Understanding Trade Finance: Theory and Evidence from Transaction-level Data*

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Abstract

This paper examines the pattern of payment methods in international trade using the universe of Colombian and Chilean import transactions data. The data reveal a striking predominance of the post-shipment payment system: the post-shipment term accounts for 80−90 percent of the total import transaction value in Colombia and Chile. Further, a substantial level of variation across source countries is affected by exchange control policies, while the incomplete contracts approach developed in previous studies is not well supported by the data. An alternative model of trade finance that features the self-liquidating and recourse nature of account receivables financing is introduced to explain the observed empirical patterns of payment methods, and delivers important policy implications. A subsequent econometric analysis strongly supports the validity of the model.

JEL classification: F1, F4, G2, G3

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1. Introduction

Exchange takes time. For example, when a seller receives a purchase order that stipulates payment after delivery, the seller has to produce and ship a product before the buyer pays. This requires financing over short horizons because the seller may need to borrow working capital to complete the order or may purchase credit insurance to protect against counterparty defaults. That is the essence of trade finance. It is often described as the lifeline of business transactions because more than 90 percent of transactions involve some form of credit, insurance, or guarantee (International Trade Center, 2009). Despite its importance in international trade, however, it was not until the recent great trade collapse that trade finance came to the attention of academic researchers.[1]

This study aims to broaden the understanding of trade finance, in particular, the pattern of payment methods—pre-shipment payment; post-shipment payment; and letter of credit. One of the most fundamental questions in trade finance is what determines the pattern of payment methods because it essentially tells who is responsible for financing transactions, and thus who would most need liquidity support. This is particularly relevant in developing countries where the lack of trade finance is often cited as the main hindrance to trade, or in times of financial crisis when the overall drying up of trade finance could lead to the global collapse in trade (e.g., Auboin, 2015). The lack of understanding on the topic thus far stems largely from the unavailability of sufficiently detailed data.

The main contributions of this paper are twofold—empirical and theoretical. First, I provide a portrait of the pattern of payment methods in international trade by exploring the universe of Colombian and Chilean import transactions data, and document three main stylized facts.[2] Second, I develop a theoretical model that can explain these empirical

[1] The 2008-09 great trade collapse has been the motivation for a variety of theoretical and empirical exercises seeking to account for the much more dramatic collapse in trade relative to GDP. The role of trade finance in the great trade collapse has been discussed in Ahn (2013), Ahn, Amiti, and Weinstein (2011), Amiti and Weinstein (2011), Auboin (2009), Berman, de Sousa, Martin, and Mayer (2012), Berman and Martin (2012), Bricongne, Fontagné, Gaulier, Taglioni, and Vicard (2012), Chor and Manova (2012), Niepmann and Schmidt-Eisenlohr (2013b), and Paravisini, Rappoport, Schnabl, and Wolfenzon (forthcoming). Other hypotheses on the great trade collapse include product composition effects (Levchenko, Lewis, and Tesar, 2010), inventory adjustment (Alessandria, Kaboski, and Midrigan, 2010), vertical integration effects (Bems, Johnson, and Yi, 2010), and other demand factors (Eaton, Kortum, Neiman, and Romalis, 2011).

[2] Given that the choice of payment methods is made between the importer and the exporter, it is critical to consider the characteristics of both sides involved in the transaction, which requires importer- and/or exporter-level transaction data with payment method information. The unique feature of these datasets—which identify the payment method used in each transaction, in addition to the fact that the majority of importers or exporters trade with multiple partners from different countries— enhances the quality of econometric analysis because it allows for exploiting within-firm variations, effectively controlling for firm-level characteristics such as nonpayment risks or financing conditions. Rare exceptions with buyer-seller matched transactions data include Antràs and Foley (forthcoming) using data from a single U.S. food exporter and Klapper, Laeven, and Rajan (2012) using data from a factoring company. Other sources for the information on patterns of payment methods include the bank-level trade finance survey, which collects first-hand information from commercial banks on market conditions for trade finance (Asmundson et al., 2011; IMF- BAFT, 2009; ICC, 2010).

findings, conveying important policy implications distinct from those in other theoretical models. The model is then taken to the data to test the main predictions of the model.

A comprehensive look at the data reveals that the post-shipment payment term is the predominant payment method in Colombian and Chilean imports. It accounts for as much as 90 percent of the total import transaction value in Colombia, and around 80 percent of the import transaction value in Chile, while letters-of-credit transactions covering only 5 percent of the Colombian import value and around 10 percent of the Chilean import value. Such a high prevalence of the post-shipment payment terms in Chilean and Colombian imports is at odds with existing theoretical models of trade finance or trade credit. It further shows that a substantial level of variation across source countries is mainly explained by exchange controls on payment methods. Controlling for goods- and firm-level fixed effects, as well as other country-level characteristics, econometric analysis does not lend support for the incomplete contract approach developed in previous studies. (Section 3).

This paper proposes an alternative model of trade finance by explicitly considering the peculiar feature of account receivables financing. According to this model, the predominance of the post-shipment payment term can be explained by the self-liquidating and recourse nature of account receivables financing—when a trade finance loan is made with account receivables (i.e., trade credits) as collateral, it becomes self-liquidating and the lender retains recourse to the borrower. In practice, account receivables further offer a broader range of financing options such as trade credit insurance, factoring, and securitization, all of which make trade financing less costly or safer than otherwise. The model predicts that cross-country variation in the share of transactions paid by post-shipment payment terms should be well explained by the degree of account receivables financing market development. This specific mechanism offers a particular channel through which financial development improves the efficiency of trade. The model is further developed to derive the implication of the relationship between trading partners with regard to the pattern of payment methods, which is used as an additional hypothesis to evaluate the validity of the model (Section 4).

By employing the total factoring value in share of exports as a proxy measure for the degree of account receivables financing market development, both Chilean and Colombian imports data support the first prediction of the model: the post-shipment payment term is more likely to be chosen for a transaction when an exporting country has more developed account receivables financing market. Colombian import data with individual importer-exporter firm-level relationship information strongly support the second model prediction as well: controlling for importer- and exporter-level characteristics, the post-shipment payment term is more likely to be chosen for a transaction between trading partners with a stronger relationship in general, but such tendency is stronger for import transactions from countries with more developed account receivables financing market (Section 5).

Main findings of this study are expected to complement a growing literature that studies

the pattern of an optimal payment system in international trade. Schmidt-Eisenlohr (2013) shows that firms in a country with relatively lower financing costs or weaker enforcement of contracts offer trade credit to counterparty firms in a country with relatively higher financing costs or stronger enforcement of contracts. Olsen (2013) considers the optimal payment system in the presence of imperfect contract enforcement, and shows how bank intermediation mitigates such problems in international trade. Antràs and Foley (forthcoming) also offer a prediction on the pattern of an optimal payment system based on an imperfect contract approach and test the prediction using international transactions data from a single U.S. food exporter. Demir and Javorcik (2014) find supporting evidence for the incomplete contract approach using the Turkish industry-country level export data. Niepmann and Schmidt-Eisenlohr (2013a) investigate the use of letters of credit in exports by employing U.S. banking data.[3]

This paper also contributes to the trade credit literature, which offers various theoretical models that explain why trade credits exist. This includes transaction costs motive (Ferris, 1981)), suppliers' informational advantage over buyers (Biais and Gollier, 1997; Smith, 1987) or better ability in monitoring buyers' moral hazard (Burkart and Ellingsen, 2004). Empirical evidence on these theories is provided in Petersen and Rajan (1997), Love, Preve, and Sarria-Allende (2007), and Klapper, Laeven, and Rajan (2012) among others.

Other closely related literature includes studies on credit constraints and international trade. In the presence of fixed costs for exporting, credit-constrained firms find it difficult to finance such fixed costs and are discouraged from participating in exporting (Chaney, 2013). This can alter the patterns of trade, depending on industry-level financial vulnerability as well as the financial development of the countries (Manova, 2013); thus, financial development can become a source of comparative advantage (Kletzer and Bardhan, 1987; Ju and Wei, 2011), and there is scope for foreign banks to facilitate international trade by reducing informational asymmetry (Claessens, Hassib, and van Horen, 2015). Empirical studies find that financial development leads to a greater level of exports (Beck, 2002; Hur, Riyanto, and Raj, 2006), and credit-constrained firms are less likely to become exporters (Muûls, forthcoming).[4] Although this literature studies the comparison between non-exporting and exporting firms in terms of long-term fixed costs financing, the present paper focuses on the short-term aspect of trade financing.

[3] There is a newly emerging literature employing various types of trade finance data. This includes Auboin and Engemann (forthcoming) and Van der Veer (forthcoming) for export credit insurance, and Felbermayr and Yalcin (2013) for export guarantees.

[4] Greenaway, Guariglia, and Kneller (2007) find that the strong correlation between firms' financial health and exporting status rather comes from the reverse causality, that is, exporting improves firms' financial health.

1.1. Methods of Payment in International Trade

There are three major types of payment methods—post-shipment payment terms; pre-shipment payment terms; and letters of credit— in international trade, each of which is illustrated in <Figure 1>. The post-shipment payment (i.e., open account system) is when suppliers extend trade credit to buyers such that the intermediate goods are produced and shipped to buyers first and the payment is made later. The exact opposite is true for the pre-shipment payment (i.e., cash-in-advance system) in that the payment by buyers is made to suppliers prior to the production or delivery of the intermediate goods. Therefore, it is the supplier that is responsible for financing the post-shipment payment transaction and thus is exposed to non-payment risk from the buyer, while it is the buyer that is responsible for financing the pre-shipment payment transaction and is subject to non-delivery risk from the supplier.

In contrast to these, a letter of credit system involves a buyer's bank and a supplier's bank in such a way that the former guarantees the payment to the latter on behalf of buyers. By accepting the agreement, the supplier's bank becomes obliged to pay the supplier whether the buyer's bank actually pays or not.[5] As a result, the supplier's bank is exposed to non-payment risk from the buyer's bank.

2. Data

2.1. Colombian Transaction-level Import Data

One of primary datasets for this study comes from the import transaction database of the Colombian Directorate of National Taxes and Customs (DIAN) over the period 2008-11.[6] The value of import transactions in the data totals up to nearly 100 percent of the official import value reported by the Central Bank of Colombia. The unique feature of the data, even when compared to other countries' micro-level customs data, is that every observation is recorded at the transaction level with extremely detailed information. This includes the name of importers and foreign exporters *both* at the firm level and payment methods in addition to other routine items such as CIF value, quantity, 10-digit product codes, country of exports, and dates.[7]

Small transactions with a CIF value below US$100, which total .04 percent of the official import value, are excluded in the main analysis to remove noisy transactions. The sample is further restricted to import transactions from those countries that are covered by other

[5] This corresponds to the irrevocable confirmed letters of credit. Detailed descriptions on various kinds of letters of credit can be found, for example, in Venedikian and Warfield (2000).

[6] The main analysis of this paper will be based on the single year's data in 2011, and the previous 3 years' data will be used to provide the importer-exporter specific past transactions history.

