

DiCaprio, Alisa; Yao, Ying

**Working Paper**

## Drivers of trade finance gaps

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**ADB Working Paper Series**

**DRIVERS OF TRADE FINANCE GAPS**

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Alisa DiCaprio  
and Ying Yao

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**Asian Development Bank Institute**

Alisa DiCaprio is a research economist and Ying Yao is a research associate, both at the Asian Development Bank Institute.

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Please contact the authors for information about this paper.

Email: [adicaprio@adbi.org](mailto:adicaprio@adbi.org), [yyao@adbi.org](mailto:yyao@adbi.org)

Asian Development Bank Institute  
Kasumigaseki Building 8F  
3-2-5 Kasumigaseki, Chiyoda-ku  
Tokyo 100-6008, Japan  
Tel: +81-3-3593-5500  
Fax: +81-3-3593-5571  
URL: [www.adbi.org](http://www.adbi.org)  
E-mail: [info@adbi.org](mailto:info@adbi.org)  
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**Abstract**

Banks are a critical facilitator of trade. Without bank-intermediated trade finance, global exports and imports would come to a halt. This has been apparent during the episodes of credit rationing that accompany financial shocks. But we have little insight into the drivers of rejection pooling by banks in normal times. Using augmented data from a global survey of financial institutions, we test the relative explanatory power of country- and bank-level characteristics as drivers of trade finance rejections in emerging markets and among small and medium-sized enterprises. The analysis suggests that rejections are driven by three broad factors: those inherent to the trade finance transaction including risk and income, those which indicate a redirection of bank's business lines, such as termination of correspondent relationships, and implementation of improved client screening mechanisms. Together, these suggest that solutions to trade finance gaps are most likely to be found outside of the traditional toolbox.

**JEL Classification:** G21, F34, O19, G32

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## 1. INTRODUCTION

Firms need credit to engage in trade. Over the last century, exporters and importers have depended on finance to enable the expansion of trade and growth (Bordo and Rousseau, 2012). However, when the global financial crisis hit in 2008, trade finance was disrupted and contributed to the precipitous fall in trade that immediately followed.

Eight years after the financial crisis, unmet demand for trade finance continues to pool among certain markets and client segments. Small and medium-sized enterprises (SMEs) throughout the world consistently report a lack of trade finance as a constraint on their ability to conduct cross-border transactions (CBI, 2013; USITC, 2010). During the financial crisis, liquidity constraints limited bank lending. But now that the crisis has resolved, what factors are driving bank decisions to keep supply low in some markets?

We know that some groups and countries have difficulty accessing finance, it is not clear to what extent this can be attributed to bank decisions. Our inability to identify with precision the reasons for persistent shortfalls in certain markets has resulted in weak policy instruments. Governments at all levels struggle to engage SMEs in international trade and promote transactions with banks in emerging markets. Different approaches exist – export credit agencies, public incentives to promote SME lending, development bank guarantee programs – but none addresses the problem in a systematic way.

Since 2013, the Asian Development Bank, in partnership with the International Chamber of Commerce Banking Commission and others, has been surveying financial institutions about their trade finance activities.<sup>1</sup> The data collected offers unique insight into the decision making process by bank respondents. This paper represents the first effort to exploit this dataset.

This paper diverges from existing studies on credit rationing by considering the scenario where it is not initiated by a credit crunch. The current empirical work on trade finance rationing examines the process during liquidity shocks where the bank itself is short of funds (Agur, 2012). That is, rationing is the mechanism through which banks transfer the shock to their borrowers. In contrast, our paper is concerned with the drivers of rationing when it is not obviously cyclical.

The seminal rationing paper modeled the situation where trade finance shortfalls arise naturally from the frictions and information asymmetries between borrowers and lenders (Stiglitz and Weiss, 1981). But the difficulty of data collection on this topic has subsequently resulted in a literature that is strongly tilted towards studies of shortfalls when there is clear evidence of financial distress which exogenously limits the supply of credit.

We build our framework from this existing foundation. Specifically, the crisis literature identifies three levels at which bottlenecks to adjustment might occur – country-level, bank-level, and client-level. We use this existing work to direct our exploration into two questions: who gets rationed? And why do banks limit supply when global markets are functioning? The answers to these questions then enable us to suggest a more targeted set of policy tools to address trade finance gaps.

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<sup>1</sup> Over the three years of the survey up to 2016, additional distributing partners for the financial institutions survey have included: the Berne Union, the Bankers Associations for Finance and Trade (BAFT), Factors Chain International (FCI), the International Credit Insurance and Surety Association (ICISA), the International Trade and Forfaiting Association (ITFA), and the Association of Forfaiters in Switzerland (VEFI).

The next section considers what we know about the global and regional trade finance gaps. Section 3 then uses multi-level modeling to explore what is driving these shortfalls. Section 4 concludes with some thoughts about what types of solutions might be possible.

## 2. WHO GETS RATIONED?

In comparison to domestic trade, cross-border activities are inherently risky. Exporting firms shoulder additional expenditures over normal operating costs. These can include, for example, learning about foreign markets, regulatory compliance, and product customization (Foley and Manova, 2015). In addition, traders experience a longer delay between production and payment and, banks may screen exporters with greater precision than domestic firms (Ahn, 2011), which increases exporters' costs of credit.

Firms often engage trade finance to cover these additional risks. In normal times, bank-intermediated trade finance covers an estimated 36% of international trade (IMF, 2009). However, the dependence on trade finance to facilitate trade is not evenly distributed across populations or geography. Particular groups – for example, small firms, or traders in high-risk countries - are more dependent on credit to support their exports than others.

Because trade finance has unique characteristics, we begin with a brief overview of its main concepts. We then review evidence about which groups are most likely to be negatively impacted by a liquidity crisis and why. This information informs the analytical framework we use to explain what is preventing financial institutions from expanding supply to meet demand.

### 2.1 What is Trade Finance?

Trade finance has specific characteristics that set it apart from other forms of credit. These include short tenor (in 2015, 85% of all letters of credit had a tenor of 90 days or less),<sup>2</sup> availability (not all financial institutions have the correspondent relationships or internal know-how to offer trade finance),<sup>3</sup> and stability (it is often the first line of credit to be pulled when there is a liquidity shortage).

Trade finance is credit that financial institutions offer to firms to facilitate global commerce. Conceptually, it consists of four elements: payments, financing, risk mitigation, and information (Malaket, 2014). In practical terms, it involves loans and guarantees from banks<sup>4</sup> that underpin imports and exports. It supports cross-border trade by either directly providing funding or through unfunded guarantees on behalf of the importer to the exporter.

