

Essays in Trade Financing and Trade Relationships

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To my Family

Abstract

In this dissertation, I examine the factors affecting trade financing and trade relationships mainly from the perspective of information asymmetry. In particular, I analyze how levels of information asymmetry affect trade financing contracts and how they can be mitigated. Signaling and screening reveal information about the types of the agents, thereby, affecting the terms of trade financing contracts. I examine the outcome of signaling and screening on trade financing. Additionally, I explain factors that define supplier-customer trade relationships.

First, I show that hold-up, information asymmetry, and trade credit affect the duration of inter-firm relationships. Particularly, if suppliers are held up by their customers the duration of relationships will be longer but at extremely high level of hold-up the likelihood of terminating the relationships will increase. Moreover, reduced information asymmetries extend the duration of relationships. If customers receive trade credit from suppliers it decreases the likelihood of terminating the relationship.

Second, I find that financially constrained firms with greater cash holdings are likely to receive significantly more trade credit. Consistent with precautionary motives, cash holdings serve as liquid collateral to offset potential default, thus providing a channel for constrained firms to obtain greater financial flexibility (i.e., signaling channel).

Third, I show that banks located close to major US trade hubs issue more commercial letters of credits (LCs) compared to their remotely located peers. After controlling for the demand, I find that this effect is due to soft information. I show that the effect of distance is greater for national, large and non-traditional banks. The results also reveal that during financial crisis, remote banks with the lowest cost of debt involve in uninformed supply of LCs.

Finally, I examine the information asymmetry in international trade by analyzing ASEAN Single Window (SW) countries. Although SW aims at reducing information asymmetry among member countries, it does not immediately increase trade flows. I argue that full potential of SW environment can be realized through integration of transport and commercial requirements thereby improving G2G, B2G and B2B information flows. Nevertheless, such integration would require the ability to capture the complex relationships between various transport actors from legal and technical standpoints.

Keywords: Trade relationships; Trade financing; Information asymmetry

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1 Introduction

The choice of financing terms in trade is affected by different factors. In a broader sense, financing of trade can be in the forms of prepayment and post payment, or be bank-intermediated. Prepayment and post payment in respect to the delivery of goods and/or services are referred to as inter-firm trade credit. The 2003 Survey of Small Business Finances shows that 69% of small firms in the U.S. receive trade credit and 31% use cash transactions. Anecdotal evidence and a study by Demirguc-Kunt and Maksimovic (2001) also show that all types of firms use trade credit predominantly. A report by the Bank for International Settlements shows similar patterns of the use of trade credit in international trade.¹ Approximately 63% of the firms involved in international trade receive or extend trade credit to their international partners. Bank intermediated financing, as a rule, is used in cross-border trade and constitutes 37% of international trade contracts.

Trade credit provides financial flexibility when bank financing is costly. Klapper, Laeven, and Rajan (2012) show that suppliers often offer short-term financing to their customers. Additionally, trade credit increases suppliers' monitoring capacity and repayment enforcement (Petersen and Rajan, 1997). In cross-border trade, the use of trade credit can vary based on the credit risk of a country (Schmidt-Eisenlohr, 2013). While the buyers from high-risk countries usually extend trade credit by paying in advance, the buyers from low-risk countries are usually the ones that receive it. Bank-intermediated financing of trade, particularly, letters of credit (LCs), are mainly used for the destinations where financial risk is relatively moderate (Niepmann and Schmidt-Eisenlohr, 2017a; Schmidt-Eisenlohr, 2013). LCs constitute one-third of bank intermediated financing of international trade. Other forms of bank intermediation are export credit and trade insurances.

In this dissertation, I examine factors affecting trade financing and trade relationships mainly from the perspective of information asymmetry. In particular, I analyze how levels of information asymmetry affect trade financing contracts and how they can be mitigated. Signaling and screening reveal information about the types of the agents, thereby, affecting the terms of trade financing contracts. I examine the outcome of signaling and screening on trade financing. Additionally, I explain factors that define supplier-customer trade relationships.

The central theoretical approach of this dissertation is based on the information asymmetry theory. The terms of trade financing contracts are affected by the degree of in-

¹See, Trade finance: developments and issues, 2014, Committee on the Global Financial System, CGFS Papers No. 50.

formation about trading parties (Klapper et al., 2012). Moreover, differences in law enforcements across countries lead to heterogeneities in legal environments (la Porta, Lopez-de-Silanes, Shleifer, and Vishny, 1998). In international trade, these discrepancies induce differences in trade financing contracts. The 2010 survey by the Finance, Credit & International Business Association shows that exporters ask for advance cash payment when trading with high-risk countries. By contrast, importers from low-risk countries pay for goods after delivery. The survey findings imply that trade credit is the most frequently used contract when information asymmetry is at the highest and lowest levels. Moderate levels of information asymmetry involve bank-intermediated trade financing.

In domestic trade, information asymmetry affects the terms of contracts differently. Since bank intermediation is not as frequently involved as in international trade, information asymmetry mostly defines the terms of trade credit contracts in domestic trade. Ng, Smith, and Smith (1999) show that suppliers extending trade credit to their buyers gain access to the information and consequently evaluate their type more accurately. Giannetti, Burkart, and Ellingsen (2011) find that continuous interaction with suppliers lead to access to superior information by the customers. Firms can signal their types and thus affect the terms of contracts. For example, in a trade financing context, by holding a higher volume of liquid collateral (e.g., cash), firms can reduce uncertainties about potential insolvency. Hence, liquid collateral can signal the type of the borrower firm and thus, allow access to trade credit. This would provide financial flexibility to the borrowing firm, especially when bank credit is costly. Moreover, visibility of the process and opportunity of monitoring affect the terms of trade financing contracts. Visibility and monitoring are especially, important in the context of the types of information. All market participants can acquire hard information because it is easily quantifiable and accessible. By contrast, soft information requires subjective judgment and is difficult to obtain remotely (Agarwal and Hauswald, 2010). Therefore, the importance of soft information for visibility and monitoring is essential in trade financing contracts.

In both, international and domestic trades, adverse selection² can lead to wrong decision-making in the choice of a contract party. For example, in international trade, a buyer can mimic a good quality buyer while being of bad quality and receive an open account contract. Consequently, this buyer can divert from the payment for goods or services and cause significant loss for the seller. Adverse selection problem is also a valid problem in domestic trade, which involves inter-firm trade credit or bank credit. Signaling and screening can help reveal the true types of the agents and therefore, reduce losses for less informed agents.

²See for example, Akerlof (1970) for the discussion of adverse selection.

Above discussions show the important role of information asymmetry in inter-firm trade relationships and trade financing. This dissertation extends existing literature by analyzing the effects of information asymmetry on trade relationships and inter-firm trade financing. In particular, this dissertation examines how information asymmetry affects inter-firm trade relationships and how the effects of adverse selection can be mitigated by signaling and screening.

