Trade Uncertainty and U.S. Bank Lending

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Abstract

When trade uncertainty directly affects credit supply it can amplify other contractionary impulses from a deterioration in the international trade environment. Exploiting heterogeneity in banks' ex-ante exposure to trade uncertainty and loan-level data for U.S. banks, we show that an increase in trade uncertainty is associated with credit contractions that impact broad classes of borrowers and go beyond directly-affected firms. Exposed banks are more likely to curtail lending to firms that are internationally oriented, rely on trade finance, and participate in global value chains. The effects are stronger for banks with business models that support global trade and for constrained banks. Moreover, firms that borrow from exposed banks have worse real outcomes. Our results suggest that trade uncertainty can contribute to a fragmentation between banks and international trade, with negative effects for the real economy.

JEL Classifications: G21, F34, F42

Keywords: Bank loans, trade finance, global value chains, trade uncertainty

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1 Introduction

The recent era of globalization witnessed firms' foreign activities proliferate as they entered new markets and sourced intermediate inputs from abroad. This *real* integration has important implications for the domestic banking sector as changes in firms' foreign activities play a key role in shifting their credit demand (Amiti and Weinstein, 2011). The period of stable international trade appears to have now ended given the threats of restrictive trade policy and geopolitical risks. These phenomena have generated substantial trade uncertainty for firms, which may have important implications not only for affected firms but may also spill over to banks' credit supply and the composition of banks' credit portfolios.

This paper estimates the effects of trade uncertainty and observed trade policy changes on U.S. banks' credit supply using a difference-in-differences regression setup. We exploit the spikes in trade uncertainty and changes in tariffs that occurred from 2018 to 2019[1] and combine them with detailed data on loan origination by U.S. banks to domestic and foreign borrowers collected through the Federal Reserve (FR) Y-14Q form (the U.S. "credit register"), and further augment the data set with bank and firm financial information.[2] We further investigate the mechanisms through which banks' exposure to sectors hit by trade uncertainty and tariffs affects credit supply. These mechanisms include banks' exposures impacting (i) their balance-sheet risk given interactions with bank-specific funding frictions, (ii) their risk assessments of all borrowers, and (iii) a change in their lending prioritization that shifts lending activity towards more core clientele.

We find that trade uncertainty impacts bank lending along several dimensions. First, an increase in trade uncertainty is associated with a larger credit contraction at the bank-firm level for banks with a greater ex-ante share of loans to firms in sectors that face higher ex-post trade uncertainty. Second, we find that the contraction in credit supply is larger for banks with business models that support global trade and for banks that face larger financial frictions. Third, we find that firm characteristics also impact how banks adjust their lending behavior in the face of trade uncertainty. Notably, banks contract lending more to firms that are more dependent on imported intermediate goods for production, highlighting a potential channel through which shocks to global value chains may affect domestic credit market conditions.

The analysis uses a comprehensive loan-level data set collected through the Federal Reserve (FR) Y-14Q form. The data comprises origination of large business loans (of minimum

[1] Figure A1 shows the stark increase in U.S. trade uncertainty during 2018–2019, as measured by text-based indexes from Hassan et al. (2019) and Caldara et al. (2020). During this time, trade uncertainty was driven primarily by uncertainty concerning trade policies.

[2] We refer to banks as shorthand for Bank Holding Companies throughout the paper.

size $1 million) extended to domestic and foreign firms by U.S. banks subject to annual stress tests (with assets above $50 billion). A key part of the analysis involves constructing bank-level measures of exposures to trade uncertainty and policy changes. To do so, we combine the loan-level data with sector-level measures of trade uncertainty and tariffs. The index of trade uncertainty is sourced from firm-level measures constructed by Hassan et al. (2019, 2020a,b), which are based on textual analysis of the transcripts of listed firms' quarterly earnings calls, which we aggregate at the sector level. We also use information on export and import tariffs enacted during 2018 and 2019 from Flaaen and Pierce (2019) in order to construct a bank's exposure to firms in sectors with tariffs. Then, we aggregate the measure of uncertainty and the tariff data *at the bank level* using banks' loan shares in the given sector as weights. Uncertainty and tariffs are measured over 2018–2019, while the banks' loan shares are measured before this period, in the fourth quarter of 2017.

The methodology is a standard difference-in-differences estimation framework. Our baseline estimation regresses the (log) amount of new loan issuance on a measure of bank exposure to trade uncertainty (or trade policy) in interaction with a *Post* dummy variable taking the value of one for the years of heightened trade policy uncertainty in 2018 to 2019, and zero for the years 2016 to 2017. To make sure that our results are not confounded by other standard determinants of banks' lending decisions, all specifications control for bank size, capital (share of common equity in total assets), share of deposit funding in total liabilities, and sectoral specialization, in levels and interaction with the *Post* dummy. Furthermore, we show that bank exposure to trade uncertainty is uncorrelated at end-2017 with these variables in the cross-section of banks.

A key challenge in isolating the effects of trade uncertainty on credit supply is the fact that credit supply by banks and credit demand by firms may change simultaneously in response to the trade environment. To address this issue, we exploit the granular nature of this data, at the bank-firm-quarter level, with controls for firm×time fixed effects to absorb credit demand shifts for a given firm (Khwaja and Mian, 2008; Jiménez et al., 2020). We also control for firm×bank fixed effects to account for bank-specific loan demand and endogenous matching between banks and firms (Chodorow-Reich, 2014; Paravisini et al., 2015a; Farinha et al., 2021). Placebo tests indicate that banks have at different levels of exposure to trade uncertainty and tariffs have similar lending patterns before the sample period, suggesting that bank unobservable characteristics do not explain our results.

Our first key finding is that an increase in trade uncertainty is associated with a greater credit contraction at the bank-firm level for more exposed banks. This effect is both statistically and economically meaningful. A simple aggregation based on our estimates shows that credit originations, while controlling for loan demand, dropped by about 0.5 percentage

points (per quarter) for banks exposed to trade uncertainty in 2018 and 2019, a material effect given that the average growth rate during 2015–2017 was 4.2%. The banks in the 75th percentile of the exposure to trade uncertainty distribution had credit growth rates 3.9 percentage points lower than banks in the 25th percentile, also a notable difference. Although bank exposure to actual tariff changes is also a significant driver of credit originations, this effect is weaker than that of trade uncertainty in a specification that includes both terms.

The second set of key findings address the mechanisms through which trade uncertainty and policy changes can affect bank's credit supply. We focus on banks' exposure to trade-related activities, through their business models, and on the strength of their balance sheets, reflecting distance to regulatory constraints around risk and funding frictions. We find that, for a given level of exposure to trade uncertainty and policies, those banks that are more involved in international activities or trade finance, and thus stand to lose more from a deterioration in the trade environment and a worsening of credit risk in their loan portfolios, contract their credit supply by more following an increase in trade uncertainty and tariffs. Furthermore, banks with lower levels of capital and less deposit funding contract their lending relatively more. This evidence supports our conjectures that financial frictions play important roles in banks' adjustment of credit supply.

The third set of key findings pertain to the heterogeneity of borrowers and the prioritization of these borrowers by banks in an uncertain environment. We focus on how uncertainty-exposed banks make lending decisions as a function of two sets of borrower attributes: borrower exposure to trade and core borrower status from the perspective of the bank. Exposed banks are shown to curtail lending to a greater extent to borrowers that rely on trade finance and are internationally integrated into global value chains (by being more dependent on imported intermediate goods for production). Furthermore, exposed banks reduce lending particularly to firms with whom informational asymmetries are greater, proxied by borrower characteristics of having shorter banking histories and being foreign firms.

Accordingly, we assess the effect of the increase in trade uncertainty on U.S. real economy outcomes. We find that uncertainty-exposed banks curtailed term loans and loans used for investment purposes. To gauge real economy effects, we further consider the possibility of extensive margin adjustment that arises if firms are able to switch financing for investment purposes away from exposed banks towards other financial institutions. For this analysis we focus on a panel of firms and compute a measure of firm-level ex-ante exposure to banks with trade uncertainty exposure (a loan-weighted average of each firm's lenders exposure to trade uncertainty). We estimate the effect of this exposure measure on the firms' growth rates of debt, investment, and assets, while controlling for firm characteristics (including sales growth as a proxy for future growth opportunities). A one standard deviation increase

in firm' reliance on banks exposed to trade uncertainty is associated with an economically meaningful decrease of the growth rate of the firm's total debt, investment, and assets in 2018–2019, by 1.2, 1.8, and 2.3 ppts, respectively. These results suggest that firms relying on financing through banks exposed to trade uncertainty were unable to substitute the reduced lending with funds from alternative sources of credit. These results are consistent with credit supply contraction having an adverse material impact on their real outcomes.

The paper provides a battery of additional tests to increase confidence in the interpretation of our results. First, we entertain alternative explanations for our baseline findings, including the possibility that changes in macroeconomic conditions—such as fluctuations in the value of the U.S. dollar and in commodity prices—may correlate with the trade environment and affect banks' lending decisions during the sample period. We show that our main results hold up when additionally controlling for bank exposures to tradeable sectors and to firms integrated in global value chains (arguably more exposed to exchange rate fluctuations), or when dropping oil companies from the sample (as the oil sector experienced a protracted credit contraction starting in 2015). Second, we show the results are robust to alternative measure of bank exposure to trade uncertainty, based on geography instead of sector, or using alternative indexes of trade policy uncertainty.

Our paper contributes to several strands of literature. Our study speaks to the role of banks in facilitating international trade (Niepmann and Schmidt-Eisenlohr, 2017a,b; Niepmann, 2015; Paravisini et al., 2015a). Within this literature, we focus on the causal link from trade to banks, which has received relatively less attention. In a closely related paper, Federico et al. (2020) document that policy actions associated with China's accession to the World Trade Organization in 2001 had sizeable effects on bank loan supply to Italian firms. The authors document endogenous financial frictions arising as a result of the trade shock's negative effects on bank loan portfolios. Our contribution shows the effects of trade policy uncertainty in addition to those of actual changes in trade policy.

Similarly, our paper contributes to the growing body of literature on global value chains, as surveyed by Antràs and Chor (2022). Previous studies highlight the importance of banks for financing international trade (Amiti and Weinstein, 2011; Niepmann and Schmidt-Eisenlohr, 2017a). Trade finance loans are mostly focused on financing the working capital required for international transactions. In contrast, global value chains require material investments, which in some cases are relationship specific, such as purchasing specialized equipment that can only be used to interact with products from certain partners. Trade policy and uncertainty shocks can limit the amount of bank credit available to make those investments if such shocks impair the growth prospects of borrowers reliant on global value chains. Amiti et al. (2019) show that the trade policies enacted in 2018 caused significant

changes to supply chains involving U.S. producers and reduced the availability of imported varieties. We contribute evidence of the effects of trade uncertainty and policies on bank financing for investment purposes, which we document to be more pronounced for firms in sectors more heavily reliant on imported inputs and more integrated with global value chains.

Our work also relates to studies focusing on the real and financial effects of uncertainty (see, among others, Kaviani et al., 2020; Berger et al., 2020; Baker et al., 2016; Bloom, 2014; Buch et al., 2015; Correa et al., 2015). Global banks play an important role in the international transmission of financial stresses through lending and liquidity flows (Weinstein and Amiti, 2018; De Haas and Van Horen, 2013; Cetorelli and Goldberg, 2012; Schnabl, 2012; Peek and Rosengren, 2000), with our work documenting the transmission domestically and abroad of uncertainty around the trade environment. Some papers document consequences of overall uncertainty for bank lending (Wu and Suardi, 2021; Alessandri and Bottero, 2020; Soto, 2021), while others relate uncertainty to global liquidity or capital flows (Rey, 2015; Avdjiev et al., 2020; Kalemli-Özcan and Kwak, 2020). This latter literature posits different reasons why aggregate risk conditions affect bank credit, including via bank value at risk constraints (Shin, 2010; Bruno and Shin, 2015). We focus on a specific type of uncertainty with potentially crucial implications for the global activities of banks and the integration of trade and finance. Trade policy uncertainty differs from aggregate uncertainty because of its sectoral and geographic specificity, which helps us understand the mechanisms at work through banks.

Finally, our work is related to a growing literature on the economic effects of "trade wars," with a particular emphasis on the U.S.-China trade tensions. Evidence has been building on the real economic effects of trade uncertainty (Handley and Limao, 2017; Caldara et al., 2020; Novy and Taylor, 2020) and supply chain disruptions (Schiller, 2017; Huang et al., 2019). These uncertainty effects, which do not focus on the credit supply channel through banks, come on top of the documented effects of tariffs, with research showing the almost complete pass-through of the tariff burden to U.S. prices (Amiti et al., 2019; Cavallo et al., 2021), and adverse effects on consumption (Waugh, 2019), investment (Amiti et al., 2020), and employment (Flaaen and Pierce, 2019). In contrast to these adverse effects on the U.S. economy, the global response to the "trade war" appears to have been more benign. Fajgelbaum et al. (2021) show that other countries decreased exports to China and increased exports to the United States and rest of world, such that global trade ultimately increased in tariffs-hit products. Our contribution is the mechanism of financial intermediaries' response to changes in trade policy and uncertainty by altered credit supply decisions.

The remainder of the paper is organized as follows. Section 2 overviews data sources and our approach to constructing measures of exposure to trade uncertainty and trade pol-

icy. Section 3 presents the conjectures on mechanisms for credit supply adjustment and the empirical testing approach. Section 4 discusses the main results and the heterogeneity in credit supply adjustment by bank and borrower characteristics. Section 5 presents the additional tests that entertain alternative explanations, alternative measures of exposure to trade uncertainty, real effects, and the economic magnitudes of the baseline effects. Section 6 concludes.