International trade can be financed using a spectrum of payment contracts. These range from open account (financed by the exporter) to cash-in-advance (financed by the importer). In the middle are bank-intermediated instruments. The decision about

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<sup>2</sup> SWIFT, 2016

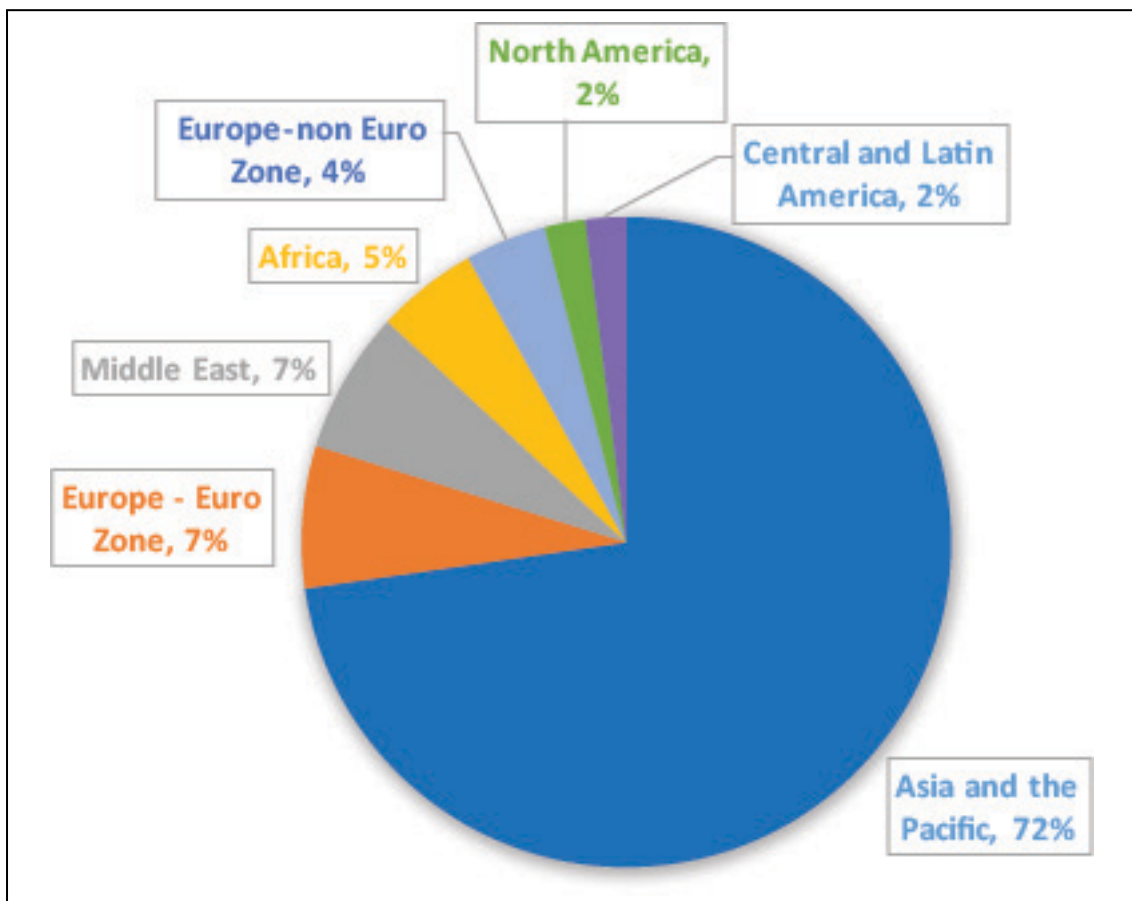
<sup>3</sup> In 2015, 36% of banks reported that a “lack of familiarity with products” by the bank’s staff was a significant reason that they did not expand the supply of trade finance (ADB, 2016).

<sup>4</sup> Loans to manufacture for export or to purchase imports, Guarantees are often in the form of letters of credit which represent a bank obligation to pay, thereby removing an exporter's payment risk on an importer and replacing it with a bank risk (risk on the bank that issued the letter of credit or other trade finance instrument). Apart from banks, insurance companies and export credit agencies also provide trade finance products.

what payment contract to use is influenced by market characteristics of the importers and exporters countries. This includes the quality of contract enforcement, the cost of finance, time to trade, and default risk. The manner in which trade is financed has been shown to have a direct impact on trade (Schmidt-Eisenlohr, 2013), and crisis outcomes (Antras and Foley, 2015).

Letters of credit (L/Cs) are the traditional instrument of bank-intermediated trade finance. They play a major role in minimizing the information asymmetries that exist when a buyer and seller are located in different countries. L/Cs are most frequently employed when one of the counterparties is located in a market where contract enforcement is poor (Niepmann and Schmidt-Eisenlohr, 2014), financial development is low (Bordo and Rousseau, 2012; Liston and McNeil, 2013), and which is smaller or poorer than average (Niepmann and Schmidt-Eisenlohr, 2016).

**Figure 1: Import Letters of Credit (MT700) Regional Breakdown (2015)**



Source: SWIFT (2016).

Historically, L/Cs have been used particularly heavily in Asia and the Pacific (see Figure 1). The countries which experienced the steepest growth in import and export L/Cs in 2015 are primarily growth markets in Asia. For import L/Cs, high growth countries include Sri Lanka, Bangladesh, and Viet Nam. For export L/Cs, growth was greatest in Indonesia, Bangladesh, and India (SWIFT, 2016).

Finally, it is important to note that trade finance as an industry is changing. Since the 2008 global financial crisis, there have been some new developments: a more complex



regulatory environment, the rise of financial technologies (fintech), and slower global trade growth. All of these have contributed to a global consolidation of the correspondent relationships which are needed for banks to do business with each other, and a pronounced trend towards open account.<sup>5</sup> Yet even as this transition continues, survey evidence reflects ongoing gaps in trade finance supply. We now turn to this evidence.

## 2.2 Measuring Global Gaps in Trade Finance

Measuring trade finance gaps is difficult to do with precision. But it is also a critical exercise that highlights the ongoing shortfalls that limit trade and growth. In 2016, Asian Development Bank (ADB) estimated a global trade finance gap of around US\$ 1.6 trillion (Figure 2). This number is notable both for its size, and the relatively consistent regional distribution that has held over the three years of the survey. In the following three sections, we break down this global number by region and client group.

Efforts to understand the size and dynamics of the global trade finance market only began following the 2008 global financial crisis. In 2008, it was clear that credit had stopped and it was dragging trade with it. Both firms and banks were reporting an inability to finance existing transactions. But at that moment in time, there was no obvious indicator that policymakers could use to understand what was happening and how to respond.