This dissertation consists of four studies, which examine the role of information asymmetry in trade financing and trade relationships from different perspectives. The first and the third studies are my own works, the second and the fourth studies are joint works with other professors. In the second study, I had an opportunity of working with Associate Professor Fariz Huseynov from North Dakota State University. This study emerged as a combination of ideas about how trade financing could be affected by signaling channels and whether it could impact firms' financial flexibility. Both authors have contributed significantly to the completion of this study. In particular, Fariz Huseynov's experience in corporate finance research and my contribution in the analysis of prior literature, data and inference of empirical findings were brought together to accomplish this study. The last study was the product of discussions with the Supply Chain Finance Group at the University of Gothenburg, which I am affiliated with. This study is a joint work with two assistant professors from the Law Department who are also members of the Supply Chain Finance Group. In this study, I have contributed with the empirical analysis of the proposed hypothesis, which was backed by legal perspectives. Studying an economic phenomenon by considering legal aspects enables analyzing a research question from holistic angle. Particularly, how legal policy changes affect certain economic conditions is of interest in the last study.

The dissertation proceeds as follows. In the next section, I discuss the theoretical framework. In Section 3, I discuss the background of the problem and address research questions. In Section 4, I explain the aim of the study. In Sections 5, I provide the literature review and hypotheses. Section 6 provides data and methodology. In Section 7, I briefly review the studies constituting the dissertation. Section 8 presents the conclusions and discusses the implications, contributions, and limitations of the dissertation.

2 Theoretical framework

As Akerlof (1970) shows, uncertainty about the quality of agents affects markets significantly. Nevertheless, agents (insiders) can reveal their types by sending informative

signals to outsiders (Spence, 1973) and outsiders can observe agents' types by monitoring their risk taking behavior (Stiglitz and Weiss, 1981). "Outsiders" refer to those that have inferior (i.e., limited) information about the insider agents. These information asymmetries influence the behavior of agents and market outcomes. This dissertation mainly examines trade financing behaviors and trade relationships in light of information asymmetries.

In credit contracts, whether it is a bank or trade credit, the borrowers' contract choice sends meaningful signals to the lenders that can only observe the borrowers' types from publicly available information. Bringing collateral into the equation mitigates information asymmetries by revealing the type of the borrower (Stiglitz and Weiss, 1981). The implication of Bester (1985)'s study is that borrowers with high probability of failure would rather accept an increase in the interest rate instead of an increase in the collateral requirement. In addition, Inderst and Mueller (2006) show that collateralized loans have higher likelihood of default. Berger and Udell (1990) find that the loan contract design can send informative signals about the borrower's type. By knowing that high-risk borrowers are likely to agree to pledge a higher level of collateral, other lenders can more accurately identify low-quality borrowers.

Observing firm financing choices also helps mitigate information asymmetries. Inderst and Mueller (2006) argue that a lender's screening ability influences the outcomes of financing contracts. More informed lenders should ideally, finance less risky projects with debt and more risky projects with equity. In long-term debt contracts, extracting immediate rents in the form of dividends is not restricted if short-term uncertainty is high (Goswami, Noe, and Rebello, 1995). If the uncertainty is higher over a longer time horizon, the restrictions are likely to be on immediate rents.

Trade credit contracts are advantageous for lenders in signaling the type of borrowers. The payment patterns of trade credit borrowers send signals to the firms that extend trade credit. These signals help in updating the lender's assessment of the borrower and affect the terms of contracts in future transactions (Smith, 1987). Moreover, trade credit allows access to information that is not otherwise observable. Suppliers (i.e., lenders in trade credit contract) that extend trade credit gain access to monitor the customers' premises frequently (Petersen and Rajan, 1997). By sending meaningful signals to outsiders, trade credit also facilitates access to bank credit for borrowers (Giannetti et al., 2011). The release of explicit positive information that updates relatively old information available to outsiders increases the likelihood of receiving credit and reduces its cost (Tang, 2009). Lee and Stowe (1993) argue that cash discounts in trade credit contracts carry meaningful information about the product quality. The higher the cash discount, the more likely it

is that the product is of low quality. Lee and Stowe (1993) show that this characteristic of trade credit contracts can help separate good firms from bad ones.

Sharpe (1990) shows that longer lender-borrower relationships reveal higher information on the borrower's quality. With access to extensive information on the borrower, lenders can extract rents from them. Assuming that terminating relationships is less costly for lenders, when the lender's rent extracting capacity reaches its limit they seek new borrowers. Behr, Entzian, and Güttler (2011) emphasize the positive effect of longer lender-borrower relationships and they find that longer creditor relationships reduce information asymmetries between lender and borrower. Moreover, more informationally opaque firms (i.e., small and young firms) benefit more from information asymmetry reduction because they can build longer trade relationships.

In international trade, the level of uncertainty is higher because of different economic and judicial environments. As a result, bank intermediation becomes inevitable.³ Bank intermediation is expected to be more important during times of distress. However, banks reduce the amount of trade financing during times of crisis (Niepmann and Schmidt-Eisenlohr, 2017b; Garcia-Appendini and Montoriol-Garriga, 2013). Consequently, inter-firm financing supports the flow of goods and services in cross-border trades during a crisis. Bank intermediation has direct effect on the exports of the country. Demir, Michalski, and Ors (2017) find that an increase in the cost of bank intermediation (i.e. price of an LC) affects exports negatively.

Prior research shows the important role of information asymmetry in trade financing and trade relationships. While high degrees of information asymmetries can affect trade negatively or restrain agents from interacting at all (Milgrom and Stokey, 1982), signals about firms' types can mitigate this problem to some extent. In addition, uninformed agents can screen the types of informationally opaque agents by offering them different contract terms. Consequently, information asymmetries could be altered to a level that would allow less informed agents to make important decisions. In the next section, I will explain this problem in the context of this dissertation in a more detailed manner.

3 Problem description and research question

In trade credit contracts, firms face different risks. Sellers (i.e. firms that extend trade credit) have to deal with credit risk (Cunat, 2007). Buyers might not abide to the terms of the contract and not pay on specified dates. Consequently, high information asymmetry

³See for example, Schmidt-Eisenlohr (2013).

can lead to worse terms of trade credit contracts for buyers (Niepmann and Schmidt-Eisenlohr, 2017a,b). Sellers can also decide not to interact with informationally opaque firms (Milgrom and Stokey, 1982). To mitigate this problem and assure creditworthiness, buyers with an information advantage would ideally like to signal their types to potential sellers. Different signaling channels can help otherwise informationally opaque buyers to receive trade credit with more favorable terms.

In international trade, the political, legal, and economic environments of the buyer's country affect the use of trade credit. Since sellers (exporters) assess their buyers (importer) by evaluating their operating environment, the terms of payment are mostly defined by the quality of the destination country. The legal system and economic conditions of the buyer firm's country and the buyer firm's prior experience of interacting with the firms from the seller's country might affect the terms of financing (la Porta et al., 1998; la Porta, de Silanes, Shleifer, and Vishny, 1997). Firms from mostly developed economies are the ones that usually receive trade credit in international trade. Yet, this does not guarantee that credit risk is eliminated if a firm operates in better economic and legal environments.

Receiving trade credit has its advantages for buyers both, in cross-border and domestic trades. These buyers gain access to the product to inspect its quality. Consequently, they can mitigate the seller's potential misbehavior. In other words, with the opportunity to receive and inspect goods before paying for them, buyers are in a better position to enforce seller's compliance with the contract, *ex ante* (Petersen and Rajan, 1997).

