. Detailed explanations on these measures for financial development will be delivered in the methodology section. $\varepsilon_{i,k}$ is the error term.

The errors, also called the residuals, are the difference between the data points and the predicted values of the regression line. For the above linear regression appropriate for the data, the residuals should be independent to each other, normally distributed around zero, and having the same variance. These assumptions can be diagnosed by analyzing the residual plot, a graph that plots the residuals with respect to the predicted values. If

the model is well-fitted, there should be no pattern between the residuals and the fitted values in the residual plot. However, the residual plot for the Equation 1 shows that the residuals “fan out” from left to right, rather than exhibiting a consistent spread around zero. This indicates that the variances of the residuals are not constant, violating the assumption of constant variance.

To improve the existing regression model, it is necessary to conduct a transformation which allows us to change the measurement scale and eliminate the problem of heteroscedasticity. After listing key results from different transformation methods in Table 3.1.1, the exponential model is chosen because it can generate the highest adjusted R^2 (0.52) and more random residual plots, compared with the initial model and other transformation models. So, the estimation equation used for regression test becomes:

$$\text{Log}(y_{i,k}) = \sum_i \alpha_i \text{Country}_i + \sum_k \beta_k \text{Industry}_k + \delta (\text{Extfin}_k * \text{Finance}_i) + \varepsilon_{i,k}$$

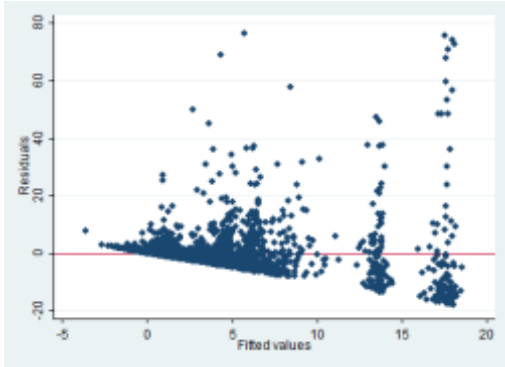
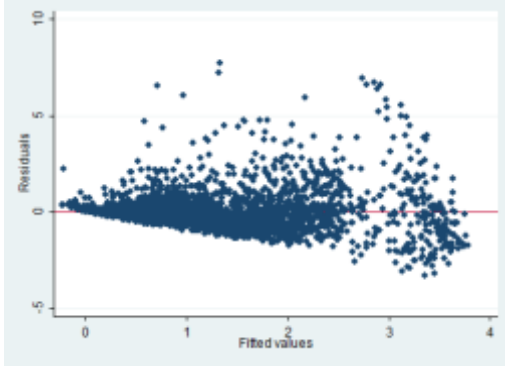
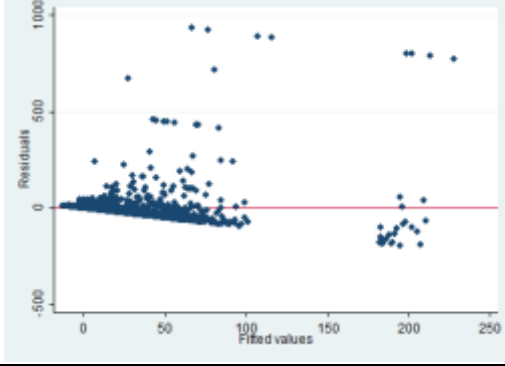
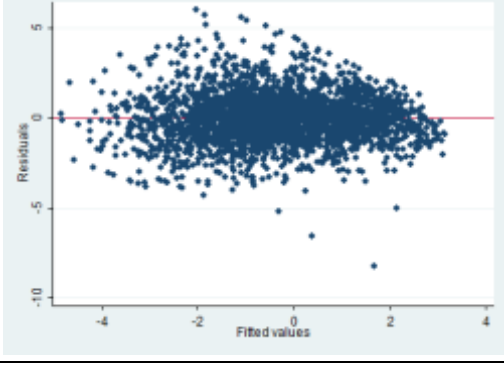
Model (1)

The research of interest is the coefficient of the interaction term $\text{Extfin}_k * \text{Finance}_i$. After controlling for country and industry specific factors, we can analyze the effect of the interaction of external financial dependence and financial development on industry export shares. If the relationship identified by previous scholars (e.g. Beck, 2003) maintains under the current circumstance, it is expected that the coefficient sign is significantly positive³⁴, meaning that development in the financial sector can have bigger positive impact on those industries that are more financially dependent. This equation will be run for three tests, one with the whole sample, and two with separate samples based on level of industry’s external financial dependence.

³⁴ As we will show later, all coefficient signs of interaction terms are expected to be positive except $\text{Extfin} * \text{Net Interest Margin}$. *Net interest margin* tends to be decrease as banking competition increases, indicating that lower margins are associated with more effective banking sector.

Table 3.1.1 Transformation to Achieve Linearity

(The interaction term used in this table is Extfin * Private Credit)

Models	Transformation	Adjusted R ²	Residual Plot
Standard linear Regression	None	0.2195	
Quadratic Model	Dependent variable = sqrt(y)	0.3901	
Reciprocal Model	Dependent variable = 1/y	0.1312	
Exponential Model	Dependent variable = log(y)	0.5222	

It should be noted, however, under the exponential model, the test for heteroscedasticity yields a p-value less than 1% and rejects the assumption of homogeneity. But it is still argued that the exponential model provides an overall well-fit for the data, considering the fact that it has a high adjusted R^2 and the residual plot showing little indication of any pattern.

The Model (1) examines the linear relationship between the financial development and industry exports. Berthou (2010) found that, in industries that require high external finance, the effect of financial development is the strongest in countries that have an intermediate level of financial institutions, and weaker in countries with poor or advanced financial institutions. This suggests that the possible relationship could be curvilinear, and thus the above estimation equations that indicate a linear relationship may not be a good model. In order to check this possible inverted U-shaped finance-export relationship in the high dependent industries, a quadratic term is added to the Model (1). This new variable takes form of the squared term of the interactions:

$$\begin{aligned} \text{Log}(y_{i,k}) = & \sum_i \alpha_i \text{Country}_i + \sum_k \beta_k \text{Industry}_k + \delta (\text{Extfin}_k * \text{Finance}_i) \\ & + \phi (\text{Extfin}_k * \text{Finance}_i)^2 + \varepsilon_{i,k} \end{aligned} \quad \text{Model (2)}$$

In the above equation, the square of $\text{Extfin}_k * \text{Finance}_i$ serves as a moderate factor of the initial $\text{Extfin}_k * \text{Finance}_i$. If there indeed exists an inverted U-shaped relationship identified by Berthou (2010), the coefficient sign of the squares should be significantly negative. This will indicate that the export-finance linear slope is getting less positive (more negative) as the level of the financial development increases.

3.2 Measurement for the Financial Development

In addition to using border and timely data to retest previous work and adding a squared term based on Beck (2003)'s estimation equation, this thesis systematically

adopts different measures for the financial development that capture different attributes in a financial system. The first half of this section describes how we construct our measures for financial development. The second half of the section explains data sources.

3.2.1 Existing measures on financial development

After looking inside the financial sector, a brief summary on indicators of financial development that appear in some previous papers studying the same topic can be made.

