The Ripple Effect: Supply Chain Reconfigurations and Cross-border Credit Dynamics*

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Abstract

We study how exporting firms finance increases in demand for their products due to global supply chain reallocations. We exploit the exogenous change in global supply chains triggered by the 2018-2019 trade tensions between China and the US to test for changes in the credit demand by exporters in a bystander country, Colombia. Combining unique transaction-level data on Colombian firms' international trade and bank and firm-to-firm lending registries – domestic and cross-border – we find that firms exporting products subjected to US tariffs increased their exports to the US ex post. While these firms gained improved access to domestic credit, we document a notable shift towards cross-border firm-to-firm credit (e.g., pre-financing of exports by foreign firms) in their financing composition. These findings underscore the material role of firm-to-firm cross-border financing in facilitating global trade.

Keywords: Trade disruptions, cross-border credit, trade finance, global value chains

JEL Codes: G21, F34, F42

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1 Introduction

Widespread supply chain disruptions have garnered growing attention in recent years, amid escalating geopolitical risks that have affected economic activity at national and global scales (see, e.g., Cavallo et al., 2019; Fajgelbaum and Khandelwal, 2021). Geopolitical stresses, including trade tensions between the US and China and the COVID-19 pandemic, have led to major shifts in the geographical configuration of supply chains, spurred by restrictions on trade, investment, and technology transfer that have affected business operations worldwide. In light of these developments, companies have sought to diversify their supply chains to mitigate the impact of geopolitical and trade policy risks, seeking to reduce their dependence on a single manufacturing base and setting the stage for a looming 'Great Reallocation' (Fajgelbaum et al., 2021; Alfaro and Chor, 2023).

In this paper, we shift the attention to the role of cross-border credit in supporting the reconfiguration of global supply chains. To that end, we explore whether exporters in a bystander country – Colombia – with products subjected to US tariffs during the 2018-2019 US-China trade tensions experienced a surge in exports to the US, and subsequently changed their credit demand from domestic and foreign sources. While global production linkages have been historically supported by global banks as facilitators of trade (see, e.g., Claessens and Van Horen, 2021), the potential role of cross-border firm-to-firm, or trade, credit (i.e., funds lent by non-financial firms located in a foreign country) in financing the reallocation of production networks has been completely understudied. We fill this gap by using novel data for Colombia capturing cross-border firm-to-firm credit transactions between Colombian exporters and foreign firms for the purposes of pre-financing exports and financing working capital needs.

Our analysis reveals an increase in exports to the US by Colombian firms with a track record of exporting products, particularly intermediate goods, which eventually became subjected to US tariffs on China. Most importantly, we document a notable shift in the

composition of financing for exporting firms, characterized by a marked increase in firm-to-firm credit, which reaches about $13 billion by end-2019, close to the $16 billion in credit provided by local banks, and much larger than the roughly $3 billion lent by foreign banks. These changing patterns in exporters' financing are also reflected in lower interest rates and longer average maturities in the credit granted to firms exposed to trade tensions abroad.

At first glance, replacing global production networks requires ample access to finance to support the costs of investments in new facilities, technology upgrades, or transportation infrastructure. These massive financing needs may represent a unique opportunity for global banks, particularly those with an extensive network of affiliated institutions across countries. However, global or local banks may not adequately support these investments if financiers perceive increased risks – from currency fluctuations to further unexpected trade disruptions that produce an increase in uncertainty (Correa et al., 2023). Moreover, restrictions on trade could be coupled with limits for banks' cross-border credit, further constraining the financing of supply chain reallocation.

We empirically explore these conflicting views in a panel at the product-firm-destination level tracing trade flows – both imports and exports – by Colombian firms in the period around the 2018-2019 US-China trade tensions. We merge these data with the Colombian credit registry, reporting individual loans to the universe of companies in the country, allowing for the tracking of credit flows from both domestic and foreign lenders. A crucial feature of these data is the inclusion of credit provided by foreign firms to Colombian businesses to finance import and export transactions. This firm-to-firm credit repository is used by the Colombian central bank to calculate Colombia's private external debt. Thus, we exploit this rich data environment spanning from 2016Q1 to 2019Q4 to explore how firms' exposure to products being subjected to US tariffs against China (and to retaliatory tariffs imposed by China) affect both trade and credit flows to firms in a bystander country not directly involved in the trade tensions.

We employ a difference-in-difference estimation framework leveraging the staggered implementation of US tariffs on specific product categories, as documented by the US International Trade Commission (e.g., Fajgelbaum et al. (2020)). Using a firm-product-destination-quarter panel, we estimate the impact of these tariffs on Colombian firms' exports to the US. Our regression model includes an interaction term between a post-tariff period indicator and a US destination dummy, revealing a significant increase in export volumes for affected product categories starting in January 2018. This analysis highlights the trade effects of newly imposed US tariffs on Colombian exports.

The identification is supported by including firm-product-quarter fixed effects to control for unobserved time-variant firm characteristics, effectively comparing trade flows to the US vs. other jurisdictions after 2018Q1 within a firm-product pair. We control for changes in the demand for Colombian goods by a vector of destination country and time fixed effects, whereas firm-country-product fixed effects capture time-invariant characteristics of trade relationships – such as distance and logistic trade frictions – that could affect the results. Exploiting this setting, we compare the trade flows of affected product categories vs. those that are not impacted by trade tensions, controlling for product-firm characteristics and for the demand patterns affecting Colombian goods across products.

This analysis confirms previous indications of a global reallocation of supply chains driven by the US-China trade tensions (see, e.g., Fajgelbaum et al., 2021) through the lens of transaction-level trade data from a bystander country for which trade tensions arise exogenously. Thus, we provide novel evidence on how materialized geoeconomic shifts – in the form of changes in trade policy – affect trade patterns across jurisdictions, even when controlling for firm-product level demand factors. Our findings can be summarized in three sets of results. First, Colombian exports to the US increase by 6.2 percentage points more after a product category is subjected to US tariffs compared to exports to other jurisdictions. Importantly, this result is driven by intermediate goods, signaling a reallocation

of production supply chains out of other jurisdictions. Second, we show that in product categories affected by retaliatory tariffs from China against the US, Colombian exports to China increase significantly more than exports in the same products to other jurisdictions. That is, bystander countries may fill the gap of a restriction of export flows from the US to China. Finally, considering firms' exports in the aggregate, we find that firms ex-ante exposed to trade tensions – as measured by a pre-determined metric capturing firms' exposure to affected goods – increase their export volumes the most.

Having established the effect of trade tensions on firms' exports, we next examine the implications of trade reallocation for firms' financing. To this end, we resort to credit registry data and ask whether firms' exposure to trade tensions affects credit volumes and interest rates distinguishing between three financing sources: domestic bank credit, cross-border bank credit, and cross-border firm-to-firm trade credit. A key empirical challenge in assessing the effect of firms' exposure to trade tensions on credit is the fact that credit supply – regardless of the source – can determine firms' capacity to engage in trade (Amiti and Weinstein, 2011), leading to a possible double causality. Moreover, credit supply and demand can change simultaneously in periods of trade tensions even absent firm-specific exposures to trade policy changes. For instance, a local currency depreciation (Bruno and Shin, 2015) or domestic changes in trade policies – as a response to global uncertainty – can shift the global trade demand with corresponding changes in credit market conditions (see, e.g., Correa et al., 2023).

We address these challenges by defining firms' exposure to trade tensions as the 2016-2017 average volume of exported goods that (eventually) became subjected to US tariffs as a share of total firms' exports. This pre-determined metric of firms' exposure alleviates concerns that firms' funding dynamics after 2018 could determine the exposure to trade tensions. We also saturate specifications with lender-quarter fixed effects to control for unobserved dynamics at the lender level, including the impact of macro shocks occurring

contemporaneously to trade tensions on credit supply. Finally, we also control for firm-bank fixed effects to account for potential biases arising from an endogenous matching between exporting firms and lenders or by time-invariant demand characteristics that are specific to a firm-lender pair.[1]

Based on this specification, we present three sets of results. First, we document that exposed firms benefit from larger financing volumes following the emergence of trade tensions in January 2018. However, this effect is concentrated in the segments of domestic bank credit and cross-border firm-to-firm credit. Notably, the economic magnitude of the effect on cross-border firm-to-firm credit is significantly more pronounced: The average volume of this credit increases by about 20 percentage points (pp) more for exposed firms than non-exposed firms. In contrast, the differential increase in domestic bank credit is comparatively modest, at 6 pp.

Secondly, we conduct additional tests to examine how financing conditions – beyond credit volumes – change for exposed firms. We find that exposed firms benefit from better credit conditions in the form of lower interest rates in the segments of domestic bank credit, only for local currency-denominated loans, and cross-border firm-to-firm credit. Hence, firms that are in a better position to participate in global supply chains obtain better financing terms, partially driven by directcredit from foreign firms. Finally, we show that exposed firms are affected by a reduction in cross-border bank credit, particularly when originated in the US. While this finding may reflect worsening credit-market conditions in the US – as documented by Correa et al. (2023) – it also reflects the possibility that US importing firms increase their participation in cross-border financing given the need to rapidly reallocate their supply chains.

Our findings unveil a previously unexplored angle of how cross-border firm-to-firm

[1]In alternative specifications, we further saturate the model with industry-time fixed effects to verify that the results are not affect by other heterogeneous sources of credit-demand shocks across firms.

credit facilitates a global reallocation of supply chains. Most of the work on trade flows and credit has focused on the specific financing of individual trade transactions (Antràs and Foley, 2015). In that setting, trade credit plays the very specific role of financing the exchange of a well-defined set of goods, with the importer getting financing from the exporter for the period of time it takes to sell the merchandise it purchased. This very narrow focus abstracts from the financing of larger shifts in trade patterns, such as those observed during the 2018-2019 trade tensions or other major shifts in global supply chains. In those settings, the foreign importer does not receive any financing; quite the contrary, it may have to serve as a source of financing for exporters, as they may require additional resources to increase their production capacity. This may be most relevant for emerging markets, where credit provision is constrained by information asymmetries between borrowers and lenders. These credit constraints may be mitigated by firms who know the exporters and their business, and have better information to provide credit to these exporters compared to banks.

Our paper highlights for the first time the importance and magnitude, for an emerging market, of cross-border firm-to-firm financing for exporters. This source of credit has not been discussed in the literature, with most of the focus devoted to bank financing (Amiti and Weinstein, 2011; Claessens and Van Horen, 2021) or the role that trade finance plays in supporting individual trade transactions (Ahn et al., 2011).

Related literature Our paper contributes to strands of literature that explore the role of global banks in trade; the real and financial effects of a reallocation in global supply chains; and the economic consequences of the US-China trade tensions in particular. Primarily, our findings build on previous evidence documenting a strong link between international financial integration and trade (see, e.g., Beck, 2002; Caballero et al., 2018). Financial integration can foster trade through an attenuation of exporter-importer information frictions (Hertzel et al., 2018) as well as through a reduction of financial constraints originated in low degrees of financial development in exporting countries (Bronzini and D'Ignazio, 2005). A

subset of this literature has focused on examining the impact of financial integration via cross-border banking on trade (see, e.g., Niepman and Schmidt-Eisenlohr, 2017; Buch and Goldberg, 2020). Claessens and Van Horen (2021) show, for example, that foreign banks' entry can lead to increased exports to banks' home countries, whereas Paravisini et al. (2023) documents how exporting firms tend to borrow from banks specialized in their countries of destination. Berger et al. (2023) illustrate the stabilizing role of global banks in mitigating the effect of pandemic-related restrictions on trade. Our contribution emphasizes a geographical reconfiguration of cross-border credit – particularly trade credit – in support of changing patterns in global supply chains.