Obtaining trade finance (i.e., LC) for cross-border trade requires the financial intermediary's assessment of the firm. When a bank becomes a lender, the buyer's credit risk is passed on to it from the exporting firm. The initiator of the LC (importing firm) needs to signal its type to the bank if there is limited information available about its type. Consequently, the bank's screening ability plays an important role in addressing information asymmetry in international trade (Schmidt-Eisenlohr, 2013).

The motivation for studying information asymmetry problem in trade financing and trade relationships is to understand its real market outcomes. As discussed, the terms of trade financing contracts, in both domestic and international trade, are affected by the degree of information asymmetries (See for example, Klapper et al. (2012); Schmidt-Eisenlohr (2013)). Moreover, longer trade relationships reduce information asymmetry for customers (Giannetti et al., 2011). Information asymmetry is a real problem for both suppliers and customers in agreeing upon trade financing contract terms and the duration of trade relationships. Consequently, high information asymmetry can lead to lost value

Table 1.
Different scenarios of assessing counterparty’s quality under information asymmetry.

Counterparty is of "Good" quality		
	TRUE	FALSE
Fail to reject	Correct decision	Type II error
Reject	Type I error	Correct decision

for the economy in terms of unrealized trade.

The broader focus of this dissertation is the financing of trade and inter-firm trade relationships under information asymmetry. As Akerlof (1970) discusses, in markets with high information asymmetry agents face adverse selection. Hence, in the case of the supplier-customer (or seller-buyer) trade relationships counterparties have to deal with a Type II error problem as shown in Table 1.

Counterparties would fail to identify the quality of potential counterparties because of limited information. An adverse selection of low-quality counterparties would increase risks related to payment (credit risk of buyers) and delivery of goods (by sellers). Moreover, the cost of cooperating with low-quality counterparties can be higher when the duration of buyer-seller trade contracts is long. Therefore, it is important to understand how different degree of information asymmetries affect the duration of buyer-seller trade relationships. To analyze this problem, I address the first research question of this dissertation:

Research question 1: “How does information asymmetry affect the duration of inter-firm trade relationships?”

A study by Macaulay (1963) finds that firms are less willing to solve their problems through the judicial system in business relationships. Therefore, long-lasting relationships become complementary to formal written contracts in finding solutions to disputes (Ryall and Sampson, 2009; Corts and Singh, 2004). The implication of von Thadden (1995) is that long-term contracting should be accompanied with active monitoring in order to be efficient. Hence, value extraction from long-term relationships is expected to be lower for the party with inferior information acquisition. The lack of the information about the counterparty is therefore expected to reduce the duration of trade relationships. Uninformed interactions of agents do not occur at all (Milgrom and Stokey, 1982) or occur

in a short timeframe. To better understand the value of inter-firm trade relationships, it is important to analyze the effect of information asymmetry on these relationships.

The information asymmetry theory discusses two factors that mitigate the impact of adverse selection: signaling and screening. Spence (1973) shows that agents can reveal their types by sending informative signals. When firms are not able to signal their reputation, it is less likely that they will receive a contract offer (Banerjee and Duflo, 2000). Signals help in updating contract terms (Smith, 1987) and the design of contract can signal borrowers' types (Berger and Udell, 1990). While signals are induced by the agent that is informationally opaque, screening is initiated by the agent that is actively seeking to obtain information about an informationally opaque agent. Stiglitz and Weiss (1981) show that outsiders can observe opaque agents' types by monitoring their risk-taking behavior. Similarly, buyers can signal their types to sellers if they seek to receive trade credit in favorable terms. Sellers can observe buyers' types by monitoring their behavior. Since signaling and screening reduce information asymmetry between buyers and sellers, it is important to study how they affect trade financing in inter-firm trade relationships. Therefore, I address the second research question of this dissertation:

Research question 2: "What are the effects of signaling and screening in financing of trade?"

I expect that informative signals and an efficient screening ability would have positive effects on the financing of trade. Trade financing can be rationed by the agents extending credit when information asymmetry is high. While borrower firms can mitigate the effect of information asymmetry by sending meaningful signals, lender firms (or banks) can reduce the impact of information asymmetry by efficiently screening the types of borrowers. Consequently, I expect that efficient screening and signaling are able to mitigate the negative effect of information asymmetry.

Firms do not always signal their types and signals can sometimes bear worthless information. In order for the signals to be useful, they need to change the agents' behavior. If agents are willing to obtain trade financing, they need to send informative signals to outsiders. Moreover, lenders also need to differentiate the types of signals. They should be able to identify agents' types by observing their behavior. Borrowers' signals together with lenders' screening abilities can alleviate the effects of information asymmetry on trade financing.

The "No-trade theorem" states that uninformed agents do not interact with each other (Milgrom and Stokey, 1982). This is a potential problem for trade. If the degree

of information asymmetry is very high in some environments there will be a higher trade gap. Consequently, this will lead to a loss of opportunities for domestic or international trade. Prior research shows that the no-trade problem can be addressed by reducing information asymmetries. Reuer and Ragozzino (2008) find that information asymmetry between firms can be reduced by forming strategic alliances. However, consistent with the implications of Behr et al. (2011), Reuer and Ragozzino (2008) find that prior trade relationships reduce information asymmetries and increase the likelihood of continuity of the relationships.

Given the scope of this dissertation and the discussions of prior research, I provide more detailed literature review of prior research and address the hypotheses in Section 5.

4 Aim of the study

This study contributes to our knowledge of trade relationships and trade financing by analyzing the impact of information asymmetry. It answers how information asymmetry affects the outcomes of inter-firm trade in a broader sense. Of particular interest is how access to information about counterparties affects firms' decision of extending trade relationships. Moreover, the channels by which the negative effects of information asymmetry are diminished in trade financing contracts are one of the focuses of this study. Signaling and screening are two channels that mitigate the information asymmetry problem. This study focuses on these channels and analyzes their effects by utilizing firm-level and macro-level data. The analyses help extend our understanding of the problems related to information asymmetries in inter-firm trade.

5 Literature review and hypothesis development

In a world of limited information, inter-firm relationships are affected by the degree of access to the information about one another. Milgrom and Stokey (1982) show that if one party has private information, then trade will not occur because the value of the trade is different to these parties. This phenomenon is referred to as the "no-trade theorem". Kelly and Ljungqvist (2012) find supporting evidence to the no-trade theorem by analyzing differently informed buyers and sellers in financial markets. Similarly, Garmaise and Moskowitz (2004) find that uninformed agents do not interact with informed ones. In their analysis of the real estate market, they show that uninformed agents would rather

buy properties with long track records, meaning that they are able to obtain publicly available information.

In a study of M&A practices, Reuer and Ragozzino (2008) find that strategic alliances reduce information asymmetries between firms. In other words, prior interaction between firms mitigates problems arising from asymmetric information. As Kurlat and Stroebel (2015) argue, sellers are usually more informed about traded assets than buyers. Hence, the true quality of assets (e.g., whether they are worth to invest in) is only known to the seller because he/she has access to superior information about the type of the asset. The implications of Reuer and Ragozzino (2008) findings suggest that if sellers and buyers have engaged in trade relationships in the past, they reduce information asymmetries between them. Banerjee and Duflo (2000) show a significant effect of reputation on obtaining contracts in the Indian software industry. They find that when firms are not able to signal their reputation, it is less likely that they will receive contract offers from potential clients.

