ISSN 2042-2695

CENTRE for ECONOMIC PERFORMANCE

CEP Discussion Paper No 1492

July 2017

Specialization in Bank Lending: Evidence from Exporting Firms

Daniel Paravisini
Veronica Rappoport
Philipp Schnabl

THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

Abstract
We develop an empirical approach for identifying specialization in bank lending using granular data on borrower activities. We illustrate the approach by characterizing bank specialization by export market, combining bank, loan, and export data for all firms in Peru. We find that all banks specialize in at least one export market, that specialization affects a firm's choice of new lenders and how to finance exports, and that credit supply shocks disproportionately affect a firm's exports to markets where the lender specializes in. Thus, bank market-specific specialization makes credit difficult to substitute, with consequences for competition in credit markets and the transmission of credit shocks to the economy.

Keywords: banking, export finance, specialization
JEL codes: F14; F34; G21

This paper was produced as part of the Centre's Trade Programme. The Centre for Economic Performance is financed by the Economic and Social Research Council.

Acknowledgements
We thank Luana Zaccaria for outstanding research assistance. We thank Luis Garicano, Asim Khwaja, Nicola Gennaioli, Rebecca Zarutskie, Johan Hombert, Gregor Matvos, and participants at Bank de France, Cambridge University, CEMFI, ERWIT 2015, Financial Intermediation Research Society Conference, LBS Finance Symposium, LSE, NBER CF, NY Fed, Paris Trade Group, ICD Annual Conference in Financial Economics, SED 2015, Stanford University, Stanford University GSB, University of British Columbia Sauder School of Business, UC Berkeley, UC Berkeley HAAS School of Business, UC San Diego, University of Zurich seminars, workshops, and conferences for useful comments. All errors are our own.

Daniel Paravisini, London School of Economics, CEPR and BREAD. Veronika Rappaport, London School of Economics, Centre for Economic Performance and CEPR. Philipp Schnabl, NTU, Stern, NBER and CEPR.

Published by
Centre for Economic Performance
London School of Economics and Political Science
Houghton Street
London WC2A 2AE

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means without the prior permission in writing of the publisher nor be issued to the public or circulated in any form other than that in which it is published.

Requests for permission to reproduce any article or part of the Working Paper should be sent to the editor at the above address.

© D. Paravisini, V. Rappoport and JP. Schnabl, submitted 2017.

1 Introduction

Are banks differentially equipped to evaluate projects in different markets or sectors of economic activity? The answer to this question is fundamental for evaluating the economic consequences of bank failures, runs, liquidity shortages, tighter monetary conditions and other events that reduce a bank's credit supply. If banks have advantages in supplying credit that are heterogeneous across markets or activities, then a credit supply shortage by a single bank may have first-order effects on the real output of the market or activity in which the bank specializes. Answering this question is also essential for the appropriate assessment and regulation of bank competition. Traditional measures of bank competition based, for example, on the geographical density of bank branches, will be misleading if sectoral lending advantages allow neighboring banks to act as monopolists in their respective areas of expertise.

In this paper we construct a new measure of bank specialization based on granular data on the market-by-market economic activities of its borrowers. Although data intensive, the measure is flexible and generalizable, as it allows measuring specialization on any dimension along which a bank may develop a lending advantage (products, sectors, geographical markets). We use this measure in the context of lending to exporters in Peru, and characterize bank specialization in financing exports to different destination markets. We then show that banks have advantages in lending to their market of specialization, that the *same* firm demands more credit from banks specialized in the market in which it expands output, and that credit supply shocks affect output disproportionately in markets where the bank is specialized.

We define a bank to be specialized in a country if its portfolio share of lending to exporters to the country is a right-tail outlier in the distribution of portfolio shares of lending by all banks. We document that all banks have an abnormally large loan portfolio exposure to at least one country, and that this outlier behavior is persistent: a bank with a large abnormal exposure to a country today has a 50% probability of having an abnormal exposure to the same country ten years later. This non-parametric approach

to measuring specialization captures bank departures from the overall specialization of the economy without taking an a priori stance on the source of the advantage. This is a useful property because the variables that in theory can provide a bank with a lending advantage to a destination market (e.g., better understanding of the risk, more value-added services attached to the issuance of credit, etc.) are typically unobservable and can be a consequence of other market-specific bank characteristics (e.g., language spoken at headquarters, distribution of the branch network, etc.).

We then test whether the observed patterns of bank specialization correspond to bank advantages in lending and obtain measures of the economic consequences of these advantages. To test for the *existence* of bank advantages we propose a new revealed preference approach that exploits the disaggregated nature of the data to account simultaneously for firm demand shocks that are common to all banks (firm-time fixed-effects), and bank credit supply shocks that are common across all firms (bank-time fixed-effects). The advantage of this approach is that it is generalizable to any setting with highly disaggregated data and does not rely on the use of instruments or strong identification assumptions.

The revealed preference approach is based on testing a direct implication of the existence of bank advantages: firms will disproportionately fund export expansions to a country with credit from a bank specialized in that country. In contrast, under the null hypothesis that banks are perfectly substitutable, variation in a firm's export activity with one country should be uncorrelated with the identity of the bank providing the funding. The empirical model represents exporting firms as a collection of projects (destination countries) in which banks may specialize. We observe a measure of the output of each project for each firm (exports by country), a measure of specialization in that project for each bank (bank specialization by country), and a measure of credit for each bank-firm pair (outstanding debt by bank and firm). Our object of interest is the residual variation in bank lending to firms after controlling for firm-time and bank-time fixed-effects, which captures the equilibrium lending that results from the firm's credit demand that is

bank-specific and the bank's credit supply that is firm-specific. Our baseline results show that when firms expand exports to a country, they increase borrowing by 79% more from banks that are specialized in the destination country than from non-specialized banks. This confirms that our measure of specialization is strongly associated with country-specific bank advantages in lending.

The generalizability of the revealed preference approach comes at a cost: it does not provide information on the economic importance of lending advantages.[1] To shed light on this issue we evaluate how lending advantages affect the demand for credit from specialized banks, and how shocks to the supply of specialized credit affect output.

We do so by estimating two elasticities. The first is the elasticity of the demand for credit from specialized banks (relative to non-specialized banks) to changes in output in the market of specialization. We identify this elasticity using macroeconomic innovations in the destination market (changes in GDP and exchange rate) as an instrument for destination-specific export demand shocks, while still saturating the empirical model with firm-time and bank-time dummies. The elasticity of credit demand to export shocks is 0.50 for banks specialized in the country of the shock. The magnitude is over 50% larger than the demand elasticity from non-specialized banks (0.33). This shows that, for the *same* firm, the demand for credit is lender-specific and strongly associated with lender specialization. Localized shocks in one export market lead to a larger surge in demand for credit from banks specialized in that market.

The second is the elasticity of firm exports in a geographical market to a credit supply shock from a bank specialized in that market (relative to a supply shock from a non-specialized bank). We identify this elasticity using the empirical setting in Paravisini et al. (2015), which exploits bank credit supply variation induced by international capital flow reversals during the 2006 crisis, and controls for demand shocks by comparing changes in exports in very narrowly defined product-destination export markets (e.g., cotton T-short exports to Germany). We find that the elasticity of exports to a credit supply shock is 6.6

[1]The size of the covariance between exports and lending confounds the magnitude of the lending advantages with the magnitude of the elasticity of substitution of credit across banks.

times larger to destinations where the lender specializes in, relative to destinations it does not. This implies that specialized bank credit is substantially more difficult to replace than non-specialized credit. Thus, bank specialization has a first order effect on the magnitude of the transmission of credit supply shocks to the real economy. The results imply that a shock to one lender will have a large impact on output in the market where the bank has a lending advantage.

The above results highlight a corollary of bank specialization, related to the now-standard approach of identifying empirically bank credit supply by controlling for credit demand using firm-time fixed effects.[2] The identifying assumption behind this approach is that changes in firms' credit demand are, in expectation, equally spread across all banks lending to the firm. In the presence of bank specialization, this assumption holds only under restrictive conditions— e.g., for shocks to bank credit supply that are either uncorrelated with sectoral demand or that proportionally affect all the potential sectors of economic activity in which banks may specialize. Using again the empirical setting in Paravisini et al. (2015) we illustrate how this identification assumption can be tested using within-firm specifications that account for the banks' pattern of export specialization. We show that demand shocks can explain a larger amount of the within-firm variation in credit than bank funding shocks, which implies that confounding the two effects can lead to severely biased results.

We conclude by exploring the potential sources of lending advantage and bank specialization. Our main focus is on the distinction between lending advantages that are *market-specific* from those that are *firm-specific*.[3] Firm-specific advantages, highlighted by a longstanding literature on relationship lending, emerge because of private information collected as part of an ongoing lending interaction.[4] In contrast, *market-specific* lending

[2]See, for example, Khwaja and Mian, 2008; Paravisini, 2008; Schnabl, 2012; Jimenez et al., 2014; Chodorow-Reich, 2014.

[3]We also explore which observable bank characteristics predict the observed patterns of lending specialization and advantage. We find that neither the geographical network of global banks nor the geographical network of branches in Peru predict the pattern of lending advantage uncovered in this paper.

[4]See Bernanke, 1983; James, 1987; Hoshi et al., 1990; Petersen and Rajan, 1994; Petersen and Rajan, 1995; Berger and Udell, 1995; Degryse and Ongena, 2005; Chava and Purnanandam, 2011; Bolton et al., 2013; for

advantages are tied to all firms operating in the market regardless of whether or not the bank has private information on each firm. We can distinguish these two sources of lending advantage by focusing on new firm-bank relationships (i.e., *extensive margin*) for which banks have no private information. We find that the probability that a firm starts a new banking relationship after exporting to a new destination is 6.9 times higher for a bank specialized in that destination market relative to a non-specialized bank. Conversely, a firm is 3.8 times more likely to start exporting to a new destination the year after it starts borrowing from a bank specialized in that new market relative to a non-specialized bank. Starting a new relationship with a bank not specialized in that market, on the other hand, is not associated with any change in the probability of export entry. These results imply that the documented bank advantages in lending by export market are not driven firm-specific private information.

To further explore the distinction between firm- and market-specific advantages in lending, we test in the data a key prediction of relationship lending. Namely, that the firm-specific advantage conferred by proprietary information gathered through the lending process is not scalable, which implies that lending advantages are lost as banks grow larger.[5] Contrary to this prediction of relationship lending models, we find no evidence of a trade-off between bank size and lending advantages in export markets. Neither the bank specialization measure nor the bank lending advantage vary systematically with bank size in the cross-section or in the time series. Moreover, using bank mergers as a source of variation in bank size and specialization, we find that bank lending advantage before a merger carries over to the combined entity after the merger. These results indicate that the source of bank advantage uncovered here is scalable and not hindered by organizational constraints.

surveys, see Boot, 2000 and Ongena and Smith, 2000. More generally, existing theories that emphasize the role of financial intermediaries in producing information have long recognized that bank debt is difficult to replace with uninformed capital. See, for example, Leland and Pyle, 1977; Diamond, 1984; Ramakrishnan and Thakor, 1984; Fama, 1985; Sharpe, 1990; Diamond, 1991; Rajan, 1992; Rajan and Winton, 1995; and Holmstrom and Tirole, 1997.

[5]The trade-off between relationship lending advantages and bank size is theorized in Stein (2002) and documented in Berger et al. (2005).

The results provide novel insights for understanding the industrial organization of bank credit markets and its consequences for the real economy. Bank lending specialization and market-specific advantages provide a rationale for why firms have multiple banking relationships and why banks form syndicates: Multiple bank relationships and syndicates arise naturally when banks are differentially equipped to fund different projects by the same firm.[6] Our results also highlight the limits of bank diversification. Traditional banking theory argues that full diversification across sectors and projects is optimal (e.g., Diamond, 1984; Boyd and Prescott, 1986). However, diversification may prove costly when it implies expanding to markets in which the bank does not possess a lending advantage. Finally, our results imply that banks' market-specific advantages in lending to exporters directly contribute to the economy's pattern of comparative advantage across sectors. This mechanism is distinct from, and complementary to, the well documented pattern of comparative advantage across countries with different levels of development of the banking sector (Rajan and Zingales, 1998, Manova, 2013).

The rest of the paper proceeds as follows. Section 2 describes the data. In Section 3 we present a theoretical framework that guides our exercise and in Section 4, the empirical methodology to identify bank's lending advantage. The results are presented in Section 5. In Section 6 we discuss the difference between market-wide lending advantage and firm-specific relationship lending. In Section 7 we narrow down the potential sources of bank lending advantage. Finally, Section 8 concludes.

2 Data

We use two datasets to construct our measure of bank specialization by export market: monthly loan-level data for each bank in Peru and customs data for Peruvian exports over the period 1994-2010. Both datasets cover the universe of firms operating in Peru.

[6] Leading theories for multi-bank relationships hinge on arguments of ex post-renegotiation (Bolton and Scharfstein, 1996), information rents by relationship lenders (Rajan, 1992), and diversification of firms' exposure to bank failures (Detragiache et al., 2000), while existing explanations for loan syndicates include risk diversification and regulatory arbitrage (Pennacchi, 1988).

We collect the customs data from the website of the Peruvian tax agency (Superintendence of Tax Administration, or SUNAT). Collecting the export data involves using a web crawler to download each individual export document. To validate the consistency of the data collection process, we compare the sum of the monthly total exports from our data, with the total monthly exports reported by the tax authority. On average, exports from the collected data add up to 99.98% of the exports reported by SUNAT.

The Peruvian bank regulator (Superintendencia de Banca, Seguros, and APF, or SBS) provides the loan-level data. These data consists of a monthly panel of the outstanding debt of every firm with each bank operating in Peru. We also collect the time-series of bank financial statements from the SBS website. We check the validity of the loan-level data by aggregating total lending, and we find that total loan volume corresponds to total lending volume reported on bank balance sheets. We match the loan data to export data using a unique firm identifier assigned by SUNAT for tax collection purposes.