Two prominent, but one-off surveys were subsequently produced to estimate the volume and change in the availability of trade finance. The first was done by the Committee on the Global Financial System and BIS, which compiled an extensive array of sources, most of which use 2011 data (BIS, 2014). The estimated value is calculated from national data of different CGFS members plus L/C figures from SWIFT. Cross-checks are done with data from the ICC Trade Register. Bank-intermediated trade finance was projected globally to be approximately US \$6.5 to 8 trillion, US \$2.8 trillion of which are L/Cs. This is the first, and so far only, attempt to estimate the size of trade finance markets globally.

Another comprehensive survey was done by the IMF along with BAFT-IFSA that surveyed 63 banks (IMF, 2011). This data illustrated the beginnings of a recovery by 2011. 17.1% of respondents reported having received more trade finance in 2011 than in 2010, with the most notable change seen in emerging Asian countries which include the People's Republic of China (PRC) and India.

The ADB also initiated a study in response to this lack of data for policymakers during the global financial crisis. The objective was to provide a comprehensive understanding of trade finance flows and their impact on firm behavior including productivity, job creation, and growth. While the main interest is in Asia, because of the nature of cross-border trade, the survey was launched on a global basis. There are two survey instruments – a user and a provider survey.<sup>6</sup> In the 2016 survey, 310 financial institutions participated. This represented 105 countries and covered all of the global banks, as well as a cross-section of regional and local banks. The data has been collected for three periods, however, this is not a panel dataset since respondents vary from year to year (see Table 1).

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<sup>5</sup> Even as L/Cs continue to play a large role in Asia and the Pacific, since 2013 there has been a global trend favoring open account transactions. 2016 data from SWIFT shows an increase in MT103 messages of 5.3% (2013-2015) versus a decline in MT700 over the same period of 6.2%.

<sup>6</sup> For the purposes of this paper, only the provider survey data is used. A detailed treatment of the user survey data can be found in Auboin and DiCarpio, 2017.

**Table 1: Respondents to the Survey**

|              | One Wave | Two Waves |           | Three Waves |
|--------------|----------|-----------|-----------|-------------|
|              |          | 2014/2015 | 2015/2016 |             |
| No. of Banks | 365      | 29        | 92        | 20          |

The ADB estimates unmet global demand for trade finance in order to underscore the persistence of shortfalls even as global flows have recovered. The trade finance gap is estimated using the rejected value of proposed trade finance transactions as reported by responding banks and weighted to match a global distribution.

Trade finance gaps are difficult to measure because of three data issues. The first is data collection – few banks have a single point of acceptance for trade finance proposals, so any value given for how much was requested is an estimate. The second is data reporting – few banks are willing to release confidential data on the exact numbers of trade finance proposals that were funded. The third reason is that estimates do not account for the quality of the proposals. Equilibrium trade finance is not one where all requests for finance are granted. Some proposals are inappropriate or do not meet minimum requirements. We now break down this number by region and client group.

### 2.3 Unmet Demand by Region

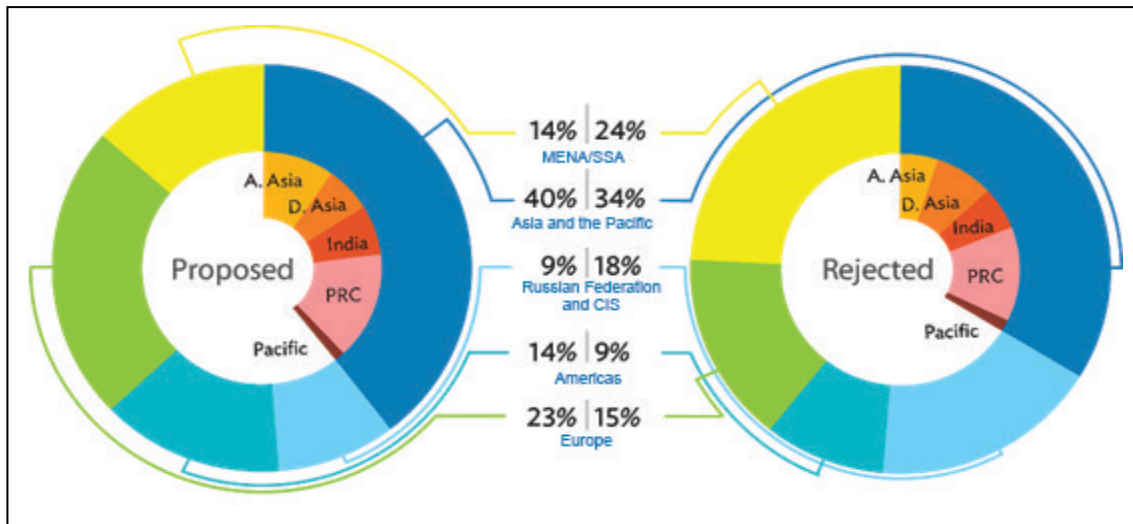
The ADB estimated global gap number is calculated by summing regional gaps. Financial institutions estimate demand and rejection rates for five regions: Asia and the Pacific, Africa and Middle East, the Americas, Europe, and Russian Federation and CIS (Figure 2).<sup>7</sup> The main findings are that unmet demand is highest in Asia and the Pacific, and Africa and the Middle East. This is consistent across all years of the survey.

In Asia and the Pacific, proposals are highest in Advanced Asia and the People's Republic of China (PRC), while rejections are concentrated in Developing Asia and the PRC. In dollar terms, the regional unmet demand in countries in Developing Asia is estimated to be up to \$692 billion.

In Africa and the Middle East, the elevated rejection proportion illustrated in Figure 2 can be explained in substantial depth by a series of comprehensive trade finance surveys produced by the African Development Bank (AfDB) in 2011 and 2012 (Gajigo et al., 2014), and in 2013 and 2014 (AfDB, 2016). The coverage and targets differ from the ADB survey, but the trends are in the same direction.

<sup>7</sup> Disaggregation beyond the regional level is only partial. Asia breaks down to: Advanced Asia, Developing Asia, People's Republic of China (PRC), India, and the Pacific. Africa breaks down to: Sub-Saharan Africa, and Middle East and North Africa. Americas breaks down to: North America, Central America, South America and the Caribbean. Country-level data is not available.

**Figure 2: Proposed and Rejected Trade Finance by Region (percent out of 100)**



A. Asia = advanced Asia; CIS = Commonwealth of Independent States; D. Asia = developing Asia; MENA/SSA = Middle East, North Africa, and Sub-Saharan Africa; PRC = People’s Republic of China.