[7] This dataset is also used in Ahn (2013), which focuses on letters-of-credit transactions during the 2008-09 financial crisis.

main country-level variables (see below), which account for 97 percent of the official import value in 2011.

Regarding the payment methods item, there are eleven different types of payment methods, most of which can be broadly reclassified into three major payment methods (i.e., post-shipment payment; pre-shipment payment; and letters of credit). Transactions with few types of payment methods that cannot fall into these three major payment methods, which account for 17 percent of the official import value in 2011, are excluded in the main analysis.[8] The consequent final dataset covers 80 percent of the official import value in 2011.

2.2. Chilean Transaction-level Import Data

The other part of primary datasets for this study is the import transaction database of the Chilean National Customs Service over the period 2008-11.[9] The value of import transactions in the data totals 89.5 percent of the official import value reported by the Central Bank of Chile in 2011. Unlike the Colombian data, this dataset cannot identify the counterparty of the transaction—foreign exporters—, but the data provide the same level of information in all other dimensions, such as the Chilean importer, payment methods, CIF value, quantity, 10-digit product codes, country of exports, and dates.

Small transactions with a CIF value below US$100, which total less than .02 percent of the official import value, are excluded in the main analysis to remove noisy transactions. The sample is further restricted to import transactions from those countries that are covered by other main country-level variables (see below), which account for 87 percent of the official import value in 2011.

Regarding the payment methods item, there are seven different types of payment methods, most of which can be broadly reclassified into three major payment methods (i.e., pre-shipment payment; post-shipment payment; and letters of credit). Transactions with few types of payment methods that cannot fall into these three major payment methods, which account for 2.7 percent of the official import value in 2011, are excluded in the main analysis.[10] The resulting final dataset covers 84.3 percent of the official import value in

[8] Eleven types of payment methods are in Spanish: (i) "PAGOS ANTICIPADOS"; (ii) "CARTA DE CREDITO SOBRE EL EXTERIOR"; (iii) "GIRO DIRECTO"; (iv) "MECANISMO DE COMPENSACION O CUENTA DE COMPENSACION EN EL EXT"; (v) "FINANCIACION DEL INTERMEDIARIO DEL MERCADO CAMBIARIO"; (vi) "FINANCIACION DIRECTA DEL PROVEEDOR"; (vii) "CREDITO EXTERNO DE MEDIANO Y LARGO PLAZO"; (viii) "ARRENDAMIENTO FINANCIERO - LEASING -"; (ix) "INVERSION EXTRANJERA DIRECTA"; (x) "COMBINACION DE ALGUNAS DE LAS ANTERIORES FORMAS DE PAGO"; (xi) "IMPORTACION QUE NO GENERA PAGO AL EXTERIOR." Cross-checking between Colombian import and Chilean export data—by Chilean exporter name, HS codes, value, and quantity— assigns (i), (ii), and (iii)-(vii) to pre-shipment payment, a letter of credit, post-shipment payment, respectively, and drops (viii)-(xi) in the analysis.

[9] The main analysis of this paper will be based on the single year's data in 2011, and the previous 3 years' data will be used to provide the importer-exporting country specific past transactions history.

[10] Seven types of payment methods are in Spanish: (i) "ANTICIPO"; (ii) "ACREDITIVO"/"CREDITO

2011.

2.3. Other Country-level Data

Additional country-level data are merged with the primary transaction-level data. The first set of the country-level data comes from the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER) database, which provides a description of the foreign exchange arrangements, exchange and trade systems, and capital controls of all IMF member countries. This has been the original source of the widely used capital control measures such as the Chinn-Ito Index (Chinn and Ito, 2008) and Quinn Index (Quinn, 1997), and also used in Wei and Zhang (2007) to construct the measure of controls on trade payment. Of particular interest to this paper is the item that records whether a member country imposes any policy measure that requires letters of credit for certain export transactions, which are expected to have first-order effects on the pattern of international payments across countries. Other country-level data include GDP data for 2010 from the World Development Indicators (WDI) database, bilateral distance data from CEPII (Mayer and Zignago, 2011), private credit to GDP ratio and total factoring value from the Global Financial Development Database (GFDD), legal origins data from LaPorta, Lopez-de-Silanes, Shleifer, and Vishny (1999), the degree of contract enforceability from Djankov, LaPorta, Lopez-de-Silanes, and Shleifer (2003), and Chilean bilateral FDI positions from the OECD database.

3. Empirical Facts and Discussion

3.1. Stylized Facts on Patterns of Payment Methods

This section documents empirical facts on the pattern of payments in import transactions in Colombia and Chile. Beginning with the aggregate level, <Figure 2> summarizes the share of international transactions financed by each payment system—pre-shipment; letter of credit; post-shipment—in Colombian and Chilean imports, both measured in terms of total import values in 2011. It reveals a striking predominance of the post-shipment payment system: the post-shipment terms account for 90 percent of total import transactions in Colombia, and 79 percent of total import transactions in Chile. On the other hand, letters of credit and pre-shipment payments are used to finance only about half the remaining transaction values, respectively.

BANCO 1 A 2 ANOS"; (iii) "COBRANZA HASTA 1 ANO"/"COBRANZA ENTRE 1 Y 2 ANOS"; (iv) "ANT/CRED"/"ANT/COB"; (v) "CBIM"/"CBOFU"/"CBOFA"; (vi) "OTRAS"; (vii) "SIN PAGO COBERTURA". Cross-checking between Colombian import and Chilean export data—by Chilean exporter name, HS codes, value, and quantity— assigns (i), (ii), and (iii) to pre-shipment payment, a letter of credit, post-shipment payment, respectively, and drops (iv)-(vii) in the analysis.

Fact 1 *The post-shipment term is the predominant payment method in import transactions in Chile and Colombia.*

The fact that the post-shipment payment term predominates in Colombian and Chilean import transactions is not as expected from previous theoretical models that study the pattern of payment systems in international trade. In particular, the sheer size of the share of transactions covered by the post-shipment terms—80−90 percent in countries such as Chile and Colombia— is by all means rather striking. For example, recent theoretical models based on incomplete contracts such as Antràs and Foley (forthcoming) and Schmidt-Eisenlohr (2013) predict that country-level contract enforceability would be the main determinant of optimal payment choice. According to these models, the post-shipment term is more likely to be chosen when, other things being equal, an importing country has a relatively stronger contract enforceability than an exporting country. Taking into account the level of contract enforcement in Chile and Colombia, the observed share of import transactions paid by the post-shipment terms in Chile and Colombia is not readily reconciled with these models.

Turning to the country-level, the first thing to consider is whether a country imposes any policy measure that restricts the choice of payment methods for international transactions because such policy will have first-order effects on the country's pattern of international payments. According to the IMF's AREAER, there were 28 countries that required letters of credit for certain export transactions in 2011.[11] <Figure 3> summarizes the share of import transactions financed by each payment system, separately for countries with an explicit policy requiring letters of credit and for countries without any such policy. As expected, those countries with such a policy tend to use post-shipment terms much less in their exports to Colombia and Chile, in favor of letters of credit.

Fact 2 *The share of Colombian and Chilean imports paid by the post-shipment term is significantly lower for imports from countries with payment control policies requiring letters of credit.*

Although hardly surprising, this fact confirms that existing payment control policies in a few countries are indeed binding in real-world cross-border transactions. When it comes to empirical investigation of the pattern of payment methods, it therefore implies that failing to control for such policies could possibly yield serious omitted variable bias.

Even after excluding those countries with the explicit policy measure requiring letters of credit, there remains a substantial level of variation in the use of each payment method

[11] Countries have different conditions under which international transactions are required to be settled by letters of credit; there are few countries that require all transactions to use letters of credit, while other countries require certain products, trade with certain countries, or transactions over certain values to be settled by letters of credit.

across trading partner countries. This is illustrated in <Figure 4> that plots the share of transactions by post-shipment terms in Colombian imports (y-axis) and Chilean imports (x-axis) from each exporting country. Such country level variation may be due to the difference in the composition of product types. There are theories suggesting that the pattern of payment methods may differ by product types (e.g., Hoefele, Schmidt-Eisenlohr, and Yu, 2013; Demir and Javorcik, 2014). Similarly, it could simply be the result of the composition of firm-level characteristics; it is possible that Chilean or Colombian importers that prefer the post-shipment payment terms for whatever reason happened to transact mostly with a certain group of countries, while the opposite is true for the other group of countries. As far as evaluating the country-level determinants of the pattern of payment methods is concerned, it will be thus crucial to control for any product- and firm-level characteristics.

<Table 1> summarizes regression results from the importer-exporter country-6 digit HS product-level Colombian and Chilean import data. Importer-HS6 level fixed effects in all columns absorb any importer- as well as product-specific characteristics. As a result, all specifications explore country-level variation within a given importer-HS6 pair, and thus actual samples are restricted to importers that imported a certain HS6-level product from multiple countries. The dependent variable is the share of transactions paid by the post-shipment term in total transaction values at the importer-exporter country-6 digit HS product level, and defined between 0 and 1. Independent variables include country-level variables such as GDP in 2010 and distance, both in log. Private credit to GDP ratio is added as a proxy for the degree of financial development. Dummy variables that measure the degree of contract enforceability in exporting countries are also included to check the extent to which incomplete contracts matter in determining the pattern of payment methods; these are common law dummy variable and enforceability of contracts dummy variable (below and above median) *a la* Antràs and Foley (forthcoming). Of particular interest in this analysis is the dummy variable for letter-of-credit requirement policy. This has the straightforward interpretation and checks the second stylized fact, but, more importantly, could speak for the relevance of potential omitted variable bias when not included. Standard errors are clustered at the exporting country-HS6 level.[12]

Column (1) shows a negative and statistically significant coefficient estimate on the common law dummy variable for Colombian import transactions. This is consistent with the prediction from the incomplete contract approach in that transactions are less likely to occur on post-shipment payment terms as an exporting country has a stronger contractual enforcement. However, as the letter-of-credit requirement policy variable is added, the

[12] It is equally plausible that standard errors are correlated within importer-HS6 level or exporting country-HS6 level. Since importer-HS6 fixed effects are expected to partially address correlated standard errors within that level, I chose clustering at the exporting country-HS6 level in all the results reported in this draft. They are all robust to clustering at the importer-HS6 level.

estimated coefficient on the common law dummy variable in column (2) becomes statistically insignificant, suggesting the previous result in column (1) possibly driven by the omitted variable bias. A similar pattern is reported for Chilean import transactions. The estimated coefficient on the common law dummy variable in column (5) is statistically insignificant but negative, only to be overturned as the letter-of-credit requirement policy variable is added. This highlights potential omitted variable bias in other studies that overlook the role of payment control policies in investigating country-level determinants of payment methods. Regression results by replacing the common law dummy variable with the degree of contract enforceability constructed by Djankov et al (2003) are reported in columns (3)-(4) for Colombian imports and (7)-(8) for Chilean imports. The coefficient estimate on the contract enforceability variable is now positive and statistically significant in all columns. This is somewhat counter-intuitive in that incomplete contract approach tends to predict the opposite sign—the stronger contract enforceability in exporting countries, the more likely pre-shipment payment terms to be used. As for the payment control policy variable, all columns show qualitatively and quantitatively similar results: as expected, the coefficient estimate of the policy dummy variable is negative and statistically significant for both Colombia (column 2 and 4) and Chile (column 6 and 8). Any given importer in Colombia and Chile tends to have the same product paid in post-shipment term by around 10 percentage points lower, when the exporting country imposes an explicit policy requiring letters of credit for their exports.