2 Data Sources and Exposure to Trade Uncertainty

2.1 The U.S. "Credit Register"

Our empirical tests require representative and detailed information on the terms of commercial loans, on lenders, and borrowers. To this end, we rely on micro-level bank data akin to a credit register. Our main data source contains information at the loan level and comes from the FR Y-14Q H1 "Wholesale credit schedule."[3] These data are collected quarterly from U.S. and foreign headquartered banks as part of the annual stress test exercise required by the Dodd-Frank Act. As banking organizations with assets above $50 billion were required to report these schedules during our sample period, these data cover the near-universe of commercial loans from large U.S. banks, which account for three-quarters of outstanding loan balances (Favara et al., 2021) and close to 90% of total banking sector assets (Weitzner and Howes, 2021). The reporting panel of banks fluctuates between 32 and 36 banking institutions between 2016:Q1 and 2019:Q4.

The FR Y-14Q data set contains loan-level information on commercial and industrial loans held by reporting banks to domestic and foreign borrowers. We restrict the sample to new loan originations and renewals in order to focus on the flow of new lending and trace changes in lending decisions by banks at each point in time[4]. We observe the characteristics of the loans, such as the loan amount, the type of loan (e.g., line of credit or term loan, trade finance loan or other loan, etc.), interest rates, maturity, and collateral. For each loan facility, banks report their own risk rating, which we use to construct an indicator of firm risk (dummy variable for firms that are rated below investment grade). In addition, banks report a wide range of annual borrower-level characteristics such as total assets, profitability, cash holdings, tangibility, and total debt. We merge the loan-level data with bank balance sheet and income statement items for each bank from form FR Y-9C.

[3]For public information about the Y-14Q data collection effort, including list of variables, see link.

[4]Loan originations and renewals refer to new loan commitments through credit lines as well as new disbursements of term loans.

Descriptive statistics for the banks, firms, and loans in our main regression sample are shown in Table A1. The distribution of bank characteristics shows significant cross-sectional variation in capital as measured by the ratio of common equity to total assets (11.3% on average in the regression sample) and deposits as measured by core deposits to total liabilities (61.8% on average). The median newly originated loan in our sample is $12 million, has a spread of 90 basis points (over the prime rate or LIBOR) and maturity of four years. Almost three-quarters of all loans are secured and borrowers on average utilize 30% of available committed credit. About one-quarter of observations represent trade-finance loans which are smaller than other loans with relatively longer maturity and a slightly higher interest rates at origination.

2.2 Bank Exposure to Trade Uncertainty and Policy

Our approach for computing sector- and geography-based bank exposures to trade uncertainty broadly classify the same banks as exposed to high levels of uncertainty. Given their similarities, we use the sector-based exposure measure in the baseline analysis and the geography-based exposure in robustness tests.

Sector-based Exposure to Trade Policy Uncertainty We proceed in two steps. In a first step, we use estimates of firm-level trade uncertainty from Hassan et al. (2019) to construct trade uncertainty measures that vary at the sector level. Then, we aggregate this information at the bank level.

The Hassan et al. (2019) firm-level estimates of trade uncertainty rely on text-based analysis that extracts information on the frequency of terms concerning trade policy and uncertainty for a sample of a publicly-listed firms. This approach leverages computational linguistics tools applied to the transcripts of quarterly earnings conference calls to construct measures of political risk facing listed firms. Text-based analysis allows the authors to calculate the share of earnings calls language that identifies risks associated with specific political topics. Key for our analysis is one such topic—"trade" risk and uncertainty—that captures discussions related to international trade and potential risk and uncertainty jointly (e.g., the words "tariffs" and "uncertain" occurring in a call).[5]

[5]The top biagrams for trade in the training library used by the authors include trade agreement, barriers, free trade, markets, trade relations, duties, globalization, labor standards, and policy objectives. Biagrams for risk and uncertainty include risk/risks, uncertainty, variable, change, possibility, uncertain/uncertainty, doubt, prospect, variability, exposed, probability, unknown, unpredictable, and speculative, among others. More generally, our approach prompts the question of how the index of trade political risk and uncertainty from Hassan et al. (2019) compares with other prominent measures of trade policy uncertainty, such as that of Caldara et al. (2020). In robustness tests, we discuss differences between these indexes and show that our

Given that the firm-level trade uncertainty measures are only for publicly listed firms while the loan data cover a large set of firms (including private ones), we aggregate the firm-level trade uncertainty measures at the 3-digit NAICS sector level using a simple average across firms.[6] Then we classify the firms in the Y-14Q data set as belonging to high-uncertainty versus low-uncertainty sectors based a dummy variable that takes the value one for the sectors with average firm-level uncertainty above the 75$^{\text{th}}$ percentile during 2018:Q1 through 2019:Q4 and zero otherwise. Figures A3 and A4 depict the high-uncertainty sectors based on this classification, which account for 13% of bank-firm-loan observations in our regression sample and are concentrated in the manufacturing sector.

In the second step, these data are used in computing the exposure to trade uncertainty faced by a bank through its loans. For this purpose, we calculate the bank's share of loans to firms in high versus low-uncertainty sectors relative to total bank loans, using data for 2017:Q4. As discussed further in Section 3, we use end-2017 loan shares to predate the period of uncertainty peaks over which we examine banks' lending responses. In the regression sample, average bank loan exposure to trade uncertainty is 16% and the inter-quartile range is about 5 percentage points (see Table A1). In the cross-section of banks, exposure to trade uncertainty in 2017:Q4 is unrelated to bank size, leverage, and the ratio of core deposits to liabilities(Table A3). Robustness checks show that our main results are similar when using an alternative, geography-based measure of bank-level exposure to trade uncertainty.

Exposure to Tariffs-Hit Sectors We collect data on detailed import tariffs for the United States from Flaaen and Pierce (2019). Increases in tariffs by the United States on its major trading partners started in February 2018. This fact may in turn have a direct impact on U.S. banks' lending behavior as well as an indirect impact by increasing trade uncertainty. To allow for a direct trade tariffs impact, we construct bank-level exposures to tariffs in a similar manner as the trade uncertainty measures. In particular, we use the data in Flaaen and Pierce (2019) to generate sector-based measures of banks' tariff exposures. The exposure measure is constructed as the total share of loans outstanding to sectors that had tariffs enacted during 2018:Q1-2019:Q4 at the 4-digit NAICS industry classification using loan shares from 2017:Q4. Close to one third of the bank-firm-loan observations in our sample correspond to firms in tariffs-hit sectors.

main results hold up using the Caldara et al. (2020) index because both measures capture similar trends during our sample period. Given these findings, we use the term trade uncertainty throughout the paper instead of trade risk or trade policy uncertainty.

[6]For this aggregation we introduce sector-level information from S&P Compustat for the firms in the Hassan et al. (2019) data set. We aggregate the firm-level information at the 3-digit NAICS level and not a more granular level to have sufficient firms in each sector for the average to be reliable.

3 Conjectures and Empirical Approach

Our focus is on trade uncertainty—a form of uncertainty with potentially important implications for the globalization of trade and finance—and banks, which are important financing sources for global trading activities. In a setting when trade policy increases the barriers to trade in specific sectors, banks can act as a cushion and provide funds for domestic producers to invest and expand their output in those sectors. However, if there is uncertainty about the magnitude and duration of these policy actions or if banks suffer losses as a result of this transition, bank contributions may turn from being buffers to amplifiers of policy actions and uncertainty.

One mechanism through which trade uncertainty can affect bank lending borrows from the corporate investment literature and highlights the irreversible features of investment, which affect the timing of those investments (Bernanke, 1983; Caballero and Pindyck, 1992; Dixit and Pindyck, 1994; Pindyck, 1991). Numerous studies establish a negative link between uncertainty and firm-level investment, supporting the notion that firms facing an increase in uncertainty tend to postpone investment until uncertainty about future conditions declines (Bloom et al., 2007; Bloom, 2009; Handley and Limao, 2015). In a similar vein, banks with material exposure to sectors suffering a bout of uncertainty or that are affected by policies likely to dampen output and reduce borrower credit quality may react by postponing lending (Buch et al., 2015), reducing the approval rates on new loans or tightening the terms of new loans. This includes to existing borrowers, which we refer to as the intensive margin of adjustment.

This mechanism for the case of U.S. banks is supported by anecdotal evidence from the Senior Loan Officer Opinion Survey (SLOOS) of the Federal Reserve. In April 2019, the survey asked its respondents—a diverse group of 71 banks with more than $2 billion in assets—to consider their loan books insofar as they were exposed to trade policy developments and to report their outlook on the performance of these loan exposures as well as any actions to minimize losses.[7] According to the survey, all banks with a significant share of exposures to affected firms (specifically, more than 40% of the loan book) expected the outlook for loan losses to deteriorate. In addition, 41% of all respondents with some exposure to these developments expected to tighten lending standards to exposed firms and about one-fifth of banks planned specific mitigating actions, including stricter collateral requirements, restructuring loans, using covenants to mitigate credit line drawdowns, and increasing loan loss provisioning in anticipation of higher losses. These observations motivate our first conjecture:

[7] Details on the survey are available here.

Conjecture 1: *Banks respond to an increase in trade uncertainty by reducing credit supply.*

We test this conjecture by estimating a standard difference-in-differences specification linking trade uncertainty and policies to banks' lending decisions on the intensive margin:

$$\begin{aligned} Log(Loan\ Amount)_{i,b,t} = \beta_1 Bank\ Exposure_b \times Post_t \\ + \beta_2 X_{b,t} + \beta_3 X_{b,t} \times Post_t + \gamma_{i,t} + \delta_{i,b} + e_{i,b,t}, \end{aligned} \tag{1}$$

where *Log(Loan Amount)* is the logarithm of the value of the loan originated (or renewed) by bank b to firm i in quarter t. The sample period includes loans originated between 2016:Q1 and 2019:Q4 and we define $Post_t$ is an indicator variable equal to one during 2018:Q1 through 2019:Q4 (and zero during 2016:Q1 through 2017:Q4). $Bank\ Exposure_b$ is our measure of bank exposure to trade uncertainty or tariffs as defined in Section 2.2. The coefficient of interest, β_1, captures the link between a bank's exposure to trade uncertainty and the size of newly granted loans. A negative value for β_1 would provide evidence supporting Conjecture 1; that is, banks respond to an increase in trade uncertainty through a reduction in credit. We also explore specifications that simultaneously include the exposures of banks to trade uncertainty *and* trade policy (capturing changes in actual tariffs) in equation (1). These specifications allow us to gauge the effects of trade uncertainty on banks' lending decision above and beyond those of changes in trade policy, which are already captured in trade uncertainty indexes.

Specification (1) includes interacted firm×quarter fixed effects ($\gamma_{i,t}$) that allow us to keep loan demand constant within a firm-quarter pair, and hence examine the differential lending behavior of banks vis-à-vis the same borrowers. We also report specifications with interacted bank×firm fixed effects ($\delta_{i,b}$), which further allow for the possibility that loan demand is specific to the loan type or bank-firm pair. This may be the case when banks specialize in certain types of credit (such as trade credit) or certain types of borrowers (such as large exporters) — see, e.g., Ivashina et al. (2021) and Paravisini et al. (2015b). These demanding fixed effects aim to allay potential concerns that the coefficient on bank exposure, β_1, captures the effects of firm-specific factors such as credit demand as opposed to banks' supply-side lending decisions. One identifying assumption behind the unbiased estimation of β_1 is that banks had similar lending decisions before the 2018 to 2019 period marked by spikes in uncertainty and changes in U.S. trade policy, regardless of their exposure to sectors ultimately affected by trade uncertainty. We verify this "parallel trends" assumption in Section 4.1.

All specifications include a vector of standard bank controls ($X_{b,t}$) that are fundamental drivers of lending decisions, such as bank size (log-total assets), capital ratio (common equity divided by total assets), and core deposit ratio (in percent of total liabilities). To address the possibility that the bank unceretainty exposure measure based on loan shares captures some form of lending concentration, and that lending concentration may determine banks' lending decisions following borrower shocks (Giannetti and Saidi, 2019; Laeven and Popov, 2021; Gelman et al., 2022), we also include a bank specialization measure following Paravisini et al. (2015a) and identify banks with extremely large exposures to a given sector.[8] In our cross-section of banks, this measure is uncorrelated with bank exposure to trade policy uncertainty, but positively and significantly correlated with bank exposure to firms in sectors hit by tariffs (0.45**). All the control variables enter both in levels ($X_{b,t}$) as well as interacted with the $Post_t$ indicator variable ($X_{b,t}$Post) to make sure that the β_1 coefficient is not contaminated by bank size, capital, deposit funding, or specialization.

Coefficients are estimated with Ordinary Least Squares (OLS) and standard errors are double clustered by quarter and bank-firm.[9] While the main specifications focus on loan origination amounts, additional specifications using this format explore other loan terms such as loan spreads, maturities, and collateral requirements.

Next, we exploit bank characteristics to extract additional information on the channels behind the relation between trade uncertainty and lending. We focus on two sets of bank characteristics. First, we zoom in on bank business models insofar as they relate to trade exposure and may thus capture the potential losses facing a bank (Buch et al., 2015). One aspect is the bank's degree of internationalization and exposure to global trade dynamics as measured by the extent to which the bank engages in trade finance and has loan exposures to foreign residents. If our specifications capture the effects of trade uncertainty and policy, as opposed to those of other macroeconomic developments that may have occurred simultaneously (e.g., changes in commodity prices), then banks that are more international and provide trade finance expect higher balance sheet losses and thus to react relatively more to a rise in trade uncertainty or tariff barriers.

Second, we examine heterogeneity in bank responses based on their balance sheet constraints as reflected by their size, level of capital, and reliance on core deposits. These measures may matter for the transmission of uncertainty shocks to lending decisions through the

[8] We start by calculating the shares of loans (at end-2017) to individual sectors (using the 3-digit NAICS classification) for each bank in our sample. Then, we calculate the 75th percentile of that distribution plus 1.5 interquantile ranges. The bank specialization variable is defined as a dummy variable that takes a value of one for bank-sector observations for which the share exceeds that threshold—these are the banks "specialized" in that particular sector—and zero otherwise.