As shown in the Table 3.2.1, measures adopted by Beck (2003), Svaleryd and Vlachos (2005), Hur et al. (2006), and Becker et al. (2013) basically comply with the previous discussion on the views on financial sector. To measure development of financial institutions, value of private credit and liquid liabilities are most used in the previous papers. To assess development of financial markets, value of stock market capitalization and stock market trade are commonly considered by these authors. Concerning the overall effectiveness of financial sector, level of accounting standards and protection on investors (creditors and shareholders) become important in their analysis. When we decompose Susanto et al. (2011)'s financial development index, it should be noted that these dimensions include regulation and reforms in both financial institutions and financial markets. Although Berthou (2010) primarily relied on private credit, which only measures one attribute of financial sector, becoming the only exception, it is worth noting that the author defined financial development solely as the capacity of financial intermediaries to channel credit to investors. In this thesis, however, a development in the financial system means a development of the overall financial sector, including financial intermediaries (mainly banks), financial markets (mainly stock markets), and regulatory effectiveness. This implies that we choose measures for financial development in the similar way as how Beck (2003),

Table 3.2.1 Summary on Measures for Financial Development Used by Previous Studies

Papers	Aspects	Measures	Descriptions
Beck (2003)	Financial intermediary development ³⁵	Private Credit	Value of credits by financial intermediaries to the private sector divided by GDP
	Stock market development ³⁶	Market Capitalization	Value of listed domestic shares on domestic exchanges divided by GDP
	Overall importance of financial sector ³⁷	Total Capitalization	Sum of Private Credit and Market Capitalization
Svaleryd & Vlachos (2005)	Size and activity of the stock market	MCAP	Value of listed shares to GDP
		STRADE	Total value of stock market trade to GDP
	Development of financial intermediaries	LLY	Liquid liabilities to GDP
		DC	Private credit by deposit money banks and other financial institutions to GDP
		CONC	Market share of the three largest banks
		MARGIN	Net interest margin to total assets
	Regulatory efficiency	ACSTAN	Accounting standards
		MINORITY	Index of minority shareholder rights, range 0-6
		CREDITOR	Index of creditor rights, range 0-4

³⁵ As a part of the sensitivity analysis, Beck (2003) used two further measures of financial intermediary development: Liquid Liabilities (currency plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries) and Commercial-Central Bank (percentage ratio of commercial banks' domestic assets divided by commercial banks' and central bank's domestic assets).

³⁶ As a part of the sensitivity analysis,, Beck (2003) used two further measures of stock liquidity: Value Traded (value of the trades of domestic shares on domestic exchanges divided by GDP) and Turnover (value of the trades of domestic shares on domestic exchanges divided by the value of listed domestic shares).

³⁷ As a part of the sensitivity analysis,, Beck (2003) used Accounting, a measure of the comprehensiveness of companies' financial statements. Beck (2003, p.303) believed that the higher is Accounting, the easier it should be for firms to obtain external financial, either from financial intermediaries or financial markets.

Table 3.2.1 Summary on Measures for Financial Development Used by Previous Studies (con't)

Papers	Aspects	Measures	Descriptions
Hur et al. (2006)	Size ³⁸ and activity of financial intermediaries	PRIVATE CREDIT	Value of credits by financial intermediaries to the private sector divided by GDP
		LLY	Value of currencies plus demand and interest-bearing liabilities of financial intermediaries and non-bank financial intermediaries divided by GDP
	Size and activity of stock market	MCAP	Stock market capitalization to GDP
		TVT	Value of the stock market trade to GDP
	Regulatory and legal efficiency	ACCOUNTING	Comprehensiveness of company's balance sheet and income statement provided to the investors
Susanto et al. (2011)	Overall financial development	Financial Reform Index	The index is constructed based on seven different dimensions ³⁹ of financial sector policy. Each dimension is coded from 0 to 3, giving a total value ranging from 0 to 21
Berthou (2010)	Size of financial system	Private Credit	Credit distributed by deposit money banks and other financial institutions to the private sector, over GDP
Becker et al. (2013)	Quality of accounting standard	Accounting stds	Comprehensiveness of company's balance sheet and income statement provided to the investors
	Stock of actual financing	Private Credit	Value of credits by financial intermediaries to the private sector divided by GDP

³⁸ As a part of the sensitivity analysis, Hur et al.(2006) used Bank Credit (credit by deposit-taking banks to the private sector divided by GDP) which captures the activity of banks in the credit market.

³⁹ The seven dimensions of financial sector policy are: (1) credit controls and excessively high reserve requirements, (2) interest rate controls, (3) entry barriers, (4) state ownership in the banking sector, (5) financial account restrictions, (6) prudential regulations and supervision of the banking sector, and (7) securities market policy.

Svaleryd and Vlachos (2005), and Hur et al. (2006) did in their works.

3.2.2 Measures for financial development to be used

As Rajan and Zingales (1998, p.569) pointed out: "... financial development should be related to the variety of intermediaries and markets available, the efficiency with which they perform the evaluation, monitoring, certification, communication and distribution functions, and the legal and regulatory framework assuring performance. Since there is little agreement on how these are appropriately measured, and even less data available, we will have to make do with crude proxies even though they may miss many of the aspects we think vital to a modern financial system." As a result, when constructing measures for financial development, it is necessary to take the multiple views on financial sector, including financial institutions, financial markets, as well as regulatory effectiveness, into the consideration.

Measures for financial institutions (intermediaries)

Regarding size (depth) of financial intermediaries, this thesis mainly relies on *Private Credit*, which equals the ratio of credits offered by deposit money banks and other financial institutions to GDP. This variable captures the size of credit channeled through financial intermediaries to private firms. As Cihak, Demirguc-Kunt, Feyen, and Levine (2012) summarized in their paper which introduces the Global Financial Development Database, private credit is the variable that has received much attention in the empirical literature. The authors also treated liquid liabilities as a major indicator for financial depth, leading us to include *Liquid Liabilities*, which is the ratio of liquid liabilities⁴⁰ (M3) to GDP as another measure for financial depth. Literature has well

⁴⁰ Based on explanations in the World Bank's Global Financial Development Report, liquid liabilities are also known as broad money, or M3. They are the sum of currency and deposits in the central bank (M0), plus transferable deposits and electronic currency (M1), plus time and savings deposits, foreign currency transferable deposits, certificates of deposit, and securities repurchase agreements (M2), plus travelers checks, foreign currency time deposits, commercial paper, and shares of mutual funds or market funds held by residents.

documented positive relationship between the financial size and economic growth (e.g. King and Levine, 1993b). Therefore, expected coefficient signs of *Extfin*Private Credit* and *Extfin*Liquid Liabilities* are both positive.

For financial intermediary efficiency, Cihak et al. (2012) constructed measures for the cost of intermediating credit. These measures include indicators such as overhead costs to total assets, net interest margin, lending-deposit spread, non-interest income to total income, and cost to income ratio. Following Svaleryd and Vlachos (2005), we introduce *Net Interest Margin*, which equals accounting value of all banks' net interest margin as a share of their average interest-bearing assets, to assess the banking sector's efficiency in allocating financial resources. Although efficient institutions are able to figure out more promising projects and become more profitable, a high net interest margin does not indicate an efficient financial system because such high margin can simply drive up by a lack of competition or an economic uprising. Indeed, the literature⁴¹ has found that smaller margins are usually accompany with increased competition which can lower social costs of financial intermediaries. Thus, the expected coefficient sign of *Extfin*Net Interest Margin* is negative.

Measures for financial markets

An underlying assumption in this paper is the that development in financial markets can be captured by stock market development. Concerning size (depth) of stock markets, Cihak et al. (2012) pointed out that the most common choice in the literature is stock market capitalization to GDP, which can be illustrated by the previous table. This indicator is named as *Stock Market Capitalization*. To measure activity in the stock market, we also follow previous scholars' approach by adopting *Stock Value Traded*,

⁴¹ For example, Maudos and De Guevara (2004) analyzed the interest margin in the major European banking sectors (the United Kingdom, Germany, France, Italy, and Spain) in the period 1993-2000 using a panel of 15,888 observations. They found that the decrease in the interest margin is compatible with a relaxation of competitive conditions (increase in market power and concentration), and such effect has been counteracted by a reduction of interest rate risk, credit risk, and operating costs. This demonstrates that a lower net interest margin actually reflects a better performing banking system.

which is the value of stock market transactions as a share of GDP. It should be noted, however, neither stock market capitalization or stock market trade represent actual amount of funding received by issuers, but rather reflect an anticipation on future earnings. In spite of this, Cihak et al. (2012) stated that these two variables keep appearing in the literature and are reasonable measure for the importance of stock market. Both coefficient signs of *Extfin*Stock Market Capitalization* and *Extfin*Stock Value Traded* are expected to be positive.

When referring to financial market efficiency, one basic measure is the stock market turnover ratio (Cihak et al., 2012, p.14). This ratio reflects stock market liquidity which is found positively related with economic growth (e.g. Levine and Zervos, 1998). Thus, *Stock Market Turnover*, which is the ratio of stock turnover to stock market capitalization, is employed in our analysis. The expected coefficient sign of *Extfin*Stock Market Turnover* is positive.

Measures for financial services

From the perspective of the financial services view, it emphasizes the importance on how to create better functioning banks and markets, and provide effective financial services. A typical case of the financial service view is the financial legal view (La Porta et al. , 1998), which is applied when constructing measures for financial services.