Several studies have explored the drivers and consequences of supply chain reallocations in the wake of episodes including the US-China trade tensions, the COVID-19 pandemic, and the Russia-Ukraine war. Fajgelbaum et al. (2021) and Alfaro and Chor (2023) document how bystander countries benefited from larger export volumes following US-imposed tariffs after 2018. Qiu et al. (2023) argue that, while global value chains have recently been lengthened, there is no evidence of an increased diversification of suppliers, with importers in the US having increased their reliance on intermediaries between them and Chinese producers. The impact of US-China trade tensions on bystander countries has been explored by Blanchard et al. (2021) and Utar et al. (2023) showing, for example, that firms more susceptible to US-imposed tariffs increased their purchase of inputs and their participation in US-based global value chains. Alfaro et al. (2024) show that US importers of tariff-hit products from China were more likely to exit relationships with Chinese suppliers and to find new suppliers in other Asian countries. This shift in US importers' supply chains was associated with an increased use of bank credit at higher rates. However, US affected firms with specialized banks were able to borrow at lower rates and were more likely, and faster, to establish new supplier relationships than firms with financing arrangements with other banks. Complementing this work, we study the financing needs of exporters instead of those of importers, and focus on the sources (and terms) of the credit they access to adjust their exporting activities.

Our results also complement findings on the economic and financial consequences of US-China trade tensions (see Antràs and Chor, 2022 for a summary of this literature). A growing body of empirical work shows that US-imposed tariffs had an almost complete pass through to US prices (Amiti et al., 2019), negatively impacting consumption, investment, and employment (see, e.g., Waugh, 2019; Amiti et al., 2020). Hassan and Esposito (2021) note, however, that global trade has remained resilient in the aggregate, despite heightened trade policy uncertainty. Other studies have focused on the impact of trade tensions on financial markets, particularly on bank lending. Correa et al. (2023) provide evidence for a negative spillover of banks' exposure to US-China trade tensions on domestic lending in the US. Focusing on a different episode, Federico et al. (2023a) and Federico et al. (2023b) document a reallocation of domestic credit in Italy following China's entry to the World Trade Organization and Russian sactions in 2014, respectively. We complement this literature by showing that banks and firms in countries directly exposed to trade tensions support the reallocation of their supply chains by directly engaging in cross-border financing.

A related strand of literature has focused on the trade effects of financial shocks, illustrating the role of global banks in propagating adverse financial conditions to trade flows. For example, Amiti and Weinstein (2011), Paravisini et al. (2015), and Amiti and Weinstein (2018) show that declines in global trade can be attributed to banks failing to provide trade finance during episodes of widespread financial stress. An important part of this evidence has been drawn from analyzing the period around the Great Financial Crisis (see Chor and Manova, 2012). While this literature highlights a 'dark side' of banks' involvement in trade, our results underscore that both domestic bank credit and foreign firm-to-firm credit play a critical role in underpinning the reallocation of global supply chains, particularly when geopolitical risks materialize.

From a corporate finance perspective, our work relates to studies on the channels and frictions in credit provision to exporting firms, particularly trade credit. Trade credit, often

described as liquidity insurance mitigating risks to buyer-supplier relationships (e.g., Cuñat, 2007; Amberg et al., 2021), has been shown to substitute for bank credit in emerging markets, especially for small and medium-sized firms (Hardy et al., 2022, 2023). Its stabilizing role in global trade is further highlighted by Hassan and Esposito (2023) in a general equilibrium context. Our results expand on this strand by focusing on the role that cross-border trade credit plays in supporting the reallocation of global supply chains. We show for the first time the size of this type of credit for an emerging economy and, importantly, the terms at which this credit is provided. Importantly, we are able to document that this type of credit dominates the use of cross-border bank credit for exporters.

2 Empirical strategy

Our aim is to identify the effect of firms' exposure to the US-China trade tensions on trade volumes. We conjecture that firms exporting product categories subject to US tariffs may increase their export volumes to the US, partially filling the gap of reduced Chinese imports. We are, thus, primarily interested in the effect of trade tensions that started in 2018 on export volumes at the firm-product-country level. Our baseline specification is represented in Eq. 1:

$$Y_{f,p,c,m} = \alpha + \beta_1 Post_{p,m} \times USA_c + \sigma_{f,c,p} + \mu_{f,p,q} + \delta_{c,m} + e_{f,p,c,m} \tag{1}$$

where $Y_{f,p,c,q}$ represents the log of either export values (measured in USD) or quantities at the firm (f), product (p), destination country (c), and monthly (m) level.

The coefficient of interest is β_1. It loads the interaction between two dummies, $Post_{p,m}$ and USA_c. First, $Post_{p,m}$ varies across products and time, and takes value 1 from the first month in which a specific product category p becomes subject to US-imposed tariffs onward. Next, the dummy variable USA_c takes value 1 for US exports.

We augment the model with a rich vector of fixed effects. $\sigma_{f,c,p}$ denotes firm $\times$

destination × product fixed effects, controlling for all observed and unobserved time-invariant heterogeneity which may drive firms' specialization in exporting a certain product to a given destination. $\mu_{f,p,q}$ is a vector of firm × product × time fixed effects, absorbing any (demand or supply) shock which may affect firm f's exports of a specific product p. Moreover, we control for destination-specific demand shocks through a vector of destination × time fixed effects, $\delta_{c,m}$.

Finally, we double cluster standard errors $e_{f,p,c,m}$ at the product and country level, in line with the layers of heterogeneity assigning the treatment dummy.

We expect β_1 to be positive and statistically significant, to the extent that export volumes to the US of products affected by tariffs increase relatively more for the US than for other destinations.

Our tight identification allows us to control for the key identification challenges associated with the estimation of the impact on tariffs on exports, namely that unobserved country or product-specific shocks may influence our estimates.

In a second stage, we aggregate the panel at the firm-country level (i.e., we collapse the product dimension) to assess the aggregate firm-level effect of trade tensions on exports. To this end, we first define firms' exposure to trade tensions as follows:

$$Exposure_f^{Total} = \frac{\sum_p Y_{f,p} * 1(\tau_p > 0)}{\sum_p Y_{f,p}} \tag{2}$$

In Eq. 2, we first define τ_p as an indicator equal to one if a product category became eventually affected by US-imposed tariffs on China at any point in time between 2018Q1 and 2019Q4; we label these categories as 'affected' products. Then, we calculate the average share of affected products in a firms' total exports between 2016Q1 and 2017Q4. Importantly, we construct Eq. 2 by aggregating the universe of trade transactions recorded at the product level by each firm. Eq. 2 provides a broad measure of a firms' exposure to affected product

categories, without distinguishing whether a firm has pre-existing trade links with the US Thus, we also employ an alternative exposure definition to capture this latter dimension. This exposure is defined in Eq. 3:

$$Exposure_f^{US} = \frac{\sum_p Y_{f,p} * 1(\tau_p > 0) * US}{\sum_p Y_{f,p}} \tag{3}$$

where $Exposure_f^{US}$ represents firm's f exposure to affected goods as measured by the firm's pre-determined share of affected goods' exports to the US to total exports in the period between 2016 and 2017. For completeness, we also define $Exposure_f^{RoW} = Exposure_f$ - $Exposure_f^{US}$ as firms' exposure to affected goods based on their pre-determined exported volumes to the rest of the world (RoW). Armed with Eqs. 2 and 3, we examine whether firms' pre-determined exposure to goods that eventually became affected by US-imposed tariffs report a different pattern of trade volumes after January 2018. Our specification is defined in Eq. 4:

$$\begin{aligned} Y_{f,q} =& \alpha + \beta_1 Post_q + \beta_2 Exposure_f^{US} + \beta_3 Exposure_f^{RoW} + \beta_4 Post_q \times Exposure_f^{US} \\ &+ \beta_5 Post_q \times Exposure_f^{RoW} + \mu_f + \delta_q + e_{f,q} \end{aligned} \tag{4}$$

where the dependent variable $Y_{f,q}$ represents the log of firm's f aggregate exports, measured in "Free on Board" (FOB) USD values, at quarter q. The variable $Post_q$ equals 1 for the quarters after 2018Q1 and zero otherwise. The coefficient β_4 captures the differential effect after 2018Q1 for firms with larger values in their pre-determined exposure to affected goods. The coefficient β_5 further captures the effect that trade tensions may have had on firms' exports irrespective of their direct US-links. In this specification, we are interested in the effect on firms' aggregate trade outcomes; thus, we do not consider the destination country dimension. In Eq. 4 we cluster standard errors at the firm level.

To assess whether firms' financing conditions change following the start of the US-China

trade tensions, we adapt the models outlined above to estimate the effect of pre-determined exposures captured by Eq. 2 on loan volumes defined at the firm-bank level. Importantly, we resort to credit registry data to distinguish between credit volumes in three financing segments: domestic bank credit, cross-border bank credit, and cross-border firm-to-firm trade credit. Eq. 5 reports our main specification:

$$Y_{f,b,q} = \alpha + \beta_1 Post_q + \beta_2 Exposure_f^{Total} + \beta_3 Post_q \times Exposure_f^{Total} + \mu_{b,f} + \delta_{b,q} + e_{f,b,q} \quad (5)$$

where $Y_{f,b,q}$ measures the log of loan-level volumes accumulated over a given quarter q for each firm-bank pair (labeled f and b, respectively). Our main variable of interest is $Exposure_f^{Total}$ as defined in Eq. 2. We would expect β_3 to report a positive coefficient if a larger exposure to the trade tensions is associated with an increase in financing flows towards firm f. $Exposure_f^{Total}$ is pre-determined, mitigating double-causality concerns between credit and trade flows. Nevertheless, we further address identification concerns by including vectors of firm-bank and bank-time fixed effects ($\mu_{b,f}$ and $\delta_{b,q}$, respectively).

The term $\delta_{b,q}$ allows us to keep lender characteristics constant over time; hence, we can examine whether credit granted by the same financier to firms differentially exposed to trade tensions varies after January 2018. The term $\mu_{b,f}$ further absorbs unobserved heterogeneity across firm-lender pairs. Thus, we control for loan demand patterns that are specific to a lender-borrower relationship. Moreover, this vector of fixed effects accounts for potential biases arising from an endogenous matching between firms and lenders that could bias our estimates. In alternative specifications, we further saturate Eq. 5 with industry-time fixed effects to verify that the results are not affected by other sources of credit-demand shocks that could be correlated with firms' exposure. In this specification, we cluster standard errors at the bank level.

In a final specification, we zoom in into firms' exposure to different lender types and estimate the share of trade credit as a proportion of total outstanding debt by firm f.

This exercise aims at finding traces of a reallocation of credit sources, for example, from domestic banks towards foreign importing firms providing trade credit. Eq. 6 formalizes this approach:

$$\begin{aligned} Y(share)_{f,q} =& \alpha + \beta_1 Post_q + \beta_2 Exposure_f^{Total} \\ &+ \beta_3 Post_t \times Exposure_f^{Total} + \mu_f + \delta_{s,q} + e_{f,q} \end{aligned} \tag{6}$$

where $Y(share)_{f,q}$ measures the ratio of trade credit to total outstanding debt at a given quarter. We follow the same structure of previous models and focus on the effect of firms' exposure as defined in Eq. 2 on the share of trade credit following the start of trade tensions in January 2018 (as defined by the dummy $Post_q$). This latter specification sheds light on a potential reallocation of credit across sources, particularly between domestic and foreign lenders. We employ vectors of firm and industry-time fixed effects (μ_f and $\delta_{s,q}$, respectively) to control for firm characteristics and for credit dynamics affecting firms active in specific sectors s. This approach helps to unravel a potential supply-driven adjustment in firms' reliance on trade credit as a consequence of individual firms' exposures to trade tensions.

3 Data and sample

We combine four data sources provided by the Central Bank of Colombia (Banco de la República, BdR), the Colombian Financial Supervisory Authority (Superintendencia Financiera de Colombia), the National Administrative Department of Statistics of Colombia (DANE), and the US International Trade Commission.

3.1 Trade data

First, we construct a monthly panel for exports at the firm-product-destination country level based on customs repositories collected by the DANE. We retain data from 2016 to 2019.

Firms in Colombia are requested to report their export and import transactions while going through customs. Products are categorized according to the 10-digit Harmonized System (HS) from the World Customs Organization. We obtain two types of series: the FOB value of trade in USD and the physical volume of trade measured in quantities of exported products. We exclude exports of commodities, i.e. of oil, metals and minerals, since their values display a notable extent of seasonality and their exports are concentrated in a handful of firms.[2] Eventually, we collapse trade data at the HS 6-digit level, which allows us lo link Colombian custom data with the information on US tariffs (explained in detail in the next paragraph).[3] The original custom data sample covers data on more than 23,000 firms' exports of roughly 3,800 (non-commodity) HS-6 products to about 200 destination countries. Since we apply a demanding empirical model, including a rich set of fixed effects (see section 2), our sample is smaller and comprises 2,608 firms, exporting 1,658 HS-6 products to 169 destination countries. It has to be noted that our sample covers more than 90% of aggregate non-commodity exports, as clear from Figure A.1, reflecting a notable degree of concentration in Colombian exports.