Table 1 shows summary statistics describing the data. The unit of observation in our empirical analysis in Section 4 is at the bank-firm-country-year level. Each observation combines the annual average bank-firm outstanding debt with the firm's annual exports to each destination country, expressed in U.S. dollars (FOB). The total number of observations in the full dataset, described in Panel 1, is 378,766. The average annual firm-bank outstanding debt is US$ 2,044,488, and the average firm-destination annual export flow is US$ 2,148,237 (conditional on bank debt being greater than zero). As usual for this type of data, exports and debt are right-skewed. The median debt and export flow are US$ 259,764 and US$ 87,218, respectively.

Panel 2 in Table 1 describes the 14,267 exporting firms in our data. On average, the median firm borrows from two banks and exports to one destination. In this dimension the data are also right-skewed; the average number of banking relationships per firm is 2.42 and the number of export countries is 2.65. We restrict the sample to include the export destination to the 22 main export markets, which represent 97% of Peruvian ex-

ports across the period of analysis.[7] The share of Peruvian exports across the main ten destinations, during the entire sample, is shown in Figure 1.

3 Specialization: Framework and Measurement

To motivate our definition of bank specialization, we present a model in which: 1) funding from one bank is not perfectly substitutable with funding from another, and 2) banks are heterogeneous in their lending capabilities for specific economic activities. In the data, these activities will correspond to export markets, and the lending advantages may come from providing credit at a lower cost, more credit for the same borrower characteristics, or more value added services attached to the issuance of credit than other lenders. Since the source of advantages is unobserved by the econometrician, we model advantages in reduced form. We use the model to derive observable and testable implications of the existence of lending advantages (whichever their source) on bank lending portfolios and the equilibrium relationship between credit from specialized banks and the economic activity in the sector they specialize in. This framework also guides the revealed preference approach used to assess whether our specialization measure (based on the stock of existing loans) is an indicator of an advantage in lending to exporters to that destination (based on the flow of new loans).

3.1 Theoretical Framework of Specialized Bank Lending

Firms are characterized by a collection of activities that require funding, and banks differ in their pattern of activity-specific lending advantages. Without explicitly defining either the market structure for the firms' output or the sources of banks' lending advantages, our goal is to present a reduced-form framework in which different sources of funding are not freely substitutable.

[7] The countries are Belgium, Bolivia, Brazil, Bulgaria, Canada, Chile, China, Colombia, Denmark, Ecuador, France, Germany, Italy, Japan, Korea, Netherlands, Panama, Spain, Switzerland, United Kingdom, United States, and Venezuela.

Each firm $i = 1, ..., I$ uses bank credit to finance a variety of activities $c \in C_i$ according to the following production function:

$$q_i^c \left(\{L_{ib}^c\}_{b=1}^B \right) = \left[\sum_{b=1}^{B} (\gamma_b^c)^{\frac{1}{\rho}} \left(L_{ib}^c \right)^{\frac{\rho-1}{\rho}} \right]^{\frac{\rho}{\rho-1}}, \tag{1}$$

where $b = 1, ..., B$ are the different banks in the banking industry; $\rho > 0$ is the elasticity of substitution between credit from different banks; and γ_b^c is the advantage of bank b in credit specific to activity c.[8]

The optimal borrowing of firm i from each bank b to fund each activity c responds to the following cost-minimization problem:

$$\min_{\{L_{ib}^c\}_{c,b}} \sum_{b=1}^{B} r_{ib} \, L_{ib} \qquad s.t. \quad q_i^c \left(\{L_{ib}^c\}_{b=1}^B \right) = \overline{q}_i^c \quad \forall c \in C_i,$$

where $L_{ib} = \sum_{c \in C_i} L_{ib}^c$ is total credit with bank b, and $q_i^c \left(\{L_{ib}^c\}_{b=1}^B \right)$ is defined in equation 1. Then, the optimal funding of firm i from bank b allocated to activity c is:

$$L_{ib}^c = \left(\frac{1}{r_{ib}} \right)^{\rho} \lambda_i^c \, q_i^c \, \gamma_b^c,$$

$(\lambda_i^c)^{1/\rho}$ is the multiplier on the output constraint, which is the marginal cost of producing q_i^c. We use the transformation of marginal cost λ_i^c to translate quantities q_i^c into monetary values, and we denote $X_i^c \equiv \lambda_i^c q_i^c$.[9] Then, the overall debt of firm i with bank b can be expressed as:

$$L_{ib} = \left(\frac{1}{r_{ib}} \right)^{\rho} \sum_{c \in C_i} X_i^c \, \gamma_b^c, \tag{2}$$

Each bank b is characterized by the interest rate, r_{ib}, which can be firm-specific, and a

[8]This CES specification generates the same credit demand function as the aggregate of a large number of firms, each discretely choosing the bank and then borrowing a given amount from the selected one, to fund activity c (see Anderson et al., 1987).

[9]In the rest of the paper, we pair $c = 1, ..., C$ with country of export destination. Then, if firms produce homogeneous goods in a competitive market, the marginal costs are equalized across firms and are equal to the international price. In that case, X_i^c corresponds to the value of exports by firm i to destination c.

vector of activity-specific capabilities $\gamma_b = \left[\gamma_b^1, ..., \gamma_b^C\right]$. This parameter can be interpreted as an activity-specific monitoring advantage, an activity-specific discount on interest rate, or as a service associated with the activity.[10]

Note that if all sources of credit are perfect substitutes (i.e., $\rho = \infty$), the funding of activity c in (1) is given by the overall funding of firm i allocated to activity c, without differentiating the lending institution, $q_i^c = \sum_{b=1}^{B} L_{ib}^c$. If this were the case, firms would borrow only from the bank that offers funding at the lowest interest rate, r_{ib}. On the other hand, if sources of credit are not perfect substitutes (i.e., $0 < \rho < \infty$) and banks are heterogeneous, then firms have multiple banking relationships. The interest rate charged by each bank influences its size, measured in overall lending (i.e., $\frac{\partial \ln \sum_i L_{ib}}{\partial \ln r_{ib}} = -\rho < 0$), and in equilibrium the firm borrows from multiple banks.

This framework guides our empirical methodology. We derive from it the measure of the bank's portfolio share associated with a given economic activity, and we use that measure in subsection 3.2. Our framework implies that, if banks are imperfectly substitutable sources of funding, then each bank has a larger portfolio share associated with the activity in which they have a lending advantage. Moreover, we derive from this framework the rationale for our revealed preference identification strategy presented in Section 4. If a firm increases its outcome in activity c, and banks are imperfectly substitutable sources of funding, it will increase its share of credit with the bank that has a lending advantage in that activity.

More formally, consider two banks b, b' that have the same productivity parameters for all activities, with the exception of sectors c and c' for which $\gamma_b^c = \gamma_{b'}^{c'} > \gamma_b^{c'} = \gamma_{b'}^c$. The following results follow from equation 2.

Result 1. *The share of lending associated with activity c is higher for bank b than for bank b'. That is, let S_b^c be defined as:*

$$S_b^c \equiv \frac{\sum_{i=1}^{I} L_{ib} X_i^c}{\sum_{k=1}^{C} \sum_{i=1}^{I} L_{ib} X_i^k}. \tag{3}$$

[10]We assume that firm-level default risk is the same across lenders. Alternatively, the interest rate for each bank should be interpreted as the risk-adjusted rate.

Then, $S_b^c > S_{b'}^c$.[11]

Result 2. *The elasticity of lending to the outcome of activity* c *is higher for the bank with an advantage in activity* c*. That is,* $\frac{\partial \ln L_{ib}}{\partial \ln q_i^c} \geq 0$ *and increases with* γ_b^c.

3.2 Specialization Measure

We obtain a measure of specialization, which is scaled by bank size, using the definition of bank portfolio share associated with an economic activity in Result 1. Each economic activity in the framework presented in subsection 3.1 represents a geographical market—an export destination country—in the data. Then, S_{bt}^c in equation 3 is the bank-b borrowers' exports (weighted by their debt in bank-b) to country c, as a share of bank-b borrowers' total exports. The firms $i = 1, ..., I$ are the universe of exporting Peruvian firms, $c = 1, ..., C$ are the destination country of exports, X_{it}^c are exports by firm i to destination country c in year t, and L_{ibt} is the outstanding debt of exporting firm i with bank b in year t.

The share of bank lending associated with exports to any given destination, S_{bt}^c, will be systematically high across all banks in countries that receive a large fraction of total Peruvian exports (e.g., U.S.). To produce a specialization measure that captures a bank's departure from the overall specialization pattern of Peruvian exports, we define a bank to be specialized if its portfolio share is a right-tail outlier towards loans associated with a given country, relative to the distribution of portfolio shares of all other banks.

We adopt a non-parametric approach to systematically identify the outlier banks in the distribution of $\{S_{bt}^c\}$ for each country-year. Formally:

Definition 1 (Specialization)**.** *We consider a bank-country-year observation,* S_{bt}^c*, to be an outlier, which we denote with the dummy* $O(S_{bt}^c) = 1$*, if* S_{bt}^c *is above the upper extreme value, defined by the 75*th *percentile plus 1.5 interquartile ranges of the distribution of* $\{S_{bt}^c\}$ *across banks for a given country-year. We refer to an outlier bank as* ***specialized*** *in the corresponding country during the corresponding year.*

[11] The derivation of this result is in the Appendix.

Identifying outliers using percentiles and interquartile ranges has the advantage that it does not rely on any assumptions about the distribution of bank portfolio shares.[12] In a normally distributed sample, our definition would correspond to observations above the mean plus 2.7 times the standard deviation, which corresponds to observations in the 1st-percentile of the distribution.

To illustrate the approach, we use a box-and-whisker plot to represent the distribution of $\{S^c_{bt}\}$ for two countries, Switzerland and the U.S., in 2010 (Figure 2). To facilitate the interpretation, we plot $\{S^c_{bt} - \overline{S}^c_t\}$ instead of $\{S^c_{bt}\}$, so that the share distributions are centered at zero for each country. The top and bottom edges of the box denote the 25th and 75th percentiles of the distribution, and the size of the box is the interquartile range (IQR). The upper (lower) *whisker* delimits the range between the 75th (25th) percentile and the upper (lower) extreme value, defined as the highest (lowest) datum within 1.5 $\times$ IQR of the 75th (25th) percentile. Then, for a given country and year, we consider a bank to be an outlier of the distribution if its share of portfolio lending to the country lies outside the whiskers (outliers are identified with dots in the plot). For example, according to our definition, in 2010 Citibank and Scotiabank are specialized in lending to firms exporting to Switzerland, while Santander is specialized in lending to firms that export to the U.S.

A key feature of our measure of specialization based on the value of exports to a market is that it captures portfolio share outliers that are driven by both the number of firms and firm size. This is an important characteristic because when firms are modeled as a collection of economic activities, and banks have a lending advantage in a subset of these activities (as in the framework in subsection 3.1), a bank may become a portfolio share outlier in a country because it lends to a large number of exporters relative to other banks, or because it provides a large fraction of the credit to a few large exporters relative to other banks. Both extremes are captured by the proposed specialization measure.

[12] See Hodge and Austin (2004) for a survey of outlier detection methods.

3.3 Bank Specialization Descriptive Statistics

We compute the shares of lending associated with each export market using the outstanding debt of Peruvian firms in the 33 banks operating in Peru between 1994 and 2010, as well as the firm-level export data by shipment to the 22 largest destination markets.[13]

The values of S^c_{bt} defined in (3) provide information on the heterogeneity in lending shares by country across banks. In Table 2, we present descriptive statistics of S^c_{bt} by country, demeaned by the average share across all banks in the corresponding country, $\overline{S}^c_t$. The median of $S^c_{bt} - \overline{S}^c_t$ is negative for every country, indicating that the within-country distribution of $\{S^c_{bt}\}$ is right-skewed. This is confirmed in column 5, where we report a large and positive skewness for every country. This skewness implies that for every destination country in the sample, there is at least one bank that specializes in financing exports to that destination. Figure 3 confirms this finding. It shows the box-and-whisker plot of the distribution of $S^c_{bt} - \overline{S}^c_t$ for each country during the years 1995, 2000, 2005, and 2010. The dots outside the range of the whiskers, for each country-year, correspond to the specialized banks according to Definition 1.

Table 3, column 1, reports the number of countries in which each bank specializes at least once in the sample period. Banks specialize in several countries during the 17-year period, with one bank (code 73) reaching a maximum of 15 countries out of a total of 22. These numbers decline considerably once we count the countries in which each bank specializes for at least 25%, 50%, or 75% of the time that the bank appears in the sample (columns 2 to 4). Even using a stringent definition of specialization—in which the bank must be an outlier in the country for at least 75% of the observed sample period in order to be considered specialized—25 out of 33 banks in the sample specialize in at least one country. This is because the pattern of bank specialization is very persistent, as shown in Figure 4. The auto-correlation between bank-country specialization is constant at around 0.45 over a 10 year period.

[13]The bank panel is unbalanced because of entry, exit and M&A activity (we discuss M&A activity in more detail in subsection 6.3).

In summary, banks specialize in the export markets of its borrowers, and each bank is associated with a subset of countries for which it exhibits long-lasting specialization. Whether this measure is associated with an underlying bank advantage in lending to the market of specialization is an empirical question. Our revealed preference empirical approach, explained in the next section, tests not only whether banks have an advantage in lending towards specific destinations, but also whether this measure of specialization indeed provides information about such an advantage.

4 Identifying Advantage in Lending

We use three different empirical strategies to characterize lending advantages. The first is aimed at testing in the data whether lending advantages *exist*, and is based on testing the prediction implied by Result 2, in Subsection 3.1: variations in firm exports to a country are more correlated with credit from banks that specialize in that country than with credit from non-specialized banks. This novel revealed preference approach to evaluate advantages is robust and generalizable, as it circumvents the problems involved in attempting to infer advantages from the direct observation of its potential sources or relying on instrumental variables.

The two other empirical approaches are aimed at identifying the magnitude of the advantages and their consequences for how demand shocks affect the health of the banking sector, and how credit supply shocks affect output. We measure how the following elasticities vary with the degree of bank specialization: the elasticity of the demand for credit in response to a demand shock in the export markets, and the elasticity of exports to a credit supply shock. The estimation of these elasticities relies on using plausible exogenous variation to export demand and to the supply of credit, which we explain in more detail below.