Getting Credit from the World Bank's Doing Business Data is introduced as an indicator of the legal factors in financial intermediaries. *Getting Credit* measures strength of credit reporting systems (credit information) and effectiveness of collateral and bankruptcy laws (legal rights). More specifically, based on the World Bank's explanation, credit information includes rules and practices affecting the coverage, scope and accessibility of credit information available through either a credit bureau or a credit registry, and legal rights reflects strength of the secured transactions system. Both

aspects are critical in facilitating effective lending: credit information enables financial institutions evaluate the creditworthiness of borrowers, while legal rights can safeguard lenders through secured transaction regulations and bankruptcy laws. Original scores in *Getting Credit* ranges from 0 to 100, wherein 0 represents the lowest performance and 100 represents the frontier. The higher the *Getting Credit* is, the more effective lending service that financial institutions can provide. This indicates that the expected coefficient sign of $Extfin * Getting\ Credit$ is positive.

As the case for financial institutions, a measure that evaluates legal factors in financial markets (mainly stock markets) is introduced. This measure is *Protecting Minorities* from the World Bank's Doing Business Data. According to the World Bank (2016), *Protecting Minorities* captures the protection on shareholders from conflicts of interest and shareholders' rights in corporate governance. More specifically, protection on shareholders covers 3 dimensions of regulation that address conflicts of interest: transparency of related-party transactions, shareholders' ability to sue and hold directors liable for self-dealing, and easiness of shareholder litigation. Shareholders' rights highlight 3 aspects of corporate governance: rights and role in major corporate decisions, governance safeguards, and corporate transparency. Strong protection and rights can secure investors' confidence which is critical for the function of stock market. Initial scores in *Protecting Minority Shareholders* varies from 0 to 100, wherein 0 implies the lowest performance and 100 represents the top. The higher the *Protecting Minorities* is, the more effective stock markets are in allocating financial resources. It is anticipated that a positive coefficient sign of $Extfin * Protecting\ Minorities$ can be realized.

3.3 Data Sources

3.3.1 Trade data

The study selects 30 industries and 100 countries as our sample (see Appendix 1 for

country list) and collect export data from 2006 to 2015. The data is obtained from Trade Map of International Trade Center. Since the industry export statistics are presented under the Harmonized System (HS), while the industry external financial dependence provided by Rajan and Zingales (1998) is constructed under the International Standard Industrial Classification (ISIC), correspondence between the two classifications is essential. Appendix 2 is the correspondent table of two industry classifications. When searching for industry export data, we refer to the HS code. For example, regarding the tobacco industry, statistics from 2006 to 2015 and under the section 24 of HS, are collected. For each industry, an average share of total exports is calculated during the period.

[Appendix 2]

3.3.2 External financial dependence

One of the biggest contribution in Rajan and Zingales (1998)'s work is that they provided a measure of external financial dependence at industry level. The data is computed from a sample of U.S listed companies over the 1980's. The authors first assumed that there exists a technological reason on difference in industries' external financial requirements. These technological differences are expected to persist across countries, meaning that if drug industry requires more external finance than tobacco industry in the U.S, the drug industry in Britain will also need more financial resources. By pointing out that the actual amount of external funds raised by a firm should equal its desired amount in a perfect capital market, and capital markets in U.S are among the most developed in the world, Rajan and Zingales (1998) suggested that the amount of external finance used by large U.S firms is likely to reflect their actual demand for external finance which is applicable to industries in other countries. More specifically, a firm's dependence on external finance is defined as capital expenditures minus cash flow from operations divided by capital expenditures (Rajan and Zingales, 1998, p.217). In

other words, it measures the firm's portion of capital expenditures not financed by cash flow from operations. The authors calculated data over the 1980's to eliminate temporal fluctuations and used the industry medians, rather than means, to prevent large firms exerting too much influence. It is assumed that the industry external dependence changes little since then. Appendix 3 is the table reporting the median level of external financial dependence for ISIC industries:

[Appendix 3]

From this table, it can be seen that industries differ greatly in their dependence for external finance: while the tobacco industry does not require any external finance (-0.45), the drug industry is highly dependent on external capital (1.49).

3.3.3 Financial development

The data of measures for financial intermediaries and markets origins from the World Bank's Global Financial Development Database (GFDD). According to the World Bank, the database is based on a "4x2 framework". "4" stands for measures of (1) depth, (2) access, (3) efficiency, and (4) stability of financial systems. "2" is from the perspective of (1) financial institutions (e.g., banks and insurance companies), and (2) financial markets (e.g., stock markets and bond markets). Having a history of more than half century and containing over 100 indicators for 203 economies, the GFDD reliably captures various aspects of financial intermediaries and financial markets. Data from 2006 to 2014 is collected. Some countries' data does not cover the whole period (not up-to-date). Thus, it is assumed that the level of financial development in these countries did not change significantly since the data was last updated.

Regarding the variables for financial intermediaries, *Private credit* is defined as the private credit by deposit money banks and other financial institutions to GDP (%); *Liquid Liabilities* is the ratio of liquid liabilities to GDP (%); *Net Interest Margin* is the

accounting value of bank's net interest revenue as a share of its average interest-bearing assets. Concerning the variables for financial markets, *Stock Market Capitalization* means the total value of all listed shares in a stock market as a percentage to GDP; *Stock Value Traded* is the total value of all traded shares in a stock market exchange as a percentage of GDP; *Stock Market Turnover* is obtained by the total value of shares traded during the period divided by the average market capitalization for the period.

The data of the measures for financial services is obtained from the World Bank's Doing Business database from the period of 2006 to 2015. Based on the description given by the World Bank, the Doing Business Report provides objective measures of business regulations and their enforcement across nearly 200 economies and selected cities at the subnational and regional level. *Getting Credit* evaluates the quality of credit information and legal rights; *Protecting Minority Investors* reflects the protection of shareholders and shareholders' rights.

The Appendix 4 lists the variables that will be tested in this paper:

[Appendix 4]

4. RESULTS DISCUSSION

4.1 Results of the Model (1)

Results of the basic regression are summarized in Table 4.1. Having F-statistics all significant at the 1% level and adjusted R^2 above 0.5, the estimation equation works for our data in general. Regarding the variables of interest, all coefficient signs of interactions between external financial dependence and financial development are significantly positive at the 1% level of confidence, except *Net Interest Margin* which is initially expected to have an opposite sign⁴² and indeed turns out to be significantly negative. Consequently, the results indicate that holding other conditions constant, countries with higher level of financial development tend to export more in industries that require more external finance.

We can first take a close look at *Private Credit* (Regression (1)) and *Stock Market Capitalization* (Regression (5)), two most commonly used measures of financial development. The coefficient of interactions between external financial dependence and these two variables are 0.0118 and 0.0025 respectively, showing that countries that have higher *Private Credit* and *Stock Market Capitalization* export more in industries that are more external financially dependent. To illustrate the point, a comparison between beverages industry (external financial dependence= 0.08) and textile industry (external financial dependence= 0.40) can be made⁴³. These two industries are 30th percentile and 70th percentile in terms of external financial dependence ranking, representing low external financial dependence and high external financial dependence respectively. When the ratio of private credit to GDP increases 0.5 (in absolute value), export share in beverages only increases by 0.11%, while export share in textile increases by 0.54%.

⁴² As we mentioned earlier, the higher the bank net interest margin, the lower the competition in the banking sector, suggesting lower level of financial development.

⁴³ Since our regression equation is $\log[\text{Exports}] = b_0 + b_1[\text{Country Dummies}] + b_2[\text{Industry Dummies}] + b_3[\text{Extfin} * \text{Finance}]$, we can know that $\text{Exports} = 10^{(b_0 + b_1[\text{Country Dummies}] + b_2[\text{Industry Dummies}] + b_3[\text{Extfin} * \text{Finance}])}$. Holding others constant, a change in the level of financial development will lead to a change in Export by: $(\text{Exports}' / \text{Exports}) - 1 = 10^{(b_3 * \text{Extfin} * (\text{Finance}' - \text{Finance}))} - 1$.