Source: ADB Trade Finance Gaps, Growth and Jobs Survey (2016).

The AfDB survey offers more specific insight into the experiences of banks in Africa. Aggregating on and off balance sheet transactions, they estimate a gap of \$91 billion in 2014. However, due to data uncertainty, they estimate the gap is somewhere between \$91 and \$120 billion. The AfDB survey also shows that the top ten clients of surveyed banks assume a high share of bank-intermediated trade finance. The parallel result being that SMEs account for a relatively small share, despite their large role in the region’s economy.

Both the ADB and the AfDB surveys confirm significant levels of unmet demand in the regions where trade-driven growth is needed most. But, there is also another dimension to the gap that comes out in both surveys: certain firms remain underserved.

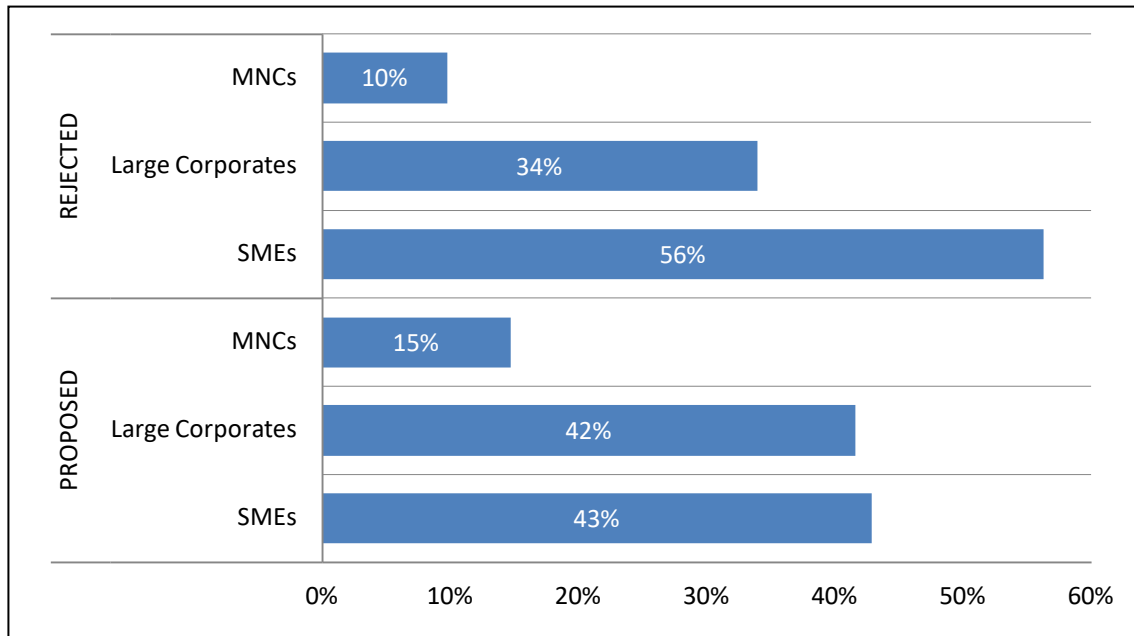
## 2.4 Unmet Demand by Firm Type

Ex-ante, it is not immediately obvious which clients will be impacted in markets where trade finance supply does not meet demand. Rationed populations can include financially vulnerable industries (Chor and Manova, 2012), firms associated with financially unhealthy banks (Amiti and Weinstein, 2011), and firms that are perceived as risky where information is imperfect (Stiglitz and Weiss, 1981). But, because trade finance is characterized by relationship lending, not all firms are impacted in the same way. Where firms have longer term (Biais and Gollier, 1997) or more networked relationships (Elliott, 2015), they are better able to maintain credit even when their bank becomes liquidity constrained.

Financial institutions report that SMEs are the source of the most proposals and the most rejections (Figure 3). While we have no information on the quality of the proposals, SMEs as a class are riskier than the general population. In one question, banks are asked to describe the reasons that they do not expand their trade finance supply. More than 60% of respondents report low company rating and insufficient collateral as significant impediments.

High SME rejection rates across countries introduce an important nuance to the literature on SME access to finance. That literature focuses on the barriers that SMEs face in gaining access to credit (getting “banked”). Our data allows us to extend this to show that even after SMEs are banked, their access to certain types of finance - specifically, trade finance - remains constrained.

**Figure 3: Proposal and Rejection Share by Firm Size (2015)**



MNCs = multinational corporations, SMEs = small and medium-sized enterprises.

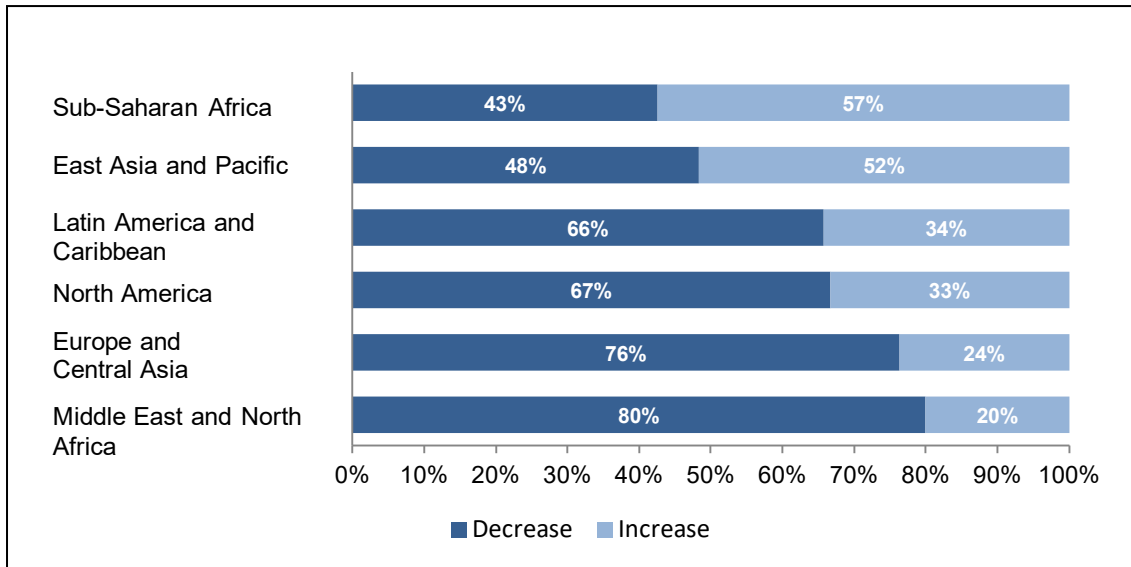
Source: ADB Trade Finance Gaps, Growth and Jobs Survey (2016).