In order to take into account the potentially distinct nature of inter-firm and intra-firm transactions, columns (1)-(4) in <Table 2> reports regression results for Colombian imports by dropping intra-firm transactions, which were identified by the name of importer and exporter firms in each transaction.[13] Since the identity of foreign exporters are not available in Chilean data, columns (5)-(8) in <Table 2> instead adds the bilateral country-level FDI share in Chile's total FDI as a proxy for the share of intra-firm imports in total trade.[14] Both yield basically similar results with those reported in <Table 1>. All of the results are robust to using fractional response models (unreported), which take into account the fact that the dependent variable is bounded between 0 and 1.

Overall, after effectively removing firm-level and product-level characteristics, only the policy dummy variable and distance variable show robust signs and remain to be highly significant, both economically and statistically across all specifications, while other country-

[13] According to this identification scheme, the share of intra-firm imports from the U.S. in total imports from the U.S. in 2011 is 12%, compared to 18.8% from the official statistics for the U.S. exports to Colombia in 2011 by the U.S. Census Bureau. Note that FDI related import transactions that cannot fall into one of three major payment methods and thus are dropped from the main sample account for 3.4% of total imports (payment methods "INVERSION EXTRANJERA DIRECTA"; see footnote 8).

[14] FDI data by partner countries come from the OECD database. The country-level FDI share variable is constructed as the sum of outward and inward FDI stocks for a given country divided by Chile's total outward and inward FDI stocks, both in 2011.

level variables are less stable across specifications and countries considered. Most importantly, those variables that measure the degree of contract enforceability do not show predicted signs from the incomplete contract approach.

Fact 3 *Once firm-level and product-level characteristics are effectively removed and the payment control policy is controlled for, evidence for the incomplete contract approach is at best mixed.*

3.2. Discussion

According to those stylized facts above, an elephant in the room is a high prevalence of the post-shipment payment terms in Colombian and Chilean import transactions. Further, an incomplete contract approach seems not the only, if any, mechanism that can explain cross-country variation in the pattern of payment methods in international transactions.[15]

In this paper, by carefully considering how trade credit is used for trade financing in practice, I propose that the account receivables financing mechanism is the missing element that could explain both: a high prevalence of the post-shipment payment terms in general and cross-country variation in the pattern of payment methods.

An interesting feature of trade financing in the post-shipment payment term is that suppliers can pledge trade credit as collateral.[16] That is, a trade finance loan is backed by self-liquidating trade credits (i.e., account receivables): the payment from the buyer is made directly to the lending bank, whereby the trade finance loan is automatically deducted before being transferred to the supplier's account. It is also subject to recourse: when the buyer fails to make the payment (i.e., trade credit defaults), the supplier is responsible for the repayment to the lending bank. Therefore, the lending bank will fail to collect the loan repayment only if *both* supplier and buyer default. This is why a trade finance loan is often viewed as safer than other types of loans (e.g., IMF, 2003). This self-liquidating and recourse nature of account receivables financing makes, this paper argues, trade financing cost of the post-shipment payment transaction less expensive than that of other payment methods. In addition, account receivables offer a broader range of financing options such as

[15] There is an extensive set of theoretical models in the trade credit literature that tended to focus exclusively on domestic transactions. The main question in the literature has been why buyers borrow from suppliers instead of banks, or, to put it differently, why trade credit exists at all. Trade credit theories have offered answers based on the idea that suppliers have an advantage over banks in monitoring or liquidating collateral—owing partly to input illiquidity—, which may not be easily extended to international transactions because it is questionable if foreign suppliers would have such advantage over domestic banks, given the weaker cross-border contract enforceability and/or greater cross-border informational friction. Alternative theories based on firm-level determinants, such as market power or financing conditions, do not seem to be able to explain the observed pattern well either, because it would require an implausibly skewed distribution of market power or financial conditions between importers and exporters.

[16] Burkart and Ellingsen (2004) consider the implication of trade credits as pledgeable assets on drawing additional loans.

trade credit insurance, factoring, and securitization, and hence, the post-shipment payment term becomes more appealing to both buyers and suppliers.

As long as the strength of the account receivables financing mechanism varies across countries, this can explain not only the predominance of the post-shipment payment terms in general, but also its cross-country variation. A weaker account receivables financing mechanism could stem from several reasons; it could simply be the reflection of the fact that some countries are actively engaged in subsidizing trade finance, often targeted at letters of credit owing to their non-fungibility.[17] It could also be the legacy of past foreign exchange control policies not captured in the present AREAER database.[18] In any case, such present and past credit policies and foreign exchange regulations in some countries would have dampened the incentive to use trade credits and thus, in turn, hindered the development in the account receivables financing market, generating cross-country variation in the degree of account receivables financing market development.

Lastly, to the extent that the degree of contract enforceability in <Table 1> and <Table 2> actually reflects the degree of enforcing recourse clause in the account receivables financing, the positive sign of the estimated coefficient on the variable can be also consistent with this mechanism: a stronger contract enforceability leads to a more developed account receivables financing market, and hence to a higher share of exports paid on post-shipment payment terms.

Conjecture 1 *The unique mechanism in account receivables financing that features the self-liquidating and recourse nature can explain the predominance of the post-shipment payment terms in general as well as its cross-country variation.*

The following section will formalize this conjecture and derive testable hypotheses to be

[17] The recent drop in metal prices precipitated by China's credit tightening, as widely covered by the media (e.g., *Financial Times* (2014)), stems from the implicit policy targeted at letters of credit in China; imported metals have become popular forms of collateral mainly because import letters of credit are cheaper and easier to get than other types of credit.

[18] For instance, China regulated the ratio of the trade credit balance and payment periods for exporters and importers until recently under the State Administration of Foreign Exchange (SAFE). In Korea, it was not until 1999 that the choice of payment methods in international trade was fully liberalized under the Foreign Exchange Transaction Act. <Figure 5> describes the evolution of the share of Korean trade financed by letters of credit since 1990, revealing two interesting facts. First, foreign exchange control policies were binding in that the relaxation of the payment methods regulation toward pre- and post-shipment payment terms coincides with the declining share of letters-of-credit transactions. Second, even a decade after the full liberalization, letters-of-credit transactions account for around 20 percent of international trade, which seems relatively high compared to present data from Colombia and Chile. This could be due to the fact that Korean exporters, importers, and banks are so accustomed to using letters of credit from their long experience under the previous regulation. Similarly, there may be a vicious circle at work: active use of letters of credit in the past for whichever reasons could have yielded underdeveloped lending technology in terms of assessing the collateral value of underlying account receivables (e.g., screening/evaluating the creditworthiness of foreign trading partners or export contracts), deterring the use of account receivables backed financing. A more detailed analysis on South Korean trade by payment methods can be found in Hong (2011) and Shin (2005).

taken to the data subsequently.

4. A Model

This section presents a model of trade finance, with particular attention to actual practices of each payment method. The main element of the model that distinguishes itself from previous models is the explicit consideration of the self-liquidating and recourse nature of account receivables financing, which enables us to predict empirical findings reported above while preserving most of the properties from other theoretical models. The model also features firm-level heterogeneity in default probability, and hence that in borrowing costs, to replicate the coexistence of multiple payment systems in bilateral trade. In addition, the model allows for other country-level variables in reduced forms to incorporate insightful properties from other models such as imperfect contract enforcement. This greatly helps to make the current model comparable to others.

4.1. Environment

A random matching process provides a unique supplier-buyer relationship between producers of intermediate goods and final goods. Once a random match is made between a supplier and a buyer, the supplier has the exclusive right to provide the inputs to the corresponding buyer who, in turn, produces and sells final goods to domestic consumers. Both suppliers and buyers are assumed to be risk neutral such that suppliers set the price for intermediate goods to maximize their own expected profit, and similarly final goods producers set the final goods price to maximize their expected profit.[19]

Each transaction can be domestic (D) or international (F), depending on the geographical location of each matched buyer and supplier. International transactions incur variable trade costs that take the form of an iceberg-type cost ($\tau_F > 1$), whereas domestic transactions are free of such trade costs ($\tau_D = 1$). This distinction intends to capture various sources of possible trade costs such as transportation costs.

A final goods producer transforms a unit of intermediate goods into final goods without any additional cost. Accordingly, the demand for intermediate inputs (q_s) follows exactly the demand for final goods (q_b):

$$q_s = q_b = q = Ap_b^{-\sigma}, \tag{1}$$

where A denotes the demand level for final goods, $\sigma = \frac{1}{1-\rho} > 1$ is the constant elasticity of substitution across varieties, and p_b is the price of final goods. Intermediate goods are

[19] The main discussion of the model can be readily extended to other types of trade finance facilities (e.g., export credit insurance) by introducing risk averse agents. It is important to note that the basic ground for other facilities such as export credit insurance will be also account receivables, consistent with the main argument of the present paper.

produced with a unit working capital requirement technology such that one unit of working capital (with unit cost w) is required to produce one unit of intermediate goods.

Firms are heterogeneous in the level of default probability: when a firm defaults, it fails to fulfill any commitment and is assumed to get zero payoff. The probability that a firm does not default throughout the transaction cycle is defined as $0 \leq \chi \leq 1$.[20] The country-level contract enforceability $0 \leq \phi_C \leq 1$ is introduced *a la* Antràs and Foley (forthcoming) and Schmidt-Eisenlohr (2013) such that when a firm in country C defaults, the counterparty firm can recover ϕ_C fraction of claims.[21] For notational simplicity, no internal financing is assumed and the only available financing in this model will be external, namely borrowing from banks. This assumption makes the default probability the only source of borrowing cost heterogeneity across firms in this model.[22]

As in other studies on trade finance, one of the novel features of the present model is the introduction of the three main modes of payment system—post-shipment payment (OA); pre-shipment payment (CA); and a letter of credit (LC). The subsequent sections will go over each payment system step by step, and provide conditions under which each mode is chosen as the optimal payment system by either party to the transaction. As for the exporter country-level variation in the strength of the account receivables financing mechanism, which will be discussed in detail below, $0 \leq \xi_{sC} \leq 1$ is introduced in deriving the trade financing cost under post-shipment payment terms.