Table 4.1 Industry Export Structures and Financial Development: Model (1)**4.1.1 Tests with measures of financial institutions_ Dependent variable: log[Exports]**

Independent variables	(1)	(2)	(3)	(4)
Interaction [<i>Extfin</i> * <i>Private Credit</i>]	.0117929*** (8.50)			
Interaction [<i>Extfin</i> * <i>Liquid Liabilities</i>]		.0074365*** (6.70)		
Interaction [<i>Extfin</i> * <i>Net Interest Margin</i>]			-.2643995*** (-9.88)	
Interaction [<i>Extfin</i> * <i>Getting Credit</i>]				.0135693*** (3.89)
F-statistics of joint significance	26.23***	25.77***	26.41***	26.06***
Adjusted R ²	0.5222	0.5176	0.5246	0.5126
No. observations	2,979	2,979	2,949	2,979

4.1.2 Tests with measures of financial markets_ Dependent variable: log[Exports]

Independent variables	(5)	(6)	(7)	(8)
Interaction [<i>Extfin</i> * <i>Stock Market Capitalization</i>]	.0024581*** (3.88)			
Interaction [<i>Extfin</i> * <i>Stock Market Trade</i>]		.0057543*** (5.75)		
Interaction [<i>Extfin</i> * <i>Stock Market Turnover</i>]			.0076395*** (5.76)	
Interaction [<i>Extfin</i> * <i>Protecting Minorities</i>]				.0171066 *** (3.86)
F-statistics of joint significance	25.28***	25.58***	25.54***	25.28***
Adjusted R ²	0.5126	0.5157	0.5153	0.5126
No. observations	2,979	2,979	2,979	2,979

4.1.3 Tests with measures of overall financial system_ Dependent variable: log[Exports]

Independent variables	(9)	(10)
Interaction [<i>Extfin</i> * <i>Total Capital</i>]	.0030781*** (6.13)	
Interaction [<i>Extfin</i> * <i>Private Credit</i>]		.0115358*** (7.55)
Interaction [<i>Extfin</i> * <i>Stock Market Capitalization</i>]		.0002784 (0.40)
F-statistics of joint significance	25.65***	26.02***
Adjusted R ²	0.5164	0.5220
No. observations	2,979	2,979

*** significance at the 1%-level; ** significance at the 5%-level; * significance at the 10%-level; all regressions include country and industry dummies.

Similarly, when the ratio of stock market capitalization to GDP increases 0.5 (in absolute value), increases in export share in beverages and textile are 0.02% and 0.11% correspondingly. For industries whose internal cash flows are sufficient to cover their capital expenditure (external financial dependence less than 0), however, such increase in *Private Credit* or *Stock Market Capitalization* will cause their export shares to decrease, because their signs of interactions are negative. This does not necessarily mean that these industries will export less, but rather reflects a fact that benefits brought by financial development vary across industries and are greater for those industries with larger external financial needs.

To check their models' robustness, Beck (2003) and Hur et al. (2006) used other indicators of financial development and found that the interaction terms of external dependence with all additional proxies for financial development have significant signs as expected. We also run regressions with different measures for financial development to verify whether changing variables can still generate similar results. *Liquid Liabilities* and *Net Interest Margin* to measure the depth and efficiency in financial institutions are employed. As reported in Regression (2) and Regression (3), both regressions are jointly significant and the interaction terms have the anticipated signs which are statistically significant. Regarding impacts of changing variable on other coefficients, it appears that vast majority of coefficients maintain their signs and level of significance, with only a few exceptions⁴⁴. Similarly, *Stock Market Trade* and *Stock Market Turnover* are introduced to proxy for the depth and efficiency in financial markets respectively. From Regression (6) and Regression (7), it is apparent that both equations explain data as good as the one using *Stock Market Capitalization*. Coefficients of the interactions stay the

⁴⁴ When using Liquid Liabilities to replace Private Credit, 8 coefficient signs (DK, GB, LB, LU, MD, UR, ZA(Country Dummies) and Pottery (Industry Dummy)) change, but all remain insignificant. When using Net Interest Margin to replace Private Credit, 13 coefficient signs including DK, GB, GE, UG, UR (Country Dummies) and Pottery, Footwear, Synthetic Resins, Printing and Publishing, Metal Products, Ship, Glass, and Drug (Industry Dummies) change, but only 6 of them change statistical significantly.

same signs and even become more significant, while only a few of other variables⁴⁵ change their coefficient signs insignificantly. The tests also use two comprehensive indicators for financial development developed by the World Bank: *Getting Credit* (Regression (4)) as a measure for financial institutions and *Protecting Minorities* (Regression (8)) as a measure for financial markets. The coefficients of the interaction terms have expected signs and are both significant, with little change to overall fitness and other variables' coefficients⁴⁶. These results indicate that Beck's (2003) model is robust using alternative measures for financial development.

Having illustrated that both financial institutions and financial markets (mainly stock markets) are important sources of comparative advantage, Beck (2003) also ran a regression test including both *Private Credit* and *Stock Market Capitalization* and observed that only the interaction term with *Private Credit* exhibit a significant positive coefficient. Regression (9) and Regression (10) replicate Beck (2003)'s approach and report the same result: when combining sum of *Private Credit* and *Stock Market Capitalization* and generating *Total Capital* as a measure for overall performance in financial system, the coefficient of the interaction with *Total Capital* is significant positive; but when adding both *Private Credit* and *Stock Market Capitalization* independently in our sample regression, coefficient of the interaction term with *Stock Market Capitalization* loses its significance while *Private Credit* does not. This supports Beck (2003, p.305)'s conclusion which states that "stock market development is not an independent source of the observed finance-export pattern or or that the exogenous component of *Stock Market Capitalization* does not contain any additional information

⁴⁵ When using Stock Market Trade to replace Stock Market Capitalization, 2 coefficient signs (ZA (Country Dummy) and Metal Products (Industry Dummy)) change. When using Stock Market Turnover to replace Stock Market Capitalization, 7 coefficient signs (CN, MX, CY, KE, PA, UR (Country Dummies) and Metal Products (Industry Dummy)) change. All these changes are statistically insignificant.

⁴⁶ When using Getting Credit to replace Private Credit, 6 coefficient signs including DK, FI, HU, KE, MD, MX (Country Dummies) change. When using Protecting Minorities to replace Stock Market Capitalization, 13 coefficient signs including (BR, GB, ID, TH (Country Dummies) and Pottery, Leather, Synthetic Resins, Other Chemicals, Rubber Products, Metal Products, Textile, Professional Goods, Drugs (Industry Dummies) change. All these changes are statistically insignificant.

about the development of the financial sector that is not contained in *Private Credit*". From the Table 4.1, it is evident that the absolute value and t-statistics of the coefficients corresponding to interactions with measure for financial institutions (*Private Credit, Liquid Liabilities, Net Interest Margins*) are all greater than those of coefficients for interactions with measure for financial markets (*Stock Market Capitalization, Stock Market Trade, Stock Market Turnover*). This is consistent with what Hur et al. (2006, p.1735) observed in their results. Therefore, development in financial institutions seems to exert a larger and more significant size effect on industry export shares than development in financial markets. One possible explanation is that, as Rajan and Zingales (1998) pointed out, one major concern in using stock market capitalization as proxy for financial development is that, unlike private credit, stock market capitalization does not represent actual amount of external funding acquired by issuers but rather reflect an anticipation on future prosperity. Exporters may find increasing credits more effective in relieving their financial constraints than booming stock markets.

In general, our findings are similar as those in previous studies (e.g. Beck 2003; Svaleryd and Vlachos, 2005; Hur et al., 2006; Becker et al., 2013), showing that industries with high external financial demand can benefit more from financial development and as a result, have higher export shares in international trade. Such evidence is in favor of the theoretical model by Kletzer and Bardhan (1987)'s which states that countries with higher level of financial development tend to specialize and have comparative advantages in industries relying more on external finance. By replicating Beck (2003)'s approach and showing that the model stays robust to different measures for financial development adopted by previous scholars and the World Bank, we validate that Beck (2003)'s model is a reasonable test on finance-export relationship. The findings also respond to different impacts of different measure of financial development: while Svaleryd and Vlachos (2005) found that legal factors do not seem to impact competitiveness of externally dependent industries, we find that both protection

on creditors and protection on minority shareholders significantly influence industry export shares and relative competitiveness. Compared to Beck (2003) who studied 56 countries and Svaleryd and Vlachos (2005) who studied 19 OECD countries, we extend our sample by including 100 countries that have different geographic locations and income levels. Our results suggest that the relationship between financial development and industry export shares found by Beck (2003) and Svaleryd and Vlachos (2005) can also apply to a larger group of countries.