4.1 Revealed Preference Identification

Consider the following general characterization of the amount of lending by bank b to firm i at time t:

$$L_{ibt} = L\left(L^S_{bt}, L^D_{it}, \mathcal{L}_{ibt}\right). \tag{4}$$

Bank-firm outstanding credit is an equilibrium outcome at time t, determined by the overall supply of credit by the bank, L^S_{bt}, which varies with bank-level variables such as overall liquidity, balance-sheet position, etc.; the firm's overall demand for credit L^D_{it}, which varies with firm-level productivity, demand for its products, investment opportunities, etc.; and, finally, a firm-bank specific component, $\mathcal{L}_{ibt}$, our object of interest: the component of bank-b's lending that depends on its relative advantage in markets supplied by the firm i.

Our baseline empirical specification isolates the bank-firm pair component of lending, $\mathcal{L}_{ibt}$, using saturated regressions. Specifically, we account for the bank-specific credit supply shocks L^S_{bt} (common in expectation across all firms) and all firm-specific credit demand shocks L^D_{it} (common in expectation across all banks) by saturating the empirical model with a full set of bank-time and firm-time dummies, α''_{bt} and α'_{it}.[14] Thus, for each country-bank-firm-year, our baseline specification is:

$$\ln L_{ibt} \;=\; \alpha^c_{ib} + \alpha'_{it} + \alpha''_{bt} + \beta_1 \ln X^c_{it} + \beta_2\, \mathcal{S}^c_{ibt} + \beta_3\, \mathcal{S}^c_{ibt} \times \ln X^c_{it} + \epsilon^c_{ibt}, \tag{5}$$

where L_{ibt} is the observed amount of debt of fimr i from bank b at time t, X^c_{it} are exports from firm i to country c, and $\mathcal{S}^c_{ibt}$ is a measure of bank specialization in country c. Under the null hypothesis that funding across banks is perfectly substitutable, $\beta_3 = 0$, meaning that firm exports to a country are not systematically correlated with borrowing from banks specialized in that country.

The measure of specialization used in this analysis, $\mathcal{S}^c_{ibt}$, is based on a rolling period

[14] This methodology builds on the recent literature that uses micro-data to account for firm credit demand shocks that are common across all banks with firm-time dummies, and for bank credit supply shocks that are common across all firms with bank-time dummies (see, for example, Jimenez et al., 2014).

of three years up to the year of the loan: for every year t, it corresponds to the fraction of years between $t-2$ and t in which bank b is an outlier in the loan distribution associated with country c.[15] To avoid any potential spurious correlation between lending by bank b to firm i (L_{ibt}) and the specialization measure of bank b, we employ the following *leave-one-out* measures of the share of bank b's borrower exports to country c to construct the specialization measure:

$$S^c_{(-i)b\tau} \equiv \frac{\sum_{k\neq i}^{I} L_{bk\tau} X^c_{k\tau}}{\sum_{c=1}^{C} \sum_{k\neq i}^{I} L_{bk\tau} X^c_{k\tau}}, \tag{6}$$

Using this leave-one-out share in our measure of specialization in Definition 1 leads to the following firm-varying measure of bank specialization:

$$\mathcal{S}^c_{ibt} = \frac{1}{3} \sum_{\tau=t-2}^{t} O(S^c_{(-i)b\tau}), \tag{7}$$

Note that although outstanding debt is a firm-bank-year value, L_{ibt}, there are 22 relationships like the one in (5) for each firm-bank-year—one for each country c in our analysis sample. To estimate the parameters of (5), we stack the observations for all countries and adjust the standard errors for clustering at the bank and firm level to account for the fact that L_{ibt} is constant across countries for a given bank-firm-time triplet. The set of time-invariant firm-bank-country fixed effects, α^c_b, accounts for all unobserved heterogeneity in the firm-bank-country lending relationship, such as the distance between bank headquarters and the destination country. We estimate this specification demeaned to eliminate the time-invariant fixed effects.

The advantage of the revealed preference approach for identifying the existence of lending advantages is that it is generalizable and assumption-free. The specification tests a join hypothesis: that banks have advantages in lending, and that our measure of specialization captures it. The disadvantage is that the magnitude of the covariance measure, β_3, is difficult to interpret. Thus, we turn next to estimating elasticities to demand and supply

[15] The results are not affected by the length of time included in this measure.

shocks, which have direct economic meaning and provide information on the magnitude of lending advantages.

4.2 Credit Demand Elasticity

To obtain the elasticity of the demand for credit to shocks in the demand for exports we use again specification (5), and estimate it by instrumenting exports to country c, X_{it}^{c}, with two macroeconomic performance measures in the destination country: GDP expansions and real appreciations in the country of destination. This exercise is similar to the gravity equation estimates in Fitzgerald and Haller (2014), which uses firm-destination-year export data from Ireland and absorbs any firm-level change in costs or productivity with firm-time fixed effects.[16]

The exclusion restriction is that changes in foreign export demand shocks and its interaction with bank specialization only affects firm borrowing through its effect on export activity. This assumption is plausible given that any direct effect of export demand shocks on bank lending is controlled for through bank-time and firm-time fixed effects, α_{it} and α_{bt}. The coefficient β_3 in this specification can be interpreted as the elasticity of credit demand to destination-specific export shocks for banks specialized in the destination country, relative to non-specialized banks (for which with elasticity is β_1).

This specification is important because it tests an additional hypothesis: that the demand for credit of a multi-market firm is bank-specific, and that demand shocks in one product market affect disproportionately the demand for credit of the banks specialized in that market.

4.3 Impact of Credit Shocks

The goal is to evaluate how shocks to the credit supply of specialized banks affect firm output in the market of specialization (relative to other markets). To isolate bank-specific

[16]See also Berman et al. (2012) for the effect of real exchange rate shocks on exports using firm-country panel data for French firms.

credit supply shocks, we use the empirical setting in Paravisini et al. (2015) (hereafter, PRSW): bank-level heterogeneity in the exposure to the 2008/09 financial crisis as an instrument for changes in credit supply. In 2008, international portfolio capital inflows to Peru decreased sharply, and, as a result, funding to banks with a high share of international liabilities dropped substantially. To account for variation in the demand for exports PRSW use country of destination-product-time dummies. We augment their analysis to assess whether a bank credit supply shock has a larger impact on exports to the bank's country of specialization:

$$\ln X_{ipt}^{c} = \alpha_{ibp}^{c} + \alpha_{pt}^{'c} + \beta_1 \ln L_{ibt} + \beta_2 S_{bit}^{c} + \beta_3 \, S_{bit}^{c} \times \ln L_{ibt} + \epsilon_{ibpt}^{c} \tag{8}$$

where X_{ipt}^{c} is the (volume) of exports of product p by firm i to country c during the intervals $t = \{Pre, Post\}$, Pre and $Post$ periods correspond to the 12 months before and after July 2008. L_{ibt} is firm-i's credit from bank-b in the Pre period, instrumented with $Exposed_b \times Post_t$, where $Exposed_b$ is a dummy equal to 1 if the bank has a share of foreign debt above 10% in 2006, and $Post_t$ is a dummy equal to 1 during the 12 moths after July 2008.[17] Together with the results, we show in Subsection 5.3, that this instrumental approach is still valid in the context of specialized banks. The coefficient β_3 in specification 8 can be interpreted as the elasticity of exports to credit supply for banks specialized in the market of export destination, relative to other banks (for which with elasticity is β_1).

The regression includes firm-product-country fixed effects, α_{ipb}^{c}, which control for all (time-invariant) unobserved heterogeneity across firms and banks in exporting that product to that destination. It also includes a full set of country-product-time dummies, α_{pt}^{c}, that accounts for non-credit determinants of exports. In particular, these dummies account for demand shocks originated in narrowly defined export markets.[18] Note that

[17]The threshold is the average exposure taken across the 13 commercial banks in 2006. The entire sample of 41 banks also includes 28 S&Ls at year-end 2006 with minimal exposure.

[18]Products are defined according to the four-digit categories of the Harmonized System. For example, product-country-time dummies account for changes in the demand for cotton T-shirts from Germany.

although exports is a firm-product-country-year value, X^c_{ipt}, the right-hand side of the relationship (8) varies also at the bank level. To estimate the parameters in (8), we stack the observations for all banks and adjust the standard errors for clustering at the product-country level to account for the fact that X^c_{ipt} is constant across banks for a given product-country-firm-time combination.

A coefficient estimate $\beta_3 > 0$ indicates that, for a given firm, the elasticity of exports to a bank credit supply shock is larger for exports to countries in which the bank specializes in. This specification tests an augmented joint hypothesis: that banks have advantages in lending, that our measure of specialization captures it, and that firms cannot easily substitute credit from specialized banks to sustain export activities. The importance of the last component of the joint hypothesis lies in that if it were rejected, then differences in bank advantages would have no impact on the patterns of exporting activity. Finding $\beta_3 > 0$ implies that bank advantages do affect real output and competition across lenders.

5 Bank Specialization, Lending, and Exports

This section presents the estimates from the three empirical specifications described in Section 4: 1) a test of whether the correlation between credit and exports is larger for banks specialized in the market of destination (revealed preference), 2) an estimate of the effect of demand shocks to product markets on the demand for credit of specialized banks, and 3) an estimate of the effect of a supply shock from a specialized bank on output in the market of specialization.

5.1 Revealed Preference Results

We present in Table 4, column 1, the estimates of specification 5. Our coefficient of interest on the interaction of exports and the specialization measure is positive and significant at the 1% level. This result shows that when a firm expands its exports to a country, it increases its borrowing disproportionately from banks that specialize in the same country.

The inclusion of firm-time fixed effects implies this correlation holds within a firm: if a firm's export composition shifts from country A to country B, its borrowing composition shifts from a bank specialized in country A to a bank specialized in country B.[19] The bank-time fixed effects imply that this correlation is not driven by generic shocks to credit supply that affect all firms in the same manner.

To interpret the magnitude of the effect, we compare the estimates for specialized and non-specialized lenders in the same specification. The coefficient on exports with non-specialized lenders is 0.024, while the point estimate on the interaction term of exports and the specialization measure is 0.019. The relative size of the coefficients implies that, for the same change in exports to a country, the increase in borrowing is 79% larger for banks specialized in that country, relative to non-specialized banks.

These results reject the hypothesis that debt is perfectly substitutable across banks, and confirm that banks have advantages in lending to the countries in which they specialize in. The results also validate that our measure of specialization captures lending advantages.

5.2 Export Demand Shocks and Credit

Table 4, column 3, presents the results of the instrumental variables estimation of specification 5, using GDP growth and real exchange rate in the destination country (and their interaction with specialization) as an instrument for export demand (and its interaction with specialization). Table 4, Column 2 shows the correlation that is the basis of the first stage: the regression coefficients of exports to country i on GDP growth and real exchange rate in the destination country. The coefficients on both variables are positive and significant, and the two first stage regressions (shown in the Appendix) have F-statistics that exceed 30.

[19] This coefficient captures the correlation between the firm-bank specific component of debt and the firm's average exports to the countries in which bank b does not specialize. Note that there is independent bank-firm variation in exports —variation that is not captured by the firm-time dummies— because not all banks specialize in the same countries.

Table 4, Column 3 presents the IV estimates of the elasticity of the demand for credit from specialized and non-specialized banks to a export demand shock. Although we obtain a positive point estimate for the elasticity of credit demand from non-specialized banks, it is noisily estimated and not statistically different from zero. In contrast, the point estimate of the elasticity from specialized banks (relative to non-specialized ones) is 0.167 and statistically different from zero.

Comparing the point estimates indicates that the elasticity of credit demand from specialized banks is close to 50% larger than the elasticity from non-specialized banks, in response an export demand shock in a given destination market. The order of magnitude of the effect of specialization on the elasticity is similar to the effect of specialization on the covariance of exports and credit obtained in the revealed preference approach above (79%). This result is important because it implies that lending advantages have a first order impact on firms' marginal credit demand decisions. The result also implies that the same product market shock will have very heterogeneous impact across banks with different markets of specialization.

We note that the point estimates of the demand elasticities are an order of magnitude larger than the OLS estimates discussed in the previous subsection (column 1). The IV approach isolates the variation in exports and credit due to market-specific export demand shocks. In contrast, the OLS estimates of the revealed preference approach capture covariances between exports to a country and borrowing from specialized banks that may be driven by export-demand shocks, firm shocks (e.g., productivity, credit, etc) and product shocks (e.g, changes in world prices, cost). The comparison of the two estimates indicates that a small fraction of the total variation in exports is driven by aggregate demand shocks in the country of destination.

5.3 Credit Supply Shocks and Exports

The results so far indicate that banks have lending advantages across different markets and that firms demand credit disproportionately from specialized banks to expand output

in their market of specialization. These results, however, do not answer the question of whether differences in bank lending advantages are large or whether they have important implications for output. The reason is that even small differences in lending advantages may lead to large swings in demand across banks if banks are close substitutes as capital suppliers. To shed light on this issue we turn to exploring how a firm's output in a market respond to changes in the supply of credit from specialized and non-specialized banks.

Table 4, columns 5 and 6, presents the OLS and IV estimates of specification 8. The endogenous variable, credit by bank b to firm i, and its interaction with bank specialization, are instrumented with the bank exposure instrument, $Exposed_b \times Post_t$, and its interaction with specialization measures. Table 4, column 4, shows the bank exposure instrument is positively and significantly correlated with lending, implying that banks with more exposure to foreign liabilities declined more after the crisis. The two first stage regressions, shown in the appendix, have F-statistics of 7.1 and 16.

The IV estimate in column 6 measures the elasticity of exports to a market to a credit supply shock and how this elasticity varies with the specialization of the bank in that market. The point estimates imply that a 10% reduction in a bank's credit supply leads to a 7% decline in exports to countries in which the bank specializes in, and a 1% decline in exports to countries in which the bank does not specialize in. All point estimates are precisely estimated and the difference between the export elasticities across specialized and non-specialized lenders is statistically different from zero.[20]

These elasticity estimates and their variation with bank specialization imply that lending advantages make specialized bank credit difficult to substitute. It implies that even isolated shocks to the balance sheet of one bank may have a large impact on output in the market where the bank has lending advantages. It also implies that market-specific lending advantages hinder competition across seemingly similar lenders. Thus, lending advantages have important implications for the equilibrium outcomes in credit markets

[20] Again here the elasticity estimates are an order of magnitude larger than the OLS estimates, indicating that a small fraction of the total variation in credit during the 2008 financial crisis was driven by credit supply.

and their real outcomes. Our proposed measure of specialization provides a useful tool to analyzing these implications.