[9] The main specifications are robust to double clustering on bank and quarter.

external finance premium for banks, which relates bank financial health to their ability to raise funding (Bernanke, 2007). Banks with smaller balance sheets, less capital, or lower reliance on stable funding face constraints that are likely more binding and therefore should be less able or willing to bear risk as uncertainty rises. Therefore, we expect more constrained banks to contract credit supply to a greater degree than other banks. Concretely, we test the following conjecture:

Conjecture 2: *Given an increase in trade policy uncertainty, banks that are more exposed to trade finance and foreign borrowers, and banks that are more balance-sheet constrained, contract lending relatively more.*

This conjecture is tested with a modified version of specification (1):

$$\begin{aligned} Log(Loan\ Amount)_{i,b,t} = {} & \beta_1 Bank\ Exposure_b \times Post_t \times Low\ Bank\ Characteristic_b \\ & + \beta_2 Bank\ Exposure_b \times Post_t \times High\ Bank\ Characteristic_b \\ & + \beta_3 X_{b,t} + \beta_4 X_{b,t} \times Post_t + \gamma_{i,t} + \delta_{i,b} + e_{i,b,t}, \end{aligned} \tag{2}$$

where we break up the difference-in-differences coefficient $Bank\ Exposure_b \times Post_t$ into subsample effects for $Low\ Bank\ Characteristic_b$ and $High\ Bank\ Characteristic_b$. These are indicator variables equal to one if the bank has a lower or higher characteristic in our sample period (for instance, lower/higher capital, lower/higher deposits; or smaller/larger bank).[10] We report p-values of one-sided tests on the equality of the β_1 and β_2 coefficients to gauge whether we have evidence supporting Conjecture 2.

Third, we explore the effects of trade uncertainty and policies on bank credit by heterogeneous firm types. Studies show that banks facing negative shocks tend to rebalance their lending portfolios across geographies (Giannetti and Laeven, 2012; Cetorelli and Goldberg, 2012; Cortés and Strahan, 2017) or economic sectors (Bidder et al., 2021a), depending on the nature of the shock. Banks are also more likely to sustain credit to borrowers that are central to their business or toward whom they have informational advantages (Giannetti and Saidi, 2019; Favarra and Gianetti, 2017; De Haas and Van Horen, 2013), such as borrowers with longer banking relationships or borrowers in domestic markets. This literature suggests that as trade uncertainty rises, bank restrict lending to "riskier" non-core borrowers.

[10] We use different cutoffs to split the cross-section of banks into lower/higher depending on the distribution of each series. In general, we either use the median or the 75th percentile as the cutoffs to assign the indicator variables.

In our context, this concept is mapped to a number of characteristics. It includes borrowers that are more integrated with global trade and are more likely to experience a worsening of growth prospects and credit risk in the new environment. Such borrowers may be reliant on trade-related forms of financing and multiple suppliers for their production processes. Additionally, borrowers that are integrated with global value chains are of particular interest because a credit contraction to these firms would impair their ability to adjust and would reduce the resilience of value chains to changes in trade policies. Such shifts may eventually lead to banks playing a lesser role in supporting global trade and potentially a decoupling of international trade and banking. These observations lead to our third conjecture:

Conjecture 3: *Given an increase in trade policy uncertainty, more exposed banks contract lending relatively more to affected international trade-oriented borrowers and to borrowers vis-à-vis whom they have an informational disadvantage.*

We test this conjecture with the following specification that is similar to equation (3):

$$\begin{aligned} Log(Loan\ Amount)_{i,b,t} = {} & \beta_1 Bank\ Exposure_b \times Post_t \times Low\ Firm\ Characteristic_i \\ & + \beta_2 Bank\ Exposure_b \times Post_t \times High\ Firm\ Characteristic_i \\ & + \beta_3 X_{b,t} + \beta_4 X_{b,t} \times Post_t + \gamma_{i,t} + \delta_{i,b} + e_{i,b,t}, \end{aligned} \tag{3}$$

The coefficients of interest are β_1 and β_2. Characteristics include the firms' exposure to trade uncertainty and policy (tariffs) changes, reliance on trade finance, and exposure to global value chains. Informational disadvantages are associated with shorting banking relationship duration, and location (foreign borrowers). Values for the β_1 and β_2 coefficients that are statistically significantly different would provide support for Conjecture 3.

4 Main Results

This section presents the results of empirical estimations testing the conjectures. The results first assess whether trade uncertainty and policy changes affected the supply of new loans by U.S. banks to U.S. firms (Section 4.1). Then the heterogeneous credit supply effects by bank and firm characteristics are provided (Sections 4.2-4.3) to address the strength of the mechanisms underlying behind trade policy uncertainty and the strength of contraction in bank lending.

4.1 Effect of Trade Uncertainty and Policies on Bank Credit

Baseline Effects The first set of tests establish whether an increase in trade uncertainty (and the increase of trade tariffs) is associated with a lower supply of bank credit, as in Conjecture 1. The baseline results in Table 1 report estimates based on equation (1). All specifications include firm×quarter fixed effects to control for time-varying firm-level credit demand; every other specification also adds bank×firm fixed effects to account for bank-firm matching.[11] In columns 1–2, the coefficient of interest on the difference-in-differences term "Bank exposure×Post" is negative and statistically significant at conventional levels, suggesting that rising trade uncertainty dampens bank lending for more exposed banks as per Conjecture 1. The coefficient magnitudes are economically sizeable. Using the coefficients in columns 1–2, a one standard deviation increase in bank exposure to trade uncertainty (by 0.07) is associated with an average decline in loan amounts by between 3.9% and 6.2% (columns 1-2).

The link between tariff enactment and bank lending is presented in columns 3–4, and shows a negative difference-in-differences coefficient that is not consistently significant across specifications. Using the coefficient estimate in column 3, a one-standard deviation increase in bank exposure to firms in sectors hit by trade tariffs is associated with a decline in loan origination volumes of 3.2%. Column 5 shows a horse race specification that allows trade uncertainty and tariffs to "compete" in explaining bank lending volumes. While, individually, both variables are associated with loan supply contractions that are similar in magnitude, this joint specification shows that trade uncertainty has more idiosyncratic power in explaining changes in bank supply than does trade policy.

Additional Lending Terms Table A2 explores the effects of trade uncertainty and policy on additional lending terms, including loan rates, maturities, and collateral. The estimates indicate that relatively more exposed banks charge higher spreads on new loans (columns 1, 4). This effect is consistent with a credit supply interpretation for the loan-amount effect, as a decline in loan demand would instead generate a narrowing of spreads. Higher bank exposure to trade uncertainty (and policy) is also associated with shorter loan maturities (columns 2, 5) and stricter collateral requirements on new loans (columns 3, 6), although the coefficient estimates are less precisely estimated.

[11] The sample therefore comprises those firms that borrow from multiple banks in any given quarter ("multibank firms"). Multibank firms represent about one-fifth of all bank borrowers in the Y-14Q sample. Figure A2 depicts the sectoral distribution of the full sample of firms compared to the multibank sample on which we conduct the estimations and shows no evidence of strong selection effects in this sample. Our baseline difference-in-differences coefficients are negative and statistically significant in the full sample of loans that includes single-bank borrowers (results not shown).

Placebo Tests In Table A4 we test the validity of the "parallel trends" assumption behind our difference-in-differences estimate with Placebo tests. This test ensures that our measure of bank exposure to trade uncertainty and policy does not capture the effects of bank unobservables—if it did, then we would find patterns similar to our baseline results in previous periods. As seen, shifting the analysis back by one or three years reveals no systematic association between bank exposure to trade uncertainty and lending. These results allay potential concerns that our results captures the effects of an unobserved bank characteristics than those of trade uncertainty itself.

Overall, our baseline results suggest that trade uncertainty is associated with a contraction in credit supply by banks exposed (ex ante) to affected sectors. This effect is stronger than that of trade policy through the enactment of trade tariffs. In the next two sections, we explore which specific bank and firm characteristics amplify the effects of trade uncertainty on credit supply.

4.2 Heterogeneous Effects Across Banks

Conjecture 2 posits heterogeneous effects across bank business models and bank balance sheet characteristics. We expect that, in the face of uncertainty, banks' loan supply should decrease relatively more for banks that face greater potential losses, that is, banks with greater internationalization in the business model (as reflected in higher shares of lending to foreign markets) and for banks more engaged in supplying trade finance (as reflected in higher share of trade finance loans). Furthermore, stronger effects for balance sheet constrained banks (lower capital ratios, lower core deposit ratio, and smaller balance sheet size) could suggest a role for financial frictions in the supply of bank credit. Tables 2 and 3 report regression estimates for specification (3).

Bank Business Models The estimates in columns 1 and 3 of Table 2 suggest that the credit supply response of more exposed banks is relatively stronger for banks with a larger focus on foreign markets, as reflected in a share of total foreign claims that is above the 25^{th} percentile of the distribution (or above 1% of total assets). By contrast, there is no evidence of a significant credit contraction for banks with negligible foreign claims. The share of trade finance claims in total assets is associated with a significantly larger contraction in the size of new loans. These effects are consistent with Conjecture 2 and apply to both measures of bank exposure—to trade uncertainty and policy, respectively.

Bank Balance Sheets Table 3 considers differences across banks in terms of balance sheet composition and size. For bank capital and deposit shares, banks are split around the median value, while for size the split uses the 75th percentile of the asset distribution (about \$400 bn). Consistent with Conjecture 2, across specifications, we find that more constrained banks curtail loan originations more than other banks. These effects suggest lower capacity to bear risk and potential financial frictions at constrained banks.

4.3 Heterogeneous Effects Across Firms

Conjecture 3 posits that exposed banks, in response to trade uncertainty shocks, are likely to rebalance their portfolios away from riskier borrowers (for instance, borrowers more reliant on trade finance or global value chains) and towards "safer" borrowers with whom they have an informational advantage (for instance, longer banking relationship borrowers and domestic firms).

Firm Exposure to Trade Uncertainty and Trade Finance Borrower heterogeneity in terms of exposure to trade uncertainty and policy changes is addressed in Table 4, where the baseline credit contraction effect is broken down between (a) directly-affected firms—those firms in high-uncertainty sectors (above the 75th percentile of the trade uncertainty distribution)—and other firms; and (b) between firms reliant on trade finance loans (about one-quarter of the loans in the regression sample), which are key for facilitating international trade transactions for both importers and exporters, and other firms. These classifications aim to identify the firms involved in trade activities and hence more likely to be affected by trade uncertainty and policy. The pattern that emerges across specifications is that directly-affected (in high uncertainty- and tariffs-hit sectors) and trade-oriented borrowers experienced a significantly greater credit contraction compared to other borrowers, consistent with Conjecture 3. The only exception is in column 1, where we cannot reject the null of equal coefficients for directly-affected and other borrowers (the p-value for a t-test of equality of coefficients is 0.155).

Firm Exposure to Global Value Chains In Table 5, we explore whether banks also decrease their credit supply to firms in importing sectors that are more exposed to GVCs. We define reliance on GVCs as the share of imported inputs in total intermediate inputs, or alternatively, as the share of imported inputs relative to total industry output (Antràs and Chor, 2022) at the 3-digit NAICS sector level using data from the Bureau of Economic Analysis Input-Output tables. We limit the analysis to manufacturing sectors because the

production of manufactured goods tends to rely on intermediate imports (and hence global supply chains). Those sectors with import shares above the 75^{th} percentile of the cross-sectoral distribution are classified as having high GVC exposures. Figure A5 shows that manufacturing sectors with high GVC exposure include Petroleum and coal products, Non-metallic mineral products, and Computer and electronic products.

Consistent with Conjecture 3, the regression estimates in Table 5 indicate a greater lending contraction vis-à-vis firms in high GVC-exposure sectors compared to firms in low-exposure sectors. The difference in lending contraction between the two groups of firms is statistically significant in all specifications and across bank-level measures of exposure to trade uncertainty and tariffs.

Relationship Intensity and Foreign vs. Domestic Borrowers Following a rise in trade policy uncertainty and tensions, banks can also adjust their lending portfolios away from borrowers where they have a lower informational advantage, for instance borrowers in a shorter relationship with the bank or foreign borrowers. Table 6 unpacks the baseline difference-in-differences effect by borrower type. As shown in columns 1–2, banks with higher trade uncertainty exposure significantly curtail lending to firms with whom they have shorter lending relationships and to foreign borrowers. However, these effects are not significant for bank exposures to tariff changes (columns 3–4).

The results in this section are overall consistent with Conjecture 3 and highlight that exposed banks pull away from borrowers in affected sectors and foreign markets as trade uncertainty and tensions rise. This pull back, in turn, may limit the capacity of such firms to adapt to the new trade landscape and reduce the role of banks in supporting global trade, thereby decoupling banks from international trade activities.

5 Additional Results

Additional tests aim to bolster confidence in our baseline results. Section 5.1 explores the validity of alternative explanations for our main results. Section 5.2 shows that our results are robust to alternative measures of bank exposure to trade uncertainty based alternative sources of data for measuring uncertainty and geographical variation in trade uncertainty. Section 5.3 documents the real effects of trade uncertainty and policies through banks. Section 5.4 discusses the quantitative implications of our regression estimates.

5.1 Ruling out Alternative Explanations

Exchange Rate Channel It is important to establish that our results are not driven by changes in macroeconomic conditions that may have occurred simultaneously with the rise in trade uncertainty and trade tariffs during 2018–2019. Such changes include fluctuations in the strength of the U.S. dollar, which affects both banks' asset quality and trade. The BIS broad U.S. dollar index appreciated by 4.7% between January 1, 2018 and December 31, 2019.