In addition, this study answers Svaleryd and Vlachos (2005)'s expectation that the trade pattern identified in their study to disappear overtime because MNCs are increasing their role in international trade and global financial markets are integrating. Using most recent data (2006-2015), no evidence supporting Svaleryd and Vlachos (2005)'s idea has been found. As we mentioned earlier, one important assumption of this study is that firms exporting depend external finance provided by the domestic financial system and global financial market is not perfectly integrated. The test results imply that in spite of ongoing global financial market integration and increasing international capital flows, financial system is still deeply embedded in domestic environment and can be a country's comparative advantage in international trade. One possible explanation is that our assumption on finance immobility still holds under the current circumstance. Another explanation is that financial development is not only about increase in financial resources (e.g. capital), but also related with strengthening of institutions and legal frameworks that ensure or encourage effective use of the resources. While capital may not have national boundaries, moving easily from one country to another, institutions and laws have, exerting significant influence on local firms' finance.

Nevertheless, the influence of MNCs on international trade should not be ignored. In Manova et al. (2015)'s paper, the authors found that Chinese firms that are affiliated with a foreign-owned multinational or a joint-venture have better export performance than

private domestic firms, and that such advantage is systematically greater in industries with higher external financial dependence. The rationale behind is that these firms have privileged access to external finance than their domestic counterparts. Thus, it is reasonable for us to expect that benefits of financial development differ not only across industries with different external financial dependence, but also among firms of different ownership structure within the same industry. For those firms without foreign ownership, the marginal impact of financial development on their exports should be greater than those firms with multinational linkages, and such difference should be larger in industries with higher external financial dependence, because firms without multinational linkages can only resort to domestic financial system for their financing. Further study can be proceeded to explore the relationship between domestic financial development and export performance of different firms (in terms of their multinational linkages) within a same industry.

4.2 Results of the Model (1) with Two Separate Samples

Inspired by different finance-trade patterns found by Berthou (2010) for industries with low and high external financial dependence, we divide our sample into two sub-samples based on level of dependence and redo our regression tests. In Table 4.2, left three columns are test results for 15 industries with lower external financial dependence, comparing with right three columns which present test results for the other 15 industries with higher external financial dependence.

A glance at the table reveals that our regression model fit for industries with high external financial dependence better, by having greater F-statistics and higher adjusted R^2 . More specifically, in tests for industries with low external financial dependence, only *Private Credit* among traditional measures for financial development have significant positive coefficient sign at the 5% level. This contradicts with tests for highly dependent industries, where only Stock Market Capitalization is “less significant” at the 5% level

and all other traditional measures for financial development have significant coefficient signs at the 1% level. Results show that financial development have significant positive impact on export shares for industries with high external financial requirement, but have no significant impact for industries with low external financial requirement. This further supports our previous finding that industries with high external financial demand can benefit more from financial development and have higher export shares in international trade, leading the country to enjoy comparative advantages in these industries in international trade.

Results are more interesting when tested with two new measures for financial development. Both *Getting Credit* and *Protecting Minorities* have significant (the 1% level and the 5% level accordingly) positive coefficient signs in sample of industries with low dependence, but do not have expected signs in sample of industries with high dependence. This is partly consistent with Svaleryd and Vlachos (2005)'s finding that legal factors and accounting standards in financial system have no significant impact on a country's competitive advantage in highly dependent industries. One possible explanation is that, *Getting Credit* and *Protecting Minorities*, as explained in the World Bank *Doing Business Report*, are the two measures that are correlated to the development of general business regulation environments in the country. While this general institutional development benefits all industries, its marginal effect could be different across industries that have different level of external financial dependence. Compared with the low dependence industries, the high dependence industries may enjoy more direct benefits from the development of financial intermediaries and financial markets.

Table 4.2 Separate Tests on Industries with Low Dependence and High Dependence**4.2.1 Tests with measures of financial institution_ Dependent variable: log[Exports]**

Independent variables	Low External Financial Dependence			High External Financial Dependence		
	(11)	(12)	(13)	(14)	(15)	(16)
Interaction [<i>Extfin</i> * <i>Private Credit</i>]	.0120849** (2.51)			.0108506*** (5.78)		
Interaction [<i>Extfin</i> * <i>Liquid Liabilities</i>]		.0028384 (0.74)			.0071061*** (4.73)	
Interaction [<i>Extfin</i> * <i>Getting Credit</i>]			.03322*** (2.74)			.0061553 (1.31)
F-statistics of joint significance	13.52	13.41	13.54	20.02	19.77	19.29
Adjusted R ²	0.4892	0.4871	0.4897	0.5932	0.5899	0.5838
No. observations	1,491	1,491	1,491	1,488	1,488	1,488

4.2.2 Tests with measures of financial market_ Dependent variable: log[Exports]

Independent variables	Low External Financial Dependence			High External Financial Dependence		
	(17)	(18)	(19)	(20)	(21)	(22)
Interaction [<i>Extfin</i> * <i>Stock Market Capitalization</i>]	.0017568 (0.81)			.0021033** (2.45)		
Interaction [<i>Extfin</i> * <i>Stock Market Trade</i>]		.0050283 (1.46)			.0039103*** (2.88)	
Interaction [<i>Extfin</i> * <i>Protecting Minorities</i>]			.033384 ** (2.18)			.0059856 (1.00)
F-statistics of joint significance	13.41	13.44	13.49	19.39	19.44	19.28
Adjusted R ²	0.4871	0.4877	0.4886	0.5851	0.5857	0.5835
No. observations	1,491	1,491	1,491	1,488	1,488	1,488

*** significance at the 1%-level; ** significance at the 5%-level; * significance at the 10%-level; all regressions include country and industry dummies.

As mentioned in the beginning of this paper, apart from providing capital, financial system also benefits economy through various mechanisms such as enhancing corporate governance and diversifying risks. It could be argued that unlike high dependence industries whose export performance can be directly improved by increasing financial resources, low dependence industries find improvement in financial service quality more attractive so tend to have better export performance when domestic conditions on getting credit and protecting minority shareholders increase.

To illustrate this point, the example including a beverage firm and a pharmaceutical is given. Due to the nature of business, the beverage firm has less financial constraints than the pharmaceutical firm. This may suggest that the two firms consider different factors when exporting. To compete with others, the pharmaceutical firm needs huge amounts of capital in developing new drugs. Sufficient external finance seems critical for the firm's continuous research and development and can become a source of comparative advantage over others, when human capital or technology level is similar. Thus, an increase in available external financial resources, such as private credit, has larger marginal impact on the pharmaceutical firm than the beverage firm. On the other hand, for the beverage firm to become competitive, since the industry has a very low level of external financial dependence and product development is more conventional, simply having sufficient external finance does not give the beverage firm a competitive edge as big as the pharmaceutical firm. Other factors, such as strategic choice, business model and branding appear to be more important. While increasing private credit does not necessarily lead to improvement in management decision making in these fields, increasing protection on minority shareholders can improve corporate governance which ensures managers to make better business decisions on behalf of shareholders. For the pharmaceutical firm, however, business models make little sense without developing effective drugs. Consequently, an increase in legal framework and institutional quality of financial system, such as protection on minority shareholders, has larger marginal impact

on the beverage firm than the pharmaceutical firm, in the channel of enhancing corporate governance.

Overall, the results indicate that an improvement in different attributes of financial system exert different impacts on industry export shares. More specifically, it is found that improving financial resources such as private credit may lead to higher export shares in industries with higher external financial dependence, while improving financial legal framework and institutional quality such as protection on minority shareholders may result in higher export shares in industries with relatively low external financial dependence. Such finance-export pattern has not been reported in previous studies (e.g. Beck, 2003; Svalyerd and Vlachos, 2005; Hur et al., 2006; Susanto et al., 2011). As a result, when we refer to their findings which show that countries with better financial development have higher export shares in industries that use more external finance, they mainly mean financial development in terms of financial resources which exert influence on export shares through the channel of providing capital. Our results suggest that different industries may need different characteristics or functions of financial system, so industries that are labeled as “low financial dependence” based on Rajan and Zingales’ (1998) calculation on difference between internal cash flows and capital expenditure may in fact have high demand for financial services other than providing capital. Since this thesis mainly focuses on financial system’s function of providing capital, further studies can be done to examine the finance-export relationship in a more detailed context.