5.4 Identifying Credit Supply Shocks

In this subsection we discuss the implications of our findings for the empirical identification and measurement of bank credit supply shocks. The state-of-the-art methodology to empirically identify credit supply shocks relies on the assumption that credit demand shocks may be accounted for by using empirical models that saturate all firm-time variation.[21] Put simply, the approach assumes that credit demand shocks *cannot* induce firms to systematically shift their borrowing from one bank to another, and thus can be controlled for with firm-time fixed effects. This assumption is only true in general if banks do not have lending advantages and do not specialize, an assumption that is shown not to hold in our setting. The assumption may hold under restricted circumstances: if the source of the credit supply shock is uncorrelated with anything affecting specialized demand. We can illustrate in our setting how regressions saturated with firm fixed effects and augmented with specialization measures can be used to evaluate the validity of this identification assumption.

We begin by estimating the standard saturated regression using our dummy measure of bank exposure to the financial crisis as a source of variation. That is, that $Exposed_b$ –i.e., a dummy equal to 1 if the bank has a share of foreign liabilities above 10% in 2006– is a predictor of bank-specific credit supply shock during 2008-2009. Using credit data we estimate the following specification:

$$\ln(L_{ibt}) = \alpha_{ib} + \alpha_{it} + \beta \cdot Exposed_b \times Post_t + \nu_{ibt}, \tag{9}$$

where the definition of the variables and time periods coincide with those in (8). The regression includes firm-bank fixed effects, α_{ib}, which control for all (time-invariant) un-

[21] For recent examples of recent papers using this approach, see Khwaja and Mian, 2008; Paravisini, 2008; Schnabl, 2012; Jimenez et al., 2014; Chodorow-Reich, 2014.

observed heterogeneity in the demand and supply of credit. It also includes a full set of firm-time dummies, α_{it}, that control for the firm-specific evolution in credit demand during the study period.

The coefficient β measures how lending by exposed and not-exposed banks changed before and after the capital flow reversals, and it is typically interpreted as the effect of the capital flow reversals on the supply of credit. The estimated coefficient is presented in Table 5, column 1 (this is an exact replication of the within-firm estimates in PRSW). The point estimate suggests that the supply of credit by exposed banks dropped by 16.8%, relative to not-exposed banks, after the capital flow reversals. However, firm-time dummies absorb credit demand variation *only if* a change in firm credit demand is, in expectation, equally spread across all banks lending to the firm, an assumption that may not hold in the presence of bank specialization.

We augment specification 9 with the variable $(C(X_i^c > 0) \bigcap C(\mathcal{S}_{ib}^c > 0)) \times Post_t$. The dummy $(C(X_i^c > 0) \bigcap C(\mathcal{S}_{ib}^c > 0))$ is equal to one if the set of countries supplied by firm i, $C(X_i^c > 0)$, has at least one country that belongs to the set of specialization of bank b, $C(\mathcal{S}_{ib}^c > 0)$—i.e., countries for which $\mathcal{S}_{ib}^c$ defined in (7) is positive in the Pre period. The coefficient on this additional term measures the change in the equilibrium amount of credit to firms that export to the country in which bank b specializes, relative to the change in credit to firms that do not. The estimated coefficients of the augmented specification are shown in Table 5, column 2. The estimated coefficient on the additional term, -0.199, most likely has a demand interpretation: the global demand for Peruvian exports declined during 2008, and firms reduced their demand for credit from banks specializing in their exporting activities. The magnitude of the coefficient indicates that the demand for export-related credit dropped by 20% during the sample period. Thus, the variable $(C(X_i^c > 0) \bigcap C(\mathcal{S}_{ib}^c > 0))$ recovers bank-specific credit demand shocks that *are not* accounted for by the firm-time dummies in specification 9.

Adding $(C(X_i^c > 0) \bigcap C(\mathcal{S}_{ib}^c > 0))$ to specification 9 does not have a statistically significant impact on the magnitude of the coefficient on $Exposed_b$. This implies that, in the

context of the PRSW application, the foreign funding shock affecting Peruvian banks was virtually uncorrelated with confounding effects related to the banks' export market of expertise. This is a necessary condition for disentangling credit supply from credit demand.

The signs and magnitudes of the estimated supply and demand effects are informative of the potential bias that may result if the two sources of variation simultaneously affect the bank and its market of expertise. Both estimates have the same sign, indicating that, in this setting, confounding demand and supply would lead to an overestimation of the credit supply shock. The magnitude of the potential bias is large. Interpreting the entire within-firm variation in credit as supply-driven would lead to overestimating the size of the supply shock by a factor of 2.3 —i.e, $(0.199 + 0.155)/0.155$.

6 Market Advantage vs Relationship Lending

In our analysis so far we have assumed that banks may have advantages in lending to firms operating in a market or sector of economic activity. This type of market- or sector-specific advantages are potentially distinct from the firm-specific advantages in lending emphasized by the existing literature on banking and relationship lending.[22] The distinction is important because market-specific and firm-specific advantages have different implications for the industrial organization of bank credit markets but may lead to the same observed phenomena. For example, consider the following two rationales for firms borrowing from multiple lenders. In the presence of market-specific advantages, the firm borrows from lenders specialized in each market it operates in to exploit the lending advantages. In the presence of firm-specific advantages, in contrast, firms borrow from multiple lenders to avoid the monopoly rents that a privately inform bank extracts from it.

In this section we explore whether the lending advantages uncovered here are market-

[22]See Bernanke, 1983; James, 1987; Hoshi et al., 1990; Petersen and Rajan, 1994; Petersen and Rajan, 1995; Berger and Udell, 1995; Degryse and Ongena, 2005; Chava and Purnanandam, 2011; Bolton et al., 2013; for surveys, see Boot, 2000 and Ongena and Smith, 2000.

specific or firm-specific, through three approaches: 1) by estimating whether specialization predicts extensive margin decision of where to export and whom to borrow from, 2) by exploring the connection between lending advantage and the size of firms and banks, and 3) by exploring the lending advantage patterns of banks before and after a merger or acquisition.

6.1 New Banking Relationships and Export Entry

The basic premise behind the firm-specific advantages gained through relationship lending is the following: banks gather private information through repeated interactions with a firm, which implies an advantage vis a vis other uninformed banks. If the observed patterns of specialization in export markets and their associated advantages are firm-specific, then our specialization measure should not predict firm behavior in the extensive margin. We begin by testing whether the probability that a firm starts borrowing from a bank increases after the firm starts exporting to the country of specialization. We estimate the following linear probability model (parallel to specification 5):

$$\begin{aligned}(L_{ibt} > 0 | L_{ibt-1} = 0) &= \alpha^c_{ib} + \alpha'_{it} + \alpha''_{bt} + \beta_1 \left(X^c_{it-1} > 0 | X^c_{it-2} = 0\right) + \beta_2 \, \mathcal{S}^c_{ibt} \\ &\quad + \beta_3 \, \mathcal{S}^c_{ibt} \times \left(X^c_{it-1} > 0 | X^c_{it-2} = 0\right) + \epsilon^c_{ibt}, \end{aligned} \tag{10}$$

where $(L_{ibt} > 0 | L_{ibt-1} = 0)$ is a dummy equal to 1 if firm i borrows from bank b in year t, but not in year $t-1$; and, correspondingly, $(X^c_{it-1} > 0 | X^c_{it-2} = 0)$ is a dummy equal to 1 if firm i exports to country c in year $t-1$, but not in year $t-2$. In this case, the specialization measure is not firm-i specific.

We also test an alternative extensive margin: whether the probability that a firm starts exporting to country c increases after the firm starts borrowing from a bank specialized

in that destination.

$$
\begin{aligned}
(X_{ibt} > 0 | X_{ibt-1} = 0) &= \alpha^c_{ib} + \alpha'_{it} + \alpha''_{bt} + \beta_1 \left(L^c_{it-1} > 0 | L^c_{it-2} = 0\right) + \beta_2 \, \mathcal{S}^c_{ibt} \\
&\quad + \beta_3 \, \mathcal{S}^c_{ibt} \times \left(L^c_{it-1} > 0 | L^c_{it-2} = 0\right) + \epsilon^c_{ibt}, \qquad (11)
\end{aligned}
$$

Our coefficient of interest in specifications 10 and 11 is β_3. A coefficient $\beta_3 > 0$ indicates that the probability of starting to borrow from a bank increases after the firm starts exporting to the bank's country of specialization (equation 10), or that the probability of starting exporting to a given destination increases after the firm starts borrowing from a bank specialized in that country (equation 11).

Table 6, columns 2 and 3, present the OLS estimates of the entry margin specifications in (10) and (11) respectively.[23] The coefficient estimates in column 1 indicate that the probability of starting a banking relationship with a non-specialized bank ($\mathcal{S}^c_{ibt}$=0) after exporting to a new destination is 0.06%, and it increases 6.9 times (to 0.46%) for a bank that has specialized in that destination for the full sample period up to t ($\mathcal{S}^c_{ibt}$=1). This is an economically large effect given that the unconditional probability that an exporter starts a new relationship with a bank at any point in time is 0.74%.

The probability of exporting to a new country increases to 2.6% the year after a firm starts borrowing from a bank specialized in that destination (column 2). There is no effect for non-specialized lenders. To assess the economic importance of this effect, we compare the magnitude of the coefficient with the unconditional probability that an exporting firm with positive credit adds a new destination in any given year (0.69%). It follows that the likelihood of exporting to a new destination increases 3.8 times after a firm starts borrowing from a specialized bank.

Taken together, these results indicate that bank specialization plays an important role in financing export activity even when the firm and the bank have no prior lending re-

[23] The sample for this estimation is the combination of all possible bank-firm relationships—meaning all the bank-firm pairs that do not have a positive outstanding balance in any given year (thus the large sample size and the low probability of a new relationship).

lationship. The extensive margin results underline the presence of *market-specific* bank advantages in lending, as opposed to *firm-specific* ones emphasized by prior work on relationship lending.

6.2 Specialization and Bank and Firm Size

We explore the connection between lending advantage and the size of firms and banks. This is motivated by the theoretical framework in Stein (2002), which suggests that there is a trade-off between bank and firm size and the firm-specific advantage generated through relationship lending. The informational wedge between insider and outsider banks is understood to be more acute for small firms, which are more opaque than large corporations. Moreover, this firm-specific information is understood to be communicated across hierarchical layers of the organization (*soft* information). In contrast, if the source of the lending advantage is scalable, not only will the advantage persist for large banks and firms, but the banks with larger advantages will be larger.

Table 7, columns 1 and 2, show the correlation between our measure of specialization, defined in (7), and bank size, measured by total (real) lending in Peru. Since foreign-owned banks are much larger than implied by their lending in Peru, we also include the dummy $Foreign_{bt}$ to capture this global size difference. Larger and foreign-owned banks are not more likely, in the cross-section, to specialize in export markets (column 1). For a given bank over time (column 2), the number of countries in which banks specialize does not grow with size, but banks do increase their set of specialization after being acquired by a foreign bank.

We are interested in whether the patterns obtained from estimating the baseline regressions in Table 6 are similar in the cross-section of bank size and foreign ownership status. We estimate specification 5 augmented with interactions of the right-hand-side variables with $Foreign_{bt}$ and $SmallBank_b$, a dummy equal to 1 if b is not one of the ten largest institutions measured in total loans over the full sample period.[24] The results are

[24]Since not all banks appear in all years, we rank the banks according to their average inflation-adjusted

reported in Table 7, columns 3 and 4. The coefficient on exports interacted with specialization is similar to that in the baseline specification in Table 6. This implies that the ten largest banks in Peru have a significant advantage in lending to the countries in which they specialize. The coefficient on the interaction with $SmallBank_b$ is negative but statistically insignificant (column 3). Although the point estimate is noisily estimated, its magnitude suggests that smaller banks may have a smaller lending advantage or none at all. Similarly, the lending advantages of foreign and domestic banks are not significantly different from each other (column 4). In column 5 we analyze whether the lending advantage is related to the firm size, measured by total exports. The correlation between export flows and credit is larger for firms in the top 10% of the total exports distribution during at least one year in our sample. But the lending advantage, measured by the interaction term $\mathcal{S}^c_{ibt} \times \ln X^c_{it}$, does not vary across firm size.

6.3 Transmission of Lending Advantage into Merged Banks

To further explore the transmission and communication of the lending advantage within the financial institution, we explore the lending patterns of banks before and after a merger or acquisition. We test whether the pattern of lending advantage that characterized the two banks prior to the M&A is preserved and expanded to the entire corporation after the merger.

We modify the data and specification 5 to perform event studies around the years in which bank mergers take place. Eight-year interval subsamples around the time of the merger—four years before and four years after the event—are drawn from the original data and stacked to perform a single estimation. We use as measure of bank specialization the variable defined in Definition 1, $\mathcal{S}^c_{ib} = O(S^c_{ibt})$, computed the year before the merger. We combine the merging entities into a single one before the merger, and we use the maximum of the outlier indicators of the two banks as a measure of their combined specialization (e.g., if, before the merger, bank 1 specialized in country A and bank

amount of total loans outstanding during the years they appear in the sample to create this variable.

2 specialized in country B, then the combined entity is considered to specialize in A and B before the merger).

We first replicate our baseline estimation in (5) without the merger interaction term to corroborate that the point estimates are robust to the change in sample and specification (Table 8, column 1). The coefficients on the term $\mathcal{S}_{ib}^{c} \times \ln(X_{it}^{c})$ are positive and significant, similar in magnitude to those in our baseline result in Table 6. The relationship between exports and lending is somewhat smaller (0.012 vs. 0.024 in the baseline regression), which implies that, in this subsample, the elasticity between exports and bank credit of specialized banks is more than twice as large as that of non-specialized banks (it was 79% in the baseline regression).