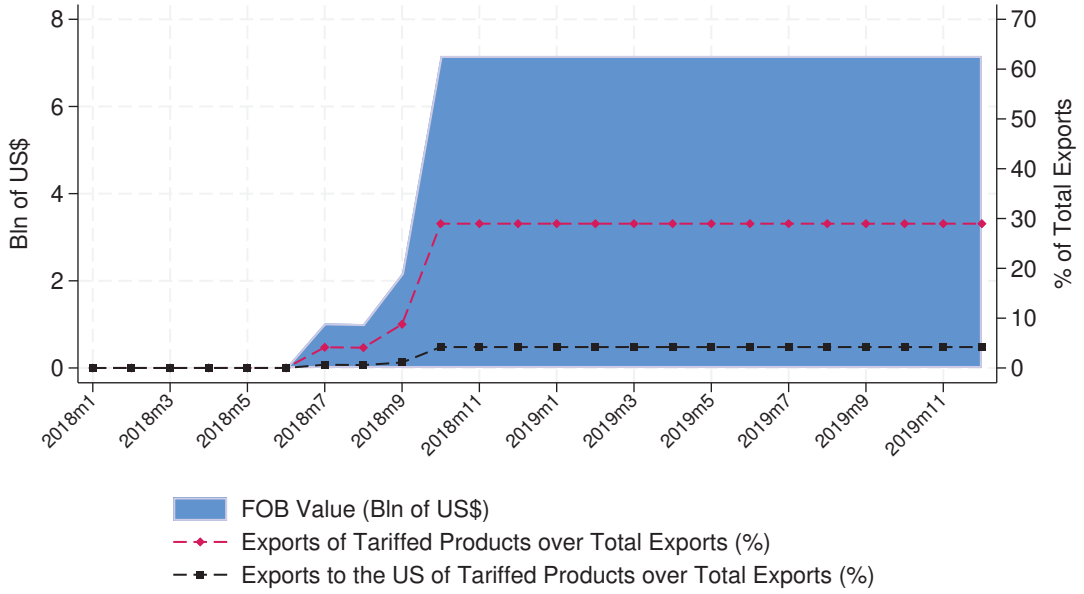
We merge this trade repository with information on US and Chinese tariffs imposed after 2018. As in Fajgelbaum et al. (2020), we exploit information on US import tariffs publicly available from the US International Trade Commission (USITC). Before 2018, the USITC would release annual baseline tariff schedules in January, with revisions in July. However, in 2018, due to a rapid succession of tariff increases, the USITC issued 14 schedule revisions. These tariff increases were primarily applied at the eight-digit level of the Harmonized System (HS). We collapse tariff data at the HS 6-digit level in order to merge them with custom data on exports.[4]

[2]Export of non-commodity goods account for about 60% of total Colombian exports, as evident from the red dashed line connected by triangles in Figure A.1.

[3]The first 6 digits of the HS code are comparable across countries. Subsequent digits may in general vary across countries.

[4]In practice, we start by defining a dummy with value 1 if the HS 8-digit product is subject to US tariffs. Next, within HS 6-digit products, we apply the maximum value of the dummy across all corresponding values

Figure 1: Value of Colombian exports subject to US tariffs on imports from China



Notes: This figures reports the sum of the value of Colombian exports of goods subject to US tariffs on imports from China. Export values are taken as the total annual value for 2017, the last year prior to the introduction of tariffs. The blue area reports the total value of Colombian exports of non-commodity products subject to US tariffs in billion of USD. The red dotted line rescale such value by the aggregate value of Colombian exports of non-commodity goods. The black dotted line depicts the ratio betweeen Colombian exports to the US of affected non-commodity goofs and the aggregate aggregate value of Colombian exports of non-commodity goods.

Overall, 2,893 products became subject to US tariffs on imports from China over 2018-2019. Figure 1 shows the relevance of such tariffs for Colombian exports, as the waves of tariffs were implemented in 2018 and 2019. By October 2018 (the month of the last round of tariffs imposed by the US), the cumulative value of Colombian exports of non-commodity goods subject to US tariffs amount to nearly \$6 billion, i.e. 30% of total exports of non-commodity goods. Colombian exports to the US of such affected products represent 4% of total exports of non-commodity goods.

We also gather information on retaliatory tariffs imposed on US exports from the World

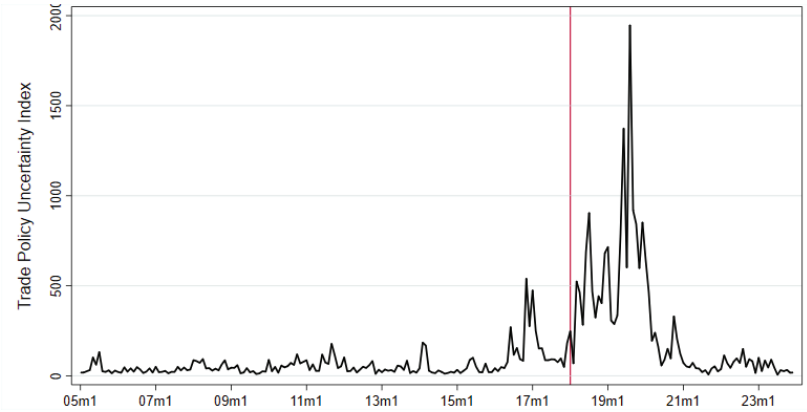
of the associated HS 8-digit products. This procedure entails a very little loss of information. Indeed, 94% of the HS 6-digit products covered in our estimation sample do not display any tariff heterogeneity across the associated HS 8-digit products.

Trade Organization (WTO), again following Fajgelbaum et al. (2020). These retaliatory tariffs are also ad valorem and took effect shortly after their announcement dates. We construct the retaliatory tariffs by combining the Most Favored Nation (MFN) tariff rates from the annual WTO database with the announced tariff rate changes. For each country-product combination, we calculated the retaliatory tariff rate by adding the MFN rate to the announced tariff rate change. We measure export tariffs at the HS6 level in line with the procedure applied for exports.

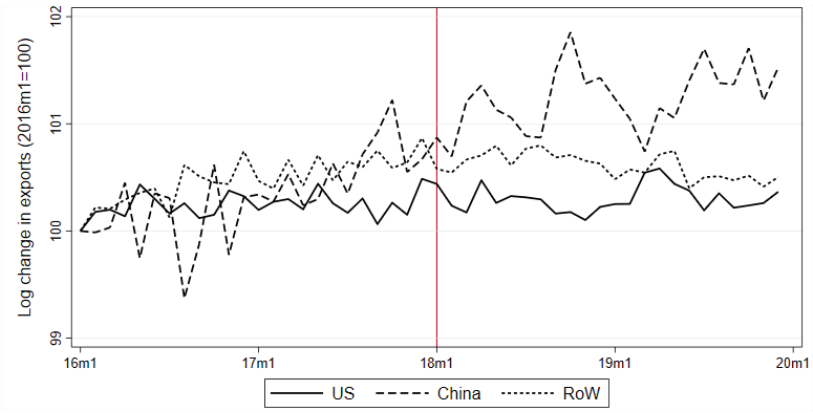
In Figure 2 we report the evolution of the Trade Policy Uncertainty Index (EPUTRADE) produced by Baker et al. (2025) from 2005 through 2023 (Panel a) and the log change in aggregate exports from Colombia to the US, China, and the rest of the world (RoW, Panel b). Panel (a) highlights a significant increase in trade policy uncertainty globally, starting in January 2018, in conjunction with the increase in tariffs. This figure supports our identification approach of exploiting product-specific exposures to US-imposed tariffs that materialize over this time window. Panel (b) shows that exports to the US and China – Colombia's two main trade partners – increased throughout our sample period starting in 2016Q1, although following different patterns. While exports to China increased significantly, with large peaks after 2018, monthly exports to the US remained slightly above 2016 figures. The identification approach outlined in Section 2 seeks to unravel a possible divergence trend between exports to the US in product categories affected by and not by newly imposed tariffs.

Figure 3 illustrates the quarterly volume of Colombian exports (in USD billion), distinguishing across product categories that eventually became affected by US tariffs against Chinese imports and those that remained exempted. Panel (a) focuses on Colombian exports to the US and shows a significant relative increase in the export volumes of affected product categories after 2018Q1, compared to the export volumes of exempted products. Interestingly, prior to the first imposition of tariffs in 2018Q1, exports of the two categories of products evolve according to comparable trends. One may wonder whether the jump in US exports of

Figure 2: Trade policy shocks and exports



(a) Trade Policy Uncertainty Index

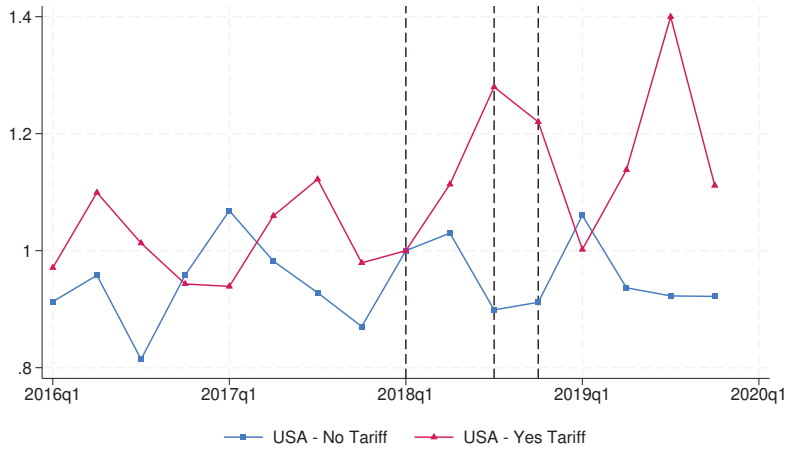


(b) Colombian exports by destination (2016m1=100)

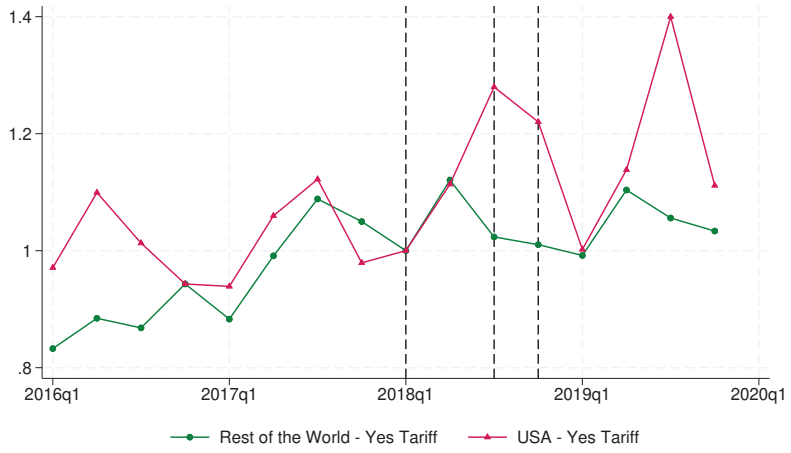
Notes: In this figure, Panel (a) illustrates the time series of the **?** Trade Policy Uncertainty Index (EPUTRADE) from 2005 through 2023. Panel (b) shows the log change in total exports to the US, China, and the rest of the world (RoW) vis-á-vis 2016M1, the first observation in our sample. The vertical lines is set at 2018M1, the month in which newly-imposed tariffs start being in implemented in the US

products subject to tariffs is due to product-specific shocks different from the tariffs, in which case we should observe an increase of exports of such products also to the rest of the world. Panel (b) suggests that this is not the case by showing the evolution of the export volumes of products subject to tariffs across different destinations, namely the US versus the rest of the world. Evidently, exports to the US of products subject to tariffs expand starting from 2018Q2, at a stronger pace than exports of the same products to non-US destinations. In the next section, we formally explore whether this shift to exports in affected product categories can be attributed to trade policy shocks once we account for confounding factors.