There are several traditional mechanisms by which exchange rate fluctuations may affect banks and firms. When the dollar appreciates, banks may pull back from lending if they expect repayment capacity to deteriorate among their borrowers, especially unhedged foreign borrowers with dollar-denominated debts. A stronger dollar also reduces the purchasing power of foreign firms, which can make it harder for some U.S. firms to sell their goods abroad. In addition, several financial mechanisms can drive the link between the U.S. dollar and the provision of dollar credit. A stronger dollar is associated with tighter dollar credit conditions (Bruno and Shin, 2021; Niepmann and Schmidt-Eisenlohr, 2019), which implies that foreign exporters more reliant on dollar-funded bank credit, experience a greater decline in credit, higher loan spreads (Meisenzahl et al., 2021), and a slowdown in real activity. This, in turn, may dampen the growth of U.S. firms that rely on intermediate inputs for their production, which may affect their demand for loans as well as their credit risk as perceived by lenders.

To rule out the possibility that fluctuations in the value of the U.S. dollar explain our results, we test whether our main results survive after we control for bank exposure to these alternative mechanisms. To this end, we construct additional exposure measures representing, for each bank, the end-2017 share of outstanding loans to (a) firms in tradeable goods sectors, which arguably are more exposed to U.S. dollar fluctuations than firms in non-tradeable goods sectors; and (b) firms in sectors more exposed to global trade, for instance through GVCs, using our two definitions (share of imported inputs relative to total intermediate inputs or total industry output above the 75^{th} percentile of the distribution). The results reported in Table 7 show that the inclusion of these additional control variables does not affect the statistical and economic significance of the estimated coefficient on the difference-in-differences term "Bank exposure×Post." Across specifications, this estimate remains negative and statistically significant at conventional levels.

Commodity Price Channel Next, we addresses a second potential concern that our results may reflect fluctuations in commodity prices rather than changes in trade uncertainty and policy. Following the mid-2014 oil price declines, banks with more concentrated expo-

sures in the oil sector experienced net worth losses and curtailed business lending, especially to firms in the oil sector (Bidder et al., 2021b; Wang, 2021). One might worry that our baseline results pick up the effects of bank exposure to the oil sector, particularly protracted effects of the credit crunch associated with the oil price decline. To alleviate this concern, we drop oil companies from the sample, which we identify using two definitions: one that is based on a coarse 2-digit NAICS classification, where oil firms are all firms in the "Mining, quarrying, and oil and gas extraction" sector; and a second definition that uses more granular industry classifications to incorporate firms in sectors related to construction of oil wells, transportation and distribution. The results, shown in Table 8, indicate that the main estimates are robust to removing oil companies from the sample—and, if anything, that the coefficients are slightly larger in magnitude than in the baseline estimations.

5.2 Alternative Measures of Bank Exposure

We check if our results hinge on the particular methodological approach to constructing the baseline measure of bank exposure to trade policy uncertainty. In the first test, we use the index of trade policy uncertainty from Caldara et al. (2020), which is similar to Hassan et al. (2019) in that it uses similar linguistic libraries, including terms that refer to trade activities and trade policy, as well as uncertainty, risk, and potentiality. Yet, Caldara et al. (2020)'s index differs in two key dimensions. First, it uses news articles from global newspapers as a basis for the textual analysis.[12] Second, it is more focused on measuring trade policy uncertainty, even though the Hassan et al. (2019) index uses some policy-related keywords as well. As a result, the two indexes are highly correlated over the period of analysis (Figure A1), when trade uncertainty was largely driven by policies, and produce a similar sorting of firms and sectors into high versus low-uncertainty sectors. Furthermore, the bank-level exposure to trade policy risk and uncertainty as captured by the Hassan et al. (2019) and Caldara et al. (2020) indexes, respectively, are also positively and strongly correlated (Figure A7).

In the second test, we employ a geography-based measure which uses information from country-level (instead of sector-level) indexes of trade uncertainty. These measure are sourced from the World Trade Uncertainty Index of Ahir et al. (2019), who build indexes using quarterly text-based analysis of the Economist Intelligence Unit country reports. The authors construct the overall index based on a frequency approach, where they count the number of

[12] Caldara et al. (2020) additionally present a trade policy uncertainty index that uses transcripts from listed firms' earnings calls and show that his index is highly correlated in the time series with their main news-based index.

times certain words indicating "uncertainty" in a given report appearing near words associated with trade (e.g., "tariffs") and deflate this raw count by the total number of words in a given report in order control for cross-country heterogeneity. Similar to the sector-based exposures, we aggregate these data using banks' share of claims to a country relative to total foreign claims.[13] Then, we split the countries by level of uncertainty and construct a dummy variable that takes a value of one for the countries with average trade uncertainty index level above the 75th percentile during 2018:Q1-2019:Q4 and zero otherwise. Once again, we aggregate the uncertainty indexes at the bank level using end-2017 loan shares. Figure A6 shows that the sector- and geography-based measures of bank exposure to trade uncertainty are positively correlated in the cross-section of banks.

The regression estimates in Table 9 suggest that our main results hold up when we use these alternative bank exposure variables: higher exposure to trade policy uncertainty is associated with a relatively greater decline in the volume of new loans, and this effect is statistically stronger than that of exposure to trade tariffs.

5.3 Real Effects

Here, we explore the implications of trade uncertainty for the real economy. We start by exploiting information on loan type in the main loan-level data set to examine whether the credit contraction associated with higher trade policy uncertainty is more pronounced for loans more likely used for investment. Then, we assemble a firm-level panel on firm financial outcomes over 2016–2019 to study the link between firm exposure to trade uncertainty via its lenders on the one hand, and firm performance on the other hand.

Loan-level Evidence To study the real economy effects of an increase in trade policy uncertainty via banks, we estimate the baseline regressions by loan type. Specifically, we break down the difference-in-differences coefficient by (a) term loans versus credit lines; and (b) loan purpose. The idea behind the first distinction is term loans, which represent 41% of the loans in the regression sample, are more likely used to acquire capital assets, such as property, plant and equipment.[14] Furthermore, we distinguish between loans that

[13]The United States is excluded from this calculation. Note that foreign claims include both loans and securities holdings, and claims held at the bank's headquarters and in foreign offices. We measure the bank's share of foreign claims with the total foreign claims reported by the bank in the FFIEC 009 data. The FFIEC 009 is a supervisory form filed by U.S. banks with foreign exposures above $30 million. The report collects quarterly information on these banks' claims on foreign residents broken down by country, type (i.e., cross-border or through local offices), and counterparty sector.

[14]As a result, term loans tend to have longer maturity and stricter covenants and are generally seen as riskier than short-term advances.

are earmarked for investment purposes (representing 5.6% of all loans in the regression sample) versus loans for all other purposes. The results, reported in Table 10, indicate that the coefficient estimates on the difference-in-differences term are statistically significant and larger in absolute value, across all specifications, for term loans (columns 1–2) and investment purpose loans (columns 3–4). These findings suggest that, on average, firms obtain less financing for investment from relatively more exposed banks. This contraction in loans for investment, however, need not imply worse firm performance if firms are able to switch away from exposed banks and obtain new loans from other financial institutions. To determine if this is the case, we turn to studying firm-level outcomes.

Firm-level Evidence We examine firm-level outcomes in a panel data set covering a wealth of (end-year) financial information for the borrowers in our baseline analysis over the period between 2016 and 2019. Specifically, we examine the link between changes in trade uncertainty and three firm outcomes through their reliance on exposed banks—total debt, investment expenditure, and total assets, expressed in growth rates. We estimate several difference-in-differences specifications where the regressor of interest is the interaction of a variable capturing "firm-level exposure to trade policy uncertainty through its lenders" with a *Post* dummy variable taking value one for the years 2018–2019 (and zero for 2016–2017). We compute the "firm-level exposure to trade uncertainty" as the average of the exposure to trade uncertainty of the firm's lenders themselves, weighted by the share of total loans outstanding from each lender. Once again this exposure is measured at end-2017 to precede the post (high-uncertainty) period. All specifications include the level and interaction with *Post* of the following firm characteristics: sales growth (as a proxyf for firms' investment opportunities), firm size (log-assets), cash ratio, tangible asset ratio, interest coverage ratio, return on assets, and risk (a dummy variable for speculative grade firms based on banks' internal risk ratings). We further control for demand for firms' services and products with firm, county, industry, and, in some specifications, county×industry fixed effects. Common time-varying shocks to all firms are absorbed by year fixed effects.

The results are reported in Table 11. Across firm outcomes, we obtain negative and statistically significant coefficients, indicating a strong inverse relation between firm exposure to trade uncertainty and total debt growth (columns 1–2), investment expenditure growth (columns 3–4), and asset growth (column 5–6). Focusing on the estimates in the most demanding specifications of columns 2, 4, and 6, we have that a one standard deviation increase in firm exposure to trade uncertainty via its banks at end-2017 (5.9%) is associated with a decline of 1.2, 1.8, and 2.3 ppts in debt, capex, and asset growth, respectively. The effects are economically meaningful as they represent 10.2%, 20.5%, and 28.9% of the average

debt, capex and asset growth across all firms in the sample during 2018–2019.

5.4 Economic Implications of Regression Estimates

Some quantitative exercises help gauge the economic significance of the estimated regression coefficients. Building on equation (1), we are interested in answering the two following questions. First, how much did aggregate credit contract given the aggregate increase in trade uncertainty? Second, conditional on the increase in trade uncertainty, what was the relative impact of this uncertainty on loan growth across different levels of bank exposure? We answer these questions by exploiting the estimate of β_1 in (1) and bank-level data.[15]

Question 1: What are the aggregate credit growth effects of trade uncertainty? To answer this question, we take the derivative of (1) viz. $Post_t$, where the change is from 0 to 1; i.e., from no-even to an event. We further demean each bank's exposure by the mean of exposure across all banks in order to account for the fact (1) was estimating using bank-level fixed effects, so that β_1 was identified from differences across banks.[16] Doing so yields (in discrete terms):

$$\begin{aligned}\widehat{\Delta L}_{i,b,t}^{Post} &\equiv \Delta Log(Loan\ Amount)_{i,b,t}^{Post} \\ &= \widehat{\beta}_1 \left(Bank\ Exposure_b - \frac{1}{N}\sum_{b=1}^{N} Bank\ Exposure_b \right) \times \Delta Post_t \\ &= \widehat{\beta}_1 \left(Bank\ Exposure_b - \frac{1}{N}\sum_{b=1}^{N} Bank\ Exposure_b \right)\end{aligned} \tag{4}$$

Next define $\omega_{i,b,t-1}$ to be share of loans that bank b lends to firm i in the pre-treatment period, then aggregate loan growth is simply the loan share weighted-sum of (4):

$$\widehat{\Delta AggL}_t^{Post} = \sum_i \sum_b \widehat{\Delta L}_{i,b,t}^{Post} = \sum_i \sum_b \omega_{i,b,t-1} \times \widehat{\beta}_1 \left(Bank\ Exposure_b - \frac{1}{N}\sum_{b=1}^{N} Bank\ Exposure_b \right)$$

Note that since the bank exposure variable does not vary across bank-firm pairs, we can

[15] By exploiting the reduced-form regression framework that controls for fixed effects, it should be noted that our quantitative results have conditioned away general equilibrium effects, so the following analysis is partial equilibrium by construction.

[16] Time-varying firm demand was also controlled for via firm×quarter fixed effects, thus any comparison we make with our aggregated loan growth to observed aggregate loan growth in the data will necessarily be smaller.

replace the bank-firm level loan share with bank-level ones and sum across banks only:

$$\widehat{\Delta AggL_t}^{Post} = \sum_b \omega_{b,t-1} \times \widehat{\beta}_1 \left(Bank\ Exposure_b - \frac{1}{N} \sum_{b=1}^{N} Bank\ Exposure_b \right) \tag{5}$$

where $\omega_b = \sum_i \omega_{i,b}$.

We therefore only require data on bank loan shares along with the estimate of β_1 from Table 1, which we choose from column (2) in order to be conservative in our estimate of the aggregate effect. Using this estimate along with the sum of banks' exposure to trade uncertainty and using (5), we find that aggregate loan growth dropped by 0.5 ppts (per quarter) due to the increased trade uncertainty over the 2018:Q1–2019:Q4 period. This is economically meaningful, as the average growth rate (per quarter) of loan originations was 4.2% between 2015 and 2017.

Question 2: What are the credit growth effects of differences in bank exposure? To answer this question, we follow the same approach as before where now we take the derivative of (1) viz. $Exposure_b$, where the difference can be calculated across banks' heterogeneous exposure in the cross-section, such as an interquartile range (IQR). We then apply this derivative for when the uncertainty event takes place ($Post_t = 1$):

$$\begin{aligned} \widehat{\Delta L}_{i,b,t}^{Exposure} &\equiv \Delta Log(Loan\ Amount)_{i,b,t}^{Exposure} \\ &= \widehat{\beta}_1 \Delta Bank\ Exposure_b \times Post_t \\ &= \widehat{\beta}_1 \Delta Bank\ Exposure_b \end{aligned} \tag{6}$$

We can then apply (6) to different ranges of bank exposures.[17] Specifically, for the interquartile range we have:

$$\widehat{\Delta L}^{IQR} = \widehat{\beta}_1 (Bank\ Exposure_{75th} - Bank\ Exposure_{25th}) \tag{7}$$

where $Bank\ Exposure_{Xth}$ is the the bank exposure to trade uncertainty in the X^{th} percentile of the sample trade uncertainty exposure distribution pre-treatment. Applying this difference in bank exposures (0.07) along with the regression estimate in column 2 of Table 1 implies that moving from the 25^{th} to the 75^{th} percentile in bank exposure to trade uncertainty results

[17] Note that we do not have subtract the mean of banks' exposure as in the aggregate exercise of Question 1 as this mean will cancel out when comparing banks in different points of the bank exposure distribution.

in a decline in quarterly credit growth of 3.9 ppts over the 2018:Q1–2019:Q4 period.