In terms of the specific timing of events, the transaction cycle of the post-shipment payment system begins with the delivery of intermediate goods at $t = 0$, and ends with the payment from the buyer to the supplier (hence, with loan repayment by borrowers) at $t = 1$. Similarly, a letter of credit transaction begins with the delivery of intermediate goods at $t = 0$, and ends with the payment from the buyer's bank to the supplier's bank (and the subsequent loan repayment from the buyer) at $t = 1$, whereas the transaction cycle of the pre-shipment payment system begins with the buyer's advance payment to the supplier at $t = 0$, and ends with the delivery of intermediate goods (and the subsequent final goods

[20] The default probability is assumed as exogenous and publicly known in the baseline model, but this assumption is relaxed later when the trading partner relationship is considered. See Ahn (2011) for a model with endogenous default probability based on informational friction between counterparty banks and firms in a transaction.

[21] For inter-bank claims, a constant contract enforceability of ϕ_{BB} is assumed. On the other hand, lending banks are assumed to recover none of claims when borrowing firms default (i.e., $\phi = 0$). As long as $\phi_C > 0$, the model, therefore, allows foreign suppliers, as well as foreign buyers, to have the advantage over domestic lenders in terms of recovery. This makes the present model comparable to previous theoretical models in the trade credit literature by sharing the property that suppliers have advantage over banks in monitoring buyers or liquidating buyers' assets.

[22] Additional sources of borrowing cost heterogeneity could be introduced by considering firm-specific collateral assets or borrowing needs, which will basically reflect the financial health of each firm. For instance, Ahn (2011) introduces a fraction of working capital that can be used as collateral. A direct implication is that firms may have different values of collateralizable assets or use different technology in terms of tangible input usage, but this can be more broadly interpreted as any other firm characteristic that leads to different borrowing costs across firms.

sale and loan repayments) at $t = 1$.[23,24]

4.2. Post-shipment Payment (OA)

Buyer's Problem On receiving the intermediate goods from a supplier, a buyer transforms them into the final goods, which are then sold to domestic consumers. As long as the buyer does not default until the end of the transaction cycle (with probability χ_b), the buyer receives revenue from the sales of final goods, and then makes the payment (i.e., account payable) to the supplier. Since the revenue from the sales of final goods is enough to cover the inputs payment, the buyer does not need to borrow from a bank. Taking an input price p_s as given, the buyer solves the simple expected profit maximization problem:

$$\max_{p_b} E\left(\Pi_b^{OA} | \chi_b\right) = p_b q - p_s q \tag{2}$$

to set the optimal price for the final goods as a markup over marginal cost:

$$p_b = \frac{1}{\rho} p_s \tag{3}$$

Supplier's Problem A supplier providing q units of intermediate goods needs $q\tau w$ value of working capital. Since, by extending trade credits to the buyer, the payment from the buyer will be made to the supplier only after the delivery, the supplier has to finance the working capital from a bank at the interest rate r_s^{OA}, hence the cost function becomes $q\tau w r_s^{OA}$. If the buyer defaults and cannot fulfill the payment, the supplier can recover only the fraction of the account receivable, depending on the degree of contract enforceability in the buyer's country, $0 \leq \phi_{bC} \leq 1$. Consequently, taking the interest rate as a given, the supplier maximizes the expected profit conditional on his/her own non-default (with probability χ_s) as in:

$$\max_{p_s} E\left(\Pi_s^{OA} | \chi_s\right) = \chi_b p_s q + (1 - \chi_b) p_s q \phi_{bC} - q\tau w r_s^{OA} \tag{4}$$

Taking into account the probability of non-payment by the buyer, the optimal price for the intermediate goods is set as a markup over marginal cost:

$$p_s = \frac{1}{\rho} \tau w r_s^{OA} \left[\frac{1}{\chi_b + (1 - \chi_b)\phi_{bC}}\right] \tag{5}$$

A risk-neutral supplier charges a higher price to a buyer with a higher default probability to compensate expected losses from the non-payment, which also depends on the recovery ratio (i.e., ϕ_{bC}).

[23] The length of transaction cycles (t) can be allowed to vary across country pairs or shipping modes *a la* Ahn et al. (2011) and Berman et al. (2012).

[24] Note that the price of final goods, as well as that of intermediate goods—hence the sales quantity—, is optimally determined at the very beginning of each transaction, and a buyer will have no incentive to change the final goods price after the intermediate goods are delivered as ordered.

Bank's Problem A bank lends working capital ($q\tau w$) to a supplier and expects to receive gross repayment ($q\tau w r_s^{OA}$) from the supplier. An interesting feature of trade financing in the post-shipment payment system is that it is backed by account receivables and thus self-liquidating, and the lending bank retains the recourse to the supplier. Therefore, the lending bank fails to receive loan repayment only if both supplier and buyer default during the transaction cycle (with probability $(1-\chi_s)(1-\chi_b)$).

The banking sector is assumed to be competitive such that the bank sets the lending rate by equalizing the expected profit with the opportunity cost of lending (or cost of funding):

$$[1-(1-\chi_s)(1-\chi_b)]\, q\tau w r_s^{OA} = q\tau w i_{sC} \tag{6}$$

where i_{sC} is the risk-free gross return rate, that is, the deposit rate at the central bank in the supplier's country. The interest rate is then set as:

$$r_s^{OA} = \frac{i_{sC}}{[1-(1-\chi_s)(1-\xi_{sC}\chi_b)]}, \tag{7}$$

where $0 \leq \xi_{sC} \leq 1$ is introduced to reflect potential variations in the strength of the account receivables financing mechanism across exporter countries.

It is intuitive that the borrowing cost is increasing in the bank's funding cost (i_{sC}) and supplier's default probability ($\frac{\partial r_s^{OA}}{\partial \chi_s} < 0$). More interestingly, it is also increasing in the buyer's default probability because the value of collateral (i.e., account receivable) declines as the buyer is more likely to default. Overall, the self-liquidating and recourse nature of trade financing loans backed by account receivables will be, other things being equal and unless the default probability is perfectly correlated, less costly than other types of general loans solely dependent on the borrower's repayment probability. Such a tendency will be stronger as the account receivables financing mechanism is stronger, that is higher ξ_{sC}, in exporter countries.

To sum up, the borrowing cost in equation (7) enters the intermediate goods price in equation (5), which in turn determines the final goods price in equation (3) as:

$$p_b^{OA} = \frac{1}{\rho^2}\tau w r_s^{OA}\left[\frac{1}{\chi_b + (1-\chi_b)\,\phi_{bC}}\right], \tag{8}$$

4.3. Pre-shipment payment (CA)

Buyer's Problem A buyer needs to pay a supplier before the intermediate goods are shipped and delivered. If the supplier defaults and cannot complete the shipment, the buyer can recover only the fraction of the scheduled shipment, depending on the degree of contract enforceability in the supplier's country, $0 \leq \phi_{sC} \leq 1$. To finance the advance payment, the buyer needs to borrow from a bank at the interest rate r_b^{CA}. The cost function for the buyer

is thus $p_s q r_b^{CA}$, and taking the interest rate and the intermediate goods price as given, the buyer maximizes expected profit:

$$\max_{p_b} E\left(\Pi_b^{CA}|\chi_b\right) = \chi_s p_b q + (1-\chi_s)\, p_b q \phi_{sC} - p_s q r_b^{CA}$$

to set the optimal price for the final goods, taking into account the probability of non-delivery from the supplier, as a markup over marginal cost:

$$p_b = \frac{1}{\rho} \frac{p_s r_b^{CA}}{[\chi_s + (1-\chi_s)\,\phi_{sC}]} \tag{9}$$

A risk-neutral buyer charges a higher price for the final goods as non-delivery risk from a supplier is higher, but relatively less so when a recovery ratio (ϕ_{sC}) is higher.

Bank's Problem A bank supports the transaction by lending to a buyer so that the buyer can make advance payment to a supplier. The bank will be able to collect the full loan repayment from the buyer only if the buyer does not default (with probability χ_b). The bank equates the expected profit with the opportunity cost of lending in a following way:

$$\chi_b p_s q r_b^{CA} = p_s q i_{bC} \tag{10}$$

to set the optimal interest rate charged to a buyer with non-default probability χ_b as:

$$r_b^{CA} = \frac{i_{bC}}{\chi_b} \tag{11}$$

The borrowing cost for a buyer increases with the bank's cost of funding in a buyer's country (i_{bC}), and decreases with the non-default probability (χ_b).

Supplier's Problem Since the advance payment made by the buyer can be used for working capital financing, a supplier does not need to borrow from a bank. More interestingly, a buyer's default after the payment no longer affects the supplier's profit. The corresponding expected profit for a supplier becomes:

$$\max_{p_s} E\left(\Pi_s^{CA}|\chi_s\right) = p_s q - q\tau w$$

yielding the optimal price for the intermediate goods as:

$$p_s = \frac{1}{\rho}\tau w \tag{12}$$

Plugging the input price expressed in equation (12) and the borrowing cost expressed in equation (11) into the final goods price in equation (9), the final goods price is expressed as:

$$p_b^{CA} = \frac{1}{\rho^2}\tau w r_b^{CA}\left[\frac{1}{\chi_s + (1-\chi_s)\,\phi_{sC}}\right] \tag{13}$$

4.4. A Letter of Credit (LC)

Buyer's Problem By issuing a letter of credit, a buyer's bank obligates itself to pay a supplier's bank on behalf of a buyer. From the bank's perspective, the letter of credit issuance essentially amounts to providing a loan to the buyer because the buyer's bank makes a payment to the supplier's bank first and gets reimbursement from the buyer later. The letter of credit fee for the buyer is thus similarly set as the interest rate for a loan, and the cost function for a buyer is expressed as $p_s q r_b^{LC}$. Taking the fee as a given, the buyer maximizes the expected profit as:

$$\max_{p_b} E\left(\Pi_b^{LC} | \chi_b\right) = p_b q - p_s q r_b^{LC}$$

that yields the optimal final goods price as:

$$p_b = \frac{1}{\rho} p_s r_b^{LC} \tag{14}$$

Issuing Bank's Problem (Buyer's Bank) Once the agreement to use a letter of credit is made and the intermediate goods are shipped, the buyer's bank has to meet the obligation to pay the supplier's bank. Unless the buyer defaults, the bank receives the repayment at the gross interest rate r_b^{LC} (i.e, a letter of credit fee). The expected profit of the buyer's bank is then equated with the opportunity cost:

$$\chi_b p_s q r_b^{LC} = p_s q i_{bC} \tag{15}$$

and the corresponding optimal interest rate (a letter of credit fee) is exactly the same to the lending rate to a buyer in the pre-shipment payment case above:

$$r_b^{LC} = \frac{i_{bC}}{\chi_b} \tag{16}$$

Supplier's Problem The supplier's bank is promised to receive the payment from the buyer's bank on behalf of the buyer, but at the same time guarantees to pay the supplier whether the buyer's bank actually pays or not. Since the supplier receives the payment only after the delivery of the inputs, the supplier still faces the working capital financing problem. A supplier borrows the total working capital from the bank using the letter of credit proceeds as collateral, which also features self-liquidating property but non-recourse in this case. In practice, a supplier receives the proceeds in advance with discount rate δ, from the supplier's bank. Taking the discount rate as a given, the supplier's expected profit function becomes:

$$\max_{p_s} E\left(\Pi_s^{LC}|\chi_s\right) = p_s q\left(1-\delta\right) - q\tau w$$

and the optimal price for the intermediate goods is set as:

$$p_s = \frac{1}{\rho}\frac{1}{\left(1-\delta\right)}\tau w \tag{17}$$

The higher the discount rate charged, the higher the price of the intermediate goods.