4.3 Results of the Model (2)

In Berthou (2010)’s paper, the author observed an inverted U-shaped relationship exists between the marginal effect of financial development on exports and the initial level of financial sector for industries rely heavily on external finance. To validate his finding, additional tests which add squares of the interaction terms of interested to the basic estimation equation are conducted. Results of additional tests are summarized in

the Table 4.3 below. After adding the squares, overall fitness of our regressions maintains significant. All coefficients of the squares have negative⁴⁷ signs, with only *Getting Credit* and *Protecting Minorities* not significant.

When looking at traditional measures for financial development, significant negative sign of all squared terms suggests a hump-shaped pattern identified by Berthou (2010). This means that the impact of financial development on industry exports is greater in countries with intermediate level of financial sector, and becomes smaller in countries with low or high level of financial sector. As Berthou (2010) stated, such pattern is partially contradictory to the traditional expectation that the marginal effect of finance on industry exports diminishes for higher initial level of financial development. According to Berthou (2010, p.8), most firms have a low productivity level and these firms need sufficient external finance to start exporting. In other words, the closer to productivity threshold (to export), the fewer the firms. When a country has a poor financial system, financial development only allows a few firms closest to the threshold to export, leaving the vast majority of firms behind. This will not lead to a large increase in aggregate exports. When a country has higher level of financial system, financial development enables more firms to export, causing larger impact on exports. Nevertheless, Berthou (2010) did not explain why the finance-export effect becomes smaller when a country has high initial level of financial development⁴⁸. Regarding firms in countries with advanced financial system, it could be suggested that the initial financial environment has already fulfilled their financing needs to an extent such that these firms no longer consider external finance as the biggest challenge for export. Therefore, an increase in available finance in countries with advanced financial system may not affect aggregate exports in the way as Berthou (2010) expected. Similar idea can also be found in Susanto

⁴⁷ Due to the nature of Net Interest Margin, we expect its squared terms to have positive sign, which is indeed the case in our test results.

⁴⁸ In fact, in Berthou's (2010) theoretical model, he proposed that the effect of financial development on exports is increasing with the initial development of financial sector. His findings only partially support the proposition: the effect is low in countries with low or high initial level of financial sector.

Table 4.3 Additional Regressions for Industries with High Dependence

4.3.1 Tests with measures of financial institutions_ Dependent variable: log[Exports]				
Independent variables	(23)	(24)	(25)	(26)
Interaction [<i>Extfin</i> * <i>Private Credit</i>]	.0200446*** (3.82)			
Square [Interaction (<i>Extfin</i> * <i>Private Credit</i>)]	-.0000309* (-1.88)			
Interaction [<i>Extfin</i> * <i>Liquid Liabilities</i>]		.0238202*** (6.54)		
Square [Interaction (<i>Extfin</i> * <i>Liquid Liabilities</i>)]		-.000036*** (-5.03)		
Interaction [<i>Extfin</i> * <i>Net Interest Margin</i>]			-.504556*** (-4.99)	
Square [Interaction (<i>Extfin</i> * <i>Net Interest Margin</i>)]			.0183163*** (3.22)	
Interaction [<i>Extfin</i> * <i>Getting Credit</i>]				-.0340339** (-2.07)
Square [Interaction (<i>Extfin</i> * <i>Getting Credit</i>)]				.0002165** (2.56)
F-statistics of joint significance	19.91***	20.16***	19.84***	19.26***
Adjusted R ²	0.5939	0.5971	0.5933	0.5854
No. observations	1,488	1,488	1,473	1,488

*** significance at the 1%-level; ** significance at the 5%-level; * significance at the 10%-level; all regressions include country and industry dummies.

Table 4.3 Additional Regressions for Industries with High Dependence (con't)

4.3.2 Tests with measures of financial markets _ Dependent variable: log[Exports]				
Independent variables	(27)	(28)	(29)	(30)
Interaction [<i>Extfin</i> * <i>Stock Market Capitalization</i>]	.0080191*** (3.92)			
Square [Interaction (<i>Extfin</i> * <i>Stock Market Capitalization</i>)]	-4.37e-06*** (-3.18)			
Interaction [<i>Extfin</i> * <i>Stock Market Trade</i>]		.0108463*** (3.97)		
Square [Interaction (<i>Extfin</i> * <i>Stock Market Trade</i>)]		-.00001*** (-2.92)		
Interaction [<i>Extfin</i> * <i>Stock Market Turnover</i>]			.017165*** (3.67)	
Square [Interaction (<i>Extfin</i> * <i>Stock Market Turnover</i>)]			-.000071*** (-3.93)	
Interaction [<i>Extfin</i> * <i>Protecting Minorities</i>]				-.0172804 (-0.82)
Square [Interaction (<i>Extfin</i> * <i>Protecting Minorities</i>)]				.0001253 (1.14)
F-statistics of joint significance	19.44***	19.46***	19.42***	19.13***
Adjusted R ²	0.5878	0.5880	0.5876	0.5836
No. observations	1,488	1,488	1,488	1,488

*** significance at the 1%-level; ** significance at the 5%-level; * significance at the 10%-level; all regressions include country and industry dummies.

et al. (2011) who highlighted that developed countries experience smaller impacts of financial development on exports than developing countries. Susanto et al. (2011, p.16) argued that the level of financial system in advanced countries may have peaked, leaving little room for financial development to exert influence on exports.

Although there is an inverted U-shaped relationship in using traditional measures for financial development, such pattern does not exist when tested with the two measures for legal factors. Neither coefficients of squared terms of *Getting Credit* (Regression (26)) and *Protecting Minorities* (Regression (30)) are significant at 99% level of confidence. One possible explanation is that, *Getting Credit* and *Protecting Minorities* are more comprehensive measures for financial development, capturing not only available financial resources, but effectiveness of financial institutions and legal frameworks which can also affect firms' export decisions. Unlike traditional financial indicators such as *Private Credit* or *Stock Market Capitalization* which can soar up in a short period of time, causing potential negative impacts on the economy (leverage risk or bubble), *Getting Credit* and *Protecting Minorities* are developed from a service perspective and cannot increase without actual improvement in overall financial service quality. Consequently, it is reasonable for us to expect that the positive impact of financial development (measured by *Getting Credit* and *Protecting Minorities*) on industry export shares to maintain regardless level of initial financial system.

5. CONCLUSION

This thesis examines the relationship between the financial development and industry export structures. Specifically, it targets to answer whether countries with more advanced financial development have higher export concentration in industries with high external financial dependence. We borrow Beck (2003)'s estimation equation where industry export shares are regressed on the interaction between industry's external financial dependence and country's financial development. The basic results show that the coefficient signs of the interactions are significant positive. Such results are robust to various measures of financial system, indicating that other conditions holding equal, the higher the level of a country's financial system is, the more concentrate the country's exports have in industries with high external financial requirement. This is consistent with what previous scholars (Beck 2003; Svaleryd and Vlachos 2005; Hur et al. 2006; Becker et al. 2013) have found regarding the finance-export relationship.

In the regression tests, we choose measures for financial development based on different views on a financial system, including an institution-based view, a market-based view, and a service-based view. Consistent with what Beck (2003) and Hur et al. (2006) observed, our independent regression results show that the development in financial institutions, measured by *Private Credit*, *Liquid Liabilities*, *Net Interest Margin*, has a larger size effect on industry export shares than the development in financial markets, measured by *Stock Market Capitalization*, *Stock Market Trade*, *Stock Market Turnover*. When the regression test includes both *Private Credit* and *Stock Market Capitalization*, *Stock Market Capitalization* loses its significance, suggesting that development in financial markets may not serve as an independent source of comparative advantage. However, unlike Svaleryd and Vlachos (2005) who found that legal factors in a financial system do not significantly affect the competitiveness of externally dependent industries, we find that both legal framework on financial institutions, measured by *Getting Credit*, and legal framework on financial markets, measured by *Protecting Minorities*, are significant in the finance-export relationship in general.