Firms are less willing to engage in trade relationships if there is a limited access to information about potential counterpart firms. Analogously, a higher level of availability of information on counterparties extends the lifespan of relationships. Therefore, I argue that:

H₁: A higher information asymmetry between a supplier and a customer reduces the duration of their trade relationships.

Faulkender and Wang (2006) and Pinkowitz, Stulz, and Williamson (2006) examine the marginal value of cash and show that the value of a dollar of cash is often less than one. Their findings suggest that holding cash may not be valuable after all. However, current literature suggests that holding cash is an endogenous decision made by firms with two major motives. First, firms desire to avoid higher flotation costs associated with issuing equity or debt securities. Information asymmetry between firms and external financing sources further exacerbates these costs (Han and Qiu, 2007).

Second, firms may choose to save cash deliberately to avoid negative effects of future financial downturns or decreasing cash flows. Faulkender and Wang (2006) and Pinkowitz et al. (2006) provide evidence that cash holdings are more valuable for constrained firms than for unconstrained firms. Their findings raise an important question of why constrained firms benefit more from cash than their unconstrained peers. Almeida, Campello, and Weisbach (2004) find that firms facing greater financial constraints may rely more on their internal financial flexibility and choose to hold more cash. Similarly,

Denis and Sibilkov (2010) find that greater cash holdings are associated with higher levels of investment for constrained firms and the association between investment and value is stronger for constrained firms than for unconstrained firms.

Demirguc-Kunt and Maksimovic (2001) show that trade credit is an important source of external financing for firms of all sizes. Firms may rely on the working capital financing offered by their suppliers. This is especially true for small or credit constrained firms (Marotta, 2005; Petersen and Rajan, 1994). Ng et al. (1999) test these hypotheses and find evidence that it is the information about trading partners that determines financing decisions in inter-firm trade. Specifically, problems related to the information asymmetry, such as moral hazard, adverse selection, and uncertainty affect financing choice the most. Antras and Foley (2015) also emphasize the significant role of low information asymmetry (inter-firm relationship) in financing trade. Since the flow of goods can be monitored by suppliers in a more efficient way, firms can offer trade credit even when banks are not willing to do so (Burkart and Ellingsen, 2004).

The implications of prior research lead to a conclusion that cash holdings act as signaling channel for customers to inform suppliers about their type. In other words, by holding more cash customers let suppliers know that they are able to pay back their trade credit. Consequently, we might observe that suppliers extend more trade credit to firms with higher cash holdings. In particular, firms with limited access to external financing can benefit from holding cash to receive trade credit. Thus, I propose the second hypothesis as follows:

H₂: Cash holdings can provide significant financial flexibility in the form of trade credit by reducing information asymmetry, while external financing is costly, especially for constrained firms.

The role of distance in the banking industry has been discussed extensively in the banking literature. Research in bank-customer distance explains the effect of distance from mainly two perspectives: transaction cost and information asymmetry. In case of information asymmetry, longer distances reduce access to soft information. While, hard information can be easily quantified and accessed remotely, collection of soft information requires local presence. Liberti and Petersen (2018) mention several attributes of soft information and its importance in financial decision-making. First, unlike hard information, soft information cannot be quantified and interpreted in a straightforward manner. Second, soft information represents subjective reasoning and varies depending on the context. Finally, the collection of soft information depends on the collector. Un-

like quantified data (hard information), soft information is collected and processed by the same person because its interpretation will vary when passed on to another person.

Petersen and Rajan (2002) argue that the importance of banks' proximity to their clients has been diminishing over time. While Petersen and Rajan (2002) show the diminishing effect of the distance to customers, Guiso, Sapienza, and Zingales (2004) find that local financial development affects business activity. Banks use distance as one of the main inputs in their price-setting strategy. Banks, on average, offer lower interest rates on loans to nearby customers (Degryse and Ongena, 2005; Bellucci, Borisov, and Zazzaro, 2013). Distance is important particularly in lending relationships. Agarwal and Hauswald (2010) find that banks are able to obtain more soft information about the borrowers that are located in the proximity.

When banks operate remotely from their customers, they have limited access to soft information about their customers. In this case, distance to customers bears soft information content. Holding all other factors fixed, with limited soft information about their customers, banks will reduce the supply of products that require soft information for credit assessment. Considering the established effect of distance in banking literature, I propose the following hypothesis:

H₃: Banks located close to customers issue more commercial letters of credit compared to the remotely located banks.

The various international and regional institutions that have been engaged in the work on issues related to trade in digital economy has, to a certain extent directed their efforts following the mantra of "trade facilitation". Some of these efforts have supported the implementation of national and regional single windows across jurisdictions to fulfil import, export, and transit-related regulatory requirements. Interoperability and internationalization of national single windows is the next logical step, as it will allow collaborative information-sharing for both public and private sector stakeholders in global supply chains. Single window is defined by the World Customs Organization as: "An intelligent facility that allows parties involved in trade and transport to lodge standardized information and documents with a single entry point to fulfil all import, export and transit-related regulatory requirements."⁴

The benefits of a single window system are well established (Carballo, Graziano, Schaur, and Martineus, 2016; Lawrence, Hanouz, and Doherty, 2012). Doing Business data reveals that less time was spent on customs clearance in countries using electronic

⁴For more details see: <https://bit.ly/2QBzhJ5>

systems for the submission and processing of export and import customs declarations (Doing Business Report 2017). Trade facilitation initiatives are commonly considered to create standards and guidelines for the exchange of goods and services across borders. This definition is particularly relevant because it emphasizes the flow of information connected with the physical movement of goods (Bal and Rajput, 2015). Given the discussed benefits of a single window environment, I expect that:

H₄: The introduction of a single window environment has a positive effect on both directions of trade flows between the countries involved.

The next section explains the data and methodology applied to investigate the hypotheses.

6 Data and methodology

The problem of information asymmetry has been studied extensively in finance research from different perspectives. To address the first research question, it is plausible to analyze the duration of supplier-customer trade relationships because it would provide an immediate answer to the question of how information asymmetry affects these relationships. Moreover, the availability of relevant data makes such a study possible. Signaling and screening channels can be studied from many perspectives. At the firm level, liquid assets and distance to customer provide good proxies for studying signaling and screening respectively. Liquid assets can signal the borrower's type, thus allowing access to trade credit. Distance can capture the effect of soft information between a lender and a borrower. Access to soft information means higher screening ability of lenders. Therefore, in this dissertation, signaling and screening channels are studied by examining firms' liquid assets and distance to borrower. From a macroeconomic perspective, the effect of screening on information asymmetry can be studied by examining a quasi-natural experiment that would affect the agents' screening ability. One such quasi-natural experiment can be the ASEAN Single Window Environment that was implemented with the aim of increasing visibility among agents involved in export-import activities. Therefore, this dissertation studies the events around the ASEAN Single Window implementation phase and addresses the screening channel from a macroeconomic perspective.