6 Conclusions

This paper shows that international trade uncertainty impacts domestic banks' credit supply along several dimensions. Banks that have higher ex-ante loan exposure to firms in sectors with greater ex-post trade uncertainty decrease credit supply to these firms as well as to borrowers that are not directly impacted by trade uncertainty. This credit retrenchment highlights an important credit market spillover from the uncertainty that arises as governments discuss adjusting the stance of their trade policies. Moreover, the effect of this trade-uncertainty-credit-supply channel is stronger than the impact of actual changes in trade policy.

Trade uncertainty has heterogeneous effects on credit supply across the distribution of banks and across borrowing firms. The reduction in credit supply is stronger for more internationally-oriented banks and for banks with weaker balance sheets, as captured by their capital levels and reliance on nondeposit funding. Furthermore, banks adjust their lending supply away from borrowers that are potentially perceived as riskier, namely borrowers that rely on trade finance, that participate in global value chains, foreign borrowers, and those with shorter banking histories. We find that the credit supply contractions, as well as the differences along these heterogeneous dimensions, are economically important and consequential for firms' ability to invest and grow. Overall, our results point to potentially important financial spillovers working in the direction of decoupling international trade linkages along several dimensions as banks retrench their lending.

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Table 1. Trade uncertainty, policy, and bank lending: Baseline results

This table shows OLS regression estimates for a specification linking loan origination and renewal amounts (log) to ex-ante bank exposure to measures of trade uncertainty and trade policy (tariffs). The data are at the bank-firm-quarter loan-level and refer to new loans granted between 2016:Q1 and 2019:Q4 to domestic borrowers (nonfinancial firms). Bank exposure to trade uncertainty is measured as the weighted average of trade uncertainty across sectors (over 2018:Q1-2019:Q4), with weights given by individual banks' loan exposures to those sectors (at end-2017). Bank exposure to trade policy (tariffs) is measured as the total share of loan exposures to sectors that had tariffs enacted during 2018:Q1-2019:Q4 at the 4-digit NAICS industry classification. The variable Post takes value of one for the period 2018:Q1-2019:Q4 and zero for the period 2016:Q1-2017:Q4. Bank characteristics include size (log-total assets), capital (common equity/total assets), deposits (core deposits/liabilities), and specialization, and enter in levels and interacted with Post. Standard errors are double clustered at the quarter and bank-firm level. Significance: *** 1%, **5%, and *10%.

	(1)	(2)	(3)	(4)	(5)
Dependent variable	**Loan amount (log)**				
	Exposure to trade uncertainty		***Exposure to trade policy (tariffs)***		***Horse race***
Bank exposure×Post	-0.874***	-0.552*			-0.942***
	(0.215)	(0.280)			(0.298)
Bank exposure×Post			-0.462**	-0.305	0.076
			(0.206)	(0.230)	(0.291)
Observations	83,970	75,583	83,970	75,583	83,970
R^2	0.729	0.777	0.729	0.777	0.729
Bank characteristics	Y	Y	Y	Y	Y
Bank characteristics×Post	Y	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y	Y
Firm×Quarter FE	Y	Y	Y	Y	Y
Firm×Bank FE		Y		Y	

Table 2. Trade uncertainty, policy, and bank lending: Heterogeneity by bank business model

This table shows OLS regression estimates for a specification linking loan origination and renewal amounts (log) to ex-ante bank exposure to trade uncertainty and trade policy (tariffs) by bank internationalization and business model. The data are at the bank-firm-quarter loan-level and refer to new loans granted between 2016:Q1 and 2019:Q4 to domestic borrowers (nonfinancial firms). Bank exposures to trade uncertainty and policy are defined as in baseline Table 1. The variable Post takes value one for the period 2018:Q1-2019:Q4 and zero for the period 2016:Q1-2017:Q4. We capture the degree of internationalization of a bank's activities with two measures: the share of foreign claims (cross-border and local) and the share of trade finance in total assets. In columns 1 and 3, high foreign claims is a dummy variable that takes value one for banks in the top 25th percentile of the distribution (with foreign claims of at least 1% of total assets); and zero otherwise. In columns 2 and 4, trade finance claims is a dummy variable that takes value one for banks in the 25th percentile of the distribution (with positive trade finance claims), and zero otherwise. Bank characteristics include size (log-total assets), capital (common equity/total assets), deposits (core deposits/liabilities), and specialization, and enter in levels and interacted with Post. Standard errors are double clustered at the quarter and bank-firm level. Significance: *** 1%, **5%, and *10%.

	(1)	(2)	(3)	(4)
Dependent variable	**Loan amount (log)**			
	Exposure to trade uncertainty		***Exposure to trade policy (tariffs)***	
Bank exposure×Post×**High Foreign Claims**	-0.989***		-0.466**	
	(0.224)		(0.209)	
Bank exposure×Post×Low Foreign Claims	-0.222		-0.001	
	(0.179)		(0.193)	
Bank exposure×Post×**With Trade Finance Claims**		-1.340***		-0.503**
		(0.273)		(0.211)
Bank exposure×Post×No Trade Finance Claims		-0.560**		-0.249
		(0.213)		(0.233)
Observations	83,970	83,970	83,970	83,970
R^2	0.729	0.729	0.729	0.729
pvlaue t-test Ha: with trade finance > no trade finance	-	0.000	-	-
Bank characteristics	Y	Y	Y	Y
Bank characteristics×Post	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y
Firm×Quarter FE	Y	Y	Y	Y

Table 3. Trade uncertainty, policy, and bank lending: Heterogeneity by bank constraints

This table shows OLS regression estimates for a specification linking loan origination and renewal amounts (log) to ex-ante bank exposure to trade uncertainty and trade policy (tariffs) by bank constraints depending on their level of capital, deposit ratio, and size. The data are at the bank-firm-quarter loan-level and refer to new loans granted between 2016:Q1 and 2019:Q4 to domestic borrowers (nonfinancial firms). Bank exposures to trade uncertainty and policy are defined as in baseline Table 1. The variable Post takes value one for the period 2018:Q1-2019:Q4 and zero for the period 2016:Q1-2017:Q4. The tests split banks into higher vs lower capital (above/below median); higher vs lower deposits (above/below median) and smaller vs larger bank (total assets above/below the 75th percentile). Bank characteristics include size (log-total assets), capital (common equity/total assets), deposits (core deposits/liabilities), and specialization, and enter in levels and interacted with Post. Standard errors are double clustered at the quarter and bank-firm level. Significance: *** 1%, **5%, and *10%.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	**Loan amount (log)**					
	Exposure to trade uncertainty			***Exposure to trade policy (tariffs)***		
Bank exposure×Post×**Lower capital**	-1.266***			-0.678***		
	(0.270)			(0.223)		
Bank exposure×Post×Higher capital	-0.798***			-0.420*		
	(0.223)			(0.207)		
Bank exposure×Post×**Lower deposits**		-1.078***			-0.501**	
		(0.234)			(0.206)	
Bank exposure×Post×Higher deposits		-0.572**			-0.278	
		(0.221)			(0.244)	
Bank exposuree×Post×**Smaller bank**			-0.877***			-0.458**
			(0.208)			(0.212)
Bank exposuree×Post×Larger bank			-0.811*			-0.211
			(0.417)			(0.339)
Observations	83,970	83,970	83,970	83,970	83,970	83,970
R^2	0.729	0.729	0.729	0.729	0.729	0.729
pvalue t-test Ha: constrained > unconstrained	0.014	0.001	0.401	0.001	0.001	-
Bank characteristics	Y	Y	Y	Y	Y	Y
Bank characteristics×Post	Y	Y	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y	Y	Y
Firm×Quarter FE	Y	Y	Y	Y	Y	Y

Table 4. Trade uncertainty, policy, and bank lending: Heterogeneity by borrower exposure to trade uncertainty and reliance on trade finance

This table shows OLS regression estimates for a specification linking loan origination and renewal amounts (log) to ex-ante bank exposure to trade uncertainty and trade policy (tariffs) by borrower type. The data are at the bank-firm-quarter loan-level and refer to new loans granted between 2016:Q1 and 2019:Q4 to domestic borrowers (nonfinancial firms). Bank exposures to trade uncertainty and policy are defined as in baseline Table 1. The variable Post takes value one for the period 2018:Q1-2019:Q4 and zero for the period 2016:Q1-2017:Q4. Borrower types capture (a) exposure to uncertainty based on a dummy variable for "directly affected borrowers" defined as the firms in the top 25th percentile of the trade uncertainty distribution over 2018:Q1-2019:Q4; and indirectly affected borrowers are all other firms; (b) reliance on trade finance loans, which refer to loan facilities classified as "trade finance". Bank characteristics include size (log-total assets), capital (common equity/total assets), deposits (core deposits/liabilities), and specialization, and enter in levels and interacted with Post. Standard errors are double clustered at the quarter and bank-firm level. Significance: *** 1%, **5%, and *10%.

	(1)	(2)	(3)	(4)
Dependent variable	**Loan amount (log)**			
	Exposure to trade uncertainty		***Exposure to trade policy (tariffs)***	
Bank exposure×Post×**Directly affected borrower**	-0.693**		-0.566**	
	(0.361)		(0.214)	
Bank exposure×Post×Other borrower	-0.976***		-0.387	
	(0.235)		(0.231)	
Bank exposure×Post×**Trade finance borrower**		-1.892***		-1.005***
		(0.264)		(0.219)
Bank exposure×Post×Other borrower		-0.556**		-0.258
		(0.194)		(0.195)
Observations	83,384	83,970	83,970	83,970
R^2	0.729	0.730	0.729	0.730
pvalue t-test Ho: directly affected = other borrower	0.155		-	
pvalue t-test Ha: trade finance > other borrower		0.001		-
Bank characteristics	Y	Y	Y	Y
Bank characteristics×Post	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y
Firm×Quarter FE	Y	Y	Y	Y

Table 5. Trade uncertainty, policy, and bank lending: Heterogeneity by borrower exposure to Global Value Chains

This table shows OLS regression estimates for a specification linking loan origination and renewal amounts (log) to ex-ante bank exposure to trade uncertainty and trade policy (tariffs) by borrower type. Borrower type refers to exposure to Global Value Chains, with high-exposure borrowers defined as those firms in 3-digit NAICS sectors with (1) share of imported inputs in total intermediate inputs; or (2) share of imported inputs in total industry output above the 75th percentile of the cross-sectional sectoral distribution over 2016–2017. The data are at the bank-firm-quarter loan-level and refer to new loans granted between 2016:Q1 and 2019:Q4 to domestic borrowers (nonfinancial firms). Bank exposures to trade uncertainty and policy are defined as in baseline Table 1. The variable Post takes value one for the period 2018:Q1-2019:Q4 and zero for the period 2016:Q1-2017:Q4. Bank characteristics include size (log-total assets), capital (common equity/total assets), deposits (core deposits/liabilities), and specialization, and enter in levels and interacted with Post. Standard errors are double clustered at the quarter and bank-firm level. Significance: *** 1%, **5%, and *10%.

	(1)	(2)	(3)	(4)
Dependent variable	**Loan amount (log)**			
	Exposure to trade uncertainty		***Exposure to trade policy (tariffs)***	
Bank exposure×Post×**High GVC exposure (1)**	-1.646***		-0.807***	
	(0.341)		(0.264)	
Bank exposure×Post×Low GVC exposure (1)	-0.590**		-0.184	
	(0.270)		(0.219)	
Bank exposure×Post×**High GVC exposure (2)**		-1.412***		-0.637**
		(0.350)		(0.235)
Bank exposure×Post×Low GVC exposure (2)		-0.689**		-0.257
		(0.253)		(0.200)
Observations	63,391	63,391	63,391	63,391
R^2	0.731	0.730	0.730	0.730
pvalue t-test Ho: high > low GVC exposure	0.002	0.016	-	-
Bank characteristics	Y	Y	Y	Y
Bank characteristics×Post	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y
Firm×Quarter FE	Y	Y	Y	Y

Table 6. Trade uncertainty, policy, and bank lending: Heterogeneity by borrower intensity and location

This table shows OLS regression estimates for a specification linking loan origination and renewal amounts (log) to ex-ante bank exposure to trade uncertainty and trade policy (tariffs) by borrower type. The data are at the bank-firm-quarter loan-level and refer to new loans granted between 2016:Q1 and 2019:Q4 to domestic borrowers (nonfinancial firms). Bank exposures to trade uncertainty and policy are defined as in baseline Table 1. The variable Post takes value one for the period 2018:Q1-2019:Q4 and zero for the period 2016:Q1-2017:Q4. Borrower intensity is based on the length of the banking relationship (long-relatioship borrowers have had a banking relationship of at least 2 years or above median). Borrower location refers to domestic vs foreign borrowers. Bank characteristics include size (log-total assets), capital (common equity/total assets), deposits (core deposits/liabilities), and specialization, and enter in levels and interacted with Post. Standard errors are double clustered at the quarter and bank-firm level. Significance: *** 1%, **5%, and *10%.