Figure 3: Tariffs and Colombian exports



(a) Colombian exports to the US of products subject to tariffs (Yes Tariff) and of exempted products (No Tariff)



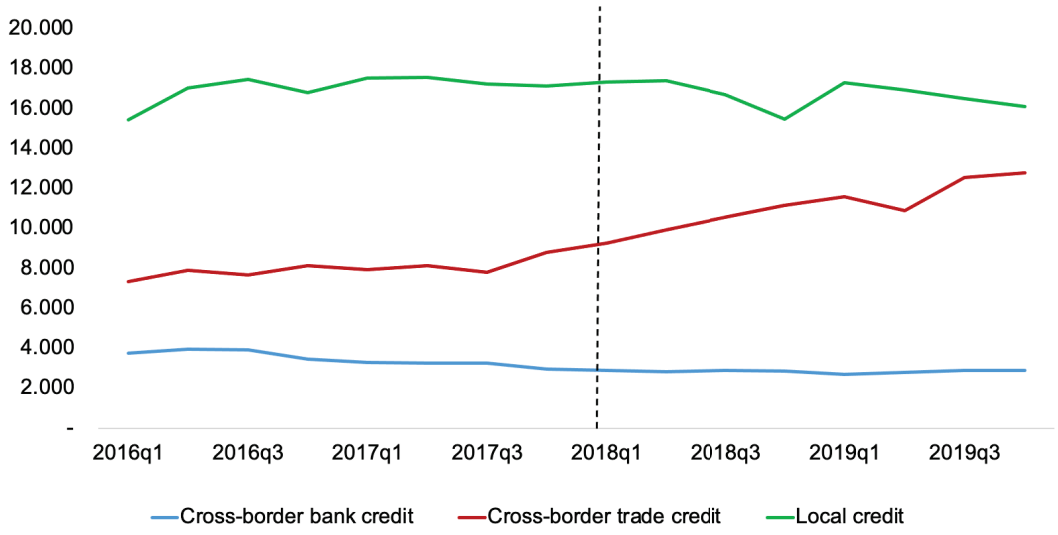
(b) Colombian exports of products subject to tariffs to the US and to the rest of the world

This figure illustrates the the quarterly volumes (in USD bill.) of Colombian exports (excluding oil, minerals and metals). Panel A represents Colombian exports to the US, distinguishing product categories that were affected by US tariffs against Chinese imports, versus product categories that were not. Panel B represents Colombian exports of product categories that were affected by US tariffs against Chinese imports, distinguishing by destination (US versus rest of the world). The dotted vertical lines denote quarters when US tariffs were raised. Export volumes are normalized so to be equal to 1 in 2018Q1. The series are constructed with data from the Colombian DANE and from the US International Trade Commission.

3.2 Domestic and cross-border credit register data

To analyze the impact of trade tensions on exporting firms' financing, we use quarterly data covering the universe of loans supplied by Colombian commercial banks to domestic businesses.

Figure 4: Credit volumes by lending source

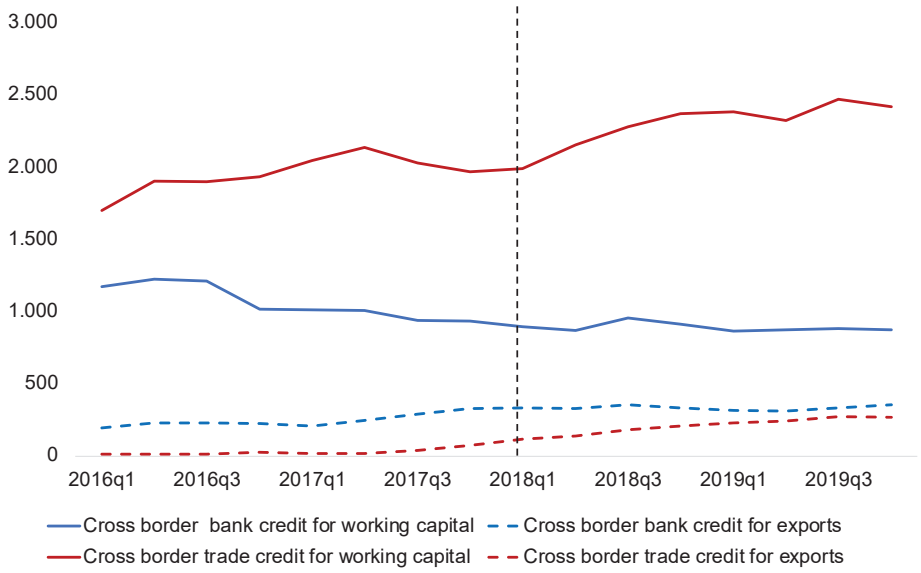


Notes: This figure reports the volumes of newly issued credit – in USD millions – as reported by borrowing firms according to the lending source. Lending sources include cross-border bank credit (blue line), cross-border trade credit (red line), and local credit vis-á-vis local banks in Colombia (green line). Borrower-level data is collected from credit registries from the Central Bank of Colombia. While the series of cross border bank and trade credit are reported in USD millions, the series for local credit are transformed from the original series in Colombian Peso using end-of-quarter nominal exchange rates reported by the Central Bank of Colombia. The series span from 2016Q1 through 2019Q4 and capture credit volumes reported by the ∼19,200 Colombian firms engaging in foreign trade used across the specifications.

This credit registry is collected by the Colombian Financial Supervisory Authority and is a key instrument used by the Colombian Central Bank to monitor dynamics in the credit market. This dataset includes information on the loan amount, interest rates, and repayment period of individual loans. Given the quarterly frequency of this source, we maintain consistency across different specifications by aggregating all data series at the quarterly level. We work with data on loans originated in 28 banks operating in Colombia, which provided credit to aprox. 26,000 individual firms during the sample period. We note that the sample is restricted to firms with a balance sheet above COP 1,000 million in assets (aprox. 240,000 USD, as of January 2025). The final sample with domestic credit and balance sheet information includes 153,166 loans granted to 19,227 firms.

Finally, one of the main contributions of the paper is the use of data on firms' access

Figure 5: Cross border credit by type of lender and loan purpose



Notes: This figures reports the volumes of cross border credit – in USD millions – as reported by borrowing firms according to the lending source and purpose. Lending sources include cross-border bank credit and cross-border trade credit granted to finance working capital and exports. Borrower-level data is collected from credit registries from the Central Bank of Colombia. The series span from 2016Q1 through 2019Q4 and capture credit volumes reported by the ∼19,200 Colombian firms engaging in foreign trade used across the specifications.

to cross-border financing, especially from foreign unrelated non-financial firms. We use a confidential repository of cross-border loans collected by the Central Bank of Colombia, containing the universe of cross-border credit granted to Colombian firms over the sample period. This source reports a total of 13,860 loans issued by a total of 210 lending banks and 45,090 loans granted by 4,730 non-financial firms (trade credit) abroad, located in 90 different jurisdictions between 2016 and 2019. Most importantly, we can trace the purpose of cross-border credit, for instance, credit that is used to pre-finance exports or to finance the working capital of a firm. This information is collected by the central bank to calculate Colombia's external debt statistics. At the micro level, we focus on cross-border credit with unaffiliated entities and with the objective of financing exports and working capital.[5]

[5]More information can be found here: https://d1b4gd4m8561gs.cloudfront.net/sites/default/files/reglamentacion/archivos/c
83-compendio-capitulo5.pdf

Using firm-level identifiers from the Colombian Tax Authority, we merge the exposure measures (Eq. 2) computed with data from the trade repository with the loan-level information contained both in the domestic credit registry and in the repository of cross-border financial transactions. Overall, 2,516 Colombian firms borrow cross-border from banks, whereas 5,200 firms borrow from unaffiliated non-financial firms located abroad using trade credit instruments. Figure 4 illustrates the series of newly issued credit volumes by quarter (in USD millions) distinguishing by lending source. It is important to note the size in overall cross-border trade credit, which becomes close to the level of local credit during our sample period, and is materially larger than the value of cross-border bank credit. Moving to the time series evolution in our sample period, we observe an increase in cross-border trade credit starting in 2018, paired with a decrease in cross-border bank credit. These dynamics occur against the backdrop of an overall increase in credit volumes.

Figure 5 shows the evolution of cross-border credit by lender and loan purpose. We observe that most of the cross-border bank and trade credit is used to finance working capital, with a smaller fraction used to pre-finance exports. The evolution of these series mimics the patterns observed for the overall volume of credit, with cross-border trade credit for working capital increasing materially after 2018, while bank credit gradually declines. Notably, after 2018Q1, cross-border credit for exports from both types of lenders increased rapidly, but credit growth from foreign firms outpaced that coming from foreign banks. In Section 4.2, we explore whether these changing patterns can be associated with exporting firms' exposure to trade tensions, as outlined above.

3.3 Trade and credit matched sample

Table 1 reports summary statistics four our working matched sample, including our main variables of interest outlined in Section 2. We distinguish between trade variables, variables capturing firms' exposure to trade tensions abroad, and credit variables. The final working sample consists of 624,362 observations in the baseline trade specification. We provide a

Table 1: Descriptive statistics

	(1) Mean	(2) Std. Dev.	(3) Min.	(4) Max.
Trade variables				
$Exports_{f,p,c,t}$	117,216	1.158e+06	0.01000	2.436e+08
$Ln(Exports)_{f,p,c,t}$	8.537	2.684	-4.605	19.31
$Ln(Q)$	6.641	3.256	-4.605	20.42
USA_c	0.0862	0.281	0	1
$Post_{p,t}$	0.399	0.490	0	1
$\Delta\tau_p$	-0.0408	0.0722	-0.100	0.200
Firms-level variables				
$Ln(Expo)_{f,t}$	10.64	2.232	-4.605	20.08
$Post_t$	0.465	0.499	0	1
$Exposure^{Total}$	0.542	0.465	0	1
$Exposure^{US}$	0.0961	0.254	0	1
$Exposure^{RoW}$	0.446	0.453	0	1
Credit variables				
Ln(Domestic loans, COP)	17.34	2.70	10.23	22.43
Ln(Cross-border bank credit, USD)	12.53	2.03	7.84	17.03
Ln(Cross-border trade credit, USD)	11.33	2.00	7.54	16.03
Loan rate (Domestic loans)	14.61	8.56	2.54	32.88
Loan rate (Cross-border bank credit)	3.15	2.29	2.36	9.11
Loan rate (Cross-border trade credit)	2.99	3.67	2.68	12.34
Maturity (Domestic loans, years)	1.73	1.45	0.52	4.78
Maturity (Cross-border bank credit, years)	1.12	1.37	0.41	2.46
Maturity (Cross-border trade credit, years)	1.84	1.75	0.57	3.24

Notes: This table reports the summary statistics for the working sample. Variables definitions are reported in Table A.1. Cols. 1 to 4 report the mean, the standard deviation (S.d.), the minimum and maximum values. Interest rates for cross-border bank credit and trade credit are defined as the spread between loan-level interest rates and a benchmark interest rate.

definition for each variable specifying the data sources in the Online Appendix (see Table A.1).

Of note, we provide a comparison of the terms of lending for the three types of credit used in our sample. As expected, the average and median interest rates are much smaller for cross-border bank and trade credit. Foreign lenders have access to deeper and more liquid capital markets, allowing them to lend at more favorable rates. Interestingly, we report that the average cross-border trade credit loan has a maturity of about 1.8 years, longer than equivalent domestic and cross-border bank loans. This maturity is also much longer than the typical trade credit used to finance individual transactions, which typically last at most a couple of months. This evidence highlights an important missing component of trade financing that has not been covered by the extant literature.

We then use the matched dataset to identify the intensity and geographical connections

in the exports-credit relationship. Figure 6 reports the main source country of credit (left axis) and the main destination country of exports (right axis) for firms using cross-border trade credit for exports in 2017Q4 (in USD millions). The figure shows that before the US-China trade tensions escalated, non-financial firms located in Luxembourg, the United States, and the United Kingdom were the most important providers of trade credit for Colombian firms exporting to the United States as their main destination. The relationship between trade credit financing from Spain for exports to Dominican Republic was also dominant in that period. Figure 7 shows that during the US-China trade tensions the number of countries providing trade credit for exports to firms exporting to the US increased. In that period, Panama, a financial center, became an important provider of trade credit for firms exporting to the United States, while the role of UK and Luxembourg firms declined. A similar pattern is observed in the intensity of the cross-border trade credit for working capital and exports (see, Appendix, A.2 and A.3). In the case of cross-border bank credit for working capital, the number of countries providing credit is lower and with a predominant role of US banks (see Appendix, A.4 and A.5). Overall, these figures suggest a potential reconfiguration of credit sources across countries to finance exports to the US.