First of all, I study the first research question from the perspective of supplier-customer trade relationships. Not only do I examine the implications of information asymmetry but also test how hold-up and trade credit affects trade relationships. As the

“no-trade” theorem implies, higher information asymmetries should lead to less likelihood of interaction between agents (Milgrom and Stokey, 1982; Kelly and Ljungqvist, 2012; Garmaise and Moskowitz, 2004). I analyze how information asymmetry affects already interacting agents and whether it eventually leads to the point of no-trade.

To analyze the signaling channel of the information asymmetry addressed in the second research question, I first examine the effect of cash holdings on receiving trade credit. Pledging collateral gives access to credit; however, firms that are willing to pledge collateral, are highly likely to be the less creditworthy ones (Bester, 1985). I address the implications of prior research in the context of trade credit and test how collateral in the form of the most liquid asset affects inter-firm trade financing.

I then examine the screening channel by focusing on commercial letters of credit. Particularly, I focus on the bank-customer distance and its effect on the commercial letters of credit. Prior research finds evidence for the association of the distance to the bank and access to bank products.⁵ I anticipate that distance is a good proxy for potential screening and monitoring; and therefore, use it to analyze how it affects the availability of trade financing.

I further analyze the screening channel of information asymmetry by examining the impact of a macroeconomic policy change on trade flows among countries. The implementation of a Single Window policy among ASEAN countries was expected to have a positive impact on the trade volume among these countries because it would increase monitoring and screening capacity for all participating agents. By examining legal and economic perspectives, my coauthors and I analyze whether this policy change has led to anticipated results.

Data used in this dissertation come from different sources covering various observation periods. For the first research question, I use data from Compustat Segments - Customer database for all available years (i.e., between 1976 and 2016). Other firm-level variables are matched from Compustat and CRSP. The main limitation of the Segments database is that it does not provide unique identifiers for customers. Therefore, I perform exact name matching in order to pull customer variables from Compustat. To further develop this study, I am aiming at obtaining information about shareholdings of customers in their suppliers and vice-versa from Thomson 13f filings.

To examine the effects of the signaling channel, I use annual firm-level data from the U.S. between the years 1992 to 2016. The data is obtained by merging two databases: Compustat and Execucomp, covering all available years for the merged data. Since the

⁵See for example, Degryse and Ongena (2005); Bellucci et al. (2013)

proxy for signaling (i.e. collateral) is firm cash holdings, I restrict the sample to the industries where cash holdings are not regulated. Therefore, industries such as Finance, Insurance and Real Estate, Public Administration and Utilities are not captured in this study. The main limitation with this data is that it reports variables at firm-aggregate levels. Therefore, it is not possible to analyze more specific questions such as terms of trade credit contracts.

To analyze the screening channel at micro-level, I use two different databases. First, I obtain data from the Bank Regulatory database. This database provides most of the variables from bank financial reports in the U.S. I particularly focus on the periods around the 2008 financial crisis to avoid noise in the effects and study the screening channel specifically during economic downturns. The study periods cover bank-level data between years the 2003 2014 (i.e. five years before and five years after the financial crisis, as well as the crisis period). One of the limitations of this data is that the outcome variable is zero in 85% of the sample. I address possible concerns and show that the results are robust to this specificity of the sample. As a measure of information asymmetry, I use driving distances between banks and their customers. This measure was obtained from Google Maps and is unique compared to other measures of the distance used in prior literature.

Finally, to test the effects of macroeconomic policy changes on screening and consequently trade volumes, I use data from UN Comtrade database. I restrict the data to the proximity of the policy change in order to capture its effect on the outcomes. The use of this data has some limitations mainly because the policy implications were very recent and therefore, there are not enough periods after the crisis. Consequently, this affects the final conclusions of the study. Moreover, this data covers macroeconomic aggregates at country level, restricting the scope of the analyses. Another limitation of this data is that the implementation of the policy was carried out in only two countries and, therefore, the results can be specific to the sample. More accurate results can be reported after conducting the study with more observation periods after the policy change and when more countries start implementing the policy.

By examining the factors affecting the supplier-customer relationship, the first study shows that information asymmetries can be harmful for long-lasting relationships. As discussed later in the next chapters, long-lasting relationships have value for firms because these relationships complement formal contracts and have enforcement effects. Therefore, firms might be interested in establishing longer relationship. This study answers the question of whether reduced information asymmetries benefit supplier-customer relationships.

The next three studies provide answers to the second research question regarding the effect of signaling and screening on mitigating information asymmetries in trade financing contracts. While the second and third studies answer the second research question at the micro-level, the last study shows the effects of increased visibility on trade volumes at a macroeconomic level. The effects of collateral in signaling borrowers' type in bank lending contracts have been studied extensively (see for example, Berger and Udell (1990)). By building on the findings of prior research, the second study shows the effect of collateral in trade credit contracts. The third study shows how banks assess the credit requests of their customers if there is less possibility of screening and monitoring. Finally, the last study has more policy implications. It addresses the question of whether single window environments are effective in increasing the screening ability of agents. Consequently, the findings can have effects on extending single window environments in other countries. In the fourth study, I have mainly contributed with data analysis and econometric tests in Section 4.1. I have also suggested policy implications of the empirical findings.

In the next sections, I provide the reviews of these studies.

7 Review of essays

7.1 Review of Essay 1

In the first study, I analyze how the duration of supplier-customer relationships respond to different factors. Particularly, I explain these relationships from hold-up, information asymmetry, and trade credit approaches. To do so, I use annual firm-level data from Compustat North America and Non-Historical Segments databases between the years 1976 and 2016. The non-historical segments database provides annual data of firms' important customers. I define supplier-customer trade relationship as supplier-customer pairs being reported in the Segments database. The duration of the relationship lasts as long as the pairs are reported continuously. If a supplier-customer pair is not reported after some time, the relationship is considered to be terminated. There can be multiple relationships and termination of relationships for supplier-customer pairs. Therefore, for one certain pair there can be multiple failure events, i.e. termination of relationship. To match firm-level variables, I use data from Compustat by matching suppliers with their gvkey identifiers and customers with exact names.

I use survival analysis to describe the patterns of supplier-customer relationships, with the following expectations. Suppliers being held-up by their customers are likely

to have longer durations because it is costly for them to terminate relationships. Higher information asymmetries affect the duration of relationships negatively. Finally, in the process of extending trade credit customers can restrain suppliers in extending their relationships. Meanwhile, receiving trade credit, can motivate customers to have longer relationships with their suppliers.

In the baseline model, I find that hold-up by a customer, measured by Share in Total Sales variable, extends the duration of relationships. In other words, one unit increase in this variable decreases hazard by 75%. I also show that information asymmetry is important from both the suppliers' and customers' perspectives. Nevertheless, its effect on the hazard to duration is twice bigger for customers. Thus, the likelihood of the termination of relationship is twice larger if customers are informationally opaque. I do not find any effect of suppliers' extending of trade credit. However, receiving trade credit has a positive effect on the duration of relationships; thus partially supporting the last hypothesis. This database provides unique information about important supplier-customer relationships from 1976. The uniqueness of this data allows for addressing the first hypothesis of the dissertation. Since the data reports supplier-customer relationships over a period of time, it is suitable for testing the duration of these relationships.