In the additional regression tests, we first divide the sample into two groups based on level of

external financial dependence. In industries with relatively high level of external dependence, the finance-export relationship is significant when tested with measures for financial resources such as private credit. In industries with relatively low level of external dependence, the finance-export relationship is significant when tested with the proxy for financial legal framework. One possible explanation is that, the two measures (*Getting Credit* and *Protecting Minorities*) chosen to capture the financial legal framework also reflect the development of institutions in general in the country. Although such development in institutional quality benefits all industries, the high dependence industries may enjoy lower marginal benefits than the low dependence industries. Unlike highly dependent industries which enjoy a larger marginal benefit from increasing financial resources through the channel of removing credit constraints, lowly dependent industries enjoy larger marginal benefit from increasing financial service quality through the channel of promoting corporate governance.

In another additional regression test which explores the possible inverted U-shaped relationship identified by Berthou (2010) for highly dependent industries, we add squares of the interaction terms to the initial model. When tested with the traditional indicators for financial development, the coefficient of the squared term is significantly negative, which indicates the same pattern as identified by Berthou (2010): the impact of financial development in highly-dependent industry exports is greater in countries with intermediate level of financial sector and becomes smaller in countries with low or high level of financial sector. This means that the export-finance linear slope is getting less positive (more negative) as the level of the financial development increases. Combination of Berthou's (2010) argument on firms' productivity and Susanto et al. (2011)'s statement on financially-developed countries gives a possible explanation to this finance-export relationship. However, when testing with the measures for financial legal framework, we do not find such pattern.

This thesis has several theoretical contributions. First, using a larger sample and the most recent data, the thesis provides new empirical evidence for Kletzer and Bardhan (1987)'s theoretical model and demonstrates that the finance-export relationship observed by previous studies can extend to a larger group of countries under the current circumstance. This underlines that in spite of global financial

market integration and increasing international capital flows, a country's financial system is still deeply embedded in the country's domestic environment, and can serve as a source of this country's comparative advantages regarding the industries with high external financial requirement over others in international trade. In addition, we respond to some specific questions raised from previous studies. Consistent with Beck (2003)'s and Hur et al. (2006)'s findings, the results suggest that functional financial intermediaries may be more effective in improving export performance of high dependence industries than booming financial markets. The results also support Berthou (2010)'s finding that an inverted U-shaped finance-export pattern exists for high dependence industries. These findings enrich the existing finance-export relationship. Furthermore, this thesis adopts the three major views (financial intermediaries, financial markets, and financial services) to construct a comprehensive measure for the financial development. Our results suggest that improvement in different attributes of financial system exert different impacts on export based on industrial external dependence. Such finance-export pattern using different measures for financial development has not been mentioned in previous studies. Thus, we add fruit to future research question regarding marginal impacts of financial development on different industries through different channels.

These results also have important implications for policy makers who want to reform domestic industrial and trade structures and enhance their competitiveness in industries that are commonly believed to be more "advanced". Since these "advanced" industries usually tend to be technological intensive and have high external financial dependence, the finance-export relationship found in this paper highlights the importance of financial reform to provide sufficient financial resources. Developing effective financial institutions seems to benefit the industries more than having flourishing financial markets. For those countries already with high level of financial development to maintain their competitiveness in highly dependent industries, they may pay their attention more on improving financial legal framework, such as protection on minority shareholders, than adding financial resources, such as liquid liabilities.

Nevertheless, this thesis is exposed to several limitations: First, while industries given their external

financial dependence are classified under the ISIC Revision 2.0, industry export shares in the sample are based on the HS Code. Although we have made correspondence between these two classification systems, there still exists difference between “Industry A” in the ISIC and “Industry A” in the HS, creating some quality concerns on our data; Second, unlike previous papers (e.g., Beck, 2003) which carried out plenty of robustness tests, including solving simultaneity bias, dealing with reverse causality, and using alternative measures of external dependence and financial development, this thesis only adopt different measures of financial development as a robustness check of our regression model. This will cast doubts that our regression’s robustness and test results may not be as convincing as the ones using sufficient robustness tests. Third, the industry external financial dependence ratio constructed by Rajan and Zingales (1998) reflects an industry’s financing needs two decades ago and may not represent the current demand for external capital in our sample period from 2006 to 2015. In addition, this ratio mainly captures the impact of financial development through the channel of reducing credit constraints, the two measures of legal factors in the financial system may intrinsically create less significant test results compared to the results tested with measures of financial resources. Financial development affects industry activities through not only the channel of reducing credit constraints but also other channels such as improving corporate governance. Using other indicators for industry’s requirement for financial service, such as upfront investment costs developed by Becker et al. (2013), or asset tangibility used by Hur et al. (2006), together with different measures for financial development, may generate more interesting results.

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Appendixes

Appendix 1: List of Countries

Argentina	Israel	Peru
Australia	Italy	Philippines
Austria	Jamaica	Poland
Bangladesh	Japan	Portugal
Belgium	Jordan	Qatar
Bolivia	Kazakhstan	Romania
Brazil	Kenya	Russia
Bulgaria	Korea	Saudi Arabia
Canada	Kuwait	Serbia
Chile	Kyrgyz	Singapore
China	Latvia	Slovak
Colombia	Lebanon	Slovenia
Costa Rica	Lithuania	South Africa
Croatia	Luxembourg	Spain
Cyprus	Macedonia	Sri Lanka
Czech	Malawi	St. Kitts and Nevis
Côte d'Ivoire	Malaysia	Swaziland
Denmark	Malta	Sweden
Egypt	Mauritius	Switzerland
El Salvador	Mexico	Tanzania
Fiji	Mongolia	Thailand
Finland	Montenegro	Trinidad and Tobago
France	Morocco	Tunisia
Georgia	Namibia	Turkey
Germany	Nepal	Uganda
Ghana	Netherlands	Ukraine
Greece	New Zealand	United Arab Emirates
Guyana	Nigeria	United Kingdom
Hong Kong	Norway	Uruguay
Hungary	Oman	Venezuela
India	Pakistan	Vietnam
Indonesia	Panama	Zambia
Iran	Papua New Guinea	
Ireland	Paraguay	

Appendix 2: Correspondence Table between ISIC and HS

Industry	ISIC	ISIC Short Definition	HS	HS Short Definition
Tobacco	314	Tobacco manufactures	24	- Unmanufactured tobacco, tobacco refuse - Cigars, cheroots, cigarillos and cigarettes, of tobacco or of tobacco substitutes - Other manufactured tobacco and manufactured tobacco substitutes 'homogenized' or 'reconstituted' tobacco, tobacco extracts and essences
Pottery	361	Manufacture of pottery, china and earthenware	68, 69	- Articles of stone, plaster, cement, asbestos, mica or similar materials - Ceramic products
Leather	323	Manufacture of leather and products of leather, leather substitutes and fur, except footwear and wearing apparel	41, 42	- Raw hides and skins (other than furskins) and leather articles of leather - Saddlery and harness, travel goods, handbags and similar containers
Footwear	324	Manufacture of footwear, except vulcanized or moulded rubber or plastic footwear	64	Footwear, gaiters and the like, parts of such articles
Nonferrous metal	372	Non-ferrous metal basic industries	74, 75, 76, 78, 79, 80, 81	- Copper and articles thereof - Nickel and articles thereof - Aluminum and articles thereof - Lead and articles thereof - Zinc and articles thereof - Tin and articles thereof - Other base metals cermet articles thereof
Apparel	322	Manufacture of wearing apparel, except footwear	61, 62, 63	- Articles of apparel and clothing accessories, knitted or crocheted - Articles of apparel and clothing accessories, not knitted or crocheted - Other made-up textile articles, sets, worn clothing and worn textile articles, rags
Petroleum refineries	353	Petroleum refineries	27	Mineral fuels, mineral oils and products of their distillation

Source: United Nations Statistics Division (UNSTATS), Classification Registry

Appendix 2: Correspondence Table between ISIC and HS (Con't)