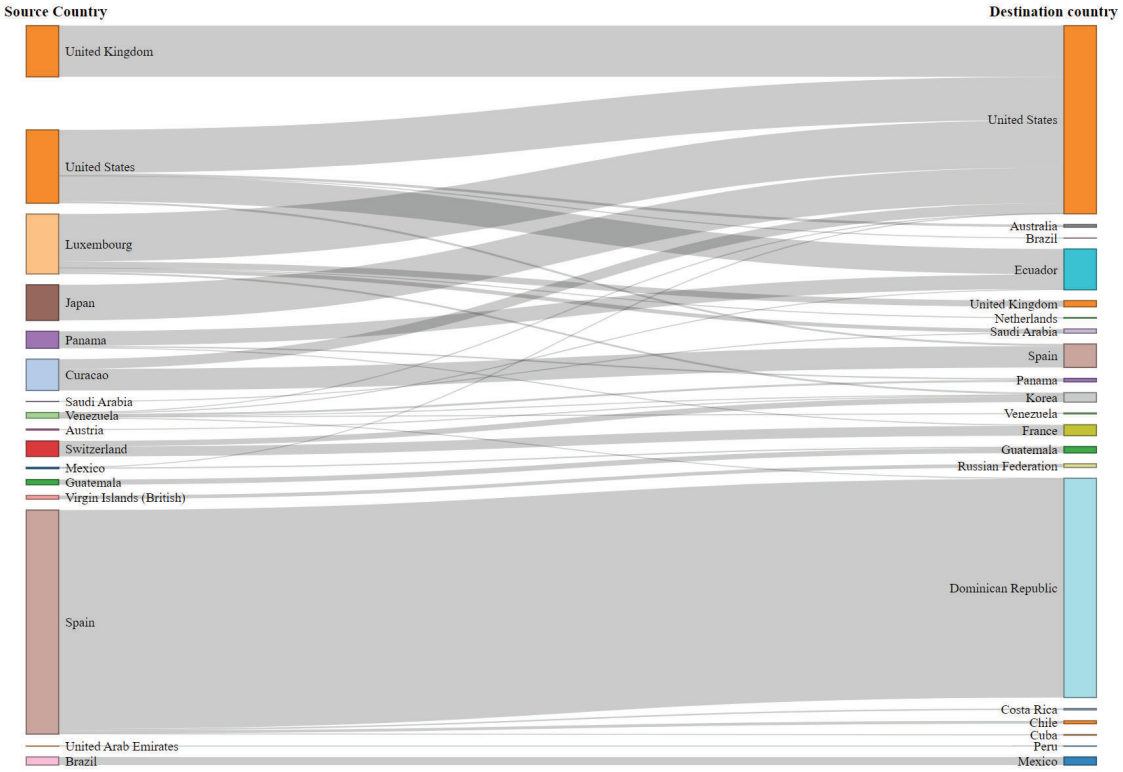
4 Results

4.1 Trade tensions and exports

We report baseline export results from the estimation of equation 1 in Table 2.[6] Column (1) shows our baseline estimates, focusing on the interaction term between the product-specific *Post* dummy and the USA indicator. The positive coefficient reflects the fact that after tariffs are imposed, exports of affected products to the US increase significantly, as opposed to exports of affected products to destinations different from the US. Quantitatively speaking,

[6]The estimation sample excludes Colombian exports to China, possibly affected by Chinese retaliatory tariffs on imports of US goods.

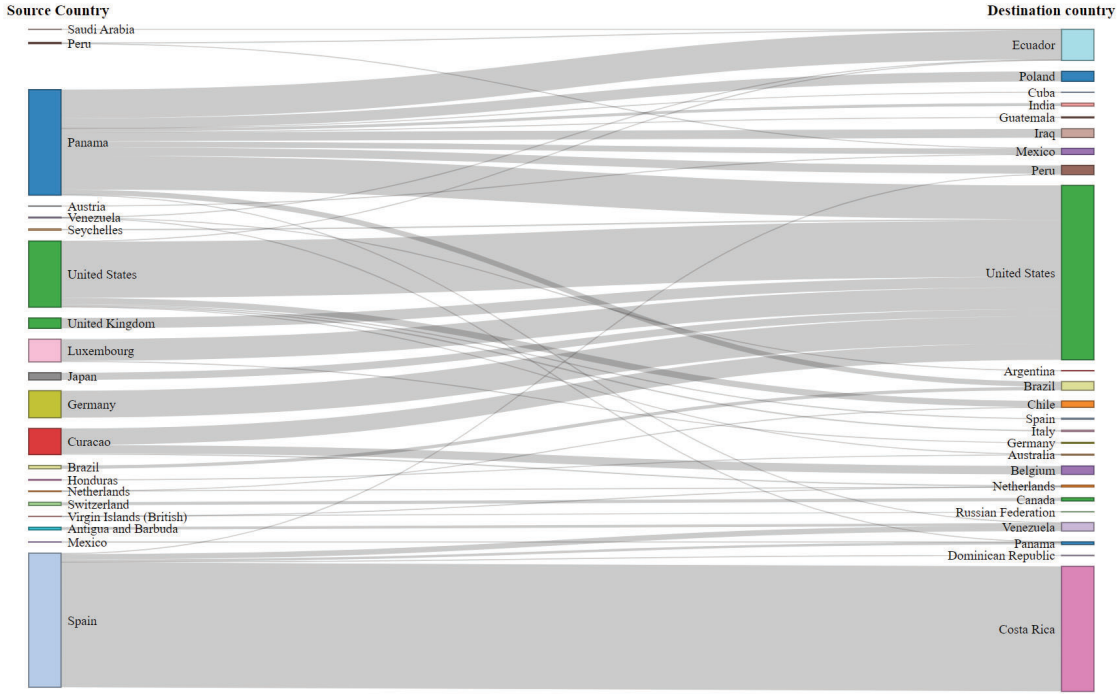
Figure 6: Cross border trade credit for exports and destination of exports (2017Q4)



Notes: This figure shows the relationship between the main source of cross-border trade credit for exports (country of origin, left axis) and the main export destination of firms (right axis) for 2017Q4 (ex-ante). Firms are grouped by source of financing and export destination, that is, the amounts of credit received by firms with the same source and the same export destination are grouped in this relationship. The figure shows the grouped amounts of the relationship on the financing side (in USD millions). It shows the intensity of the relationship between external financing and export destination.

the export value of affected goods increases by 6.2 percentage points (pp) in relative terms. In column 4, export quantities of affected products to the US display an even larger increase, by 8.5 pp. Next, in columns (2) and (4) we extend our baseline specification by adding a triple interaction between our term of interest and a variable ($\Delta\tilde{\tau}$), measuring the change in product-specific tariffs minus the minimum change across all product categories. The coefficients point to a mixed link between the relative size of a change in tariffs and the increase in exports to the US, which is however not statistically significant. Moreover, in columns (3) and (6) we augment the baseline specification by adding an interaction term with an indicator dummy capturing whether a product is an intermediate good, in contrast

Figure 7: Cross border trade credit for exports and destination of exports (2019Q4)



Notes: This figure shows the relationship between the main source of cross-border trade credit for exports (country of origin, left axis) and the main export destination of firms (right axis) for 2019Q4 (ex-post). Firms are grouped by source of financing and export destination, that is, the amounts of credit received by firms with the same source and the same export destination are grouped in this relationship. The figure shows the grouped amounts of the relationship on the financing side (in USD millions). It shows the intensity of the relationship between external financing and export destination.

to final goods. The results suggests that our findings are driven by an increase in affected intermediate goods, especially for product quantities in column (6). This indicates that global supply chains connected to bystander countries like Colombia can be used to fill the gap of missing Chinese imports in the US.

Table A.2 in the Online Appendix shows estimates from otherwise identical models, though looking at the relative effect of retaliatory tariffs on Colombian exports to China.[7] The results suggest that Colombian firms over-proportionally increase their exports to China in affected product categories after retaliatory tariffs are implemented. Interestingly, we find that this effect is stronger for final goods – and has the opposite sign for intermediate goods –

[7]The estimation sample excludes Colombian exports to the US.

Table 2: Product-level effect of US tariffs on Colombian exports

	(1)	(2)	(3)	(4)	(5)	(6)
	Ln(Exp. value, fob)			Ln(Exp. volume, quant.)		
$Post * USA$	0.0623*	0.0556	0.0582	0.0852**	0.0888**	0.0366
	(0.0346)	(0.0360)	(0.0389)	(0.0354)	(0.0386)	(0.0418)
$Post * USA * \Delta\tilde{\tau}$		0.222			-0.117	
		(0.414)			(0.360)	
$Post * USA * Intermediate$			0.00861			0.103**
			(0.0500)			(0.0488)
Firm*Product*Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm*Product*Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country*Time FE	Yes	Yes	Yes	Yes	Yes	Yes
N	594595	594595	594595	594595	594595	594595
R^2	0.889	0.889	0.889	0.878	0.878	0.878

Notes: This table reports the results of estimating Eq. 1. The table shows results with the dependent variable defined as the log of the value of exports (cols. 1 to 3) or as the log of the volume of exports in tons. (cols. 4 to 6). The variable $\Delta\tilde{\tau}$ measures the quarterly change in a product-specific tariff minus the minimum change across product categories. The variable *Intermediate* represents a dummy equal to one if a product is labeled as an intermediate good and zero otherwise. All constitutive terms of the interaction terms are included as individual variables but excluded when subsumed by the fixed effects structure. All specifications include a complete set of fixed effects specified in Eq. 1: firm, product, country; firm, product, quarter; and country, quarter. Standard errors (in parentheses) are double clustered at the product and country levels. The sample period spans from 2016Q1 through 2019Q4 with the variable *Post* identifying the quarters after 2018Q1. *** p<0.01, ** p<0.05, * p<0.1.

in line with the different nature and scope of tariffs implemented in the US and China.

Next, we use Eq. 4 to estimate the aggregate impact of firms' exposures on their total export values. To this end, we rely on Eqs. 2 and 3 to define firms' pre-determined exposure to product categories that eventually became affected by tariffs. Recall that in this specification, the variable *Post* is defined equally for all firms as a dummy that equals one in the period after 2018Q1 and zero otherwise. Our results are reported in Table 3. First, we find that, on average, all firms increased their exports after the cutoff date by aprox. 8.9 pp with respect to the previous period (Column 1).

However, this average effect masks a surprising heterogeneity across firms depending on their ex-ante exposure to trade tensions. First, we find that the increase in exports is 2 percentage points larger for a firm with a one standard deviation larger US exposure (as

Table 3: Firm-level effects of US tariffs on Colombian exports

	(1)	(2)	(3)	(4)	(5)
	Ln(Exp. value, fob)				
$Post_t$	0.0890***	0.0829***	0.0811***	0.0695***	0.0696***
	(0.0175)	(0.0180)	(0.0204)	(0.0216)	(0.0216)
$Post_t * Exposure^{US}$		0.0740*		0.0874**	
		(0.0389)		(0.0407)	
$Post_t * Exposure^{RoW}$			0.0209	0.0324	
			(0.0227)	(0.0237)	
$Post_{f,t} * Exposure^{Total}$					0.0421*
					(0.0227)
Firm FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
N	151890	151890	151890	151890	151890
R^2	0.754	0.754	0.754	0.754	0.754

Notes: This table reports the results of estimating Eq. 4. The table shows results with the dependent variable defined as the log of the value of exports (fob). All constitutive terms of the interaction terms are included as individual variables but excluded when subsumed by the fixed effects structure. All specifications include a complete set of fixed effects specified in Eq. 4, i.e., firm and quarter fixed effects. Standard errors (in parentheses) are clustered at the firm level. The sample period spans from 2016Q1 through 2019Q4 with the variable *Post* identifying the quarters after 2018Q1. *** p<0.01, ** p<0.05, * p<0.1.

defined by Eq. 3) compared to a firm with an average exposure (see Column 2). Notably, Column (3) shows that this differential effect does not arise for firms with a relatively large exposure to other countries (rest of the world, RoW). Hence, those firms with pre-existent trade links with the US in product categories that became affected by tariffs are those grasping the benefits of a reallocation in global supply chains the most. This conclusion remains in place when controlling simultaneously for US and RoW exposures, as reported in Column (4). Finally, using firms' total exposure as defined by Eq. 2, we find that overall, firms with a larger pre-determined exposure to affected goods where the ones that eventually increased their export value the most, as illustrated by the positive and statistically significant coefficient on Column (5).