Results show that suppliers' size and age have a positive effect on the duration of relationships. Moreover, having one additional customer in their network (supplier) for suppliers (customers) decreases the likelihood of termination of the relationship. Finally, I show that firms with superior power, in terms of profitability and market share are likely to have shorter relationships with their suppliers or customers. The effect is 50% larger when customers have superior power.

Additionally, I estimate a baseline model for different quartiles of the Share in Total Sales variable. Although it is likely that for suppliers held-up by their customers it will be difficult to terminate relationships because of incurred costs, this association is not expected to be linear. At extreme levels of hold-up, it might be optimal to terminate relationships in order to not incur additional relationship-specific costs. I show that hold-up increases the duration of relationships until the 75% percentile of the Share in Total Sales variable. The median duration of relationship falls when this variable is between 75 to 100% percentiles. This finding implies that at the highest level of hold-up, relationships are more likely to be terminated compared to mid-high levels. This might be due to deteriorated profitability of suppliers.

The analysis of supplier and customer information asymmetries provide additional evidence for the baseline estimations. I find that, on average, the median duration of

relationships is the longest (i.e. 46 months) for the pairs where both, suppliers and customers, have low information asymmetry. By contrast, the duration is shortest (29 months) when they both have high information asymmetry. Low and high information asymmetries are defined by median values of the measures. I also confirm the results of the baseline model and show that the customers' information asymmetry is more important than that of the suppliers'. Thus, while the median duration for customers with high information asymmetry and suppliers with low information asymmetry pairs is 40 months, the similar measure is 43 months when customers have low and suppliers have high information asymmetry. The analysis of receiving and extending trade credit at different levels show that the median duration of relationships is 41 months when the trade receivables of supplier and the trade payables of customer are both low and high. The duration is longest for pairs with high trade receivables and low trade payables.

7.2 Review of Essay 2

In this study, we use a sample of over 32,000 firm-year observations from Compustat (U.S.) during the period from 1992 to 2016, to examine whether firms with greater cash holdings are likely to receive more trade credit. By doing so, we test the second hypothesis of the dissertation. Cash holdings is assumed to proxy for the signaling channel of information asymmetry. Compustat provides extensive data on firms' financial statements. Moreover, the study of a single country allows for examining the stated hypothesis more comprehensively.

We use trade payables as a proxy for trade credit and control for other sources of debt financing, such as short-term and long-term debt. These control variables allow us to isolate the marginal impact of cash holdings on, specifically, obtaining funding through trade credit. We recognize that the causality of the relationship between cash holdings and trade payables can be reverse. A firm's ability to attract more trade credit due to other firm specific characteristics or market conditions may impact the level of cash the firm decides to hold in the current year. To control for endogeneity, we use lagged values of cash holdings (up to previous three years) assuming that suppliers can observe cash positions of their buyers from previous years and assess the liquidity of their trade partners, whereas trade credit from future years will have limited impact on current year's cash holdings.⁶

⁶We also assume that receiving trade credit and extending trade credit are interrelated. Firms that receive more trade credit can also extend more trade credit and vice-versa. Receiving more trade credit can relax the restrictions on the funds that otherwise would be used for the payment of purchases. Therefore, by postponing cash payments to their suppliers, firms are also able to allow their customers to delay their cash payments.

The findings indicate that trade credit is positively associated with cash holdings. Firms with greater cash holdings are likely to receive more trade credit. Thus, consistent with the precautionary motives, firms appear to hold more cash reserves deliberately to increase the liquidity of their assets and reduce the probability of default, especially to obtain short-term external financing in the form of trade credit. Our analysis of the lagged effect of cash holdings on trade credit indicates that by holding more cash firms are able to increase their trade credit significantly for two years in the future.

To further control for endogeneity, we also conduct additional robustness tests with an instrument that induces exogenous variation on cash holding without affecting a firm's creditworthiness. Acharya, Davydenko, and Strebulaev (2012) suggest that one such instrument is the private benefit that managers derive from avoiding default. Due to the differences in managerial compensation across firms, managers will have different incentives to save cash to avoid default, because the private costs differ. These differences in compensation can result in an exogenous variation in cash holdings. Following Acharya et al. (2012), we use managerial compensation as an instrument for cash holdings and conduct a two-stage least squares estimation method (2SLS) to examine the impact of cash holdings on trade payables in robustness estimation.⁷ Our findings remain similar, indicating that firms with greater cash holdings are likely to receive more trade credit.

The presence of financing constraints force riskier firms to maintain higher cash reserves as a buffer against a possible cash flow shortfall in the future (Acharya et al., 2012). Almeida et al. (2004) and Denis and Sibilkov (2010) find that financially constrained firms tend to hold more cash to offset the negative shocks and increase their ability to invest in positive NPV projects. Holding larger cash reserves may also enable financially constrained firms to attract trade credit, which helps them reduce short-term financing costs, especially when these firms temporarily face higher external financing costs. We examine whether financially constrained firms can benefit from holding cash and receive significantly more trade credit than unconstrained firms. We use the HP index, a financial constraints index developed by Hadlock and Pierce (2010) as a measure of financial constraints.⁸ We divide our sample into constrained firms and unconstrained firms using the median value of HP index and examine the impact of cash holdings on trade payables separately for each group. The univariate analysis shows that financially

⁷In separate regressions, we also included growth options as an instrument for cash holdings in addition to managerial compensation; however, the first-stage results for the impact of growth opportunities were not consistent with theoretical predictions outlined in Acharya et al. (2012). Because they do not report their first stage results, we are not able to compare our findings with theirs.

⁸Hadlock and Pierce (2010) refer to this measure as the SA index, i.e Size and Age index. Later in the paper, we use alternative measures of financial constraints and confirm that our main findings remain similar.

constrained firms have significantly greater trade credit than unconstrained firms. The multivariate analysis indicates that cash holdings have positive and statistically significant impact on trade credit especially for constrained firms. In particular, the magnitude of the impact of cash holdings on receiving trade credit is greater for constrained firms. Thus, our findings suggest that, consistent with our predictions, cash is more valuable in constrained firms, because by holding cash these firms can signal their solvency to their trade partners and access much needed financial flexibility. These findings extend the results of Klapper et al. (2012) and provide evidence that cash holdings may explain why suppliers are willing to extend trade credit to their constrained partners.

Denis and Sibilkov (2010) show that financially constrained firms hold more cash when they have greater investment needs. We then investigate whether the impact of cash holdings on trade credit, especially in financially constrained firms, is conditional on the level of the firms' investment needs. We define investment needs as a binary variable that takes the value 1 if capital expenditures in the year $(t+1)$ is higher than those in the year t and 0 otherwise. We form four sub-samples based on the firms' investment needs and the level of financial constraints. Our results indicate that trade payables are positively related to cash holdings across all subsamples, however, the magnitude of the effect of cash holdings is greater for the firms with investment needs. Thus, constrained firms with investment needs can attract more trade credit by holding more cash, whereas holding cash by unconstrained firms has a smaller impact on receiving trade credit. Denis and Sibilkov (2010) argue that constrained firms may hold more cash when they have more investment needs. Our findings complement their results such that when firms are constrained and have immediate investment needs their trade partners evaluate additional cash holdings as a signal for creditworthiness for both paying back trade credit and fulfilling future investment projects. Trade partners are likely to value a firm's potential for growth opportunities and ability to generate future cash when offering trade credit.