In column 2, these regressions are augmented with the interaction of $Merger_{bt}$, a dummy equal to 1 during the four years after the event for the merging entity. We also augment the bank-time, firm-time, and bank-country sets of dummies with an event dummy interaction (e.g., there is a separate bank-time dummy for every merger event). The coefficient on the triple interaction with the Merger indicator, $\mathcal{S}_{ib}^{c} \times \ln(X_{it}^{c}) \times Merger_{bt}$, measures whether the link between the specialization and lending is affected by the merger. The point estimate in column 2 is positive and statistically significant at the 5% level. That is, the merged entity inherits, and even deepens, the specialization of the original banks.

These results imply that banks retain their capabilities in their markets of specialization even as they grow or merge into larger institutions. Thus, the source of the lending advantage analyzed here is distinct from that derived from firm-specific information (as emphasized in Stein, 2002), and it is not hindered by organizational constraints.

7 Characterization of the Bank Lending Advantage

Banks provide a variety of services supporting firms' export activities. Bartoli et al. (2011) report the results of a survey on Italian firms precisely about this question. They find

that, beyond ordinary services such as online payments or insurance and guaratees, there is a substantial request of advisory services, in the form of legal and financial advisory, *in loco* support during fairs, and investment opportunities abroad. These services and the cross-bank advantage in providing them are typically unobservable. And, even if they were observable, one cannot conclude that specialization implies an underlying bank advantage on the provision of that specific service.

To illustrate this point, consider for example the case of letters of credit, which is an observable financial instrument that can be associated to a specific export destination. Niepmann and Schmidt-Eisenlohr (2014) documents that U.S. banks are specialized in export countries when issuing letters of credits, which coincides with the specialization patterns in Subsection 3.2. However, one cannot conclude whether the bank specialization implies an advantage in the issuing of letters of credit towards a specific destination, or whether the demand for such instrument is a consequence of another underlying destination-linked bank advantage. Then, although our methodology can identify the existence and importance of a lending advantage associated to an export destination, the specific source of the bank lending advantage is unknown.

In this section we use our empirical methodology to characterize the lending advantage in our data, which narrows down potential mechanisms. First, we explore whether bank specialization patterns are related to the international presence of global banks such as the country of ownership and the location of international subsidiaries. Second, we examine whether the local distribution of bank brunches is correlated with the geographical distribution of firms exporting to same destinations. And finally, we explore an alternative source of lending specialization based on the mix of products exported by the firms.

7.1 International Presence of Global Banks

We first evaluate the correlation between our measure of bank specialization in a country and the variables that capture the geographical advantages conferred by the ownership country and subsidiary network. Table 9, column 1, shows the cross-sectional correlation

between the bank-country specialization index and: 1) $CountryOwnership_b^c$, a dummy equal to 1 if bank b's headquarters are located in country c; 2) $CountrySubsidiary_b^c$, a dummy equal to 1 if bank b has a subsidiary in country c in 2004;[25] 3) $CommonLanguage_b^c$, a dummy equal to 1 if the language in bank b's headquarters coincides with that in country c; and 4) $DistanceToHeadquarters_b^c$ between the country of ownership and the export destination c.[26] For this cross-sectional analysis, we use the measure of specialization in Definition 1, $O(S_{bt}^c)$, averaged during the entire life of the bank.[27] We find that, indeed, there is a connection between the bank's country of ownership and the set of specialization. Banks are more likely to specialize in the country of their headquarters or in countries with the same language.

We then explore whether the bank's country of ownership is a sufficient statistic of the market-specific lending advantages found in our baseline regressions in Table 6. If lending advantages were driven exclusively by the location and network of the headquarters, including the above variables in our baseline revealed preference regression would make the specialization measure redundant. We explore this possibility by expanding the baseline regression in (5) with the four indicators above, interacted with exports (i.e., $CountryOwnership_b^c \times \ln(X_{it}^c)$, $CountrySubsidiary_b^c \times \ln(X_{it}^c)$, $CommonLanguage_b^c \times \ln(X_{it}^c)$, $DistanceToHeadquarters_b^c \times \ln(X_{it}^c)$). Results are presented in Table 9, columns 2 and 3. None of these interaction terms is statistically significant, and their inclusion in the regression does not change the magnitude or the significance of the interaction of exports and specialization.[28]

We conclude that, even though our specialization measure is correlated with the bank's

[25] We construct the subsidiary network using Bankscope data. We start by identifying the ultimate owner of the Peruvian bank (e.g., Citibank U.S. for Citibank Peru). We then use the Bankscope subsidiary data to identify all countries in which the ultimate owner has a subsidiary as of 2005 (e.g., all countries with Citibank subsidiaries).

[26] We obtain these bilateral measures from Mayer and Zignago (2011).

[27] That is, $\mathcal{S}_b^c$, as defined in equation 7, up to the last year the bank appears in our dataset (t_F): $\mathcal{S}_b^c = \frac{1}{t_F - t_0} \sum_{\tau=t_0}^{t_F} O(S_{b\tau}^c)$.

[28] Our results are different from those in Bronzini and D'Ignazio (2012). Using a different methodology and data from Italian firms, they find that the geographical distribution of the bank foreign subsidiaries affects the export performance of related firms.

country of ownership, banks' advantage in lending for an export destination cannot be summarized as a home-country advantage.

7.2 Geographical Distribution of Local Branches

Another potential source of destination-specific lending advantage is the geographical proximity between exporters and banks in Peru. If firms that export to a specific country are geographically clustered, then banks that have a larger presence in that area may end up specializing in funding exports to this country.

There are 1,853 districts in Peru and each denotes a relatively small geographical area. Exporter location, obtained from the tax authority web page (SUNAT), is concentrated in 305 districts, and the top ten districts account for 52.3% of the exporters. Bank branch location data are from the bank supervision agency in Peru and are only available after 2001, so we restrict the sample to the 2001 to 2010 period for this analysis. Bank branch location is also geographically concentrated. The 1,455 bank branches in Peru in 2010 were located in only 144 districts.

We test whether the destination-specific lending advantage can be explained by local clustering. To do so, we augment the baseline regression 5 with two measures of proximity between firm i and bank b (and their interaction with firm exports, $\ln(X_{it}^{c})$): 1) a dummy if bank b has a branch in year t in the district in Peru where firm i is located, and 2) the number of branches that bank b has in year t in the district where firm i is located. Table 10, column 1, replicates the baseline regression estimates on the 2001 to 2010 and obtains very similar estimates to those in Table 6. Column 2, shows the estimated coefficients on the specification augmented with the local distance variables and their interaction with firm exports. We find that the coefficient on the interaction between the bank specialization measure and exports does not change after the inclusion of the local geography variables. This implies that local distance to a branch does not explain the bank advantages related to specialization.

7.3 Product or Destination Advantage?

There are potentially many confounding effects behind banks advantage in lending towards export destinations. In our sample, for example, export markets differ greatly in the mix of Peruvian products demanded. Coffee, which in 2010 totaled approximately 2.5% of Peruvian exports, accounted for 18% of the exports towards Germany. Possibly, banks' advantage in lending to firms exporting to Germany may not only involve expertise related to this destination but also on monitoring the activities of coffee producers.

We test for industry-specific lending advantage in Table 10, column 3. We further disaggregate firms' annual exports into product-destination flows, X_{it}^{pc} (products defined according to 2-digit categories of the Harmonized System). We can therefore analyze whether the baseline measure of bank specialization based on country of destination ($\mathcal{S}_{ibt}^{c}$) or the one based on export products ($\mathcal{S}_{ibt}^{p}$) is a better predictor of the pattern of credit. When both interactions are included, the baseline results are maintained. The elasticity of credit to exports, at the product-destination level, is 53% larger for a bank that has been specialized in the country of destination during the whole sample relative to a non-specialized bank. The interaction with product-specialization, on the other hand, turns insignificant when the two measures of specialization are included. We conclude that in our sample, although both measures of specialization are highly correlated, bank specialization on export destination is a better predictor of bank lending patterns.

8 Conclusions

In this paper, we document novel patterns of specialization in bank lending. Using matched credit-export data for all firms in Peru between 1994 and 2010, we show that the share of funding that each bank allocates to exporters to a destination country is heavily right-skewed. We define a bank as specialized in a country if it is an outlier in the right tail of the exposure distribution to that country. Then, we adopt a revealed preference approach to demonstrate that bank specialization in a country is related to an advantage

in providing new funding for export activities to that country. We show, in specifications that saturate all firm-time and bank-time variation, that firms that expand exports to a destination market tend to expand borrowing disproportionately more from banks that specialize in that destination market. We further find that the probability that a firm starts exporting to a new destination increases almost four times the year after it starts borrowing from a bank specialized in the new market.

The findings in this paper have important implications for the identification and assessment of credit supply shocks. First, we show that a bank's credit supply shock has a disproportionate effect on the activities in which it specializes. This implies that specialized bank credit cannot be freely substitutable by unspecialized sources of finance, and that the identified lending advantage is economically significant.

And, second, we illustrate the difficulty of disentangling demand from supply of credit in the presence of sectoral or aggregate shocks that affect the activity in which banks specialize. The results in this paper call for caution when applying the empirical strategy—now standard in identifying the lending supply channel—of absorbing the demand for credit with firm-time fixed effects. This methodology relies on firm credit demand to be, in expectation, spread equally across all banks lending to the firm. In other words, this methodology relies on banks being perfectly substitutable sources of funding for firms with whom they already have a credit relationship. Our results suggest that this assumption may not always hold.

References

Anderson, S., De Palma, A. and Thisse, J.-F. (1987), 'The CES is a Descrete Choice Model?', *Economics Letters* (24), 139–140.

Bartoli, F., Ferri, G., Maccarone, E. and Rotondi, Z. (2011), Can banks help small business export performance?, *in* G. Bracchi and D. Masciandaro, eds, 'L'Europa e Oltre. Banche e Imprese Nella Nuova Globalizzazione', EDIBANK, Italy.

Berger, A. B. and Udell, G. (1995), 'Relationship lending and lines of credit in small firm finance', *Journal of Business* **68**, 351–381.

Berger, A., Miller, N., Petersen, M., Rajan, R. and Stein, J. (2005), 'Does function follow organizational form? evidence from the lending practices of large and small banks', *Journal of Financial Economics* **76**, 237–269.

Berman, N., Martin, P. and Mayer, T. (2012), 'How do different exporters react to exchange rate changes?', *Journal of Banking and Finance* **127**(1), 437–492.

Bernanke, B. (1983), 'Non Monetary Effects of the Financial Crisis in the Propagation of the Great Depression', *The American Economic Review* **73**(3), 257–276.

Bolton, P., Freixas, X., Gambacorta, L. and Mistrulli, P. E. (2013), Relationship and transaction lending in a crisis. BIS Working Paper No. 417.

Bolton, P. and Scharfstein, D. (1996), 'Optimal debt structure and the number of creditors', *Journal of Polotocal Economy* **104**(1), 1–25.

Boot, A. W. A. (2000), 'Relationship banking: What do we know?', *Journal of Financial Intermediation* **9**, 7–25.

Boyd, J. H. and Prescott, E. C. (1986), 'Financial intermediary coalitions', *Journal of Economic Theory* **38**, 211–232.

Bronzini, R. and D'Ignazio, A. (2012), Bank internationalization and firm exports: Evidence from matched firm-bank data. EFIGE Working Paper No 59.

Chava, S. and Purnanandam, A. (2011), 'The effect of banking crisis on bank-dependent borrowers', *Journal of Financial Economics* **99**(1), 116–135.

Chodorow-Reich, G. (2014), 'The employment effects of credit market disruptions: Firm-level evidence from the 2008-09 financial crisis', *Quarterly Journal of Economics* **129**(1), 1–59.

Degryse, H. and Ongena, S. (2005), 'Distance, lending relationships, and competition', *Journal of Finance* **60**(1), 231–266.

Detragiache, E., Garella, P. and Guiso, L. (2000), 'Multiple versus single banking relationships: Theory and evidence', *The Journal of Finance* **55**(3), 1133–1161.

Diamond, D. W. (1984), 'Financial intermediation and delegated monitoring', *Review of Economic Studies* **51**, 393–414.

Diamond, D. W. (1991), 'Monitoring and reputation: The choice between bank loans and directly placed debt', *Journal of Political Economy* **8**(1), 689–721.

Fama, E. F. (1985), 'What's different about banks?', *Journal of Monetary Economics* **15**(1), 29–39.

Fitzgerald, D. and Haller, S. (2014), Exporters and shocks: Dissecting the international elasticity puzzle. Federal Reserve Bank of Minneapolis Working Paper.

Hodge, V. and Austin, J. (2004), 'A survey of outlier detection methodologies', *Artificial Intelligent Review* **22**(2), 85–126.

Holmstrom, B. and Tirole, J. (1997), 'Financial intermediation, loanable funds, and the real sector', *Quarterly Journal of Economics* **112**(3), 663–691.

Hoshi, T., Kashyap, A. and Scharfstein, D. (1990), 'The role of banks in reducing the costs of financial distress in japan', *Journal of Financial Economics* **27**, 67–88.

James, C. (1987), 'Some evidence on the uniqueness of bank loans', *Journal of Financial Economics* **19**(2), 217–235.

Jimenez, G., Ongena, S., Peydro, J. L. and Saurina, J. (2014), 'Hazardous times for monetary policy: What do 23 million loans say about the impact of monetary policy on credit risk-taking', *Econometrica* **82**(2), 463–505.

Khwaja, A. and Mian, A. (2008), 'Tracing the Impact of Bank Liquidity Shocks: Evidence from an Emerging Market', *The American Economic Review* **98**(4), 1413–1442.

Leland, H. E. and Pyle, D. H. (1977), 'Informational asymmetries, financial structure, and financial intermediation', *Journal of Finance* **32**(2), 371–387.

Manova, K. (2013), 'Credit constraints, heterogeneous firms, and international trade', *Review of Economic Studies* **80**, 711–744.

Mayer, T. and Zignago, S. (2011), 'Notes on cepii's distances measures: the geodist database', *CEPII Working Paper* **25**.

Niepmann, F. and Schmidt-Eisenlohr, T. (2014), Banks in international trade finance: Evidence from the u.s. Federal Reserve Bank of New York Working Paper.