The concentration of rejections on SMEs is likely to continue given market trends including the ongoing consolidation of banking relationships.<sup>8</sup> In today’s market, correspondent relationships are the formal channel that banks use to communicate. Yet since 2011, data shows that the number of active correspondents across all corridors has declined (BIS, 2016). Figure 4 looks at the change by region in 2015 relative to 2012.

The decline in correspondent relations has the additional feature that in affected markets, those banks which retain relationships gain market power. This is potentially problematic for SMEs given that increased market concentration in the banking sector has been shown to make borrowing more difficult for them (Ryan et al., 2014; Chong et al., 2013).

<sup>8</sup> The withdrawal of correspondent relationships in particular jurisdictions was analyzed further in BIS (2016).

**Figure 4: Change in Number of Active Correspondents (by region)**



Source: BIS (2016).

Who gets rationed? According to the ADB survey, in 2015 rejection rates were elevated in emerging markets and among SMEs in all markets. This is line with banking industry trends towards consolidation and the reduction of correspondent relationships in specific markets including Africa, Asia and Latin America (Erbenova et al., 2016).

### 3. WHY DO BANKS REJECT TRADE FINANCE PROPOSALS?

Some potential triggers that lead to rationing during a crisis include capital requirements (Agur, 2013), higher interbank rates (Chor and Manova, 2012), the overall health of the bank (Amiti and Weinstein, 2011) or the market power of the bank (Ryan et al., 2014).

In normal times, trade finance transactions are complex, and rejection can occur at several stages of the application process. Trade finance transactions involve two countries, a buyer and a seller, and their banks. Our objective is to understand which level or factor is driving rejection rates. While each cause has the same results – less credit availability - policy must be carefully calibrated to mitigate the correct problem. To provide policy guidance, in the next section we explore which of these have the greatest influence on bank rejection rates.

#### 3.1 Data and Methodology

To explore the drivers for trade finance gaps, we use data from the 2016 ADB Trade Finance Survey. We augment survey data with objective data about banks and countries: Orbis Bank Focus, S&P Global Market Intelligence, and the World Bank Development Indicators. This enables us to provide a more comprehensive look at the banking environment in target countries.

To empirically assess the determinants of trade finance gaps, we follow the framework of Bruno and Shin (2014) who investigate the drivers for cross-border bank lending. Bank flows originate from various financing activities, and bank-intermediated trade finance is one of these (Serena and Vasihttha, 2015). Cross-border bank capital flows are driven by both country-specific and global factors. The leverage and equity at both levels determine cross-border lending.

There are three points in the transaction which may trigger a rejection. The first is associated with the firms which require trade finance. Once an L/C is signed, both the importer's and exporter's bank have an obligation to pay upon presentation of documents. The issuing bank (importer's bank) has to pay the confirming bank (exporter's bank) first and receives the repayment later. This issuing bank maximizes its profit conditional on the importer not defaulting. The credit risk of the importer will be a concern for the issuing bank.

The second point is at the bank level. From the other side of the transaction, the confirming bank is committed to paying the exporter irrespective of default of the issuing bank. To avoid losses, the confirming bank will evaluate the performance of the counterparty bank.

The third point in the transaction which may trigger rejection is at the country level, especially the regulatory environment, market risk, and macroeconomic conditions. Sovereign risk or economic stability may affect the security of the financing business. A low-risk business environment is preferable. Overall, banks make rejection contingent on the risks of the buyer, counterparty banks, and the market.

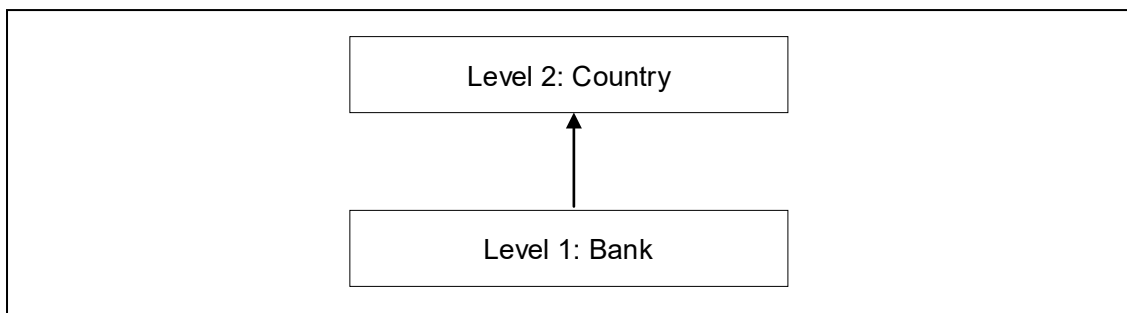
Our decision to use a multi-level analysis allows us to simultaneously examine the effects of country-level and bank-level factors on unmet trade finance demand and to assess inter-bank and inter-country variations. Guided by the previous empirical work, we use the following specification:

$$\begin{aligned} \text{Re}_{ij} &= \beta_0 + \beta_1 X_{ij} + u_j + \epsilon_{ij} \\ u_j &\sim N(0, \sigma_u^2), \epsilon_{ij} \sim N(0, \sigma_e^2) \end{aligned}$$

The model has two levels (see Figure 5). Banks (level one) are clustered in countries (level two).  $\text{RE}_{ij}$  denotes the rejection rate of bank  $i$  in country  $j$ .  $\beta_0$  captures the overall mean of rejection rate across all countries.  $X_{ij}$  represents bank- and country-level characteristics.  $u_j$  is the random intercept for country  $j$ .  $\epsilon_{ij}$  denotes the residual term, which measures the difference between individual banks' rejection rate and their country's mean.  $\sigma_u^2$  and  $\sigma_e^2$  are the variation at level 1 and level 2, respectively.

Multilevel modeling requires sufficient sample sizes for higher levels to avoid biased estimates (Maas and Hox, 2005; Bryan and Jenkins, 2016). Although banks in the survey are clustered within regions, the number of regions is too small to conduct multilevel analysis for that aggregation.

We now describe the variables in detail. The summary of statistics is displayed in Table 2.

**Figure 5: Levels of Entities**

**Rejection Rate.** The unmet demand for trade finance is our primary interest. It is measured by the ratio of the rejected transactions over the proposed transactions. In 2015, banks on average declined 12% of proposed transactions. Rejection rates are on a spectrum of 0%-80% of proposals.