Confirming Bank's Problem (Supplier's Bank) The supplier's bank would receive the payment from the buyer's bank only if the buyer's bank does not default (with probability χ_{BB}), while the guaranteed payment is made to the supplier irrespective of the buyer's bank default. As discussed above, the supplier's bank disburses the proceeds in advance with discount rate δ, to the supplier. The supplier's bank equates the following expected profit with the opportunity cost:

$$\chi_{BB} p_s q + \left(1-\chi_{BB}\right) p_s q \phi_{BB} = \left(1-\delta\right) p_s q i_{sC} \tag{18}$$

where χ_{BB} and ϕ_{BB} denote the buyer's bank's non-default probability and the contract enforceability between banks. This yields the discount rate charged to a supplier for a letter of credit issued by a bank with the non-default rate χ_{BB} as:

$$\frac{1}{\left(1-\delta\right)} = \frac{i_{sC}}{\left[\chi_{BB} + \left(1-\chi_{BB}\right)\phi_{BB}\right]} \tag{19}$$

It is intuitive that the discount rate will be higher as the buyer's bank is more likely to default or the cost of fund is higher.

Substituting the supplier bank's optimal discount rate from equation (19) into equation (17), which in turn enters equation (14) together with equation (16), the final goods price is expressed as:

$$p_b^{LC} = \frac{1}{\rho^2}\tau w \frac{i_{bC}}{\chi_b}\frac{i_{sC}}{\left[\chi_{BB} + \left(1-\chi_{BB}\right)\phi_{BB}\right]} \tag{20}$$

4.5. Optimal Payment System

Depending on who has control over the choice of payment systems, the payment system that gives the highest expected profit for the corresponding entity will be chosen as an optimal payment system for a transaction between a given buyer-supplier pair (χ_b, χ_s). The overall pattern of optimal payment system in this model depends on country-, buyer-, and supplier-level characteristics as well as the joint distribution of buyers and suppliers and the matching process between them. This section compares key variables across payment

systems as summarized in <Table 3>, and performs simple comparative statics analysis to discuss conditions under which each payment system is optimally chosen for a transaction. The key property of the model will be that typical country-level determinants of the pattern of the payment system play a limited role in the presence of the account receivables financing mechanism that strongly favors the post-shipment payment term.

Hypothesis 2 *The model of trade finance based on the account receivables financing mechanism predicts that, other things being equal, transactions are more likely to occur on the post-shipment payment term as the account receivables financing market is more developed in an exporter's country.*

Symmetric case First consider the choice between the post-shipment term and pre-shipment payment term for a symmetric case in which $\chi_b = \chi_s$, $\phi_{bC} = \phi_{sC}$, and $i_{bC} = i_{sC}$. Comparing the intermediate goods price (p_s) in two payment systems, it is clear that a supplier always charges a higher price for the intermediate goods under the post-shipment payment system, by the amount of trade financing cost (r) and the (effective) probability of successful payment from the buyer ($1/\left[\chi_b + (1-\chi_b)\,\phi_{bC}\right]$). The former reflects that the supplier is responsible for financing the transaction, which therefore enters the supplier's marginal cost. The latter stems from the risk-neutral supplier's optimal pricing behavior to take into account the non-payment probability from the buyer's side: a lower intermediate goods price is charged to a buyer with lower default probability (i.e., higher χ_b). This offers a unique explanation for the stylized fact in the trade credit literature that the price offered via trade credits (implied by the discount rate in the early payment option) is often more expensive than the general bank-borrowing rate, which gives rise to the long-standing puzzle—why are trade credits widely used despite such high prices?

On the contrary, the final goods price (p_b) will always be lower when a transaction is supported by the post-shipment payment system than when it is undertaken by the pre-shipment payment system. The final goods price between two payment systems differs only by trade financing cost (r). This is because the risk-neutral buyer also factors in the non-delivery risk from the seller's side when setting an optimal final goods price in the pre-shipment payment system. As for the difference in the cost of trade financing, it is easy to see that, in the symmetric case, the cost of financing the post-shipment payment system is, unless the account receivables financing mechanism does not work at all (i.e., $\xi_{sC} \neq 0$), always lower than that of financing the pre-shipment payment system (i.e., $r_b^{CA} > r_b^{OA}$), precisely because of the self-liquidating and recourse nature of the financing backed by account receivables, consistent with the general notion among practitioners that a trade finance loan is safer than other types of loans (i.e., $1-(1-\chi_s)\,(1-\xi_{sC}\chi_b) > \chi_b$).

Since the final goods demand is decreasing with the final goods price from equation (1) (i.e., $\partial q/\partial p_b < 0$), the expected profit for a supplier will be always greater in the post-

shipment payment system (i.e., $r_s^{OA} q^{OA} > q^{CA}$), and thus a supplier will always prefer the post-shipment payment system to the pre-shipment payment system. Similarly, a buyer also finds the post-shipment payment system always more profitable than the pre-shipment payment system (i.e., $\left(p_b^{OA}\right)^{1-\sigma} > \left[\chi_s + (1-\chi_s)\,\phi_{sC}\right]\left(p_b^{CA}\right)^{1-\sigma}$).

The important difference between the present model and other trade finance models is that, unlike their prediction that firms will be indifferent in choosing between the post-shipment payment and pre-shipment payment system when countries (as well as firms in an implicit manner) are symmetric, the present model suggests that both buyers and suppliers will prefer the post-shipment payment system. This also offers a unique explanation for the wide use of trade credits in general—the account receivables financing mechanism—, which has not been discussed in the trade credit literature.

Comparative statics Considering a deviation from the country-level symmetry condition (i.e., $i_{bC} \neq i_{sC}$ or $\phi_{bC} \neq \phi_{sC}$), holding the firm-level symmetry condition fixed (i.e., $\chi_b = \chi_s$), gives qualitatively similar predictions from previous studies (Antràs and Foley, forthcoming); Schmidt-Eisenlohr, 2013): as the bank's funding cost in the supplier's country is relatively higher than that in the buyer's country, the pre-shipment payment system becomes more attractive for both suppliers and buyers, and the same is true as the contract enforceability in the supplier's country is relatively stronger than the contract enforceability in the buyer's country. However, this model predicts that the sensitivity of the choice in the optimal payment system to variations in country-level parameters will be relatively limited because of the presence of the account receivables financing mechanism discussed above that unambiguously works toward the post-shipment payment system under the symmetric condition. In other words, it requires sufficiently large asymmetries in country-level determinants for the pre-shipment payment system to be chosen as an optimal payment method in this model. This will be relatively more so, as the account receivables financing mechanism is stronger (i.e., $\xi_{sC} \to 1$).

A firm-level heterogeneity in the default probability allows a richer prediction of the within-country share of each payment system. Considering a deviation from the firm-level symmetry condition (i.e., $\chi_b \neq \chi_s$), holding country-level parameters fixed at the symmetric case, shows that as a buyer's default probability is lower, final goods prices for both the post-shipment payment and pre-shipment payment system decline because it reduces the cost of trade financing in both cases as well as the intermediate goods price charged by a supplier in the post-shipment payment system. Which payment system becomes relatively more attractive depends on model parameter values. Intuitively, it will make the pre-shipment payment system more attractive when the contract enforceability in a buyer's country is sufficiently strong because the marginal impact of a decrease in the buyer's default probability on the supplier's expected payoff rate is decreasing with the degree of

contract enforceability in a buyer's country (i.e., $\partial^2 \left[\chi_b + (1-\chi_b)\,\phi_{bC}\right]/\partial\chi_b\partial\phi_{bC} < 0$). The opposite will be true when the contract enforceability in a buyer's country is sufficiently weak. Similarly, as a supplier's default probability declines, the pre-shipment payment system can become either more attractive or less attractive depending on parameter values. The intuition will be that it makes the pre-shipment payment system more attractive when the contract enforceability in a supplier's country is sufficiently weak because the marginal impact of a decrease in the supplier's default probability on the buyer's expected payoff rate is decreasing with the degree of contract enforceability in a supplier's country (i.e., $\partial^2 \left[\chi_s + (1-\chi_s)\,\phi_{sC}\right]/\partial\chi_s\partial\phi_{sC} < 0$). The opposite will be true when the contract enforceability in a supplier's country is sufficiently strong.

Letter of credit Now consider the letter of credit system for a symmetric case in which $\chi_b = \chi_s = \chi_{BB}$, $\phi_{bC} = \phi_{sC} = \phi_{BB}$, and $i_{bC} = i_{sC}$. The final goods price will be always the highest under the letter-of-credit system, mainly owing to the fact that the letter of credit requires both sides of the transaction, supplier and buyer, to bear the financing costs. This highlights that trade financing costs for the letter of credit will be more expensive than other types of trade financing costs when everything else is equal. Given this, both a supplier and a buyer will always find it optimal to choose the post-shipment payment system over the letter of credit.

Deviating from the symmetry condition (e.g., $\chi_b = \chi_s \neq \chi_{BB}$ or $\phi_{bC} = \phi_{sC} \neq \phi_{BB}$), it becomes clear when and why the letter of credit is used for transactions. As the bank-level default probability declines relative to the firm-level default probability (i.e., higher χ_{BB}) or the contract enforceability between banks is higher than the one between firms (i.e., higher ϕ_{BB}), a letter of credit can become significantly more attractive for both buyers and suppliers. Intuitively, a letter of credit will be an optimal choice when, for example, gains from replacing risks from buyers with the lower bank-level default risk are greater than costs of a letter of credit. Trade finance subsidies toward letters of credit can be expressed as lower i_{bC} or i_{sC}, banks' effective costs for issuing letters of credit.

Policy implications In addition to the ability to explain empirical patterns reported above, the present model delivers important policy implications distinct from those in other theoretical models. First, it is worth noting that models based on incomplete contracts predict that, when everything else is symmetric, firms' profits, and hence the optimal payment method in each transaction depends solely on $\max\{\phi_{bC}, \phi_{sC}\}$—that is, the degree of contract enforceability in a relatively weaker country, either importer's or exporter's country, does not matter as long as it stays weaker than that in the other country. In contrast, the present model highlights the role of the development in account receivables financing markets in exporting countries: it improves the efficiency of each transaction and

profits for both importers and exporters via the parameter ξ_{sC}, which is expected to lower the trade financing cost under the post-shipment terms, and thus to lower the final goods price and increase the volume of trade. This can be viewed as a specific channel through which financial development promotes international trade and becomes additional source of comparative advantage in international trade.