Ongena, S. and Smith, D. C. (2000), *Performance of Financial Institutions*, Cambridge University Press, chapter Bank Relationships: A review, pp. 221–258.

Paravisini, D. (2008), 'Local Bank Financial Constraints and Firm Access to External Finance', *The Journal of Finance* **63**(5), 2160–2193.

Paravisini, D., Rappoport, V., Schnabl, P. and Wolfenzon, D. (2015), 'Dissecting the effect of credit supply on trade: Evidence from matched credit-export data', *Review of Economic Studies* **82**(1), 333–359.

Pennacchi, G. G. (1988), 'Loan sales and the cost of bank capital', *The Journal of Finance* **43**(2), 375–396.

Petersen, M. and Rajan, R. (1994), 'The benefits of lending relationships: Evidence from small business data', *Journal of Finance* **49**(1), 3–37.

Petersen, M. and Rajan, R. (1995), 'The effect of credit market competition on lending relationships', *Quarterly Journal of Economics* **5**, 407–443.

Rajan, R. (1992), 'Insiders and outsiders: The choice between informed and arm's-length debt', *Journal of Finance* **47**(4), 1367–400.

Rajan, R. and Winton, A. (1995), 'Covenants and collateral as incentives to monitor', *Journal of Financ* **50**(4), 1113–1146.

Rajan, R. and Zingales, L. (1998), 'Financial dependence and growth', *American Economic Review* **88**(3), 559–586.

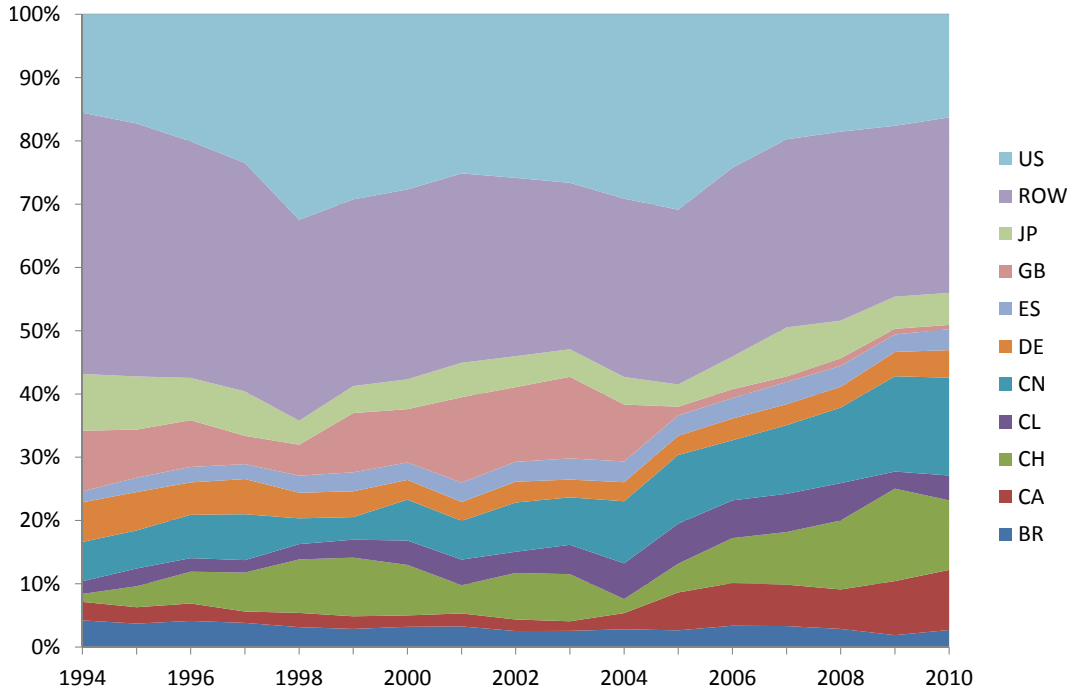
Ramakrishnan, R. T. S. and Thakor, A. V. (1984), 'Information reliability and a theory of financial inter', *Review of Economic Studies* **51**(3), 415–432.

Schnabl, P. (2012), 'The international transmission of bank liquidity shocks: Evidence from an emerging market', *The Journal of Finance* **67**(3), 897–932.

Sharpe, S. A. (1990), 'Asymmetric information, bank lending and implicit contracts: A stylized model of customer relationships', *Journal of Finance* **45**(4), 1069–1087.

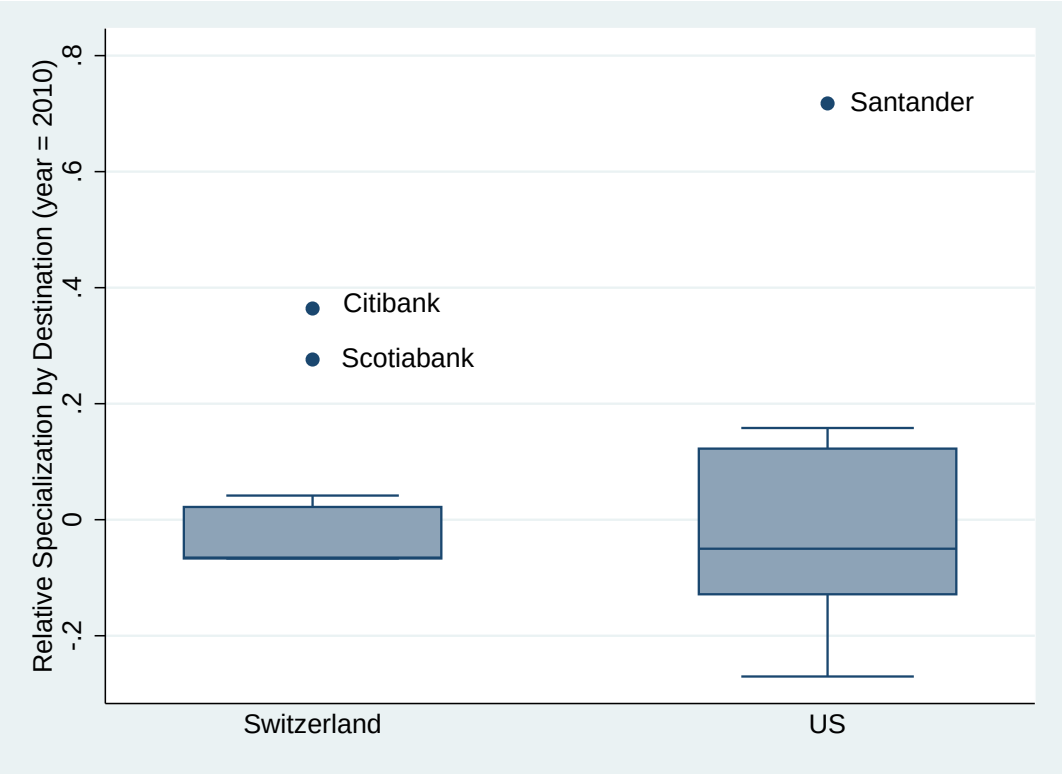
Stein, J. (2002), 'Information production and capital allocation: Decentralized versus hierarchical firms', *The Journal of Finance* **57**(5), 1891–1921.

Figure 1: Export Composition by Destination



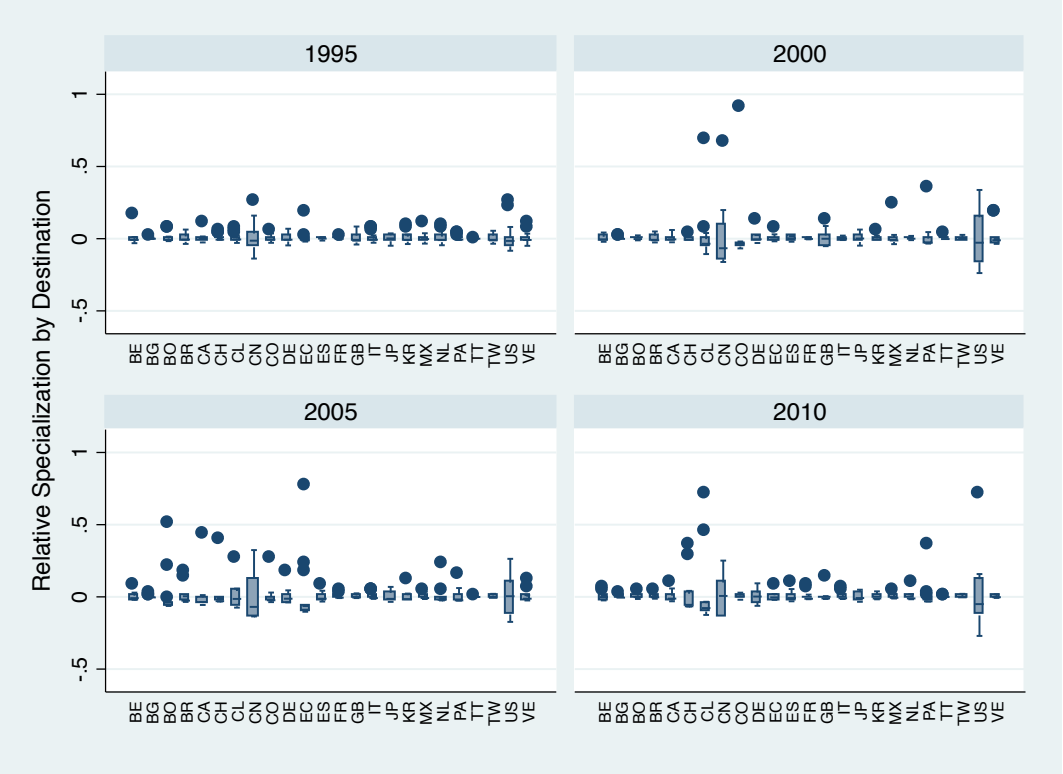
Note: Export shares according to export values. The ten main destinations included in the figure are United States, Japan, Great Britain, Spain, Germany, China, Chile, Switzerland, Canada and Brazil.

Figure 2: Outlier Definition: Example



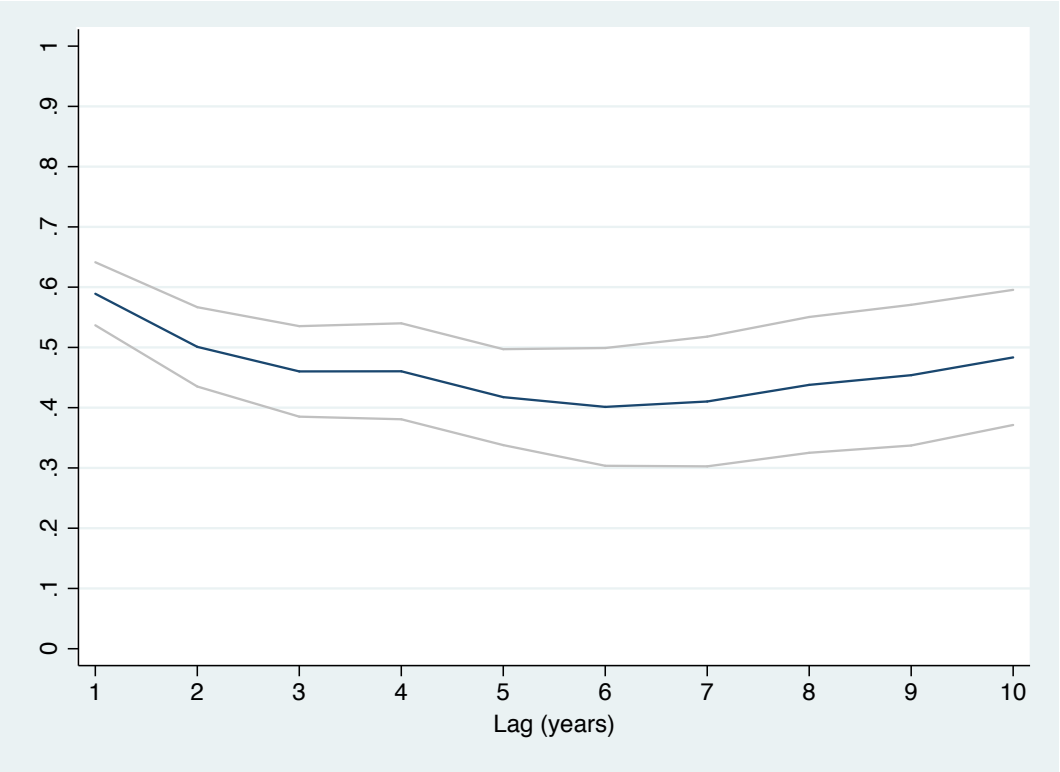
Note: The boxes encompass the interquartile range of the distribution of S^c_{bt} (defined in equation 3) for each country in 2010. The limits of the lines encompass 4 times the interquartile range. The dots outside that range, for each country-year, correspond to the specialized banks according to Definition 1.

Figure 3: Distribution of Bank Lending Shares by Country



Note: The boxes encompass the interquartile range of the distribution of S_{bt}^{c} (defined in equation 3) for each country c, in years 1995, 2000, 2005, and 2010. The limits of the lines encompass 4 times the interquartile range. The dots outside that range, for each country-year, correspond to the specialized banks according to Definition 1.

Figure 4: Persistence of Bank Specialization



Note: Auto-correlation in the bank set of specialization over a 10 year period: $corr(O(S_{bct}), O(S_{bct-\tau}))$ for $\tau = 1, ..., 10$ and 95% confidence interval. $O(S_{bct})$ defined in Definition 1.

Table 1: Descriptive Statistics

	Mean (1)	S.D (2)	Min (3)	Median (4)	Max (5)
Panel 1: the unit of observation is firm-bank-country-time					
Outstanding Debt (US$ '000)	2,044	6,804	0	260	235,081
Exports (US$ '000)	2,148	19,821	0	87	1,470,300
$\mathcal{S}^c_{ibt}$	0.17	0.33	-	-	1.00
Panel 2: the unit of observation is firm-time					
Total Debt (US$ '000)	2,633	12,791	0	92	395,149
Number banks per firm	2.43	1.95	1.00	2.00	19.00
Total Exports (US$ '000)	4,518	55,648	0	77	2,855,313
Number destinations per firm	2.65	2.84	1.00	1.00	22.00

Note: The statistics in Panel 1 describe the full firm-bank-country-time panel used in Section 5, which has 378,766 observations. $\mathcal{S}^c_{ibt}$, defined in (7), is our leave-i-out measure of specialization of bank b in country c in the last three years up to t. The variable Outstanding Debt has the same value across all destinations within the same firm-bank-time and, similarly, the variable Exports has the same value across all banks for the same firm-country-time. Panel 2 describes the firm-time panel, which has 45,762 observations. There are 14,267 firms in the dataset.