**Banks' characteristics.** These include profitability, liquidity, and bank size. Low-risk and profitable transactions are preferable. Because banks are profit maximizing, changes in profitability will affect their trade finance activities. To perform transactions, enough liquidity is required. The higher the liquidity, the higher capacity of providing financial services. It is also notable that the average bank size in total assets is USD 160 billion, indicating potential to provide trade finance. Although total assets do not represent trade finance volume, they implicitly show the lending capacity of the bank. We would expect that larger banks will supply more trade finance. Among the three features, profit-seeking banks may attach more importance to profitability, given liquidity and bank size. In the analysis, the change in the net income from trade finance is an indicator of profitability. And the percentage of liquid assets over deposits and short-term funding are used to measure the liquidity of banks. Information regarding bank size and liquidity is obtained from Orbis Bank Focus and S&P Global Market Intelligence. Aside from these objective indicators, we extracted information from the survey questions, including the ability to satisfy trade finance demand.

**Environmental Factors.** Other than characteristics of banks, the environment of the transaction matters. It encompasses bank- and country-level business circumstances. Bank-level indicators include strictness of environmental and social criteria for transaction screening, and the cost and complexity of regulatory compliance. Country-level factors consist of financial depth and banking industry credit risk. Financial depth is extracted from the World Bank Development Indicators. It is the ratio of domestic private credit to GDP, capturing the size of the financial institutions and market in a country. Banking industry credit risks are evaluated by S&P Global Market Intelligence. The Banking Industry Country Risk Score (BICRS) covers 200 countries. It measures the strengths and weaknesses of country's banking industry by jointly evaluating economic and industry risks. Scores are assigned on a scale from 6 to 16, from lowest to highest risk.

**Table 2: Summary of Statistics**

| Variables                                   | Descriptions   | Mean   | Min  | Max     | N   |
|---|--|--------|------|---------|-----|
| <i>Bank-level Characteristics</i>           |  |        |      |         |     |
| rej_rate                                    | Rejection rate in 2015   | 0.12   | 0.00 | 0.80    | 139 |
| Dnetinc                                     | If the net income from TF decreases  | 0.33   | 0    | 1       | 220 |
| LADST                                       | Liquid Assets/Deposits & Short Term Funding  | 26.15  | 0.43 | 124.49  | 282 |
| assets                                      | Total bank assets (USD bn)   | 160.67 | 0.05 | 2590.00 | 281 |
| tftype                                      | Type of TF department (dummy variable 0= local; 1=regional & global)               | 0.34   | 0    | 1       | 299 |
| capacity                                    | If the capacity to satisfy TF needs decreases                                      | 0.10   | 0    | 1       | 215 |
| <i>Environmental Factors: Bank-Level</i>    |  |        |      |         |     |
| stringency                                  | If the bank uses environmental and social criteria to evaluate TF applications     | 0.66   | 0    | 1       | 218 |
| rej_policy                                  | If the bank has rejected TF transactions due to environmental and social criteria  | 0.55   | 0    | 1       | 214 |
| term_relation                               | If the bank terminated a relationship due to complexity of compliance              | 0.43   | 0    | 1       | 176 |
| term_bank                                   | If the bank experienced termination by other banks due to complexity of compliance | 0.39   | 0    | 1       | 173 |
| <i>Environmental Factors: Country-level</i> |  |        |      |         |     |
| BICRS                                       | Banking industry country risk score  | 11.22  | 7    | 16      | 306 |
| findepth                                    | Financial depth  | 104.58 | 2.70 | 374.00  | 305 |

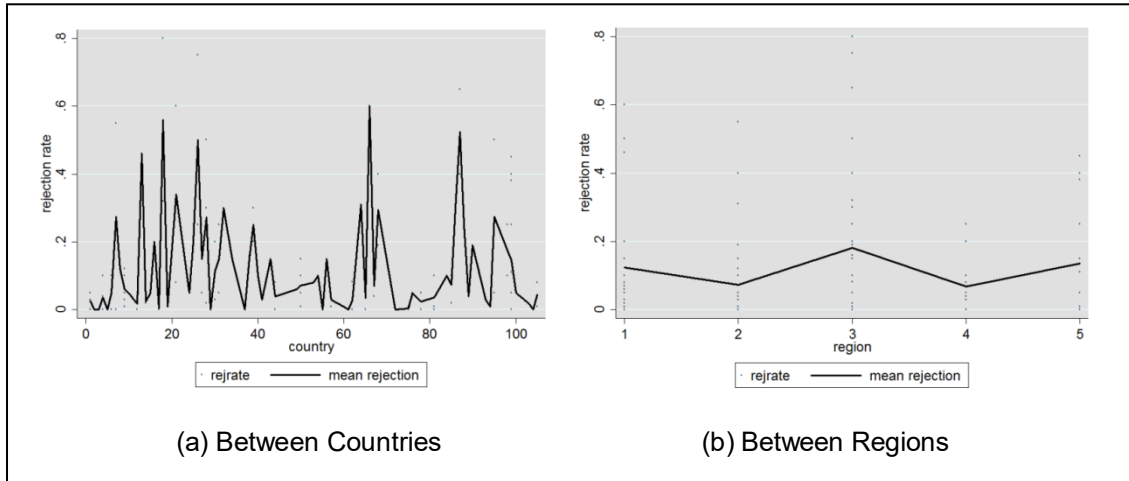
### 3.2 Estimation Results

Before discussing the determinants of trade finance gaps, we look at the variation between groups. Figure 6 presents disparities of the average rejection rate between countries and regions, respectively. In the sample, 310 banks are clustered in 105 countries and five regions. Individual banks' rejection rates, denoted by dots, are scattered on a large scale. The average rejection rate fluctuates between countries, ranging from 0 to 0.6 (Figure 6a). By contrast, the rate among countries is within the



range of 0.07 to 0.18, showing a relatively stable trend (Figure 6b). Therefore, the country effect may be more important than that of regions.

**Figure 6: The Variation Between Groups**



To test group effects, we apply two-level random intercept models which allow differences between countries in rejection rates. The analysis starts from key variables and extends to effects of other factors that might impact the rejection rate. All the estimations use the Kenward-Roger method (Kenward and Roger, 1997) to adjust for the small sample size.

First, we test group effects by fitting a null model that only contains a constant term (Table 3). As discussed earlier, the profitability of trade finance may be the primary concern of banks. Liquidity might be less important in the decision-making but still indicates the capacity. Here, we use different indicators of liquidity to test this hypothesis. Given that trade finance is short-term in nature, liquid assets as a proportion of deposit and short-term funding is adopted. In addition, we use banks' survey responses regarding their perceived ability to meet trade finance demand. Still, bank size potentially represents the volume of trade finance business. Large banks might behave differently from small banks concerning rejection.