	(1)	(2)	(3)	(4)
Dependent variable	**Loan amount (log)**			
	Exposure to trade uncertainty		***Exposure to trade policy (tariffs)***	
Bank exposure×Post×**Short-relationship firm**	-0.614**		-0.365	
	(0.277)		(0.224)	
Bank exposure×Post×Long-relationship firm	-0.480		-0.279	
	(0.300)		(0.241)	
Bank exposure×Post×**Foreign firm**		-1.416***		-0.744**
		(0.345)		(0.315)
Bank exposure×Post×Domestic firm		-0.822***		-0.403*
		(0.220)		(0.211)
Observations	75,354	92,064	75,354	92,064
R^2	0.777	0.734	0.777	0.734
pvalue t-test Ha: noncore borrower > core borrower	-	0.057	-	0.119
Bank characteristics	Y	Y	Y	Y
Bank characteristics×Post	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y
Firm×Quarter FE	Y	Y	Y	Y

Table 7. Trade uncertainty, policy, and bank lending: Ruling out the exchange rate channel

This table shows OLS regression estimates for a specification linking loan origination and renewal amounts (log) to ex-ante bank exposure to trade uncertainty and trade policy (tariffs), controlling for additional measures of bank exposure to the potential effects of fluctuations in the exchange rate. These measures are bank exposure to firms in tradable goods sectors (columns 1–2), firms with high exposure to Global Value Chains, defined as above the 75th percentile of imported inputs in total intermediate inputs (columns 3–4), and respectively, defined as above the 75th percentile of imported inputs in total industry output (columns 5–6). The data are at the bank-firm-quarter loan-level and refer to new loans granted between 2016:Q1 and 2019:Q4 to domestic and foreign borrowers. Bank exposures to trade uncertainty and policy are defined as in baseline Table 1. The variable Post takes value one for the period 2018:Q1-2019:Q4 and zero for the period 2016:Q1-2017:Q4. Bank characteristics include size (log-total assets), capital (common equity/total assets), deposits (core deposits/liabilities), and specialization, and enter in levels and interacted with Post. Standard errors are double clustered at the quarter and bank-firm level. Significance: *** 1%, **5%, and *10%.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable			**Loan amount (log)**			
Bank exposure to:						
Trade uncertainty×Post	-1.081***	-0.811**	-0.851***	-0.538**	-0.989***	-0.683**
	(0.238)	(0.287)	(0.207)	(0.258)	(0.209)	(0.258)
Firms in Tradable-goods sectors×Post	0.363	0.390				
	(0.230)	(0.268)				
Firms in Global Value Chains (1)×Post			-0.108	-0.045		
			(0.244)	(0.349)		
Firms in Global Value Chains (2)×Post					0.628*	0.553**
					(0.305)	(0.429)
Observations	83,970	75,583	83,970	75,583	83,970	75,583
R^2	0.729	0.777	0.729	0.777	0.729	0.777
Bank characteristics	Y	Y	Y	Y	Y	Y
Bank characteristics×Post	Y	Y	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y	Y	Y
Firm×Quarter FE	Y	Y	Y	Y	Y	Y
Firm×Bank FE		Y		Y		Y

Table 8. Trade uncertainty, policy, and bank lending: Ruling out the commodity price channel

This table shows OLS regression estimates for a specification linking loan origination and renewal amounts (log) to ex-ante bank exposure to trade uncertainty and trade policy (tariffs) as in the baseline, with the difference that oil firms are dropped in order to avoid potential effects of fluctuations in commodity prices. In panel A we drop all firms in the 2-digit NAICS sector "Mining, quarrying, and oil and gas extraction" (code 21). In panel B we drop all firms in the sectors: "Oil and gas extraction" (code 211), "Drilling Oil and Gas Wells" (code 213111), "Support Activities for Oil and Gas Operations" (code 213112), "Natural Gas Distribution" (code 2212), "Pipeline Transportation" (code 486), "Oil and Gas Pipeline and Related Structures Construction" (code 23712), and "Mining and Oil and Gas Field Machinery Manufacturing" (code 33313). The data are at the bank-firm-quarter loan-level and refer to new loans granted between 2016:Q1 and 2019:Q4 to domestic borrowers (nonfinancial firms) in nonoil industries. Bank exposures to trade uncertainty and policy are defined as in baseline Table 1. The variable Post takes value one for the period 2018:Q1-2019:Q4 and zero for the period 2016:Q1-2017:Q4. Bank characteristics include size (log-total assets), capital (common equity/total assets), deposits (core deposits/liabilities) and specialization, and enter in levels and interacted with Post. Standard errors are double clustered at the quarter and bank-firm level. Significance: *** 1%, **5%, and *10%.

	(1)	(2)	(3)	(4)	(5)
Dependent variable	**Loan amount (log)**				
	A. Drop oil firms 2-digit NAICS classification				
	Exposure to trade uncertainty		***Exposure to trade policy (tariffs)***		***Horse race***
Bank exposure×Post	-1.018***	-0.670*			-0.971***
	(0.225)	(0.316)			(0.298)
Bank exposure×Post			-0.596**	-0.412	-0.052
			(0.227)	(0.253)	(0.310)
Observations	79,837	72,697	79,837	72,697	79,837
R^2	0.730	0.777	0.730	0.776	0.730
	B. Drop oil firms Granular NAICS classification				
	Exposure to trade uncertainty		***Exposure to trade policy (tariffs)***		***Horse race***
Bank exposure×Post	-1.053***	-0.633**			-0.990***
	(0.211)	(0.296)			(0.290)
Bank exposure×Post			-0.620**	-0.387	-0.071
			(0.224)	(0.243)	(0.312)
Observations	78,921	72,042	78,921	72,042	78,921
R^2	0.730	0.778	0.730	0.778	0.730
Bank characteristics	Y	Y	Y	Y	Y
Bank characteristics×Post	Y	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y	Y
Firm×Quarter FE	Y	Y	Y	Y	Y
Firm×Bank FE		Y		Y	

Table 9. Trade uncertainty, policy, and bank lending: Alternative measures of bank exposure

This table shows OLS regression estimates for a specification linking loan origination and renewal amounts (log) to ex-ante bank exposure to trade uncertainty. Here we use alternative measures of bank exposure to trade uncertainty. The first measure is sector-based and is computed similar to the baseline measure but using the trade uncertainty index of Caldara et al. (2020) instead of that from Hassan et al. (2019) to capture trade policy risks and uncertainty. The first measure is geography based and is computed at the bank level as the average of trade uncertainty across countries, weighted by the share of individual banks' total claims exposures to those countries. Country level uncertainty takes value one for the countries with average trade uncertainty index level (Ahir et al., 2019) above the 75th percentile during 2018:Q1-2019:Q4 and zero otherwise. Individual banks' loan and claims shares vis-à-vis specific sectors and countries are measured at end-2017. In columns 3 and 6 showing a horse-race of exposures measures, we additionally include the bank-level exposure to tariffs-hit sectors from baseline specification in column 5 of Table 1. The data are at the bank-firm-quarter loan-level and refer to new loans granted between 2016:Q1 and 2019:Q4 to domestic borrowers (nonfinancial firms). The variable Post takes value one for the period 2018:Q1-2019:Q4 and zero for the period 2016:Q1-2017:Q4. Bank characteristics include size (log-total assets), capital (common equity/total assets), deposits (core deposits/liabilities), and specialization, and enter in levels and interacted with Post. Standard errors are double clustered at the quarter and bank-firm level. Significance: *** 1%, **5%, and *10%.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	**Loan amount (log)**					
	Exposure to trade policy uncertainty, using index from Caldara et al. (2020)			***Geography-based exposure to uncertainty, using index from Ahir et al. (2019)***		
Bank exposure to uncertainty×Post	-0.466***	-0.293*	-0.329**	-0.356***	-0.331**	-0.342***
	(0.128)	(0.160)	(0.134)	(0.110)	(0.136)	(0.108)
Bank exposure to tariffs×Post			-0.290			-0.428**
			(0.227)			(0.201)
Observations	83,970	75,583	83,970	83,970	75,583	83,970
R^2	0.729	0.777	0.729	0.729	0.777	0.729
Bank characteristics	Y	Y	Y	Y	Y	Y
Bank characteristics×Post	Y	Y	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y	Y	Y
Firm×Quarter FE	Y	Y	Y	Y	Y	Y
Firm×Bank FE		Y			Y	

Table 10. Trade uncertainty and bank lending: Real effects at loan level

This table shows OLS regression estimates for a specification linking loan origination and renewal amounts (log) to ex-ante bank exposure to trade uncertainty by loan type: term loans versus credit lines; and investment-purpose loans versus other loans. Investment-purpose loans are those loans whose credit facility purpose is "capital expenditures excluding real estate." The data are at the bank-firm-quarter loan-level and refer to new loans granted between 2016:Q1 and 2019:Q4 to domestic borrowers (nonfinancial firms). The variable Post takes value one for the period 2018:Q1-2019:Q4 and zero for the period 2016:Q1-2017:Q4. Bank characteristics include size (log-total assets), capital (common equity/total assets), deposits (core deposits/liabilities), and specialization, and enter in levels and interacted with Post. Standard errors are double clustered at the quarter and bank-firm level. Significance: *** 1%, **5%, and *10%.

	(1)	(2)	(3)	(4)
Dependent variable	**Loan amount (log)**			
	Exposure to trade uncertainty		***Exposure to trade policy (tariffs)***	
Bank exposure to uncertainty×Post×**Term Loan**	-0.984***		-0.620***	
	(0.249)		(0.183)	
Bank exposure to uncertainty×Post×Credit Line	-0.089		-0.118	
	(0.174)		(0.156)	
Bank exposure to uncertainty×Post×**Investment Loan**		-3.767***		-2.176***
		(0.453)		(0.285)
Bank exposure to uncertainty×Post×Other		-0.808***		-0.375*
		(0.209)		(0.208)
Observations	72,264	83,843	72,264	83,843
R^2	0.759	0.730	0.759	0.730
pvalue t-test Ha: term or investment loan > other	-	0.000	-	0.000
Bank characteristics	Y	Y	Y	Y
Bank characteristics×Post	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y
Firm×Quarter FE	Y	Y	Y	Y

Table 11. Trade uncertainty and bank lending: Real effects at firm level

This table shows OLS regression estimates for a specification linking firm level total debt growth, capital expenditure growth, and asset growth, to firms' ex-ante exposure to banks facing trade uncertainty. "Firm exposure to trade uncertainty through its lenders" is computed as the average exposure to trade uncertainty of the banks from which a given firm borrows, weighted by relative importance of each bank in the firms' total borrowing, at end-2017. The data are at the firm-year level over the period between 2016 and 2019. The variable Post takes value one for the period 2019–2019 and zero for the period 2016–2017. Firm characteristics include size (log-assets), liquidity (cash and marketable securities/assets), tangibility (tangible assets as a share of total assets), interest coverage ratio (EBITDA/total interest expense), ROA (return on assets), real sales growth—all lagged one year—and a dummy variable taking value one for firms rated below investment-grade by their lender banks, and enter in levels and interacted with Post. Firm industry is 2-digit NAICS classification. Standard errors are clustered at the firm level. Significance: *** 1%, **5%, and *10%.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	**Debt growth**		**Capex growth**		**Asset growth**	
Firm exposure to trade uncertainty through its lenders×Post	-0.206*	-0.206*	-0.306***	-0.306***	-0.402***	-0.402***
	(0.115)	(0.119)	(0.091)	(0.095)	(0.075)	(0.078)
Mean of dep. var. 2018–2019	0.119	0.119	0.088	0.088	0.082	0.082
Observations	64,514	64,514	70,399	70,399	72,237	72,237
R^2	0.323	0.323	0.342	0.342	0.417	0.417
Firm characteristics	Y	Y	Y	Y	Y	Y
Firm characteristics×Post	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
County FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
County×Industry FE		Y		Y		Y

Appendix: Additional Figures and Tables

Figure A1. Trade Policy Uncertainty Indexes

The figure depicts two indexes of Trade Policy Uncertainty for the United States that are constructed using text-based analysis using linguistic libraries that broadly capture trade political risk and policy uncertainty. The first index comes from Hassan et al. (2019) and is based on information from listed firms' quarterly earnings calls. We aggregate the firm-level measure by calculating the simple average across firms in each quarter. The second index comes from Caldara et al. (2020) and is based on news articles across major newspapers. We standardize both indexes to make them comparable. Sources: Hassan et al. (2019, 2020a,b), Caldara et al. (2020) and Haver Analytics.

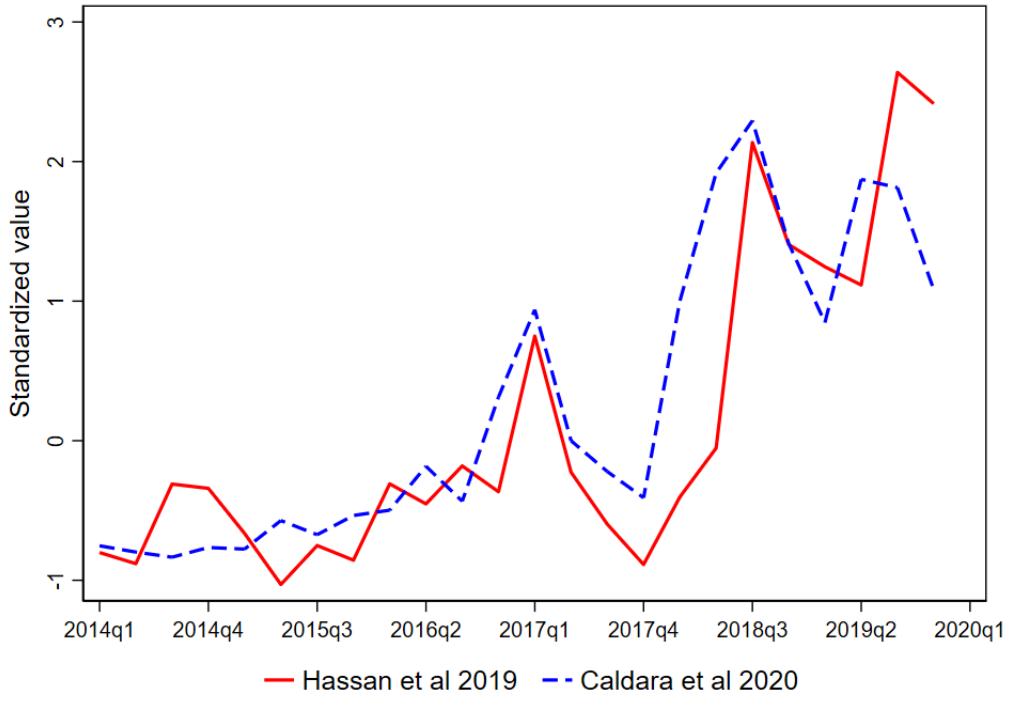


Figure A2. Sectoral distribution of full sample versus multibank sample (%)

The figure depicts a coarse sectoral distribution (at the 2-digit NAICS level) of firms in the regression sample versus the full Y-14Q loan-level sample. This allows us to compare the industry composition of multibank firms on which we can estimate regressions with firm×quarter FE, as required by the identification strategy, with that of single bank firms for which FE estimations is not feasible and hence drop out from the sample. The figure shows that multibank firms are more likely in the manufacturing, retail, and constructions sectors, and less likely in the wholesale trade and professional, scientific and technical sectors. Sources: FR Y-14Q.