Table 2: Distribution of Bank Lending Shares by Country

		$S^c_{bt} - \overline{S}^c_t$				
		Min (1)	Median (2)	Max (3)	S.D (4)	Skewness (5)
Belgium	BE	-0.033	-0.004	0.166	0.027	3.172
Bulgaria	BG	-0.007	-0.001	0.033	0.006	2.379
Bolivia	BO	-0.063	-0.007	0.497	0.047	6.743
Brazil	BR	-0.050	-0.005	0.176	0.028	2.024
Canada	CA	-0.056	-0.007	0.439	0.044	4.691
Switzerland	CH	-0.083	-0.008	0.592	0.084	4.652
Chile	CL	-0.134	-0.034	0.914	0.155	3.983
China	CN	-0.251	-0.014	0.658	0.121	1.002
Colombia	CO	-0.068	-0.010	0.905	0.067	9.208
Germany	DE	-0.075	-0.010	0.487	0.056	3.186
Ecuador	EC	-0.103	-0.009	0.765	0.076	7.410
Spain	ES	-0.065	-0.006	0.935	0.064	10.619
France	FR	-0.026	-0.005	0.234	0.026	5.121
Great Britain	GB	-0.060	-0.006	0.358	0.040	3.041
Italy	IT	-0.035	-0.003	0.338	0.026	7.699
Japan	JP	-0.102	-0.001	0.669	0.062	5.451
South Korea	KR	-0.037	-0.004	0.212	0.023	3.787
Mexico	MX	-0.066	-0.006	0.818	0.086	7.701
Netherlands	NL	-0.047	-0.005	0.234	0.032	4.040
Panama	PA	-0.108	-0.012	0.564	0.068	4.725
Trinidad and Tobago	TT	-0.006	0.000	0.033	0.004	5.570
Taiwan	TW	-0.044	-0.003	0.157	0.019	2.338
USA	US	-0.281	-0.037	0.846	0.172	1.648
Venezuela	VE	-0.050	-0.008	0.263	0.036	3.602
Overall		-0.281	-0.005	0.935	0.071	5.480

Note: The statistics describe the distribution of the bank-country-time share S^c_{bt} (defined in equation 3) demeaned by the banking system's average $\overline{S}^c_t$.

Table 3: Patterns of Bank Specialization

	Number of countries in which the bank is an outlier for at least X% of the years in the sample			
	X = 0% (1)	X = 25% (2)	X = 50% (3)	X = 75% (4)
Bank Code				
1	7	4	2	1
2	7	3	2	2
4	6	2	2	1
6	7	3	2	1
7	5	3	2	2
9	4	2	2	1
22	8	2	1	0
25	5	3	2	2
26	4	2	1	1
31	5	3	2	1
36	5	4	1	1
52	11	3	1	0
54	5	2	2	1
55	7	4	2	1
61	13	7	2	1
68	3	2	0	0
72	13	5	3	1
73	15	7	2	1
77	5	3	2	1
78	3	3	1	1
80	3	3	0	0
81	4	3	2	1
82	5	3	2	1
120	9	4	2	0
121	11	4	1	1
122	1	1	1	1
123	12	3	2	1
124	6	3	1	0
125	9	3	2	2
126	6	3	1	1
127	5	3	3	1
130	10	6	3	1
140	4	4	1	1

Note: A bank b is an outlier if S^c_{bt} is above the Upper Extreme Value, defined by the 75th percentile plus 1.5 interquartile ranges of the distribution of $\{S^c_{bt}\}$ across banks for a given country-year (Definition 1).

Table 4: Lending Advantage and Specialization

	Revealed Preference (Baseline)	Export Demand Shock		Credit Supply Shock		
Dep. Variable	$\ln(L_{ibt})$	$\ln(X^c_{it})$	$\ln(L_{ibt})$	$\ln(L_{ibt})$	$\ln(X^c_{ipt})$	
	OLS	Basis for First Stage	IV	Basis for First Stage	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathcal{S}^c_{ibt} \times \Delta \ln(X^c_{it})$	0.019***		0.167**			
	(0.006)		(0.065)			
$\ln(X^c_{it})$	0.024***		0.330			
	(0.006)		(0.196)			
$\mathcal{S}^c_{ibt}$	0.000		-0.003		-0.073**	-0.156
	(0.030)		(0.011)		(0.038)	(0.106)
$GDPGrowth^c_t$		0.010**				
		(0.004)				
$\ln(RER^c_t)$		0.499***				
		(0.066)				
$Exposed_b \times Post_t$				-0.181***		
				(0.064)		
$\ln(L_{ibt}) \times \mathcal{S}^c_{ibt}$					-0.004	0.630*
					(0.019)	(0.324)
$\ln(L_{ibt})$					0.016	0.095**
					(0.012)	(0.042)
Firm-Bank-Country FE	Yes	Yes	Yes	–	–	–
Firm-Year FE	Yes	Yes	Yes	No	No	No
Bank-Year FE	Yes	Yes	Yes	No	No	No
Bank-Firm-Product-Country FE	–	–	–	No	Yes	Yes
Product-Country-Year FE	–	–	–	No	Yes	Yes
Observations	334,432	303,942	303,942	51,024	51,024	51,024
R^2 adj	0.31	0.27		0.19	0.19	

Note: L_{ibt} is the credit of firm i with bank b in year t, X^c_{it} is annual exports of firm i to country c in year t, and X^c_{ipt} is annual exports of firm i to country c and product p (HS 4-digits). $\mathcal{S}^c_{ibt}$ is the measure of specialization of bank b in country c in the three years up to year t, defined in 7. Column 1 shows the Revealed Preference estimation 5. Column 3 shows results of specification 5 using GDP growth ($GDPgrowth^c_t$) and real exchange rate (RER^c_t), and the corresponding interactions, to instrument for X^c_{it} and $X^c_{it} \times \mathcal{S}^c_{ibt}$. Column 6 shows the results of estimation 8 using $Exposed_b \times Post_t$, and the corresponding interactions, as an instrument for L_{ibt} and $L_{ibt} \times \mathcal{S}^c_{ibt}$ in years $t = \{Pre, Post\}$, 12 months before and after July 2007. $Exposed_b$ is a dummy equal to 1 for exposed banks–i.e., bank-b's share of foreign debt in 2006 is above the system's mean. $Post_t$ is a dummy equal to 1 if $t = Post$. Standard errors are clustered at the bank and firm levels in columns 1 to 3, and at the bank and product-destination level in columns 4 to 6. ***p$<$ 0.01, **p $<$ 0.05, and *p $<$ 0.1.

Table 5: Identification of Credit Supply Shocks

	$\Delta \ln L_{ib}$	
	(1)	(2)
$Exposed_b$	-0.168***	-0.155***
	(0.046)	(0.049)
$C(X_i^c > 0) \bigcap C(\mathcal{S}_b^c > 0)$		-0.199**
		(0.079)
Firm FE	Yes	Yes
Obs	10,334	10,334
R^2 adj	0.261	0.262

Note: Results of the within-firm specification in (9). $\Delta L_{ib} \equiv \ln L_{ibPost} - \ln L_{ibPre}$ is the change in bank-firm credit; $Exposed_b$ is a dummy equal to 1 for exposed banks–i.e., bank-b's share of foreign debt in 2006 is above the system's mean; and $C(X_i^c > 0) \bigcap C(\mathcal{S}_{ib}^c > 0)$ is a dummy equal to one if, in the Pre period, the set of countries supplied by the firm has at least one country that belongs to the set of specialization of the bank (i.e., set of countries with positive $\mathcal{S}_{ib}^c$). Standard errors clustered at the bank level. ***p$<$ 0.01, **p $<$ 0.05, and *p $<$ 0.1.

Table 6: Specialization and New Banking Relationships

Dep. Variable	$(L_{ibt} > 0 \mid L_{ibt-1} = 0)$ (x100) (1)	$(X^c_{it} > 0 \mid X^c_{it-1} = 0)$ (x100) (2)
$\mathcal{S}^c_{ibt} \times (X^c_{it-1} > 0 \mid X^c_{it-2} = 0)$	0.400***	
	(0.065)	
$(X^c_{it-1} > 0 \mid X^c_{it-2} = 0)$	0.058***	
	(0.006)	
$\mathcal{S}^c_{ibt} \times (L_{ibt-1} > 0 \mid L_{ibt-2} = 0)$		2.578***
		(0.155)
$(L_{ibt-1} > 0 \mid L_{ibt-2} = 0)$		-0.006
		(0.005)
$\mathcal{S}^c_{ibt}$	-0.003**	-0.190***
	(0.002)	(0.015)
Bank-Country FE	Yes	Yes
Bank-year FE	Yes	Yes
Firm-year FE	Yes	Yes
Observations	145,599,237	145,869,772
$R^2 adj$	0.28	0.26

Note: L_{ibt} is the credit of firm i with bank b in year t. X^c_{it} is annual exports of firm i to country c in year t. And $\mathcal{S}^c_{ibt}$ is the measure of specialization of bank b in country c leaving-i-out, in the three years up to year t, defined in (7). Columns 1 and 2 report the *extensive-margin* results of specifications 10 and 11, respectively. Standard errors are two-way clustered at the bank and firm levels. ***p$<$ 0.01, **p $<$ 0.05, and *p $<$ 0.1.

Table 7: Specialization and Bank Size

Dep. Variable	$\mathcal{S}^c_{bt}$		$\ln(L_{ibt})$		
	between	within			
	(1)	(2)	(3)	(4)	(5)
$\ln(Size_{bt})$	-0.006	0.004			
	(0.006)	-0.004			
$Foreign_{bt}$	-0.021**	0.017***			
	(0.010)	(0.002)			
$\mathcal{S}^c_{ibt} \times \ln(X^c_{it})$			0.019**	0.016**	0.019**
			(0.007)	(0.007)	(0.008)
$\ln(X^c_{it})$			0.031***	0.034***	0.015***
			(0.006)	(0.005)	(0.005)
$\mathcal{S}^c_{ibt}$			-0.003	-0.003	-0.027
			(0.030)	(0.028)	(0.032)
$\mathcal{S}^c_{ibt} \times \ln(X^c_{it}) \times SmallBank_b$			-0.010		
			(0.028)		
$\ln(X^c_{it}) \times SmallBank_b$			-0.028*		
			(0.015)		
$\mathcal{S}^c_{ibt} \times SmallBank_b$			0.018		
			(0.011)		
$\mathcal{S}^c_{ibt} \times \ln(X^c_{it}) \times Foreign_{bt}$				0.009	
				(0.015)	
$\ln(X^c_{it}) \times Foreign_{bt}$				-0.045***	
				(0.010)	
$\mathcal{S}^c_{ibt} \times Foreign_{bt}$				0.02	
				(0.016)	
$\mathcal{S}^c_{ibt} \times \ln(X^c_{it}) \times LargeFirm_i$					-0.004
					(0.014)
$\ln(X^c_{it}) \times LargeFirm_i$					0.024***
					(0.005)
$\mathcal{S}^c_{ibt} \times LargeFirm_i$					0.055***
					(0.011)
Bank FE	No	Yes			
Country FE	Yes	Yes			
Year FE	Yes	Yes			
Bank-year FE			Yes	Yes	Yes
Firm-year FE			Yes	Yes	Yes
Country-Bank FE			Yes	Yes	Yes
Observations	7,560	7,560	334,432	334,432	334,432
$R^2 adj$	0.49	0.51	0.31	0.31	0.31

Note: $Size_{bt}$ is total lending of bank b at time t, $Foreign_{bt}$ is a dummy equal to 1 if the bank if foreign-owned, $SmallBank_b$ is a dummy equal to 1 for banks outside the top 10, measured in average total (real) lending over the entire sample, and $LargeFirm_i$ is a dummy equal to 1 if the firm belongs to the top 10% of the total exports during at least one year in our sample. In columns 1 and 2, $\mathcal{S}^c_{bt}$ is computed over all firms. Columns 3 to 5 correspond to specification 5. Standard errors are two-way clustered at the bank and firm levels. ***p$<$ 0.01, **p $<$ 0.05, and *p $<$ 0.1.

Table 8: Persistence of Specialization after a Merger

Dep. Variable	$\ln(L_{ibt})$	
	(1)	(2)
$\mathcal{S}^c_{ibPreMerger} \times \ln(X^c_{it})$	0.016***	0.013**
	(0.005)	(0.005)
$\mathcal{S}^c_{ibPreMerger} \times \ln(X^c_{it}) \times Merger_{bt}$		0.051**
		(0.019)
$\ln(X^c_{it})$	0.012***	0.015***
	(0.003)	(0.003)
$\ln(X^c_{it}) \times Merger_{bt}$		-0.022***
		(0.008)
$\mathcal{S}^c_{ibPreMerger} \times Merger_{bt}$		-0.009
		(0.019)
$Merger_{bt}$		-0.021
		(0.024)
Bank-Merger-year FE	Yes	Yes
Firm-Merger-year FE	Yes	Yes
Country-bank-Merger FE	Yes	Yes
Observations	543,788	543,788
R^2	0.29	0.29

Note: L_{ibt} is the credit of firm i with bank b in year t. X^c_{it} is annual exports of firm i to country c in year t. And the index of specialization leaving-i-out, $\mathcal{S}^c_{ibPreM}$ defined in (7), is computed the year before the merger for both banks participating in the Merger. Results of specification 5 (demeaned) with data rearranged around event time (Merger). Column 1 replicates specification 5. Column 2 adds the interaction term $Merger_{bt}$, a post-merger dummy. Standard errors are two-way clustered at the bank and firm levels. ***p$<$ 0.01, **p $<$ 0.05, and *p $<$ 0.1.