Finally, we examine the role of external borrowing conditions for the impact of cash holdings on trade credit. We find that the impact of cash on trade payables is positive for all firms, during tight and loose borrowing conditions. Nevertheless, cash holdings provide the greatest value for constrained firms in the form of trade credit, especially when monetary conditions are tighter.

7.3 Review of Essay 3

In this study, I examine the distance effect on LCs from the perspective of soft information. In particular, I examine how the distance between a bank and firms in trade hubs affects the bank's supply of LCs. The U.S. banking market was chosen for this study because unlike small economies, the U.S. market possesses a significant degree of information asymmetry. For example, the Swedish banking market is less competitive because of the number of participating banks. Moreover, information asymmetry is less problematic in societies like Sweden where government and private institutions collect comprehensive information about businesses and people. Therefore, a bank market environment with a higher degree of information asymmetry is more appropriate to examine the third hypothesis of this dissertation. The US banking market provides such a setting and therefore has been chosen for the third study.

Commercial letters of credit (LC) are one of the important financing tools in international trade. LCs help mitigate uncertainty in cross-border trade, thus allowing for flow of goods across borders in less risky terms. While Open Account and Cash in Advance contracts are more frequently used in exports to the least risky and the riskiest countries respectively, LCs are used in trade between moderately risky countries (Schmidt-Eisenlohr, 2013).

Prior research finds that distance to customers has effects on the supply of loans by banks and different characteristics of loan contracts (See for example, Degryse and Ongena (2005); Bellucci et al. (2013); Jimenez, Salas, and Saurina (2009)). Similarly, the supply of LCs by banks can be affected by the distance between a bank and its customers. While closer customers have higher probability of receiving loans, they usually get loans at lower rates if there is a competition among banks in their operating environment.

Since LCs are used by firms that import goods or services in cross-border trade, demand for LCs are higher in the proximity of trade hubs. Moreover, the number of firms that request for LCs are much higher in the vicinity of trade hubs. In this study, I use trade hubs as proxies for the cluster of firms with demand for LCs. By doing so, I am able to calculate distances between observed banks and unobserved firms with demands for LCs. Using the sample of the U.S. commercial banks from WRDS Bank Regulatory database for the years 2003 to 2014, I examine the relationship between distance and LCs.

I first show that banks close to trade hubs grant more LCs than remotely located banks. After controlling for the demand effect, I show that remote banks grant less LCs compared to close banks. Because of the mechanism of granting LCs, I argue that this is

due to soft information effect (i.e. distance has soft information content for banks).

I further show that the effect of distance is lower for local banks compared to national banks. I argue that local banks are well aware of their operating environment; therefore, they are in a better position of accessing soft information from a distance as compared to national banks. Hence, the flow of information is slower in national banks compared to local ones.

Additionally, the findings show that distance matters more for large banks than for mid-sized and small ones. Also large banks are the most frequent providers of LCs regardless of their distance to any of the trade hubs. The marginal negative effect of distance is also greater for non-traditional banks. Since these banks are more frequently involved in non-traditional revenue generating activities, being remotely located from trade hubs costs them more in terms of lost opportunities of generating gains from LCs.

Although, on average, distance has a negative effect this effect turns out to be positive during the 2008-financial crisis. I explain this with the uninformed participation of remote banks during the financial crisis. Banks close to trade hubs were likely rationing the supply of LCs during the crisis. Consequently, remote banks tried to fill this gap by supplying LCs. I show that this supply by remote banks was only coming from the ones with the lowest cost of debt. Only remote banks whose cost of debt was at the lowest quartile were able to offer LCs during and after the crisis. It is likely that these banks were able to charge “information premium” during the crisis. I also show that remote small and medium-sized banks involve in uninformed supply of LCs during the crisis. Additional robustness tests provide strong support for the baseline model.

7.4 Review of Essay 4

The various international and regional institutions that have been engaged in the work on issues related to trade in digital economy have, to a certain extent directed their efforts following the mantra of “trade facilitation”. Some of those efforts have supported the implementation of national and regional single windows across jurisdictions to fulfil import, export, and transit-related regulatory requirements. Interoperability and internationalization of national single windows is the next logical step, as it will allow collaborative information sharing for both public and private sector stakeholders in global supply chains. This study reviews the legal framework necessary for implementing an international single window environment (ISWE) and, in that context, examine particular economic and financial aspects of the current developments. The past and on-going efforts of some of the relevant international and regional institutions are examined in

contextual detail to provide a legal basis for the integration of national single windows (NSW) through ISWE. The focus of the discussion is on the necessity for creating ISWE and how it may direct policymaking to respond to global challenges such as participation and financing of small and medium enterprises (SMEs) in international supply chains.

ASEAN Single Window which has been implemented from the beginning of 2016, provides a natural setting for studying the fourth hypothesis of this dissertation. While ASEAN SW environment changed the trade policy among participating countries, it was aiming to facilitate the information flow among all participating agents. The logical step in the analysis of the fourth hypothesis would then be to examine whether this particular policy change has facilitated information flow and consequently increased the volumes of exports.

With the progressive ratification of the WTO's Trade Facilitation Agreement (TFA), several WTO Member States are likely to move to the broader use of electronic transactions through the use of information and communications technologies (ICT) to meet their multilateral treaty obligations. For example, the TFA suggests that member-states should implement NSW and recommend the use of ICT methods for trade. The paper considers the contribution of the TFA and suggests that once majority of the WTO Member States establish single windows, most of the necessary infrastructure for creating ISWE would be present. In this context the contribution of other international institutions such as, WCO, UN/CEFACT, UN/ESCAP, UNCITRAL and UNNEXT, among others, to develop the supplementary legal framework is discussed.

Since 2005, the Association of Southeast Asian Nations (ASEAN) has been working to develop both the technical and legal frameworks for a regional Single Window referred to as the ASEAN Single Window (ASW). This paper discusses the ASW initiative to identify prospects and challenges that may be relevant for creating ISWE. During the past several months, ASW has supported electronic exchange of customs declaration and certificate of origin between five Member States on a pilot basis. ASW is utilised to highlight discussions on the legal and economic viability of interoperability. The initiative is examined from the perspectives of transaction cost and information asymmetry theories to provide a methodology for conducting empirical analysis at the country-level. The analysis allows drawing conclusions about the aggregate impact of ASW's early implementation on trade among ASEAN Member States.

By building upon the findings from the ASW experience this paper emphasises that the full potential of the ISWE can be realized through the integration of Government-to-Government (G2G), Business-to-Government (B2G) and Business-to-Business (B2B)

information. Such integration of information into an interoperable environment will allow flow of real-time data that can offer numerous possibilities to enhance the visibility of international supply chains. It is argued that single window integration at the international level should include transport and related commercial requirements to improve information flows among all supply chain actors.

The inclusion of the transport stakeholders into the single window system would require complex coordination that can capture the existing relationships between carrier interests, shipper interests, ports, transport authorities, and insurance providers, among others, from legal and technical perspectives. The emergence of new technology has opened up possibilities for creating technical solutions for such complex arrangements. Nevertheless, the lack of enabling national laws on transport and e-commerce in most jurisdictions may pose a challenge.