4.6. Relationship between Trading Partners

Thus far, firm-level default probability has been assumed as exogenously given and publicly known. However, when it is endogenous or private information, the relationship between trading partners could affect the subjective or estimated default probability of the counterparty significantly. For example, repeated transactions between a trading partner allow for collecting more information on the counterparty or give rise to stronger incentives to fulfill the commitment. The former can be formalized into a model via the improved screening channel (Ahn, 2011) or Bayesian updates (Antràs and Foley, forthcoming), while the latter can take a form of the reputation mechanism (Schmidit-Eisenlohr, 2010; Olsen, 2013). The present paper is apathetic to the exact form and leaves the micro-foundation of the endogenous default probability to the above-mentioned papers. It is sufficient for this study to take the common reduced form property, $\frac{\partial \chi(I)}{\partial I} > 0$, where I denotes the intensity of the relationship between trading partners.

Specifically, the model distinguishes two types of default probability, one assessed by the direct lender (borrower's own bank), and the other assessed by the counterparty as well as the counterparty's bank. The former is independent of the intensity of the relationship between trading partners, whereas the latter is decreasing in the intensity of the relationship between trading partners. <Table 4> modifies <Table 3>, by explicitly denoting endogenous parts of default probability as $\chi(I)$.[25]

The main question is which payment method becomes preferred as the relationship between trading partners develops. According to the model, the question reduces to:

$$\begin{aligned} & \frac{\partial \ln \left[E\left(\Pi_b^{OA} | \chi_b\right) / E\left(\Pi_b^{CA} | \chi_b\right) \right]}{\partial I} \\ = & \overbrace{(1-\sigma) \frac{\partial \ln r_s^{OA}}{\partial I}}^{ARF>0} + \sigma \left[\kappa_{bC} \frac{\partial \chi_b(I)}{\partial I} - \kappa_{sC} \frac{\partial \chi_s(I)}{\partial I} \right] - \kappa_{bC} \frac{\partial \chi_b(I)}{\partial I} \gtreqless 0 \end{aligned} \tag{21}$$

for buyers, and

[25] Note that a letter of credit transaction does not involve any endogenous part of default probability and thus repeated transactions between trading partners do not change expressions for a letter of credit in <Table 3>.

$$\frac{\partial \ln \left[E\left(\Pi_s^{OA}|\chi_s\right)/E\left(\Pi_s^{CA}|\chi_s\right)\right]}{\partial I}$$

$$= \overbrace{(1-\sigma)\frac{\partial \ln r_s^{OA}}{\partial I}}^{ARF>0} + \sigma\left[\kappa_{bC}\frac{\partial \chi_b(I)}{\partial I} - \kappa_{sC}\frac{\partial \chi_s(I)}{\partial I}\right] \gtrless 0 \tag{22}$$

for suppliers, where $\kappa_{sC} = \frac{(1-\phi_{sC})}{[\chi_s(I)+(1-\chi_s(I))\phi_{sC}]}$ and $\kappa_{bC} = \frac{(1-\phi_{bC})}{[\chi_b(I)+(1-\chi_b(I))\phi_{bC}]}$ with $\frac{\partial \ln r_s^{OA}}{\partial I} = -\frac{\xi_{sC}(1-\chi_s)}{[\chi_b(I)+\chi_s-\xi_{sC}\chi_s\chi_b(I)]}\frac{\partial \chi_b(I)}{\partial I} < 0$, and ARF denotes the term capturing the account receivables financing mechanism.

Overall, the direction of inequalities depends on model parameter values. For example, when the contract enforceability in the buyer's country is perfect (i.e., $\phi_{bC} = 1$), it becomes more likely that pre-shipment payment terms get more attractive as transactions reoccur over time between trading partners. On the other hand, if the contract enforceability in the supplier's country is perfect (i.e., $\phi_{sC} = 1$), it will be only the post-shipment payment terms that become more preferred as the relationship develops. The same is true when the supplier's default probability does not depend on the intensity of the relationship (i.e., $\frac{\partial \chi_s(I)}{\partial I} = 0$), which is indeed the assumption made in Antràs and Foley (forthcoming) that led to the prediction that the post-shipment payment terms would become more likely to be chosen for trading partners with previous transactions.

Irrespective of parameter values, however, the presence of the account receivables financing mechanism unambiguously makes the post-shipment payment term more likely to be used as the transaction reoccurs over time. This is captured by the first term in each inequality, which is always positive (denoted as ARF) and increasing in the strength of the account receivables financing mechanism in an exporting country (ξ_{sC}). The default probability of a buyer having a stronger relationship with a given supplier is assessed as lower owing either to less incentive for the buyer to renege on payment or to more information on the buyer collected over time, which raises the value of the collateral (i.e., account receivables) and hence lowers the cost of financing post-shipment term transactions. Therefore, the stronger the account receivables financing mechanism (i.e., higher ξ_{sC} in exporter countries), the stronger the tendency for the post-shipment transaction to be chosen for repeated transactions.

Hypothesis 3 *The model of trade finance based on the account receivables financing mechanism predicts that transactions between trading partners with a stronger relationship will use the post-shipment payment term more, but such tendency will be less pronounced for transactions with exporting countries with less developed account receivables financing market, where the account receivables financing mechanism is likely to be weaker.*

5. Evidence on the Validity of the Model

The model developed in the previous section showed how the account receivables financing mechanism can explain the predominance of the post-shipment payment terms in international transactions and its cross-country variation. According to the model, cross-country variation in the share of the post-shipment terms in exports to Colombia and Chile could be due to varying degrees in the strength of account receivables financing mechanism in exporting countries; this could stem from underdeveloped financial system in some countries, or more specifically, weaker account receivables financing markets owing to implicit and explicit trade financing subsidies targeted at letters of credit or foreign exchange control policies that restrict the choice of payment methods. Moreover, the model predicts, if the observed difference in the use of the post-shipment payment term is indeed due to the difference in the degree of the account receivables financing mechanism, the likelihood for the post-shipment transaction to be chosen for repeated transactions should be also different across countries along this dimension.

One way to check the validity of the model based on the account receivables financing mechanism is to test two hypotheses stated above, which requires to employ a variable that measures the degree of account receivables financing market development. A good candidate for such a proxy variable is the total factoring value as share of total exports, compiled by the Global Financial Development Database (GFDD) and originally provided by Factoring Chain International (FCI). Factoring is one particular type of account receivables financing products whereby suppliers obtain financing by selling account receivables to factors at discount. It includes factoring from both domestic and international account receivables, thereby measuring the overall factoring market development in each country. Moreover, according to FCI, around the half of total factoring is with recourse, which is the fundamental component of the present model. Although there is an inherent endogeneity issue at aggregate level because the total factoring-to-export ratio will be higher as a greater share of exports occurs on the post-shipment payment term, the present empirical strategy designed at highly disaggregate level will be largely free from such concerns.

<Table 5> extends <Table 1> by adding the dummy variable (below and above median) for the account receivables financing market development measure, proxied by the total factoring value as share of total exports in 2010. Consistent with the first hypothesis from the model, the coefficient estimate on the factoring to exports ratio dummy variable is all positive and statistically significant across all columns: transactions are more likely to occur on the post-shipment payment term when an exporter country's account receivables financing market is more developed. It also shows an economically significant effect: the absolute size of the estimated coefficient is up to a third of that on the explicit payment control policy in Colombian imports and even bigger than that in Chilean imports. As in <Table 2>, <Table 6> checks the robustness of the results in <Table 5> by taking into

account the potentially distinct nature of inter-firm and intra-firm transactions. Columns (1)-(4) in <Table 6> reports regression results for Colombian imports by dropping intra-firm transactions, which were identified by the name of importer and exporter firms in each transaction. Columns (5)-(8) in <Table 6> instead adds the bilateral country-level FDI share in Chile's total FDI as a proxy for the share of intra-firm imports in total trade. Both yield basically similar results with those reported in <Table 5>.

A rigorous test of the second hypothesis regarding repeated transactions requires the importer-exporter-level matched data with the history of past transactions, which are available only for Colombian import transactions data. <Table 7> reports econometric tests of the hypothesis for Colombian imports. The dependent variable in <Table 7> is the share of transactions covered by the post-shipment terms defined at the importer-exporter-product level. The intensity of the relationship between an importer and an exporter is measured by the number of years in which the two undertook transactions in the past three years during 2008-10. One can compare the effect of the relationship on the payment method across two distinct sets of countries by interacting the relationship intensity measure with the country-level dummy variable. Lastly, various model parameter values will be controlled by importer-HS6 and exporter-level fixed effects, with the latter basically absorbing all other country-level variables. As a result, the sample is restricted to importer-HS6 pairs that imported from multiple exporters as well as to exporters that exported to multiple importer-HS6 pairs.

The results confirm that the post-shipment transaction is more likely to be chosen for a transaction between trading partners with a longer relationship in general, but such a tendency almost doubles for imports from countries with a more developed account receivables financing market. The estimated effect is both economically and statistically significant: any given importer and exporter pair with repeated transactions continuously over the past three years tends to use post-shipment payment terms more by around 4 percentage points than the first-time trading partners. The difference jumps to around 7 percentage points if the exporter is from a country with relatively more developed account receivables financing market. Columns (3) and (4) exclude intra-firm transactions identified by importer and exporter names, and yield similar results.

6. Conclusion

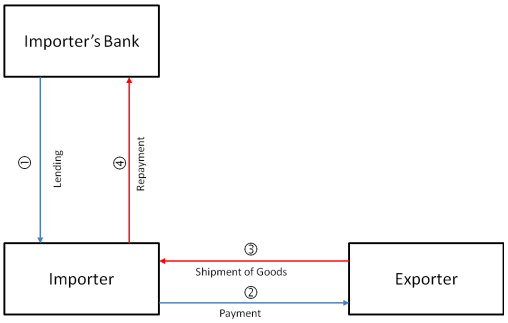
This study is one of recent efforts in the literature to broaden the understanding of trade finance. In particular, I examine one of the most fundamental questions in trade finance: what determines the pattern of payment methods?

A portrait of the pattern of payment methods in international trade at the national level—Colombian and Chilean imports— uncovers a strikingly high prevalence of the post-shipment payment terms in general and other patterns which are not easily reconciled with

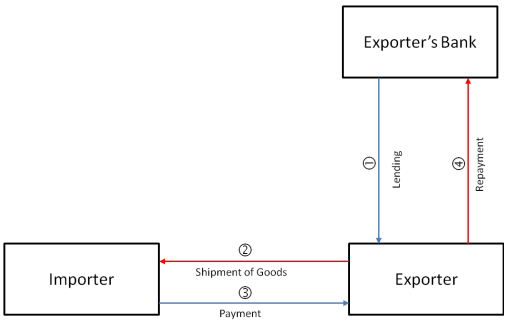
existing models of trade finance or trade credit. As an attempt to explain those observed patterns of payment methods, I propose an alternative model of trade finance that features the self-liquidating and recourse nature of account receivables financing, which makes the trade financing cost for transactions under the post-shipment payment term less costly than other payment terms. This specific mechanism provides a specific example of how financial development could promote trade and become additional source of comparative advantage in international trade.

The main findings of this study are expected to complement a growing literature that studies the pattern of an optimal payment system for international trade as well as the broad trade credit literature that studies the use of trade credits. Future studies on this topic with other countries' data will help determine the generalizability of empirical findings from this paper. The model of trade finance proposed in the paper can be a useful tool in analyzing the cyclical property of trade finance and its impact on trade, such as the great trade collapse.