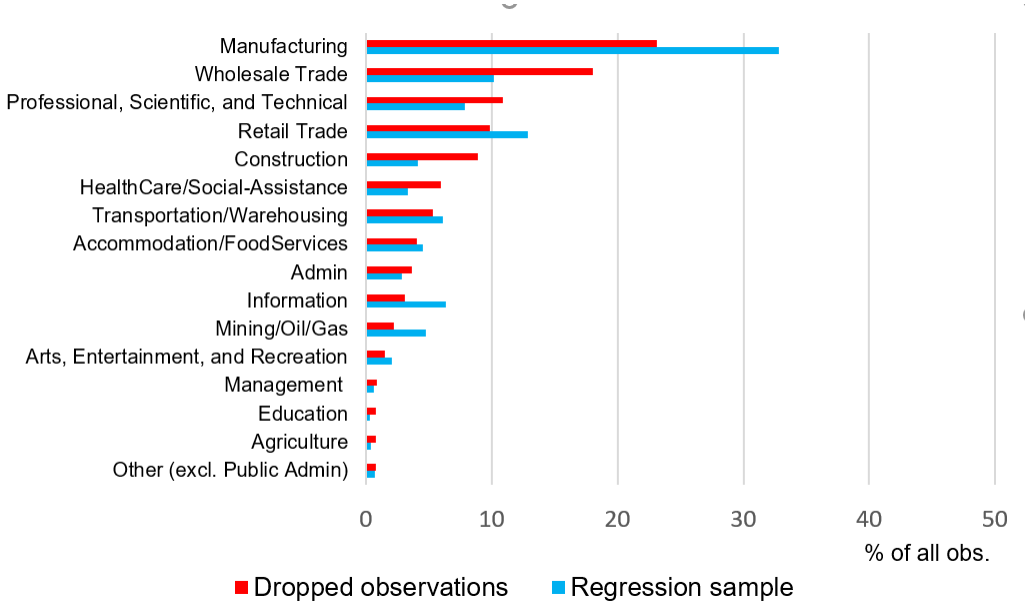


Figure A3. Sectoral distribution of high-uncertainty versus low-uncertainty firms (%)

The figure depicts the 2-digit NAICS sectoral distribution of firms in high trade uncertainty (above 75th percentile) versus low trade uncertainty sectors in the Y-14Q loan-level regression sample. Firms are classified as high trade uncertainty if they are in sectors with average firm-level uncertainty above the 75th percentile during 2018:Q1-2019:Q4; and zero otherwise. Firm-level trade uncertainty is based on text analysis of transcripts from quarterly earnings calls of listed companies from Hassan et al. (2019, 2020a,b). Sources: FR Y-14Q, Hassan et al. (2019, 2020a,b), and https://sites.google.com/view/firmrisk for firm-level uncertainty.

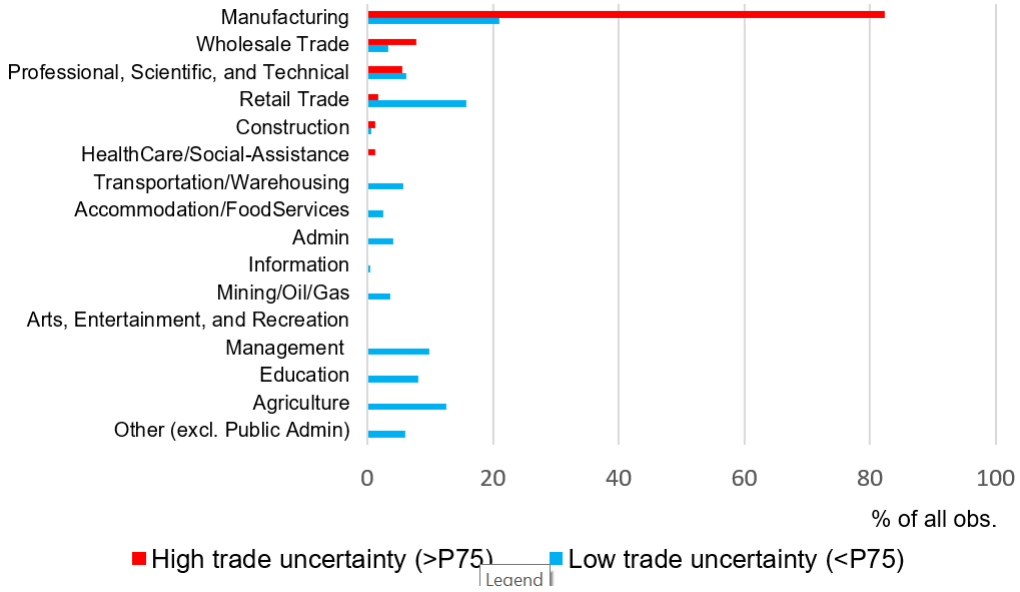


Figure A4. Average trade uncertainty by 3-digit NAICS sector

The figure depicts average trade uncertainty during 2018:Q1-2019:Q4 by 3-digit NAICS sector. Uncertainty at the sector level is computed as average firm-level uncertainty, which in turn is based on text analysis of transcripts from quarterly earnings calls of listed companies from Hassan et al. (2019, 2020a,b). In the textbox, the sectors in the top 25th percentile of the uncertainty distribution are listed in descending order of trade policy uncertainty level. Sources: FR Y-14Q, Hassan et al. (2019, 2020a,b), and https://sites.google.com/view/firmrisk for firm-level uncertainty.

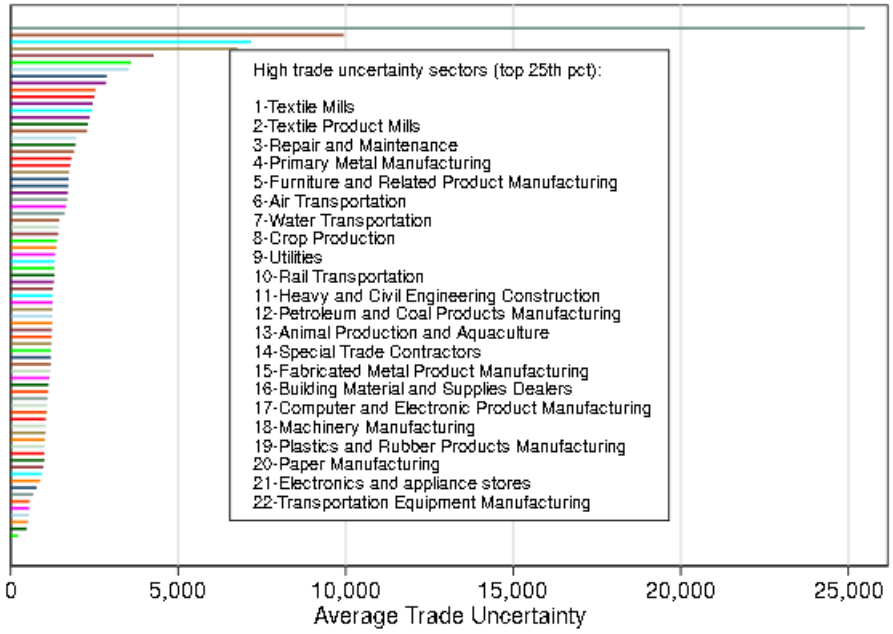


Figure A5. Share of imported goods in industry output by 3-digit NAICS manufacturing sector

The figure depicts the share of imported inputs in total industry output by 3-digit NAICS sector for manufacturing sectors, for manufacturing sectors and the year 2017, which we use as a measure of exposure to global value chains. This variable is obtained by multiplying the shares of total imported intermediates to total intermediates with the share of total intermediates to total industry output, for each sector. Sources: U.S. Bureau of Economic Analysis (BEA), IO tables.

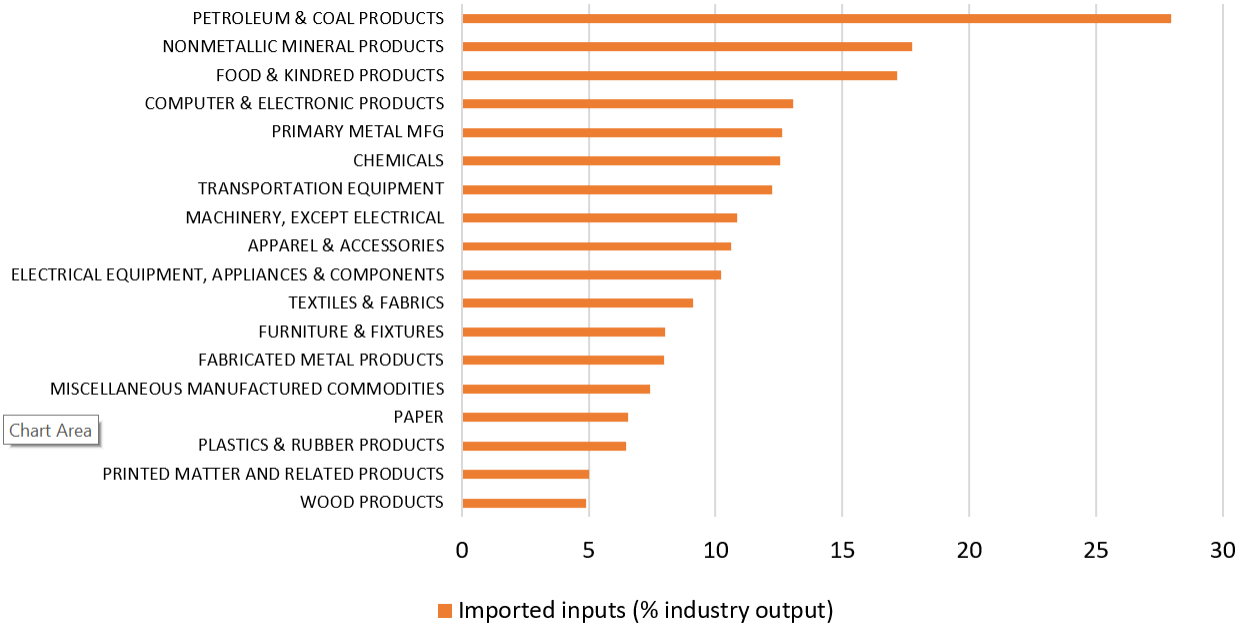


Figure A6. Sector- and geography-based measures of bank exposure to trade uncertainty

The figure shows a binned scatterplot between bank exposure to trade uncertainty that is sector-based (measured as the weighted average of trade uncertainty across sectors, with weights given by individual banks' loan exposures to those sectors) and bank exposure to trade uncertainty that is geography based (measured as the weighted average of trade uncertainty across countries (excluding the United States), with weights given by the share of individual banks' total claims exposures to those countries). Sector-level trade uncertainty takes value one for the sectors with average firm-level uncertainty (Hassan et al., 2019, 2020a,b) above the 75th percentile during 2018:Q1-2019:Q4 and zero otherwise. Country level uncertainty takes value one for the countries with average trade uncertainty index level (Ahir et al., 2019) above the 75th percentile during 2018:Q1-2019:Q4 and zero otherwise. Individual banks' loan and claims shares vis-à-vis specific sectors and countries are measured as of end-2017. Sources: FR Y-14Q, FFIEC 009, Ahir et al. (2019), Hassan et al. (2019, 2020a,b), and https://sites.google.com/view/firmrisk for firm-level uncertainty.

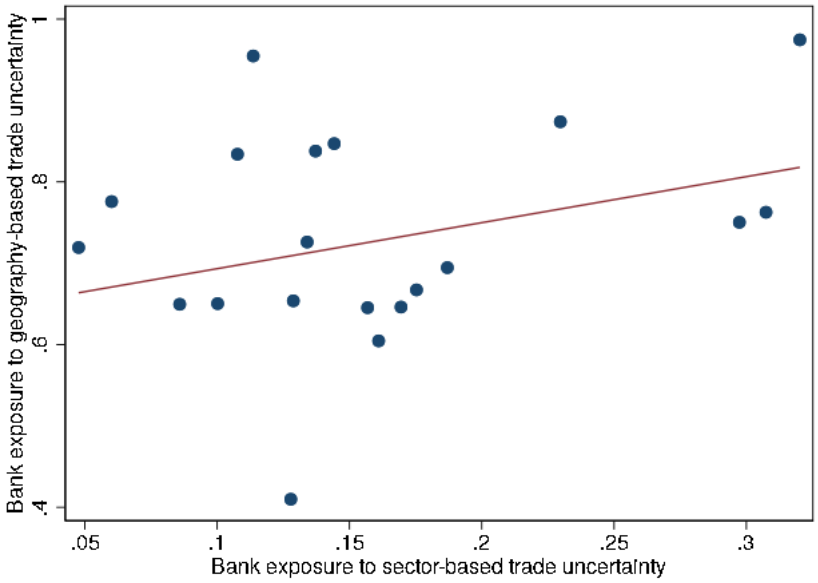


Figure A7. Bank exposure to trade policy uncertainty based on alternative indexes

The figure shows a binned scatterplot between bank exposure to trade policy and uncertainty based on the Hassan et al. (2019) and Caldara et al. (2020) indexes. The exposure measures are sector-based and are computed as the weighted average of trade uncertainty across sectors, with weights given by individual banks' loan exposures to those sectors (at end-2017). Sector-level trade uncertainty takes value one for the sectors with average firm-level uncertainty (from either index) above the 75th percentile during 2018:Q1-2019:Q4 and zero otherwise. The two indexes share similar linguistic training libraries aimed at broadly capturing trade political risk and policy uncertainty. Hassan et al. (2019) conduct text analysis on the transcripts of quarterly earnings calls from U.S. listed companies, while Caldara et al. (2020) examine news items from global newspapers. Sources: FR Y-14Q, Hassan et al. (2019, 2020a,b), and Caldara et al. (2020).