We further investigate whether the export expansion associated with the tariffs reflects a

Table 4: Firm-level effects of US tariffs on Colombian imports from China

	(1)	(2)
	Ln(Imports)	
Post*China	-0.0360	-0.0384
	(0.0388)	(0.0412)
Post*China*Exposed	0.0278	
	(0.0325)	
Post*China*Exposure^{US}		0.00350
		(0.0716)
Post*China*Exposure^{RoW}		0.0352
		(0.0388)
Firm*Product*Country FE	Yes	Yes
Firm*Product*Time FE	Yes	Yes
Country*Time	Yes	Yes
N	406153	406153
R^2	0.882	0.882

Notes: This table reports the results of estimating Eq. 1 for imports. We estimate the effect of US tariffs on Colombian imports from China, depending on whether firms ex-ante produce products subject to US tariffs or to continues proxies of ex-ante US and Rest-of-the-World. Standard errors double clustered at the product and origin-country level. *** p<0.01, ** p<0.05, * p<0.1.

potential triangulation mechanism in which Colombian firms simply intermediate US imports from China. This would imply that Colombian firms increase imports from China of goods subject to US tariffs after the policy shocks. Table 4 shows that this is not the case. We use a model otherwise identical to that in equation 1, though with imports as dependent variable and exploiting the interaction term between the usual $Post_{p,t}$ dummy for product-specific US tariffs on Chinese imports and $China_c$, a further dummy variable with value 1 if the origin country of a given import transaction is China. Evidently, the coefficient loading such interaction is not statistically significant and slightly negative in both columns (1) and (2). Moreover, the effect is not statistically different from 0 also for firms with positive ex-ante Exposure (column 1) or with higher levels or with higher ex-ante US or rest of the world exposure (column 2).

We conclude this section by asking whether Colombian firms exposed to the US tariff shocks experience an increase in investment and in working capital. Indeed, exporting requires

Table 5: Firm-level exposure to US tariffs shocks, investment and working capital

	(1)	(2)	(3)	(4)	(5)	(6)
	Ln(Investment)			Ln(Working Capital)		
Post ∗ *Exposure*	0.071***	0.063***	0.062***	0.091**	0.089**	0.077**
	(0.024)	(0.021)	(0.018)	(0.044)	(0.042)	(0.040)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry*Time FE	No	Yes	Yes	No	Yes	Yes
Location*Time FE	No	No	Yes	No	No	Yes
N	21237	21237	21237	21237	21237	21237
R^2	0.73	0.77	0.77	0.69	0.71	0.73

Notes: This table reports the results of estimating Eq. 4, with either log investment (columns 1 to 3) or log working capital (columns 4 to 6) as dependent variables. All constitutive terms of the interaction terms are included as individual variables but excluded when subsumed by the fixed effects structure. Standard errors (in parentheses) are clustered at the firm level. The sample period spans from 2016Q1 through 2019Q4 with the variable *Post* identifying the quarters after 2018Q1. *** p<0.01, ** p<0.05, * p<0.1.

additional capital; hence, evidence of higher investment and/or working capital would further corroborate the hypothesis that Colombian firms are taking advantage of the market slack left by retrenching Chinese exporters through their own production (rather than by simply operating as an intermediary for arbitraging the tariffs). Moreover, it would also establish the base for an external finance demand shock, as firms typically require more funds to increase capital. Evidence in Table 5 strongly supports this hypothesis. According to the most robust coefficients in columns 3 and 6, firms with a 1 standard deviation (sd) higher exposure to the US-tariff policy shocks experience an ex-post relative increase in investment and in working capital by 2.9 and 3.6 percent, respectively.

4.2 The effect of trade tensions on credit

Having established the effect of trade tensions on exports, we next examine the implications of supply chains' reallocation for firms' financing. We base our analysis on estimating Eq. 5 separately for different credit segments: domestic bank credit, cross-border bank credit, and cross-border (firm-to-firm) trade credit. Our main variable of interest is firms' exposure to

Table 6: Effect of firms' exposure to trade tensions on local credit

Dependent variable:	Log (Credit, COP)		Interest rate (%)		Log (Maturity, years)	
	(1)	(2)	(3)	(4)	(5)	(6)
Post x Exposure_f	0.073**	0.069**	-0.542***	-0.538**	0.132***	0.141***
	(0.031)	(0.036)	(0.019)	(0.017)	(0.019)	(0.017)
N	334765	334765	334765	334765	334765	334765
R2	0.805	0.817	0.802	0.816	0.765	0.779
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-lender FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-time FE	No	Yes	No	Yes	No	Yes
Lender-time FE	Yes	Yes	Yes	Yes	Yes	Yes

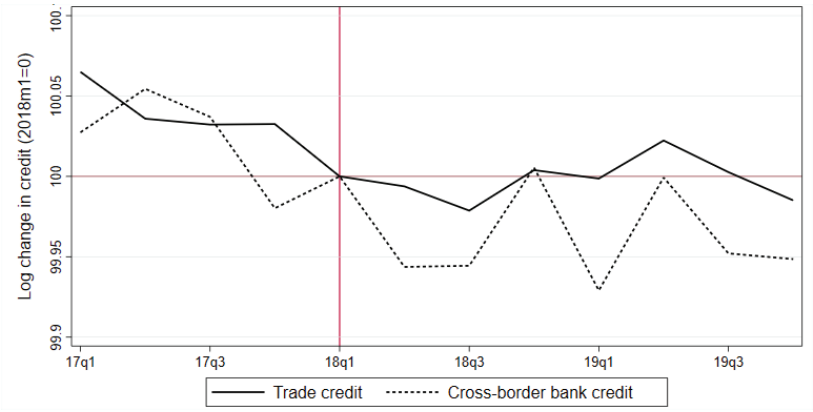
Notes: This table reports the results of estimating Eq. 5 for local credit. We estimate the effect of firms' exposure to trade tensions on the log of credit volumes, interest rates (in pp), and log of maturity (years). The estimations are based on loan-level data for the period between 2016 and 2019. Standard errors (in parentheses) are clustered at the firm level. *** p<0.01, ** p<0.05, * p<0.1. Variables' definitions are reported in Table A.1.

trade tensions as defined by Eq. 3, that is, the pre-determined share of exports in products categories that became affected by US tariffs to total exports (based on averages for 2016-2017). To ease the interpretation, in this exercise we define the exposure variable as a dummy that equals one for firms that report a positive number in Eq. 3 and zero otherwise.

A visual inspection of the aggregated credit time series lends support to the notion that trade credit was particularly stable after 2018Q1 compared to cross-border bank credit. Figure 8 depicts the series for both sources of funding measured as log changes vis-á-vis 2018Q1. The figure shows that while both sources of cross-border funding followed a downward trend during 2017, after 2018Q1 trade credit stabilizes and cross-border bank credit shrinks. Figure 8(b) shows that exposed firms are more likely benefiting from stable trade credit flows. When plotting the growth rate of trade credit – as log changes vis-á-vis 2018Q1 – for exposed vs. non-exposed firms, we find that the former firms report an increase in trade credit volumes compared to a decrease in trade credit reported by non-exposed firms.

Our main results are reported in tables 6 through 11. First, we report the results of

Figure 8: Cross-border credit time series



(a) Cross-border credit series by source (2018Q1=100)



(b) Trade credit by firms' exposure (2018Q1=100)

Notes: In this figure, Panel (a) illustrates the time series of log changes in aggregate trade credit and cross-border bank credit vis-á-vis 2018Q1 for the universe of firms in the sample. Panel (b) reports the log change in aggregate trade credit for the groups of exposed vs. non-exposed firms, as defined by Eq. 3. The vertical lines is set at 2018Q1, the quarter in which newly-imposed tariffs start being in implemented in the US

estimating the effect on credit volumes and interest rates for domestic bank credit (Table 6). We find that exposed firms receive, on average, loans that are 7 percentage points (pp) larger (Col. 2) after 2018Q1 compared to non-exposed firms. In line with the notion that exposed firms are able to secure favorable lending terms from specific lenders, we find that interest rates for these firms are lower by approximately 54 basis points (bps) compared to other firms in the post period(Col. 4). These results suggest that domestic bank credit conditions improve significantly for exposed firms even as their credit demand increases. We recall that

Table 7: Effect of firms' exposure to trade tensions on local credit in FX

Dependent variable:	Log (Credit, COP)		Interest rate (%)		Log (Maturity, years)	
	(1)	(2)	(3)	(4)	(5)	(6)
Post x Exposure_f	0.026**	0.029**	0.731***	0.826**	0.112***	0.123***
	(0.014)	(0.013)	(0.022)	(0.023)	(0.012)	(0.015)
N	36517	36517	36517	36517	36517	36517
R2	0.65	0.67	0.71	0.72	0.67	0.69
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-lender FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-time FE	No	Yes	No	Yes	No	Yes
Lender-time FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports the results of estimating Eq. 5 for local credit in foreign currency. We estimate the effect of firms' exposure to trade tensions on the log of credit volumes, interest rates (in pp), and log of maturity (years). The estimations are based on loan-level data for the period between 2016 and 2019. Standard errors (in parentheses) are clustered at the firm level. *** p<0.01, ** p<0.05, * p<0.1. Variables' definitions are reported in Table A.1.

these findings survive regardless of the inclusion of lender-time (Col. 1) and industry-time (Col. 2) fixed effects. Thus, improved credit conditions should not be attributed to unobserved macro or industry-specific shocks; neither should the results be attributed to an endogenous match between banks and exposed firms or to an overall increase in credit volumes by a given bank. In Table 7, we find that the amount of foreign currency loans granted by local banks increased for exposed firms after 2018Q1 compared to non-exposed firms. The loan maturity was also larger while loan rates increased more for those firms. This result could confirm the increased need for external financing by exposed firms to finance additional exports as a result of trade tensions.

In Table 8, we report the results on the role of cross-border bank credit. We find that credit volumes decrease by more for exposed firms after 2018Q1 vis-á-vis non-exposed firms. To shed light on this result, we extend Eq. 5 by adding a triple interaction term that identifies whether the lending bank is based in the US. Across specifications, we find that the reduction in cross-border credit is particularly acute for loans originated in the United States. This

Table 8: Effect of firms' exposure to trade tensions on cross border bank credit: The role of US banks

Dependent variable:	Log (Credit, USD)		Interest rate (%)		Log (Maturity, years)	
	(1)	(2)	(3)	(4)	(5)	(6)
Post x Exposure_f	-0.123***	-0.114***	0.191***	0.184***	-0.062	-0.073
	(0.034)	(0.036)	(0.041)	(0.047)	(0.052)	(0.055)
Post x Exposure_f x US Lender		-0.067**		0.085**		-0.024***
		(0.029)		(0.041)		(0.010)
N	13860	13860	13860	13860	13860	13860
R2	0.68	0.70	0.81	0.83	0.72	0.73
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Lender FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Time FE	No	Yes	No	Yes	No	Yes
Lender-Time FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports the results of estimating Eq. 5 for local credit in foreign currency. We estimate the effect of firms' exposure to trade tensions on the log of credit volumes, interest rates (in pp), and log of maturity (years). The estimations are based on loan-level data for the period between 2016 and 2019. Standard errors (in parentheses) are clustered at the firm level. *** p<0.01, ** p<0.05, * p<0.1. Variables' definitions are reported in Table A.1.

result is accompanied by an increase in interest rates for those banks. The fact that exposed firms observe a decrease in cross-border credit – particularly from the US – may reflect an overall decrease in credit by US banks exposed to trade tensions (see, e.g., Correa et al., 2023). These credit restrictions affects exposed firms the most, and could be potentially explained by the fact that these firms had, ex-ante, a larger initial value of cross-border bank liabilities.