Table 9: Specialization and Global Banks

Dep. Variable	$\mathcal{S}_b^c$	$\ln(L_{ibt})$	
	(1)	(2)	(3)
$CountryOwnership_{bc}$	0.095***		
	(0.018)		
$DistanceToHeadquarters_{bc}$	0.005*		
	(0.003)		
$CommonLanguage_{bc}$	0.027***		
	(0.010)		
$CountrySubsidiary_{bc}$	-0.002		
	(0.008)		
$\mathcal{S}_{ibt}^c \times \ln(X_{it}^c)$			0.021**
			(0.008)
$CountryOwnership_b^c \times \ln(X_{it}^c)$		-0.031	-0.028
		(0.022)	(0.024)
$ln(DistancetoHeadquarters_b^c) \times \ln(X_{it}^c)$		-0.002	-0.004
		(0.006)	(0.006)
$CommonLanguage_b^c \times \ln(X_{it}^c)$		0.007	0.008
		(0.006)	(0.007)
$CountrySubsidiary_b^c \times \ln(X_{it}^c)$		0.016	0.012
		(0.010)	(0.010)
$\ln(X_{it}^c)$		0.042	0.050
		(0.052)	(0.056)
$\mathcal{S}_{ibt}^c$			0.000
			(0.030)
Bank FE	Yes		
Country FE	Yes		
Year FE	Yes		
Firm-year FE		Yes	Yes
Bank-year FE		Yes	Yes
Country-Bank FE		Yes	Yes
Observations	7,560	366,696	366,696
$R^2 adj$	0.51	0.31	0.31

Note: In column 1, the dependent variable is $\mathcal{S}_b^c$, defined in (7), over the entire sample period. Columns 2 and 3 show the results of an augmented version of specification 5 (demeaned). $CountryOwnership_b^c$ is a dummy equal to 1 if the destination country of the export flow coincides with the country of ownership of the bank. Similarly $CountrySubsidiary_b^c$ is equal to 1 if the bank has a subsidiary in the destination country of the export flow. The variables distance (in (log) km) and common language (dummy variable) refer to the connection between the bank's country of ownership and the export destination. Standard errors are two-way clustered at the bank and firm levels. ***p$<$ 0.01, **p $<$ 0.05, and *p $<$ 0.1.

Table 10: Bank Specialization, Bank Branches, and Product Mix

Dep. Variable	$\ln(L_{ibt})$		
	(1)	(2)	(3)
$\mathcal{S}^c_{ibt} \times \ln(X^c_{it})$	0.020***	0.019***	
	(0.006)	(0.006)	
$\ln(X^c_{it})$	0.027***	0.009	
	(0.006)	(0.013)	
$\mathcal{S}^c_{ibt}$	0.003	0.003	0.031
	(0.035)	(0.035)	(0.023)
$BranchDistrict_{ib}$		-0.000	
		(0.054)	
$N\ BranchDistrict_{ib}$		-0.007	
		(0.006)	
$BranchDistrict_{ib} \times \ln(X^c_{it})$		0.013	
		(0.015)	
$N\ BranchDistrict_{ib} \times \ln(X^c_{it})$		0.000	
		(0.001)	
$\mathcal{S}^c_{ibt} \times \ln(X^{pc}_{it})$			0.014**
			(0.007)
$\mathcal{S}^p_{ibt} \times \ln(X^{pc}_{it})$			-0.007
			(0.024)
$\ln(X^{pc}_{it})$			0.019***
			(0.005)
$\mathcal{S}^p_{ibt}$			0.205***
			(0.054)
Firm-year FE	Yes	Yes	Yes
Bank-year FE	Yes	Yes	Yes
Country-Bank FE	Yes	Yes	Yes
Observations	228,911	228,911	402,332
$R^2 adj$	0.33	0.33	0.29

Note: Results of specification 5 (demeaned). In columns 1 and 2 the period is 2001-2010, for which branch locations are available. $BranchDistrict_{ib}$ is a dummy equal to 1 if the firm is located in a district where the bank has a branch. $N\ BranchDistrict_{ib}$ is number of branches of the bank in the firm's district. In column 3, exports are disaggregated at the product-destination level, X^{pc}_{it}. There are 33 product categories corresponding to HS 2-digits with at least 0.25% of Peruvian exports in the pool sample. $\mathcal{S}^p_{ibt}$ is computed parallel to (7):

$$S^p_{ibt} \equiv \frac{\sum_{i \neq k}^{I} L_{bkt} X^p_{kt}}{\sum_{p=1}^{P} \sum_{i \neq k}^{I} L_{bkt} X^p_{kt}}.$$

Standard errors are two-way clustered at the bank and firm levels. ***p$<$ 0.01, **p $<$ 0.05, and *p $<$ 0.1.

Appendix

A.1 Proof of Result 1

Proof. Notice that $\sum_{k=1}^{C} S_b^k = 1$. Since $\gamma_b^k = \gamma_{b'}^k$ for all $k \neq c, c'$, it follows that $S_b^c + S_b^{c'} = S_{b'}^c + S_{b'}^{c'}$. Then,

$$\frac{\sum_{i=1}^{I} L_{ib}\left(X_i^c + X_i^{c'}\right)}{\sum_{i=1}^{I} L_{ib'}\left(X_i^c + X_i^{c'}\right)} = \frac{\sum_{k=1}^{J}\sum_{i=1}^{I} L_{ib} X_i^k}{\sum_{k=1}^{C}\sum_{i=1}^{I} L_{ib'} X_i^k}.$$

It follows that:

$$\frac{S_b^c}{S_{b'}^c} = \frac{\sum_{i=1}^{I} L_{ib} X_i^c}{\sum_{i=1}^{I} L_{ib'} X_i^c} \cdot \frac{\sum_{i=1}^{I} L_{ib'}\left(X_i^c + X_i^{c'}\right)}{\sum_{i=1}^{I} L_{ib}\left(X_i^c + X_i^{c'}\right)},$$

which is bigger than one as long as $\sum_{i=1}^{I} L_{ib} X_i^c \cdot \sum_{i=1}^{I} L_{ib'} X_i^{c'} > \sum_{i=1}^{I} L_{ib'} X_i^c \cdot \sum_{i=1}^{I} L_{ib} X_i^{c'}$. This condition is always satisfied for $\gamma_b^c = \gamma_{b'}^{c'} > \gamma_b^{c'} = \gamma_{b'}^c$. □

A.2 Additional Results

In this appendix we complement the analysis in Subsections 5.2 and 5.3. Table A.1 shows the first-stage corresponding to the IV results in Table 4, column 3. The F-test for columns 1 and 2 are 31.7 and 96.5, respectively.

Table A.2 shows the first-stage corresponding to the IV results in 4, column 6. The F-test for columns 1 and 2 are 7.2 and 16.3, respectively.

Table A.1: Complementary Results: Export Demand Shock

	First Stage		$\ln(L_{ibt})$	
	$\ln(X^c_{it})$	$\ln(X^c_{it}) \times \mathcal{S}^c_{ibt}$	OLS	IV
	(1)	(2)	(3)	(4)
$GDPGrowth^c_t$	0.011**	-0.001		
	(0.004)	(0.001)		
$\ln(RER^c_t)$	0.561***	-0.006		
	(0.068)	(0.008)		
$GDPGrowth^c_t \times (\mathcal{S}^c_{ibt} = 1)$	0.022**	0.015***		
	(0.009)	(0.003)		
$\ln(RER^c_t) \times (\mathcal{S}^c_{ibt} = 1)$	1.259***	1.087***		
	(0.269)	(0.121)		
$GDPGrowth^c_t \times (\mathcal{S}^c_{ibt} = 2)$	0.007	0.021***		
	(0.011)	(0.007)		
$\ln(RER^c_t) \times (\mathcal{S}^c_{ibt} = 2)$	1.908***	2.948***		
	(0.342)	(0.261)		
$GDPGrowth^c_t \times (\mathcal{S}^c_{ibt} = 3)$	0.031**	0.048***		
	(0.011)	(0.010)		
$\ln(RER^c_t) \times (\mathcal{S}^c_{ibt} = 3)$	2.488***	5.049***		
	(0.408)	(0.367)		
$\mathcal{S}^c_{ibt} \times \Delta \ln(X^c_{it})$			0.019***	0.167**
			(0.006)	(0.065)
$\ln(X^c_{it})$			0.024***	0.33
			(0.006)	(0.196)
$\mathcal{S}^c_{ibt}$	0.068***	0.037***	0.000	-0.003
	(0.008)	(0.007)	(0.030)	(0.011)
Bank-Country-Firm FE	Yes	Yes	Yes	Yes
Firm-Year FE	Yes	Yes	Yes	Yes
Bank-Year FE	Yes	Yes	Yes	Yes
Observations	303,947	303,947	334,432	303,942
R^2 adj	0.27	0.29	0.31	

Note: First stage, OLS and IV estimates of specification **??** using GDP growth ($GDPgrowth^c_t$) and real exchange rate (RER^c_t), and the corresponding interactions, to instrument for X^c_{it} and $X^c_{it} \times \mathcal{S}^c_{ibt}$. $\mathcal{S}^c_{ib}$ is defined in (7). Standard errors are two-way clustered at the bank and firm levels. ***p$<$ 0.01, **p $<$ 0.05, and *p $<$ 0.1.

Table A.2: Complementary Results: Credit Supply Shock

	First Stage		$\ln(X^c_{ipt})$	
	$\ln(L_{ibt})$	$\ln(L_{ibt}) \times \mathcal{S}^c_{ibt}$	OLS	IV
	(1)	(2)	(3)	(4)
$Exposed_b \times Post_t$	-0.175***	0.003***		
	(0.067)	(0.001)		
$Exposed_b \times Post_t \times (\mathcal{S}^c_{ibt} = 1)$	-0.315**	-0.155**		
	(0.153)	(0.070)		
$Exposed_b \times Post_t \times (\mathcal{S}^c_{ibt} = 2)$	0.069	-0.070		
	(0.145)	(0.072)		
$Exposed_b \times Post_t \times (\mathcal{S}^c_{ibt} = 3)$	0.144	-0.047		
	(0.229)	(0.178)		
$\ln(L_{ibt}) \times \mathcal{S}^c_{ibt}$			-0.004	0.630**
			(0.025)	(0.319)
$\ln(L_{ibt})$			0.016***	0.095**
			(0.004)	(0.319)
$\mathcal{S}^c_{ibt}$	0.027	0.194***	-0.073**	-0.156**
	(0.109)	(0.054)	(0.035)	(0.066)
Bank-Firm-Product-Country FE	Yes	Yes	Yes	Yes
Product-Country-Year FE	Yes	Yes	Yes	Yes
Observations	51,024	51,024	51,024	51,024
R^2 adj	0.192	0.156	0.537	

Note: First stage, OLS and IV estimates of specification 8 using $Exposed_b \times Post_t$, and the corresponding interactions, as an instrument for L_{ibt} and $L_{ibt} \times \mathcal{S}^c_{ibt}$ in years $t = \{Pre, Post\}$, 12 months before and after July 2007. $Exposed_b$ is a dummy equal to 1 for exposed banks–i.e., bank-b's share of foreign debt in 2006 is above the system's mean. $Post_t$ is a dummy equal to 1 if $t = Post$. $\mathcal{S}^c_{ib}$ is defined in (7) and X^c_{ipt} are exports of firm i to country c in product p (HS 4-digits). Standard errors are clustered at the bank and product-destination level. ***p$<$ 0.01, **p $<$ 0.05, and *p $<$ 0.1.

CENTRE FOR ECONOMIC PERFORMANCE
Recent Discussion Papers

1491	M.A. Clemens J. Hunt	The Labor Market Effects of Refugee Waves: Reconciling Conflicting Results
1490	V. Bhaskar Robin Linacre Stephen Machin	The Economic Functioning of Online Drug Markets
1489	Abel Brodeur Warn N. Lekfuangfu Yanos Zylberberg	War, Migration and the Origins of the Thai Sex Industry
1488	Giuseppe Berlingieri Patrick Blanchenay Chiara Criscuolo	The Great Divergence(s)
1487	Swati Dhingra Gianmarco Ottaviano Veronica Rappoport Thomas Sampson Catherine Thomas	UK Trade and FDI: A Post-Brexit Perspective
1486	Christos Genakos Tommaso Valletti Frank Verboven	The Compact City in Empirical Research: A Quantitative Literature Review
1485	Andrew E. Clark Sarah Flèche Richard Layard Nattavudh Powdthavee George Ward	The Key Determinants of Happiness and Misery
1484	Matthew Skellern	The Hospital as a Multi-Product Firm: The Effect of Hospital Competition on Value-Added Indicators of Clinical Quality
1483	Davide Cantoni Jeremiah Dittmar Noam Yuchtman	Reallocation and Secularization: The Economic Consequences of the Protestant Reformation

1482	David Autor David Dorn Lawrence F. Katz Christina Patterson John Van Reenen	The Fall of the Labor Share and the Rise of Superstar Firms
1481	Irene Sanchez Arjona Ester Faia Gianmarco Ottaviano	International Expansion and Riskiness of Banks
1480	Sascha O. Becker Thiemo Fetzer Dennis Novy	Who voted for Brexit? A Comprehensive District-Level Analysis
1479	Philippe Aghion Nicholas Bloom Brian Lucking Raffaella Sadun John Van Reenen	Turbulence, Firm Decentralization and Growth in Bad Times
1478	Swati Dhingra Hanwei Huang Gianmarco I. P. Ottaviano João Paulo Pessoa Thomas Sampson John Van Reenen	The Costs and Benefits of Leaving the EU: Trade Effects
1477	Marco Bertoni Stephen Gibbons Olmo Silva	What's in a name? Expectations, heuristics and choice during a period of radical school reform
1476	David Autor David Dorn Lawrence F. Katz Christina Patterson John Van Reenen	Concentrating on the Fall of the Labor Share
1475	Ruben Durante Paolo Pinotti Andrea Tesei	The Political Legacy of Entertainment TV

The Centre for Economic Performance Publications Unit
Tel: +44 (0)20 7955 7673 Email info@cep.lse.ac.uk
Website: http://cep.lse.ac.uk Twitter: @CEP_LSE