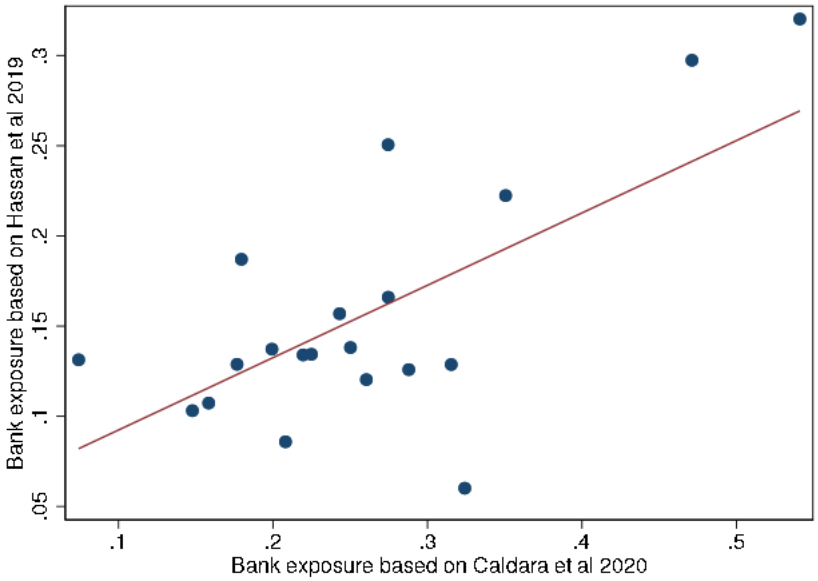


Table A1. Selected descriptive statistics

This table reports selected summary statistics for the loan-level regression sample (N=83970 observations) and variables. In Panel A we report summary statistics for four measures of bank exposure to trade uncertainty: bank exposure to trade uncertainty that is sector-based (with uncertainty index from Hassan et al. (2019)) and bank exposure to trade policy (tariffs)—both used in the baseline analysis; bank exposure to trade uncertainty that is geography-based and bank exposure to trade uncertainty that is sector based but differs from the baseline measure as it uses a different uncertainty index (from Caldara et al. (2020))—both used in the robustness checks. All measures are described in Section 2.2. The regression sample at the loan level refers to U.S. BHCs with at least $50 billion in assets that participate in CCAR stress tests and report to the FR Y-14Q before 2019; and domestic nonfinancial firms (except when specifically referring to foreign firms). Sources: FR Y-14Q, FFIEC 009, U.S. Bureau of Economic Analysis (BEA), Ahir et al. (2019), Caldara et al. (2019), Flaaen and Pierce (2019), Hassan et al. (2019, 2020a,b), and https://sites.google.com/view/firmrisk for firm-level uncertainty.

	N	Mean	St. Dev.	P25	P50	P75
A. Bank characteristics						
Bank exposure to trade uncertainty (sectoral, Hassan et al. (2019))	83970	0.159	0.072	0.127	0.129	0.175
Bank exposure to trade policy (tariffs, Flaaen and Pierce (2019))	83970	0.303	0.095	0.253	0.277	0.328
Bank exposure to trade uncertainty (geographical, Ahir et al. (2019))	83970	0.255	0.083	0.192	0.258	0.315
Bank exposure to trade uncertainty (Caldara et al., 2020)	83970	0.677	0.149	0.605	0.667	0.763
Bank size (log-assets)	83970	20.068	1.226	18.808	19.762	21.381
Bank capital (common equity/assets)	83970	11.287	1.614	10.325	10.953	12.368
Bank deposits (core deposits/liabilities)	83970	61.818	14.814	55.656	67.158	73.717
Bank's sectoral specialization	83970	0.426	0.494	0.000	0.000	1.000
1: High foreign claims	83970	0.826	0.379	1.000	1.000	1.000
1: With trade finance claims	83970	0.784	0.412	1.000	1.000	1.000
B. Firm characteristics						
1: Firm in high trade uncertainty sector	83384	0.127	0.333	0.000	0.000	0.000
1: Firm in tariffs-hit sector	83970	0.319	0.466	0.000	0.000	1.000
Firm size (log-assets)	79313	20.086	2.698	17.966	20.067	22.080
Firm interest coverage ratio (ICR)	77765	29.016	63.267	4.473	9.138	20.870
Firm return on assets (ROA)	79313	14.295	18.451	5.720	11.444	17.877
Firm leverage (total debt/assets)	78847	36.243	26.771	16.151	32.398	51.327
Firm liquidity (cash and marketable securities/assets)	79259	8.877	11.897	1.495	4.584	11.371
1: Firm is rated non-investment grade	83970	0.686	0.464	0.000	1.000	1.000
1: Firm has high GVC exposure (1)	63391	0.281	0.494	0.000	0.000	1.000
1: Firm has high GVC exposure (2)	63391	0.289	0.453	0.000	0.000	1.000
1: Firm is in long-relationship with bank	83722	0.521	0.500	0.000	1.000	1.000
1: Firm is foreign (all firm sample)	97149	0.129	0.336	0.000	0.000	0.000
1: Firm is in tradable goods sector	83970	0.409	0.101	0.353	0.362	0.428
1: Firm is in oil sector (2-digit NAICS)	83970	0.048	0.214	0.000	0.000	0.000
1: Firm is in oil sector (granular classification)	83970	0.060	0.238	0.000	0.000	0.000
C. Loan characteristics						
Loan amount (US$ million)	83970	39.500	138.000	3.063	12.000	37.800
Loan spread (ppts)	74681	1.110	1.301	0.000	0.900	2.000
Loan maturity (years)	83970	3.499	2.051	1.250	4.000	5.000
1: Secured loan	83750	0.732	0.443	0.000	1.000	1.000
Utilization rate (credit lines)	53379	0.304	0.371	0.000	0.060	0.608
1: Trade finance loan	83970	0.247	0.431	0.000	0.000	0.000
1: Term loan	74564	0.410	0.492	0.000	0.000	1.000
1: Investment loan	83868	0.056	0.229	0.000	0.000	0.000

Table A2. Trade uncertainty, policy, and bank lending: Additional lending terms

This table shows OLS regression estimates for a specification linking additional lending terms to ex-ante bank exposure to trade uncertainty and trade policy (tariffs). Dependent variables are loan interest rate spread, maturity, and collateral (a dummy variable taking value one for secured loans; and zero otherwise). The data are at the bank-firm-quarter loan-level during 2016:Q1-2019:Q4. Bank exposures to trade uncertainty and policy are defined as in baseline Table 1. The variable Post takes value one for the period 2018:Q1-2019:Q4 and zero for the period 2016:Q1-2017:Q4. Bank characteristics include size (log-total assets), capital (common equity/total assets), deposits (core deposits/liabilities), and specialization, and enter in levels and interacted with Post. Standard errors are double clustered at the quarter and bank-firm level. Significance: *** 1%, **5%, and *10%.

Dependent variable	(1) **Spread**	(2) **Maturity**	(3) **Collateral**	(4) **Spread**	(5) **Maturity**	(6) **Collateral**
	Exposure to trade uncertainty			***Exposure to trade policy (tariffs)***		
Bank exposure×Post	0.633**	-0.317	0.025			
	(0.283)	(0.250)	(0.070)			
Bank exposure×Post				0.408*	-0.191	0.202**
				(0.214)	(0.238)	(0.070)
Observations	71,756	83,975	83,741	71,756	83,975	83,741
R^2	0.676	0.723	0.840	0.676	0.723	0.840
Bank characteristics	Y	Y	Y	Y	Y	Y
Bank characteristics×Post	Y	Y	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y	Y	Y
Firm×Quarter FE	Y	Y	Y	Y	Y	Y

Table A3. Balancing table: Correlation of bank exposure measures with basic balance sheet characteristics

This table shows OLS regression estimates for a specification linking our two main measures of ex-ante bank exposure to trade uncertainty and trade policy (tariffs) to basic balance sheet characteristics, using data for end-2017 and 27 BHCs. Bank exposures to trade uncertainty and policy are defined as in baseline Table 1. The bank characteristics include size (log-total assets), capital (common equity/total assets) and deposits (core deposits/liabilities). Standard errors are clustered robust. Significance: *** 1%, **5%, and *10%.

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Exposure to trade uncertainty				**Exposure to trade policy (tariffs)**			
Size (log-assets)	-0.007			0.004	0.017			0.004
	(0.009)			(0.013)	(0.017)			(0.022)
Capital (equity/assets)		0.008		0.007		-0.020		-0.020
		(0.008)		(0.008)		(0.012)		(0.015)
Core deposit ratio			0.001	0.001			-0.000	0.000
			(0.001)	(0.001)			(0.001)	(0.002)
Observations	27	27	27	27	27	27	27	27
R^2	0.011	0.047	0.046	0.077	0.033	0.147	0.003	0.150

Table A4. Trade uncertainty, policy, and bank lending: Placebo tests

This table shows Placebo tests as OLS regression estimates for a specification linking loan origination and renewal amounts (log) to ex-ante bank exposure to trade uncertainty and trade policy (tariffs) that is lagged by 12 or 36 months compared to the baseline analysis. The data are at the bank-firm-quarter loan-level and refer to new loans granted between 2014:Q1 and 2017:Q4 (panel A) and between 2013:Q1 and 2016:Q4 (panel B) to domestic borrowers (nonfinancial firms). In panel A, the variable Post takes value one for the period 2016:Q1-2017:Q4 and zero for the period 2014:Q1-2015:Q4. In panel B, the variable Post takes value one for the period 2015:Q1-2016:Q4 and zero for the period 2013:Q1-2014:Q4. All variable definitions and controls are as in baseline Table 1. Standard errors are double clustered at the quarter and bank-firm level. Significance: *** 1%, **5%, and *10%.

	(1)	(2)	(3)	(4)
Dependent variable	**Loan amount (log)**			
	A. Placebo: Analysis is lagged 12 months			
	Exposure to trade uncertainty		***Exposure to trade policy (tariffs)***	
Bank exposure×Post	0.156	0.060		
	(0.298)	(0.263)		
Bank exposure×Post			0.068	0.100
			(0.257)	(0.179)
Observations	83,810	75,454	83,810	75,454
R^2	0.732	0.779	0.732	0.779
	B. Placebo: Analysis is lagged 36 months			
	Exposure to trade uncertainty		***Exposure to trade policy (tariffs)***	
Bank exposure×Post	0.398	0.557		
	(0.475)	(0.551)		
Bank exposure×Post			0.180	0.345
			(0.283)	(0.305)
Observations	66,468	58,311	66,468	58,311
R^2	0.721	0.762	0.721	0.762
Bank characteristics	Y	Y	Y	Y
Bank characteristics×Post	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y
Firm×Quarter FE	Y	Y	Y	Y
Firm×Bank FE		Y		Y

Table A5. Additional Results: Lending terms and credit line utilizations by firms in high uncertainty and tariffs-hit sectors

This table shows OLS regression estimates for a specification linking several lending outcomes to firm characteristics, differentiating between firms in high-uncertainty sectors and tariffs-hit sectors compared to other firms. Dependent variables are loan amount (log), interest rate spread, maturity, and utilization rate for credit line (defined as the ratio of utilized amount to total commitment). As in the baseline analysis, high-uncertainty sector is a dummy variable that takes value one for firms in 3-digit NAICS sectors with average uncertainty over the period 2018:Q1-2019:Q4 above the 75$^{\text{th}}$ percentile; and zero otherwise. Tariffs-hit sectors is a dummy variable that takes value one for firms in 4-digit NAICS sectors that had tariffs enacted during 2018:Q1-2019:Q4. The data are at the bank-firm-quarter loan-level during 2016:Q1-2019:Q4. Firm characteristics include size (log-assets), leverage (total debt/assets), ROA (return on assets), and liquidity (cash and marketable securities/assets) for the previous year-end, and a dummy variable taking value one for firms rated below-investment grade by their lender banks. Standard errors are double clustered at the quarter and bank-firm level. Significance: *** 1%, **5%, and *10%.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable:	**Amount (log)**		**Spread**		**Maturity**		**Utilization rate**	
	A. Firms high trade policy uncertainty sectors							
High-uncertainty firm	0.121**		-0.090***		0.016		-0.053***	
	(0.042)		(0.023)		(0.078)		(0.008)	
High-uncertainty firm×Post		0.046		-0.058		-0.078		-0.035**
		(0.034)		(0.048)		(0.065)		(0.015)
Observations	83,384	83,384	74,146	73,044	83,384	83,384	53,024	49,011
R^2	0.153	0.661	0.112	0.570	0.092	0.606	0.099	0.582
	B. Firms in tariffs-hit sectors							
Tariffs-hit firm	0.331***		-0.157***		0.141***		-0.063***	
	(0.031)		(0.018)		(0.034)		(0.007)	
Tariffs-hit firm×Post		0.010		-0.026		-0.035		-0.009
		(0.029)		(0.031)		(0.039)		(0.009)
Observations	83,970	83,970	74,681	73,561	83,970	83,970	53,379	49,316
R^2	0.161	0.661	0.114	0.570	0.093	0.606	0.102	0.582
Firm characteristics	Y	Y	Y	Y	Y	Y	Y	Y
Firm characteristics×Post	Y	Y	Y	Y	Y	Y	Y	Y
Bank×Quarter FE	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE		Y		Y		Y		Y