As expected, lack of profitability and capacity to meet demand are associated with greater rejections. However, neither bank size nor liquid assets as a percentage of deposits and short-term funding has a significant impact on rejection.

Next, we turn to country effects. A likelihood ratio (LR) test of the null model shows that the p-value for the Chi-squared statistic with a degree of one ( $\chi^2_1 = 8.16$ ) is 0.0021, indicating that two-level model is preferable to a single-level model without considering variances of countries.

Similar results are observed in models by adding a predictor. The intraclass correlation coefficients (ICCs) measure group homogeneity. ICCs reported in Table 3 range from 0.35 to 0.43, showing that banks from the same country have some degree of similarity. ICCs also show that at least 35% of the variation in rejection rate is due to differences between countries. Statistics such as the Akaike information criteria (AIC) and the Bayesian information criteria (BIC) present improved fit of models if bank-specific features are controlled.

Baseline estimates show that banks' trade finance rejection rates are influenced by the profitability of the instrument or the bank's internal capacity to offer credit. We now test if these factors are still drivers of trade finance gaps when incorporating other controls. For comparison purposes, single-level linear regression is presented.

**Table 3: Determinants of Trade Finance Gaps: Baseline**

|            | <i>Null</i>       | <i>Null+netinc</i> | <i>Null+liquidity</i> | <i>Null+capacity</i> | <i>Null+asset</i> |
|------------|-------------------|--------------------|-----------------------|----------------------|-------------------|
| Dnetinc    |                   | 0.06**<br>(0.03)   |                       |                      |                   |
| LADST      |                   |                    | 0.00<br>(0.00)        |                      |                   |
| logasset   |                   |                    |                       |                      | 0.00<br>(0.01)    |
| capacity   |                   |                    |                       | 0.11**<br>(0.05)     |                   |
| constant   | 0.12***<br>(0.02) | 0.11***<br>(0.02)  | 0.12***<br>(0.03)     | 0.11***<br>(0.02)    | 0.12***<br>(0.02) |
| <i>N</i>   | 139               | 133                | 129                   | 128                  | 129               |
| <i>ICC</i> | 0.35              | 0.37               | 0.42                  | 0.35                 | 0.43              |
| <i>AIC</i> | -102.15           | -91.25             | -82.25                | -89.18               | -86.48            |
| <i>BIC</i> | -93.34            | -79.68             | -70.81                | -77.77               | -75.04            |

Allowing variations between countries, we find that banks' decisions are also influenced by the financial environment including the complexity of compliance, financial depth, and banking industry risk. Banks reject more transactions if the income from trade finance is lower. Relationship terminations due to the increasing cost or complexity of compliance also contribute to increasing rejection.

There are two additional results. First, banks reject fewer transactions if they have implemented environmental and social screening on trade finance applications. Because this type of screening is not widespread and often part of a bank's brand image, such criteria may serve as a signal about the types of clients the bank is seeking as well as a screening tool for would-be applicants.<sup>9</sup>

Second, banks that are located in countries with greater financial depth display higher rejection rates for trade finance applications. Markets with better financial infrastructure are likely to have greater banking competition, and more trade overall, thus suggesting that respondents are confirming banks. While economic growth and poverty reduction are usually tied to a large-sized financial market, a greater level of financial depth may also be associated with vulnerability to the crisis due to the potential fragility of highly interconnected financial networks (see e.g. Acemoglu et al., 2015). To avoid such risks, banks are likely to behave conservatively and reject more transactions. Similarly, banks reject more in a country with a high probability of default.

This model assumes that the rejection rate differs from country to country and banks share some extent of similarity in a country. The assumption also implies a constant

<sup>9</sup> For example, the Equator Principals are one set of standards in this area. There are 89 financial institutions globally which have signed on, and for many of them, this is part of their brand. Thus, applicants may self-select in a way that results in an applicant pool that is better matched with that bank. For more information and a list of the 89 financial institutions located in 37 countries, see: <http://www.equator-principles.com>

relationship between bank-specific factors and the rejection. It might be the case that banks' responses to the change of profitability or liquidity constraints may not be constant and differ across countries. To test this hypothesis, we apply a random coefficient model. Allowing the change of net income to have different effects on rejections, we obtain similar estimates in the last column of Table 4. We further compare the current random coefficient model to random intercept model. A likelihood ratio test suggests that such extension does not improve the model fit. Therefore, the random intercept model is more appropriate for analysis.

**Table 4: Determinants of Trade Finance Gaps: Full Model**

|               | OLS               | Random Intercept   | Random Coefficient for <i>netinc</i> |
|---------------|-------------------|--------------------|--------------------------------------|
| Dnetinc       | 0.08<br>(0.06)    | 0.09**<br>(0.04)   | 0.09**<br>(0.04)                     |
| LADST         | 0.00<br>(0.00)    | 0.00<br>(0.00)     | 0.00<br>(0.00)                       |
| logasset      | -0.01<br>(0.01)   | -0.01<br>(0.01)    | -0.01<br>(0.01)                      |
| capacity      | 0.06<br>(0.06)    | 0.05<br>(0.06)     | 0.05<br>(0.06)                       |
| tftype        | -0.03<br>(0.03)   | -0.04<br>(0.04)    | -0.05<br>(0.04)                      |
| stringency    | -0.10**<br>(0.04) | -0.10***<br>(0.03) | -0.10***<br>(0.03)                   |
| rej_policy    | -0.00<br>(0.04)   | -0.01<br>(0.04)    | 0.00<br>(0.04)                       |
| term_relation | 0.06<br>(0.05)    | 0.08**<br>(0.04)   | 0.09**<br>(0.04)                     |
| term_bank     | 0.05<br>(0.04)    | 0.03<br>(0.03)     | 0.03<br>(0.03)                       |
| finddepth     | 0.00<br>(0.00)    | 0.00**<br>(0.00)   | 0.00**<br>(0.00)                     |
| bicrs         | 0.01<br>(0.01)    | 0.02**<br>(0.01)   | 0.02**<br>(0.01)                     |
| constant      | -0.06<br>(0.12)   | -0.09<br>(0.10)    | -0.09<br>(0.09)                      |
| Observations  | 101               | 101                | 101                                  |
| AIC           |                   | 6.66               | 8.17                                 |
| BIC           |                   | 43.27              | 50.01                                |
| ICC           |                   | 0.47               | 0.33                                 |

Standard errors in parentheses; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

To sum up, we have examined the effects of banks' internal and external environmental factors on trade finance gaps. The rejection rate on average will be 9 percent higher if trade finance transactions are less profitable. Banks' termination of relationships due to regulatory policy contributes 8 percent of increment to the rejection rate. Conversely, a ten percent reduction in the rejection rate is observed if a bank has implemented environmental and social screening on finance applications. At country level, with each scale point higher on the risk of the banking industry, the rejection rate is expected to increase by 2 percent. The financial depth of a country also widens the gap, but the effect is very small. Overall, banks' decisions are mostly affected by profitability, internal screening criteria, and country risk.