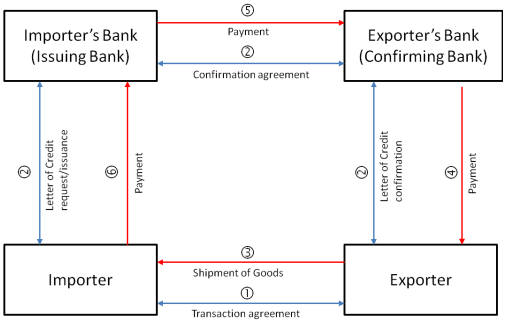
Figures



(a) Pre-shipment payment system (i.e., cash-in-advance)



(b) Post-shipment payment system (i.e., open account)



(c) Letter of credit system (i.e., bank-intermediated)

Figure 1: Description of Major Payment Systems

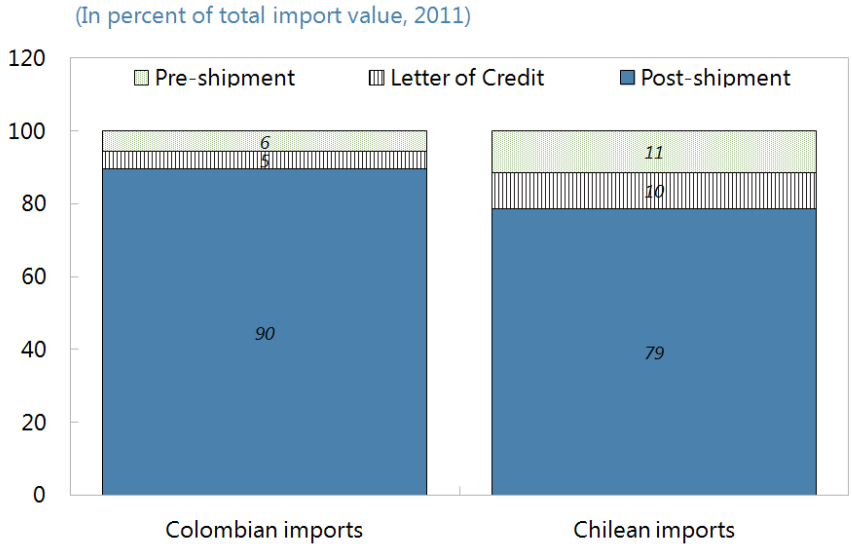


Figure 2: Patterns of Payment Methods: Aggregate

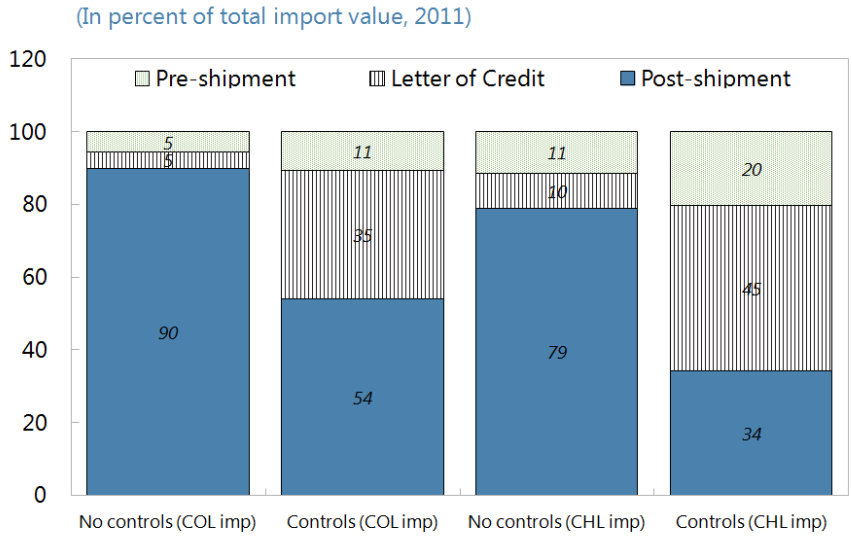


Figure 3: Patterns of Payment Methods by Payment Control Policy

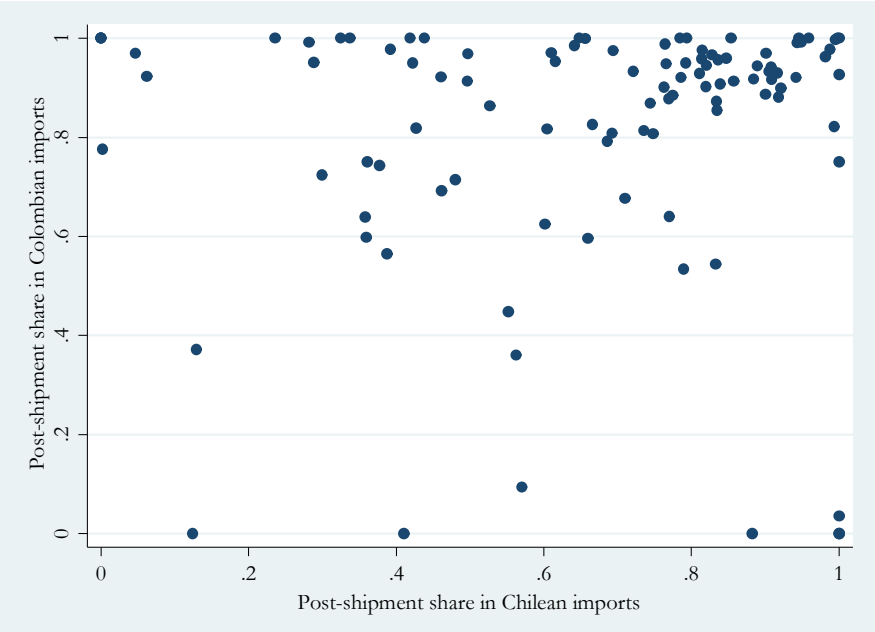
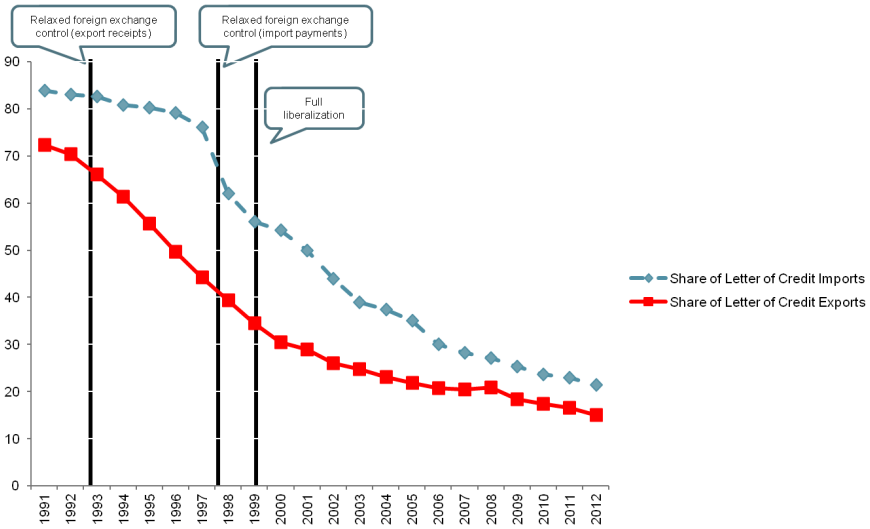


Figure 4: Pattern of Payment Methods: Country-level Scatterplot



Sources: Korea Customs Service. Data are available at the website of The Korea International Trade Association (http://www.kita.net/statistic/index_eng.jsp) and Foreign Exchange Transaction Act of the Republic of Korea

Figure 5: Evolution of Letter-of-Credit Share in Korean Trade

Tables

Dependent variable: Post-shipment payment share (Importer-Country-HS6 level)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Colombian Imports				Chilean Imports			
ln_GDP	0.007 ***	0.007 ***	-0.003 ***	-0.002	0.000	0.000	-0.005 ***	-0.004 ***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ln_Distance	-0.053 ***	-0.049 ***	-0.066 ***	-0.062 ***	-0.096 ***	-0.088 ***	-0.106 ***	-0.101 ***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
Credit-to-GDP ratio	0.024 ***	0.012 ***	0.007 *	-0.001	0.065 ***	0.050 ***	-0.005	-0.013 ***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Common law	-0.016 ***	-0.003			-0.006	0.009 **		
	(0.003)	(0.004)			(0.004)	(0.004)		
Contract Enforceability			0.041 ***	0.043 ***			0.135 ***	0.135 ***
			(0.004)	(0.004)			(0.005)	(0.005)
LC controls		-0.095 ***		-0.094 ***		-0.109 ***		-0.107 ***
		(0.011)		(0.011)		(0.013)		(0.012)
Importer-HS6 FE	Y	Y	Y	Y	Y	Y	Y	Y
Adj-R2	0.388	0.389	0.397	0.398	0.472	0.473	0.471	0.472
OBS	117,418	117,418	98,122	98,122	124,308	124,308	114,003	114,003

Note: The dependent variable in columns (1) - (4) is the importer-exporter country-HS6-level share of post-shipment payment transactions in total import values in Colombia in 2011. In columns (5) - (8), it is the importer-country-HS6-level share of post-shipment payment transactions in total import values in Chile in 2011. Independent variables include nominal GDP in 2010 in log, bilateral distance in log, private credit to GDP ratio in 2010, dummy variables for countries with common law, contract enforceability measure (1 for above median and 0 for below median) and countries that imposed the explicit policy promoting the use of letter of credits in exports in 2011. All columns include importer-HS6 pair fixed effects. Standard errors in parentheses are clustered at the country-HS6 level. Significance: * 10 percent; ** 5 percent; *** 1 percent.