Lastly, we turn our attention to the role of firm-to-firm cross-border trade credit. The results are reported in tables 9 to 11. In Table 9, we focus on all trade credit from unrelated non-financial firms for all purposes. We find that firms exposed to trade tensions benefit from significantly larger firm-to-firm credit volumes, lower interest rates, and larger maturity after 2018Q1, compared to non-exposed firms. On average, trade credit is approximately 14 pp larger for exposed firms after the cutoff date (Col. 2). At the same time, we observe that the interest rates on trade credit was lower by 17 bps in the post for exposed firms, and the maturity increased by less then a month. The effects are slightly larger when the credit is

Table 9: Effect of firms' exposure to trade tensions on cross border trade credit

Dependent variable:	Log (Credit, USD)		Interest rate (%)		Log (Maturity, years)	
	(1)	(2)	(3)	(4)	(5)	(6)
Post x Exposure_f	0.132***	0.144***	-0.151***	-0.168**	0.032***	0.039***
	(0.039)	(0.034)	(0.029)	(0.024)	(0.009)	(0.008)
Post x Exposure_f x US Lender		0.015**		-0.022***		0.009**
		(0.008)		(0.007)		(0.004)
N	45090	45090	45090	45090	45090	45090
R2	0.75	0.76	0.63	0.65	0.71	0.72
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-lender FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-time FE	No	Yes	No	Yes	No	Yes
Lender-time FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports the results of estimating Eq. 5 for cross border trade credit. We estimate the effect of firms' exposure to trade tensions on the log of credit volumes, interest rates (in pp), and log of maturity (years). The estimations are based on loan-level data for the period between 2016 and 2019. Standard errors (in parentheses) are clustered at the firm level. *** p<0.01, ** p<0.05, * p<0.1. Variables' definitions are reported in Table A.1.

granted by non-financial firms located in the US, suggesting that trade credit operates as stabilizer of supply chains in times of trade tensions. The effects of trade credit are stronger in the segment of cross-border trade credit for exports (see Table 10), confirming the increasing need for financing to increase exports by affected firms during the US-China trade tensions. On average, trade credit for exports is approximately 25 pp larger for exposed firms after the cutoff date (Col. 2). At the same time, we observe that the interest rates on trade credit decrease in the post-period, albeit the magnitude is relatively small. An important effect is observed in loan maturity. After 2018Q1, exposed firms obtained loans from their trade partners at a maturity of close to a month longer than non-exposed firms (Col. 6). The effects on credit terms in the segment of cross-border trade credit for working capital are presented in Table 11. The results are consistent, both in significant and magnitudes, to those observed for trade credit supplied for exporting purposes.

In line with previous evidence highlighting the stabilizing role of trade credit in a domestic context(see, e.g., Hardy et al., 2023), our results suggest that cross-border firm-to-

Table 10: Effect of firms' exposure to trade tensions on cross border trade credit for exports

Dependent variable:	Log (Credit, USD)		Interest rate (%)		Log (Maturity, years)	
	(1)	(2)	(3)	(4)	(5)	(6)
Post x Exposure_f	0.241***	0.252***	-0.068*	-0.077**	0.042***	0.044***
	(0.052)	(0.051)	(0.035)	(0.038)	(0.012)	(0.018)
N	3810	3810	3810	3810	3810	3810
R2	0.71	0.73	0.69	0.68	0.74	0.75
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-lender FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-time FE	No	Yes	No	Yes	No	Yes
Lender-time FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports the results of estimating Eq. 5 for cross border trade credit for exports. We estimate the effect of firms' exposure to trade tensions on the log of credit volumes, interest rates (in pp), and log of maturity (years). The estimations are based on loan-level data for the period between 2016 and 2019. Standard errors (in parentheses) are clustered at the firm level. *** p<0.01, ** p<0.05, * p<0.1. Variables' definitions are reported in Table A.1.

Table 11: Effect of firms' exposure to trade tensions on cross border trade credit for working capital

Dependent variable:	Log (Credit, USD)		Interest rate (%)		Log (Maturity, years)	
	(1)	(2)	(3)	(4)	(5)	(6)
Post x Exposure_f	0.191***	0.186***	-0.251***	-0.294***	0.042***	0.051**
	(0.036)	(0.039)	(0.032)	(0.027)	(0.019)	(0.025)
N	27220	27220	27220	27220	27220	27220
R2	0.73	0.74	0.69	0.68	0.73	0.74
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-lender FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-time FE	No	Yes	No	Yes	No	Yes
Lender-time FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports the results of estimating Eq. 5 for cross border trade credit for working capital. We estimate the effect of firms' exposure to trade tensions on the log of credit volumes, interest rates (in pp), and log of maturity (years). The estimations are based on loan-level data for the period between 2016 and 2019. Standard errors (in parentheses) are clustered at the firm level. *** p<0.01, ** p<0.05, * p<0.1. Variables' definitions are reported in Table A.1.

firm financing is an important source of funds for firms seeking to expand their production when faced with demand shocks. This may be a favored financing source, because informational asymmetries between borrowers and lenders could be lower due to the lenders knowledge of the borrowing firm and the segment in which it operates. This provides the lender with additional information to determine the creditworthiness of the borrowing firm. In addition, given the potential role of the lender in the same sector of the borrower, it could potentially exert credible threats to reduce its commercial interactions with the borrower in case the latter defaults on its obligations.

Better prospects for exposed borrowing firms coupled with limited asymmetric information between the preferred lenders and these borrowers are manifested in lower borrowing costs – both for domestic bank credit and cross-border trade credit –, which enable these firms to invest more and exploit the export opportunities arising from trade tensions. These implications suggest that while trade tensions may disrupt traditional trade patterns and relationships, they also prompt adjustments in financial interactions among firms. Exposed firms seem to adapt by leveraging increased trade credit availability and benefiting from favorable financing terms. This highlights the complex and multifaceted nature of responses to trade tensions in that particular business environment.

5 Conclusion

Recent periods of heightened geopolitical risks have received increasing attention given their widespread implications for both affected and bystander countries. These episodes raise questions about the resilience of global supply chains and about global firms' capacity to reconfigure their supplies by shifting their demand for production inputs across jurisdictions. While mounting evidence suggests that recent geopolitical tensions have had material implications for the geographical distribution of production networks worldwide, any policy guidance to grasp the benefits and mitigate the costs of supply chain reallocation requires

understanding the mechanisms that drive these changing trade patterns.

In this paper, we advance this understanding by evaluating the impact of supply chains' reallocation to bystander countries on cross-border financing flows in the context of the 2018-2019 US-China trade tensions. We use novel data for Colombia – a bystander country for which these geopolitical risks arise exogenously — linking exporting firms' outcomes at the product-destination country level with repositories on firms' access to both domestic and cross-border credit. Most importantly, we consider the role of firm-to-firm cross-border financing via trade credit and ask whether firms abroad engage in the cross-border financing of new global supply chains.

Our main results are twofold. First, we document a significant increase in the export of products affected by US-imposed tariffs, particularly when the US is the destination country. Notably, this result arises when comparing export flows across products and within firms, controlling for several confounders. While this effect is stronger for intermediate goods, we find similar results when considering the effect of Chinese retaliatory tariffs on exports to China. Second, we document evidence supporting the notion that affected firms resort to firm-to-firm cross-border financing to adjust their production and participate in the reallocation of supply chains. Loan-level results illustrate an increase in the demand for both domestic and cross-border credit by Colombian firms with a large pre-determined exposure to trade tensions. This increase is larger for cross-border trade credit, a dynamic that unveils a shift in exporting firms' financing from bank-based to firm-to-firm credit sources.

Our results reveal a novel angle on how international credit enables the reconfiguration of global supply chains, especially during periods marked by increased geopolitical risks. Our findings suggest that banks and businesses in jurisdictions facing trade limitations often provide financing to companies in other (bystander) countries. This result underscores the importance of initiatives aimed at improving regulations and enhancing transparency in cross-border transactions as a way to facilitate access to cross-border trade credit. Implementing

such measures could enhance the effectiveness and availability of international financing channels, ultimately bolstering the resilience of global supply chains.

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Online Appendix

Table A.1: **Variables definition**

Variable	Definition	Unit; Source
Trade variables:		
$Ln(Exp.value)$	Log of quarterly exports defined at the firm-product-destination country level. Exports are reported in FOB USD.	USD; DANE
$Ln(Exp.volume)$	Log of quarterly exports defined at the firm-product-destination country level. Exports are reported in tons.	Tons, DANE
US	Dummy variable equal to one for export entries with the US as the destination country and zero otherwise.	0–1, DANE
$China$	Dummy variable equal to one for export entries with China as the destination country and zero otherwise.	0–1, DANE
$Intermediate$	Dummy variable equal to one for export entries identified as intermediate goods. Final goods are labeled with a zero.	0–1; DANE
Exposure variables:		
$Exposure^{Total}$	Firm's f exposure to export goods subjected to US tariffs on China's products as measured by the firm's pre-determined value (FOB) of exports in affected goods' categories as a share of total exports in the period between 2017 and 2018 (see Eq. 2).	0–1; DANE
$Exposure^{US}$	Firm's f exposure to export goods subjected to US tariffs on China's products as measured by the firm's pre-determined value (FOB) of exports in affected goods' categories to the US as a share of total exports in the period between 2017 and 2018 (see Eq. 3).	0–1; DANE
$Exposure^{RoW}$	Firm's f exposure to export goods subjected to US tariffs on China's products as measured by the firm's pre-determined value (FOB) of exports in affected goods' categories to all countries excluding the US as a share of total exports in the period between 2017 and 2018. This variables is defined as $Exposure^{Total}$ - $Exposure^{US}$.	0–1; DANE

NOTES: This table provides a description of the main variables used for the empirical analysis reported in the paper. Sources are reported in parentheses. DANE stands for the National Administrative Department of Statistics of Colombia; BdR stands for the Central Bank of Colombia (Banco de la República); and SFC stands for the Colombian Financial Supervisory Authority (Superintendencia Financiera de Colombia).

Table A.1: **Variables definition (continued)**

Variable	Definition	Unit; Source
Tariffs variables:		
$Post$	Product-specific dummy variable equal to one for the quarters following the inclusion of a product category in US tariffs and zero otherwise.	0–1; USITC
$\Delta\tilde{\tau}$	Quarter-to-quarter change in a product's category US tariffs minus the minimum change in tariffs across all product categories.	Percent; USITC
Credit variables:		
$Ln(loans)$	Domestic bank loans between firm f and bank b aggregated at the quarterly frequency. Loan values are defined in Colombian Pesos (COP) and represent the universe of bank-firm loans granted during the sample period for firms with a balance sheet above COP 1,000 million in assets (aprox. 240,000 USD, as of January 2025).	COP; BdR, SFC
$Ln(XB\,loans)$	Cross-border bank loans between firm f and bank b originated in country c aggregated at the quarterly frequency. Loan values are defined in Colombian Pesos (COP) and represent the universe of bank-firm loans granted during the sample period for firms with a balance sheet above COP 1,000 million in assets (aprox. 240,000 USD, as of January 2025).	COP; BdR, SFC
$Ln(Trade\,Credit)$	Cross-border firm-to-firm trade credit loans between firm f and customer firms located in country c. Loan values are defined in Colombian Pesos (COP) and represent the universe of bank-firm loans granted during the sample period for firms with a balance sheet above COP 1,000 million in assets (aprox. 240,000 USD, as of January 2025).	COP; BdR, SFC
Interest rate	Loan-level interest rate by credit segment. Interest rates for cross-border bank credit (Cross-border rate) and trade credit (Trade-credit rate) are defined as the spread between loan-level interest rates and a benchmark interest rate.	Rates; BdR, SFC