To illustrate the legal complexity from transport law and e-commerce law perspectives the existing situation with electronic bills of lading is briefly examined. The bill of lading, in addition to being the transport document issued by the carrier to the shipper, serves essential trade functions for the consignor, consignee and banks. The paper explores ways through which the legal concept of a bill of lading can be dematerialised. In this context, the selected provisions of the Rotterdam Rules and the Model Law on Electronic Transferable Records is examined through the lens of recent developments brought through automation in trade and evolving technologies such as distributed ledger and cloud computing.

Empirical findings from the implication of ASW, suggest that exports between Malaysia and Singapore have fallen after the ASW has been in force. The results indicate a 40% decrease in the exports between Malaysia and Singapore after the implementation of ASW. However, one should take into account that the period analyzed in this study is significantly short. Therefore, this effect should be interpreted as a short-run effect of ASW on exports. As it was argued in the previous section, the negative effect should not be interpreted as ASW's direct effect on exports. Since it is not clear what operations have been carried out during the implementation of ASW after December 2015, the results do not imply an aggregate negative effect of ASW.

This result can be explained from different perspectives. First, ASW might affect exports negatively because exporters might want to postpone their operations to make use of ASW opportunities. Thus, to take advantage of trading through a Single Window, exporters might have delayed sales at the end of 2015 and the beginning of 2016. This might have affected exports between Malaysia and Singapore in the short-run. Second, it

is possible that the processing through SW is not as fast as it was expected. Moreover, not all exporters might be able to fully utilize the SW application because they are not well prepared (or trained). Finally, the uncertainty on how the SW application would work might also contribute to the negative impact of its implementation. Thus, uninformed exporters might be willing to wait and observe how the new application works.

8 Discussions and conclusions

As prior research show, continuous relationships act as complementary to formal contracts in resolving disputes (Macaulay, 1963; Ryall and Sampson, 2009; Corts and Singh, 2004; McMillan and Woodruff, 1999). Longer relationships also lead to optimal rent sharing between a supplier and a customer (Brown, Falk, and Fehr, 2004). Therefore, counterparties should seek to continue their trade relationships as long as they both receive fair rents from this contract. Then, what are the factors that affect inter-firm trade relationships and how should they be managed in order to extend the duration of relationships? By addressing these questions, the first study identifies the role of information asymmetry in trade relationships.

One of the implications of the first study is that both suppliers and customers should reduce information asymmetries in order to extend the duration of trade relationships, as no-trade theorem foresees that firms with high information asymmetry are likely to lose their network of firms faster (Milgrom and Stokey, 1982). Particularly, the customers' quality should be communicated more diligently in order to send meaningful signals to outsiders. Long lasting trade relationships will be achieved especially if customers' information asymmetry is reduced not only towards its suppliers but also to other outsiders. By reducing information asymmetry, customers can also attract new suppliers.

The findings of the first study show the role of information asymmetry in inter-firm trade relationships. By providing answers to the first research question, the first study set the foundation to further analyze the second research question. To this end, I examine how trade financing in inter-firm trade relationships is affected by signaling the type of the borrower. The findings of the second study show that liquid collateral has important signaling capacity for outsiders. Thus, holding more cash improves access to trade financing.

By analyzing the impact of cash holdings on trade credit separately for constrained and unconstrained firms, the second study shows that cash holdings provide a channel for constrained firms to receive trade credit. Specifically, it answers the question of whether

by holding more cash, constrained firms can receive more trade credit. The findings provide evidence that cash holdings serve as liquid collateral that offset the negative implications of financial constraints and enable constrained firms to receive much-needed external financing from their suppliers.

How about the role of screening addressed in the second research question? Does it affect access to trade financings? The third study tries to answer these questions by focusing on distance between banks and their potential customers. The study first shows that banks close to trade hubs grant more letters of credit (LCs) than remotely located banks. Large trade hubs accommodate a lot of firms involved in international trade. Since LCs are one of the frequently used trade instruments in international trade, demand for LCs is higher in the proximity of trade hubs. Consequently, banks located in the proximity of trade hubs grant more LCs compared to remotely located ones. Nevertheless, this is not only a demand side effect. The distance between remote banks and trade hubs reduces remote banks' access to soft information, thus reducing their screening capacity. After controlling for the demand effect, I show that the access to soft information affects the supply of LCs to remotely located customers.

Having examined the role of screening on trade financing, I further analyze it from a macroeconomic perspective. In order to do so, the fourth study analyzes events around a quasi-natural experiment (i.e., the introduction of single window environment for trade) to draw causal relationships. Although prior single window practices have led to increased exports, the findings in the fourth study do not provide any support in favor of a screening channel. I relate this to data limitation and the early stage of implementation of single window environment. The findings imply that channels for screening such as electronic platforms might not immediately transfer information to participating agents in international trade.

These findings provide answers to the research questions and have several implications. First, I show that information asymmetry has a significant impact on supplier-customer trade relationships. If firms seek to establish stronger networks, they should consider reducing information asymmetries to outsider agents. These results are in line with the findings of prior literature in trade relationships (Milgrom and Stokey, 1982; Kelly and Ljungqvist, 2012; Garmaise and Moskowitz, 2004; Reuer and Ragozzino, 2008). Second, in line with prior research (Ng et al., 1999; Antras and Foley, 2015; Giannetti et al., 2011; Klapper et al., 2012), I show that signaling affects trade relationships by defining access to trade financing. By signaling their types, agents can reveal their type and reduce information asymmetries between them and target firms. This would improve their access to trade financing. Finally, I find that screening provides a channel to reduce informa-

tion asymmetries between banks and their potential customers. This is in line with prior research in banks' ability of screening (see for example, Berger and Udell (1990)). Although information asymmetry affects inter-firm trade relationships negatively, signaling and screening can mitigate negative effect and improve access to trade financing.

The main limitations of this dissertation are related to the access to data. In particular, the data used in these studies do not allow the analysis of the research questions in a more detailed manner. Hence, in the first study the reporting of customer names do not allow the inclusion of all available firms in the sample. Firms whose names do not allow for matching data from Compustat are lost during merging process. In the second study, it is not possible to observe trade credit contract terms. The impact of information asymmetry on the contract terms could provide more accurate answer to the question how signaling affects trade credit contracts. In the third study, the data does not allow to capture actual bank-customer relationships. Therefore, I approximate between banks and customers by making assumptions about their concentration. Finally, the data utilized in the last study was provided for a limited period. Moreover, the time period covered after the implementation of the new policy was short. Consequently, these limitations in the access to data does not allow an investigation of the research questions in a more comprehensive manner.

The studies contribute to the literature in several ways. The first study analyzes different determinants of supplier-customer trade relationships and shows the significance of different factors. In particular, the results show that higher asymmetry is harmful for sustainable trade relationships. By emphasizing the role of cash holdings in attracting trade credit in constrained firms, the second study provides an alternative explanation to the question "why cash holdings are important for firms". To my best knowledge, the third study is the first to utilize accurate measure for distance in bank-customer relationship literature. By doing so, this study shows how the access to soft information affects bank supply of trade financing.

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