### 3.3 Robustness Check

To test the robustness of results, we re-estimate the model using Markov Chain Monte Carlo (MCMC) methods. Similar to the main analysis, we first fitted a null model and then added controls. The estimation applies a flat prior  $p(\beta) \propto 1$  for fixed effects and inverse  $\Gamma(10^{-3}, 10^{-3})$  priors for variance parameters. We run the MCMC simulation for 10,000 iterations. The deviance information criteria (DIC) diagnostic implies improved model fit when controlling for more variables. Unlike the analysis in the previous part, we report 95% credible intervals which indicate the significance of the variable. The factors are regarded as important if 95% credible intervals do not include the value of zero. As shown in Table 5, consistent coefficients were obtained. Decreased net income, strictness of environmental and social screening, and country-level banking industry risks are drivers for trade finance gaps.

**Table 5: Robustness Check: MCMC**

|               | Null        |         | Null+netinc |             |      | Null+internal |             |         | Null+all controls |              |       |        |
|---------------|-------------|---------|-------------|-------------|------|---------------|-------------|---------|-------------------|--------------|-------|--------|
|               | Coeff.      | 95% CrI | Coeff.      | 95% CrI     |      | Coeff.        | 95% CrI     |         | Coeff.            | 95% CrI      |       |        |
| constant      | <b>0.12</b> | 0.00    | 0.20        | <b>0.11</b> | 0.07 | 0.15          | <b>0.09</b> | 0.03    | 0.16              | -0.08        | -0.28 | 0.11   |
| Dnetinc       |             |         |             | <b>0.06</b> | 0.00 | 0.13          | 0.04        | -0.03   | 0.11              | <b>0.09</b>  | 0.01  | 0.16   |
| LADST         |             |         |             |             |      |               | 0.00        | -0.00   | 0.00              | 0.00         | -0.00 | 0.00   |
| logasset      |             |         |             |             |      |               | 0.00        | -0.01   | 0.01              | -0.01        | -0.03 | 0.01   |
| capacity      |             |         |             |             |      |               | 0.08        | -0.03   | 0.19              | 0.05         | -0.07 | 0.16   |
| tftype        |             |         |             |             |      |               |             |         |                   | -0.04        | -0.13 | 0.04   |
| stringency    |             |         |             |             |      |               |             |         |                   | <b>-0.10</b> | -0.17 | 0.04   |
| rej_policy    |             |         |             |             |      |               |             |         |                   | -0.01        | -0.08 | 0.06   |
| term_relation |             |         |             |             |      |               |             |         |                   | 0.08         | -0.00 | 0.16   |
| term_bank     |             |         |             |             |      |               |             |         |                   | 0.04         | -0.03 | 0.11   |
| findepth      |             |         |             |             |      |               |             |         |                   | 0.00         | -0.00 | 0.00   |
| bicrs         |             |         |             |             |      |               |             |         |                   | <b>0.02</b>  | 0.00  | 0.04   |
| ICC           | 0.31        |         |             | 0.34        |      |               | 0.34        |         |                   | 0.43         |       |        |
| DIC           |             | -122.86 |             |             |      |               |             | -103.83 |                   |              |       | -96.02 |

There are of course limitations to this analysis. As mentioned earlier, trade finance involves four types of interactions: confirming and issuing banks, importers and exporters, importers and their issuing banks, and exporters and their confirming banks. Shortfalls of trade finance could be induced by banks' internal factors, macroeconomic status, and default risk of clients. Due to data availability, we focused on the first two

aspects, without controlling for the client. Further, the analysis is based on cross-sectional data, which does not allow us to capture the complexity and intertemporal dynamics of banks' decision-making.

## 4. CONCLUSION

The reason that we are concerned with the reasons for financial frictions is its impact on firms. When credit is constrained, productivity and job creation is limited (Chodorow-Reich, 2014), export volumes are lower (Minetti and Zhu, 2011), export entry rates drop (Berman and Hericort, 2010), diversification and firm survival rates will be lower than expected (Contessi and deNicola, 2013), and low-risk opportunities will go unfunded.

The analysis in this paper suggests that there are three types of drivers for trade finance rejections. The first type includes drivers inherent in the trade finance transaction itself. That is, risk and profitability related to the counterparty bank.

Given how trade finance is typically processed today, and the continuing implementation of new regulations that are often not harmonized between jurisdictions, these are unlikely to be "solved" in the short run. Some have suggested the need for a global regulatory body in this sector (Tierney, 2014; Buthe and Mattli, 2011; Brummer, 2010). But there is little movement towards this reality.

The second type of driver is related to the re-orientation of traditional financial institutions to lower risk markets. Financial institutions that report having terminated correspondent relations due to the complexity of regulatory compliance reject more transactions overall. Banks' withdrawal from correspondent relationships in certain markets signals their movement into new and lower risk business segments. This is tied to bank-to-bank relationships rather than the firm.

Rejections that fall into this segment have greater potential to be addressed in the short-to-medium term as new institutions and instruments move to cover the markets that were left underserved. There is considerable interest in the rise of fintech and new sources of capital for SME exporters. While the pace of digitization is increasing, there is not yet evidence that these new providers are addressing gaps in trade finance.

The third driver is implementation of screening devices to address information asymmetries inherent in the transaction process. This is in line with Stiglitz and Weiss (1981). Due diligence on trade finance proposals is expensive. By implementing environmental and social standards, banks can screen out lower quality would-be applicants. We suspect that this is why implementation of standards results in lower rejection rates.

What all types of drivers underscore is that trade finance gaps result from bank decisions, but that solutions are unlikely to be generated internally by those same institutions. While some banks and credit agencies have implemented special lines of credit for SMEs or for other vulnerable populations, this is often a small proportion of their business.

There are three policy directions that governments could consider to reduce trade finance gaps given the global trade landscape. The first is to move towards harmonization of regulatory requirements among jurisdictions. The second is to promote capacity building among trade finance departments within banks. The final is to take measures to improve the visibility of SMEs to facilitate due diligence and information sharing.

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