Industry	ISIC	ISIC Short Definition	HS	HS Short Definition
Nonmetal products	369	- Manufacture of structural clay products - Manufacture of cement, lime and plaster - Manufacture of non-metallic mineral products not elsewhere classified	25, 26	- Salt sulphur earths and stone plastering materials, lime and cement - Ores, slag and ash
Beverages	313	- Distilling, rectifying and blending spirits - Wine industries - Malt liquors and malt - Soft drinks and carbonated waters industries	22	Beverages, spirits and vinegar
Iron and steel	371	Iron and steel basic industries	72, 73	- Iron and steel - Articles of iron or steel
Food products	311	- Slaughtering, preparing and preserving meat - Manufacture of dairy products - Canning and preserving of fruits and vegetables - Canning, preserving and processing of fish, crustaceans and similar foods - Manufacture of vegetable and animal oils and fats - Grain mill products - Manufacture of bakery products - Sugar factories and refineries - Manufacture of cocoa, chocolate and sugar confectionery - Manufacture of food products not elsewhere classified - Manufacture of prepared animal feeds	02~ 21	- Animal products - Vegetable products - Animal or vegetable fats and oils and their cleavage products - Prepared edible fats - Animal or vegetable waxes prepared foodstuffs
Synthetic resins	3513	Manufacture of synthetic resins, plastic materials and man-made fibres except glass	33	- Essential oils and resinoids - Perfumery, cosmetic or toilet preparations
Paper and products	341	- Manufacture of pulp, paper and paperboard - Manufacture of containers and boxes of paper and paperboard - Manufacture of pulp, paper and paperboard articles not elsewhere classified	47, 48	- Pulp of wood or of other fibrous cellulosic material, recovered (waste and scrap) paper - Paper and paperboard, articles of paper pulp, of paper or of paperboard

Source: UNSTATS, Classification Registry

Appendix 2: Correspondence Table between ISIC and HS (Con't)

Industry	ISIC	ISIC Short Definition	HS	HS Short Definition
Printing and publishing	342	Printing, publishing and allied industries	49	Printed books, newspapers, pictures and other products of the printing industry manuscripts
Other chemicals	352	Manufacture of other chemical products	38	Miscellaneous chemical products
Rubber products	355	- Tyre and tube industries - Manufacture of rubber products not elsewhere classified	40	Rubber and articles thereof
Furniture	332	Manufacture of furniture and fixtures, except primarily of metal	94	Furniture bedding, mattresses, mattress supports, cushions and similar stuffed furnishings ...
Metal products	381	- Manufacture of cutlery, hand tools and general hardware - Manufacture of furniture and fixtures primarily of metal - Manufacture of structural metal products - Manufacture of fabricated metal products except machinery and equipment not elsewhere classified	82, 83	- Tools, implements, cutlery, spoons and forks, of base metal, parts thereof of base metal - Miscellaneous articles of base metal
Wood products	331	Manufacture of wood and wood and cork products, except furniture	44	Wood and articles of wood charcoal
Transportation equipment	384	- Ship building and repairing - Manufacture of railroad equipment - Manufacture of motor vehicles - Manufacture of motorcycles and bicycles - Manufacture of aircraft - Manufacture of transport equipment not elsewhere classified	86, 87, 88, 89	- Railway or tramway locomotives, rolling stock and parts thereof, railway or tramway track fixtures - Vehicles other than railway or tramway rolling stock, and parts and accessories thereof - Aircraft, spacecraft, and parts thereof - Ships, boats and floating structures
Motor vehicle	3843	Manufacture of motor vehicles	87	Vehicles other than railway or tramway rolling stock, and parts and accessories thereof

Source: UNSTATS, Classification Registry

Appendix 2: Correspondence Table between ISIC and HS (Con't)

Industry	ISIC	ISIC Short Definition	HS	HS Short Definition
Textile	321	<ul style="list-style-type: none"> - Spinning, weaving and finishing textiles - Manufacture of made-up textile goods except wearing apparel - Knitting mills - Manufacture of carpets and rugs - Cordage, rope and twine industries - Manufacture of textiles not elsewhere classified 	53~60	<ul style="list-style-type: none"> - Other vegetable textile fibres paper yarn and woven fabrics of paper yarn - Man-made filaments strip and the like of man-made textile materials - Man-made staple fibres - Wadding, felt and nonwovens special yarns twine, cordage, ropes and cables and articles thereof - Carpets and other textile floor coverings - Special woven fabrics tufted textile fabrics lace tapestries trimmings embroidery - Impregnated, coated, covered or laminated textile fabrics textile articles of a kind suitable ... - Knitted or crocheted fabrics
Machinery except electrical	382	<ul style="list-style-type: none"> - Manufacture of engines and turbines - Manufacture of agricultural machinery and equipment - Manufacture of metal and wood working machinery - Manufacture of special industrial machinery and equipment except metal and wood working machinery - Manufacture of office, computing and accounting machinery - Machinery and equipment except electrical not elsewhere classified 	84	Machinery, mechanical appliances, nuclear reactors, boilers parts thereof
Ship	3841	Ship building and repairing	89	Ships, boats and floating structures

Source: UNSTATS, Classification Registry

Appendix 2: Correspondence Table between ISIC and HS (Con't)

Industry	ISIC	ISIC Short Definition	HS	HS Short Definition
Other industries	390	<ul style="list-style-type: none"> - Manufacture of jewellery and related articles - Manufacture of musical instruments - Manufacture of sporting and athletic goods - Manufacturing industries not elsewhere classified 	71, 92, 95, 96, 99	<ul style="list-style-type: none"> - Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad ... - Musical instruments parts and accessories of such articles - Toys, games and sports requisites parts and accessories thereof - Miscellaneous manufactured articles Commodities not elsewhere specified
Glass	362	Manufacture of glass and glass products	70	Glass and glassware
Electric machinery	383	<ul style="list-style-type: none"> - Manufacture of electrical industrial machinery and apparatus - Manufacture of radio, television and communication equipment and apparatus - Manufacture of electrical appliances and housewares - Manufacture of electrical apparatus and supplies not elsewhere classified 	85	Electrical machinery and equipment and parts thereof sound recorders and reproducers, television ...
Professional goods	385	<ul style="list-style-type: none"> - Manufacture of professional and scientific, and measuring and controlling equipment not elsewhere classified - Manufacture of photographic and optical goods - Manufacture of watches and clocks 	90, 91	<ul style="list-style-type: none"> - Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical ... - Clocks and watches and parts thereof
Plastic products	356	Manufacture of plastic products not elsewhere classified	39	Plastics and articles thereof
Drugs	3522	Manufacture of drugs and medicines	30	Pharmaceutical products

Source: UNSTATS, Classification Registry

Appendix 3: Industry External Financial Dependence

Industry	ISIC	External Financial Dependence
Tobacco	314	-0.45
Pottery	361	-0.15
Leather	323	-0.14
Footwear	324	-0.08
Nonferrous metal	372	0.01
Apparel	322	0.03
Petroleum refineries	353	0.04
Nonmetal products	369	0.06
Beverages	313	0.08
Iron and steel	371	0.09
Food products	311	0.14
Synthetic resins	3513	0.16
Paper and products	341	0.18
Printing and publishing	342	0.2
Other chemicals	352	0.22
Rubber products	355	0.23
Furniture	332	0.24
Metal products	381	0.24
Wood products	331	0.28
Transportation equipment	384	0.31
Motor vehicle	3843	0.39
Textile	321	0.4
Machinery except electrical	382	0.45
Ship	3841	0.46
Other industries	390	0.47
Glass	362	0.53
Electric machinery	383	0.77
Professional goods	385	0.96
Plastic products	356	1.14
Drugs	3522	1.49

Source: Rajan and Zingales (1998)

Appendix 4: Measures for Financial Development

Variable Names	Descriptions	Reference Code	Source
Private Credit	Private credit by deposit money banks and other financial institutions to GDP (%)	GFDD.DI.12	Global Financial Development Database, the World Bank
Liquid Liabilities	Ratio of liquid liabilities to GDP (%)	GFDD.DI.05	Global Financial Development Database, the World Bank
Net Interest Margin	Accounting value of bank's net interest revenue as a share of its average interest-bearing assets.	GFDD.EI.01	Global Financial Development Database, the World Bank
Stock Market Capitalization	Total value of all listed shares in a stock market as a percentage of GDP	GFDD.DM.01	Global Financial Development Database, the World Bank
Stock Value Traded	Total value of all traded shares in a stock market exchange as a percentage of GDP	GFDD.DM.02	Global Financial Development Database, the World Bank
Stock Market Turnover	Total value of shares traded during the period divided by the average market capitalization for the period	GFDD.EM.01	Global Financial Development Database, the World Bank
Getting Credit	Credit information and legal rights	Getting Credit- DTF (Distance-to-Frontier)	Doing Business Database, the World Bank
Protecting Minority Investors	Protection of shareholders and shareholders' rights	Protecting Minority Investors- DTF (Distance-to-Frontier)	Doing Business Database, the World Bank