Table 1: Importer-Exporter Country-HS6-Level Regression I: Baseline

Dependent variable: Post-shipment payment share (Importer-Country-HS6 level)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Colombian Imports				Chilean Imports			
ln_GDP	0.007 ***	0.007 ***	-0.005 ***	-0.004 ***	0.002	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ln_Distance	-0.054 ***	-0.050 ***	-0.070 ***	-0.065 ***	-0.103 ***	-0.090 ***	-0.132 ***	-0.123 ***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.005)	(0.005)	(0.005)
Credit-to-GDP ratio	0.024 ***	0.011 ***	0.007	-0.002	0.071 ***	0.052 ***	0.020 ***	0.008
	(0.003)	(0.003)	(0.004)	(0.004)	(0.005)	(0.005)	(0.006)	(0.006)
FDI ratio					-0.097 **	-0.026	-0.332 ***	-0.260 ***
					(0.039)	(0.039)	(0.042)	(0.043)
Common law	-0.019 ***	-0.004			-0.005	0.009 **		
	(0.003)	(0.004)			(0.004)	(0.004)		
Contract Enforceability			0.042 ***	0.044 ***			0.139 ***	0.138 ***
			(0.005)	(0.005)			(0.005)	(0.005)
LC controls		-0.101 ***		-0.100 ***		-0.108 ***		-0.089 ***
		(0.012)		(0.012)		(0.013)		(0.013)
Importer-HS6 FE	Y	Y	Y	Y	Y	Y	Y	Y
Adj-R2	0.381	0.382	0.386	0.388	0.472	0.473	0.472	0.472
OBS	107,079	107,079	88,776	88,776	124,308	124,308	114,003	114,003

Note: The dependent variable in columns (1) - (4) is the importer-exporter country-HS6-level share of post-shipment payment transactions in total import values in Colombia in 2011. In columns (5) - (8), it is the importer-country-HS6-level share of post-shipment payment transactions in total import values in Chile in 2011. In order to control for the potentially distinct nature of intra-firm transactions, the sample for Colombian imports excludes intra-firm transactions identified by the name of importer and exporter, whereas partner country-level FDI share in total FDI is included for Chilean imports. Independent variables include nominal GDP in 2010 in log, bilateral distance in log, private credit to GDP ratio in 2010, dummy variables for countries with common law, contract enforceability measure (1 for above median and 0 for below median) and countries that imposed the explicit policy promoting the use of letter of credits in exports in 2011. All columns include importer-HS6 pair fixed effects. Standard errors in parentheses are clustered at the country-HS6 level. Significance: * 10 percent; ** 5 percent; *** 1 percent.

Table 2: Importer-Exporter Country-HS6-Level Regression II: Addressing Intra-firm Transactions

	Post-shipment (OA)	Pre-shipment (CA)	Letter of Credit (LC)
p_s	$\frac{1}{\rho}\tau wr\left[\frac{1}{\chi_b+(1-\chi_b)\phi_{bC}}\right]$	$\frac{1}{\rho}\tau w$	$\frac{1}{\rho}\frac{1}{(1-\delta)}\tau w$
p_b	$\frac{1}{\rho^2}\tau wr\left[\frac{1}{\chi_b+(1-\chi_b)\phi_{bC}}\right]$	$\frac{1}{\rho^2}\tau wr\left[\frac{1}{\chi_s+(1-\chi_s)\phi_{sC}}\right]$	$\frac{1}{\rho^2}\tau wr\frac{1}{(1-\delta)}$
r	$\frac{i_{sC}}{[1-(1-\chi_s)(1-\xi_{sC}\chi_b)]}$	$\frac{i_{bC}}{\chi_b}$	$\frac{i_{bC}}{\chi_b}$
$\frac{1}{(1-\delta)}$	$N.A.$	$N.A.$	$\frac{i_{sC}}{[\chi_{BB}+(1-\chi_{BB})\phi_{BB}]}$
$E(\Pi_s\|\chi_s)$	$(1-\rho)\frac{1}{\rho}\tau wrq$	$(1-\rho)\frac{1}{\rho}\tau wq$	$(1-\rho)\frac{1}{\rho}\tau wq$
$E(\Pi_b\|\chi_b)$	$(1-\rho)p_b^{1-\sigma}$	$\frac{(1-\rho)p_b^{1-\sigma}}{[\chi_s+(1-\chi_s)\phi_{sC}]^{-1}}$	$(1-\rho)p_b^{1-\sigma}$

Table 3: Summary of Key Variables—Baseline Model

	Post-shipment (OA)	Pre-shipment (CA)
p_b	$\frac{1}{\rho^2}\tau w r\left[\frac{1}{\chi_b(I)+(1-\chi_b(I))\phi_{bC}}\right]$	$\frac{1}{\rho^2}\tau w r\left[\frac{1}{\chi_s(I)+(1-\chi_s(I))\phi_{sC}}\right]$
r	$\frac{i_{sC}}{[1-(1-\chi_s)(1-\xi_{sC}\chi_b(I))]}$	$\frac{i_{bC}}{\chi_b}$
$E(\Pi_s\|\chi_s)$	$(1-\rho)\frac{1}{\rho}\tau w r q$	$(1-\rho)\frac{1}{\rho}\tau w q$
$E(\Pi_b\|\chi_b)$	$(1-\rho)p_b^{1-\sigma}$	$\frac{(1-\rho)p_b^{1-\sigma}}{[\chi_s(I)+(1-\chi_s(I))\phi_{sC}]^{-1}}$

Table 4: Summary of Key Variables—Endogenous Default Probability Model

Dependent variable: Post-shipment payment share (Importer-Country-HS6 level)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Colombian Imports				Chilean Imports			
ln_GDP	-0.001	0.001	-0.007 ***	-0.004 ***	-0.016 ***	-0.014 ***	-0.014 ***	-0.013 ***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ln_Distance	-0.050 ***	-0.046 ***	-0.061 ***	-0.060 ***	-0.094 ***	-0.090 ***	-0.096 ***	-0.095 ***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)
Credit-to-GDP ratio	0.027 ***	0.014 ***	0.005	-0.001	0.065 ***	0.052 ***	-0.006	-0.008 *
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Common law	-0.002	0.006			0.020 ***	0.029 ***		
	(0.004)	(0.004)			(0.004)	(0.004)		
Contract Enforceability			0.050 ***	0.047 ***			0.148 ***	0.147 ***
			(0.004)	(0.004)			(0.005)	(0.005)
LC controls		-0.087 ***		-0.078 ***		-0.090 ***		-0.032 **
		(0.012)		(0.013)		(0.014)		(0.014)
Factoring-to-exports ratio	0.043 ***	0.030 ***	0.038 ***	0.018 ***	0.078 ***	0.068 ***	0.094 ***	0.087 ***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
Importer-HS6 FE	Y	Y	Y	Y	Y	Y	Y	Y
Adj-R2	0.386	0.387	0.395	0.396	0.473	0.473	0.472	0.472
OBS	113,964	113,964	96,156	96,156	120,885	120,885	112,871	112,871

Note: The dependent variable in columns (1) - (4) is the importer-exporter country-HS6-level share of post-shipment payment transactions in total import values in Colombia in 2011. In columns (5) - (8), it is the importer-country-HS6-level share of post-shipment payment transactions in total import values in Chile in 2011. Independent variables include nominal GDP in 2010 in log, bilateral distance in log, private credit to GDP ratio in 2010, dummy variables for countries with common law, contract enforceability measure (1 for above median and 0 for below median) and countries that imposed the explicit policy promoting the use of letter of credits in exports in 2011. The dummy variable based on total factoring value to total exports ratio in 2010 (1 for above median and 0 for below median) is used as a proxy for the accout receivables financing market development measure. All columns include importer-HS6 pair fixed effects. Standard errors in parentheses are clustered at the country-HS6 level. Significance: * 10 percent; ** 5 percent; *** 1 percent.

Table 5: Importer-Exporter Country-HS6-Level Regression III: Testing the Model I

Dependent variable: Post-shipment payment share (Importer-Country-HS6 level)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Colombian Imports				Chilean Imports			
ln_GDP	-0.001	0.001	-0.009 ***	-0.005 ***	-0.013 ***	-0.013 ***	-0.008 ***	-0.008 ***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
ln_Distance	-0.051 ***	-0.048 ***	-0.064 ***	-0.062 ***	-0.104 ***	-0.095 ***	-0.121 ***	-0.120 ***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.005)	(0.006)	(0.005)	(0.005)
Credit-to-GDP ratio	0.026 ***	0.012 ***	0.004	-0.003	0.074 ***	0.057 ***	0.017 ***	0.016 ***
	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)	(0.006)	(0.006)	(0.006)
FDI ratio					-0.119 ***	-0.058	-0.298 ***	-0.292 ***
					(0.042)	(0.043)	(0.044)	(0.045)
Common law	-0.005	0.005			0.020 ***	0.028 ***		
	(0.004)	(0.004)			(0.004)	(0.005)		
Contract Enforceability			0.052 ***	0.048 ***			0.151 ***	0.151 ***
			(0.005)	(0.005)			(0.005)	(0.005)
LC controls		-0.098 ***		-0.091 ***		-0.086 ***		-0.008
		(0.013)		(0.014)		(0.015)		(0.015)
Factoring-to-exports ratio	0.040 ***	0.025 ***	0.036 ***	0.013 *	0.076 ***	0.068 ***	0.091 ***	0.089 ***
	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
Importer-HS6 FE	Y	Y	Y	Y	Y	Y	Y	Y
Adj-R2	0.381	0.382	0.386	0.387	0.473	0.473	0.473	0.473
OBS	104,234	104,234	87,217	87,217	120,885	120,885	112,871	112,871

Note: The dependent variable in columns (1) - (4) is the importer-exporter country-HS6-level share of post-shipment payment transactions in total import values in Colombia in 2011. In columns (5) - (8), it is the importer-country-HS6-level share of post-shipment payment transactions in total import values in Chile in 2011. In order to control for the potentially distinct nature of intra-firm transactions, the sample for Colombian imports excludes intra-firm transactions identified by the name of importer and exporter, whereas partner country-level FDI share in total FDI is included for Chilean imports. Independent variables include nominal GDP in 2010 in log, bilateral distance in log, private credit to GDP ratio in 2010, dummy variables for countries with common law, contract enforceability measure (1 for above median and 0 for below median) and countries that imposed the explicit policy promoting the use of letter of credits in exports in 2011. A dummy variable based on total factoring value to total exports ratio in 2010 (1 for above median and 0 for below median) is used as a proxy for the accout receivables financing market development measure. All columns include importer-HS6 pair fixed effects. Standard errors in parentheses are clustered at the country-HS6 level. Significance: * 10 percent; ** 5 percent; *** 1 percent.

Table 6: Importer-Exporter Country-HS6-Level Regression IV: Testing the Model II

Dependent variable: Post-shipment payment share (Importer-Exporter-HS6 level)				
	(1)	(2)	(3)	(4)
	Including intra-firm transactions		Excluding intra-firm transactions	
Years	0.0137 ***	0.0140 ***	0.0139 ***	0.0142 ***
	(0.0015)	(0.0015)	(0.0016)	(0.0018)
Factoring-to-exports ratio		0.0100 ***		0.0101 ***
*Years		(0.0028)		(0.0027)
Importer-HS6 FE	Y	Y	Y	Y
Exporter FE	Y	Y	Y	Y
Adj-R2	0.860	0.860	0.861	0.861
OBS	166,098	166,098	161,310	161,310

Note: The dependent variable is the importer-exporter-HS6-level share of post-shipment payment transactions in total import values in Colombia in 2011. Independent variables includes number of years each importer and exporter undertook transactions during 2008-10 and its interactions terms with a dummy variable based on factoring-to-exports ratio (1 for above median and 0 for below median). Columns (1)-(4) include all transactions, whereas columns (5)-(8) excludes intra-firm transactions identified by the name of importer and exporter. All columns include importer-HS6 pair fixed effects and exporter fixed effects. Bootstrap standard errors are in parentheses. Significance: * 10 percent; ** 5 percent; *** 1 percent.

Table 7: Importer-Exporter-HS6-Level Regression: Testing the Model III

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