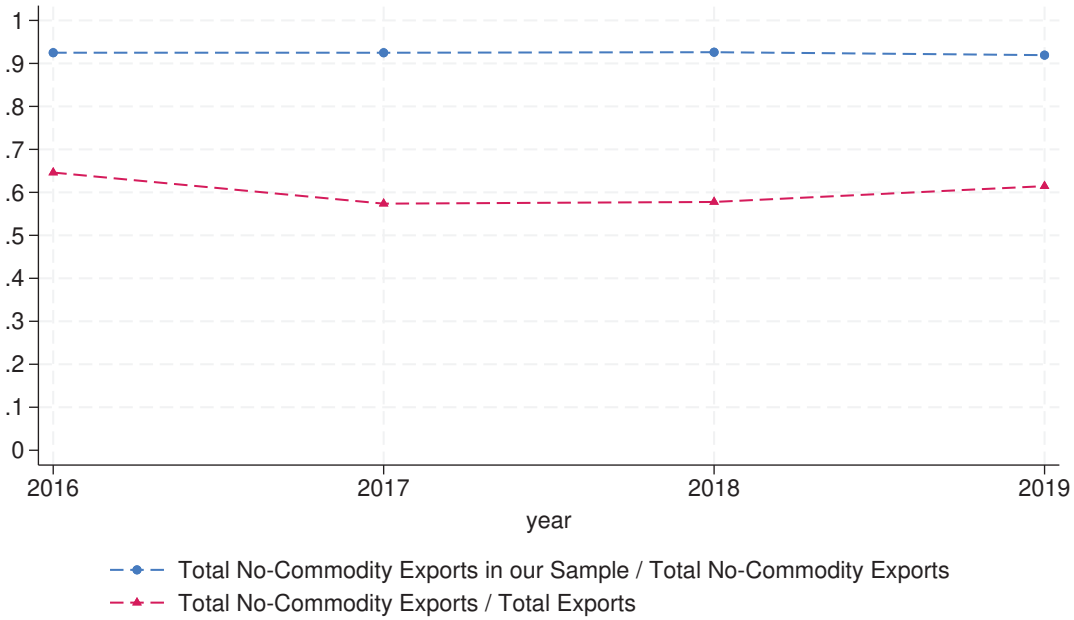
NOTES: This table provides a description of the main variables used for the empirical analysis reported in the paper. Sources are reported in parentheses. DANE stands for the National Administrative Department of Statistics of Colombia; BdR stands for the Central Bank of Colombia (Banco de la República); and SFC stands for the Colombian Financial Supervisory Authority (Superintendencia Financiera de Colombia).

Table A.2: Product-level effect of Chinese tariffs on Colombian exports

	(1)	(2)	(3)	(4)	(5)	(6)
	Ln(Exp. value, fob)			Ln(Exp. volume, tons.)		
$PostRet * China$	0.284***	0.464***	0.485***	0.241**	0.195	0.267**
	(0.0457)	(0.167)	(0.0815)	(0.113)	(0.141)	(0.118)
$PostRet * China * \Delta\tilde{\tau}^{ret}$		-1.835			0.0853	
		(1.331)			(0.849)	
$PostRet * China * Intermediate$			-0.394***			-0.0511
			(0.0817)			(0.0654)
Firm*Product*Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm*Product*Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country*Time FE	Yes	Yes	Yes	Yes	Yes	Yes
N	556311	481335	556311	556311	481335	556311
R^2	0.891	0.901	0.891	0.889	0.895	0.889

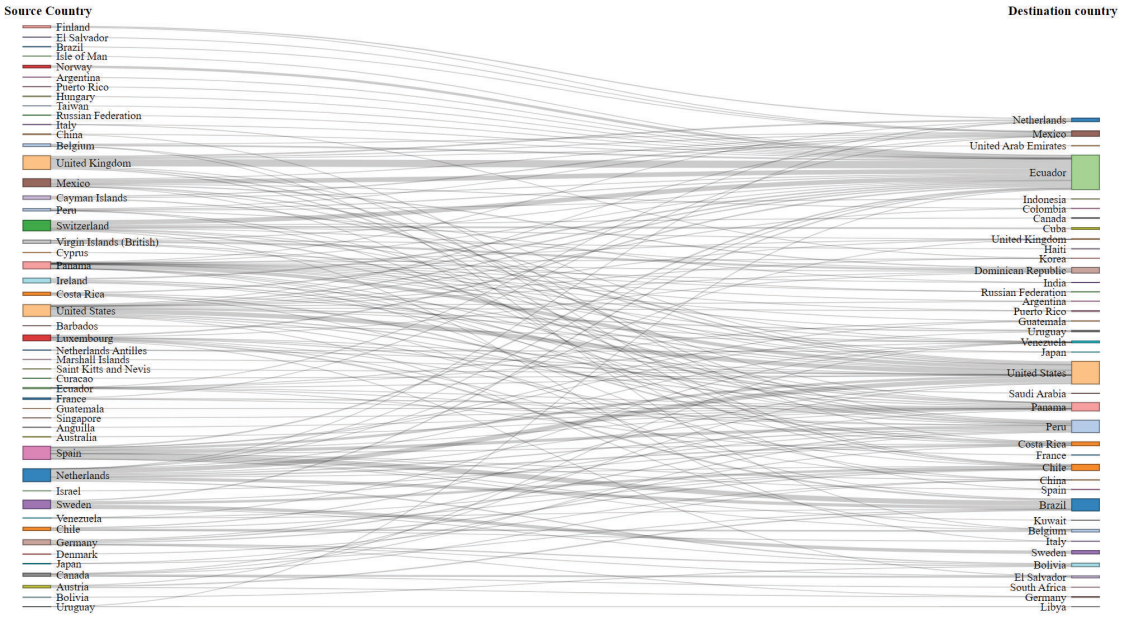
Notes: This table reports the results of estimating Eq. 1. The table shows results with the dependent variable defined as the log of the value of exports (cols. 1 to 3) or as the log of the volume of exports in tons. (cols. 4 to 6). The variable $\Delta\tilde{\tau}$ measures the quarterly change in a product-specific tariff minus the minimum change across product categories. The variable *Intermediate* represents a dummy equal to one if a product is labeled as an intermediate good and zero otherwise. All constitutive terms of the interaction terms are included as individual variables but excluded when subsumed by the fixed effects structure. All specifications include a complete set of fixed effects specified in Eq. 1: firm, product, country; firm, product, quarter; and country, quarter. Standard errors (in parentheses) are double clustered at the product and country levels. The sample period spans from 2016Q1 through 2019Q4 with the variable *Post* identifying the quarters after 2018Q1. *** p<0.01, ** p<0.05, * p<0.1.

Figure A.1: Coverage of aggregate exports by our estimation sample



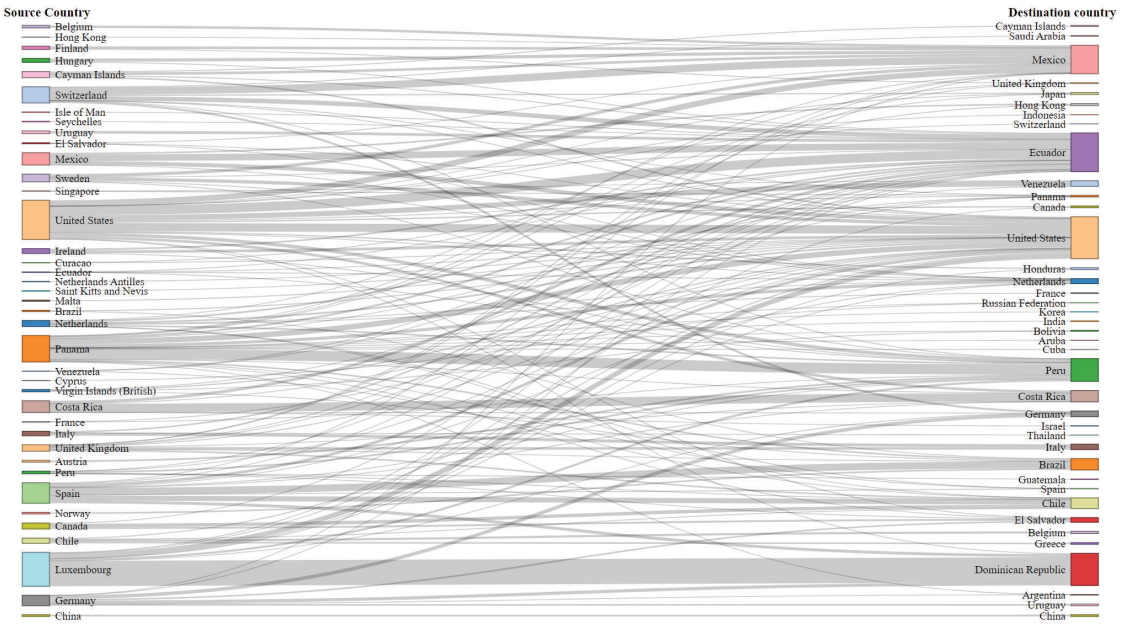
Notes: This figure shows the share of aggregate exports covered by our sample. The blue line connected by circles represents the ratio between the total value of no-commodity exports in our estimation sample and the total aggregate value of no-commodity exports. The red line connected by triangles shows the ratio between the total aggregate value of no-commodity exports and the total aggregate value of exports across all products (i.e., including commodities). Commodities denote oil, metals and minerals.

Figure A.2: Cross border trade credit for working capital and destination of exports (2017Q4)



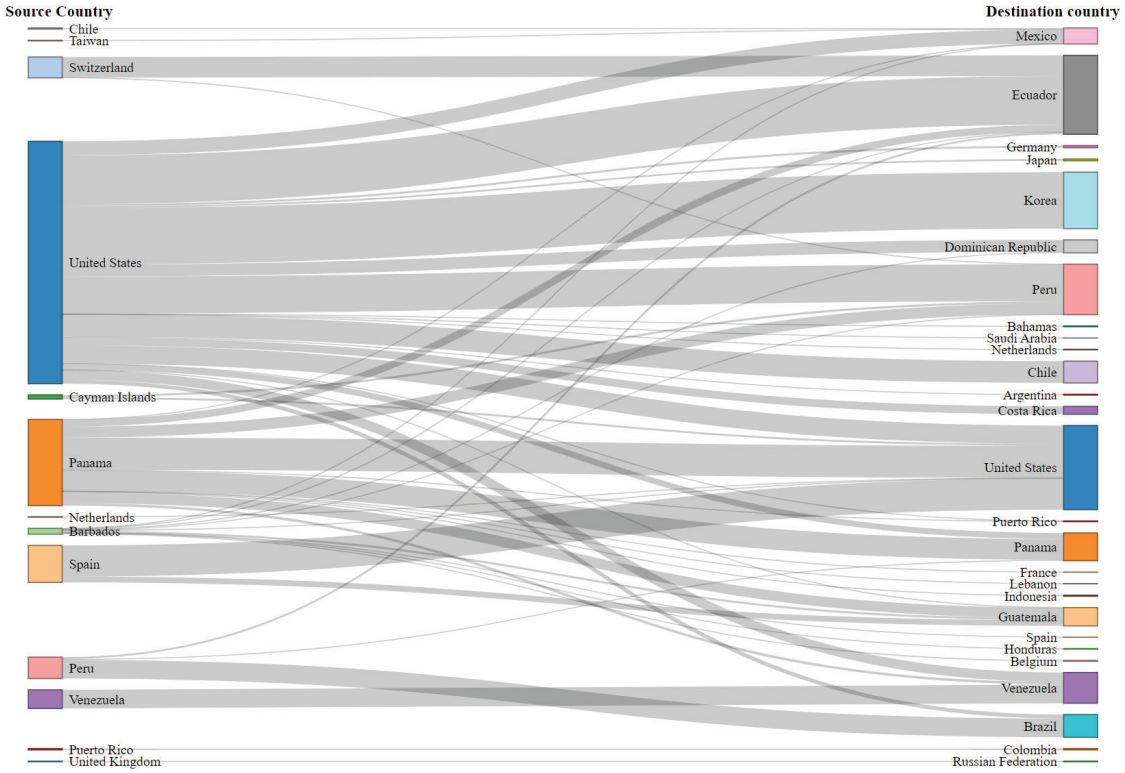
Notes: This figure shows the relationship between the main source of cross-border trade credit for working capital (country of origin, left axis) and the main export destination of firms (right axis) for 2017Q4 (ex-ante). Firms are grouped by source of financing and export destination, that is, the amounts of credit received by firms with the same source and the same export destination are grouped in this relationship. The figure shows the grouped amounts of the relationship on the financing side (in USD millions). It shows the intensity of the relationship between external financing and export destination.

Figure A.3: Cross border trade credit for working capital and destination of exports (2019Q4)



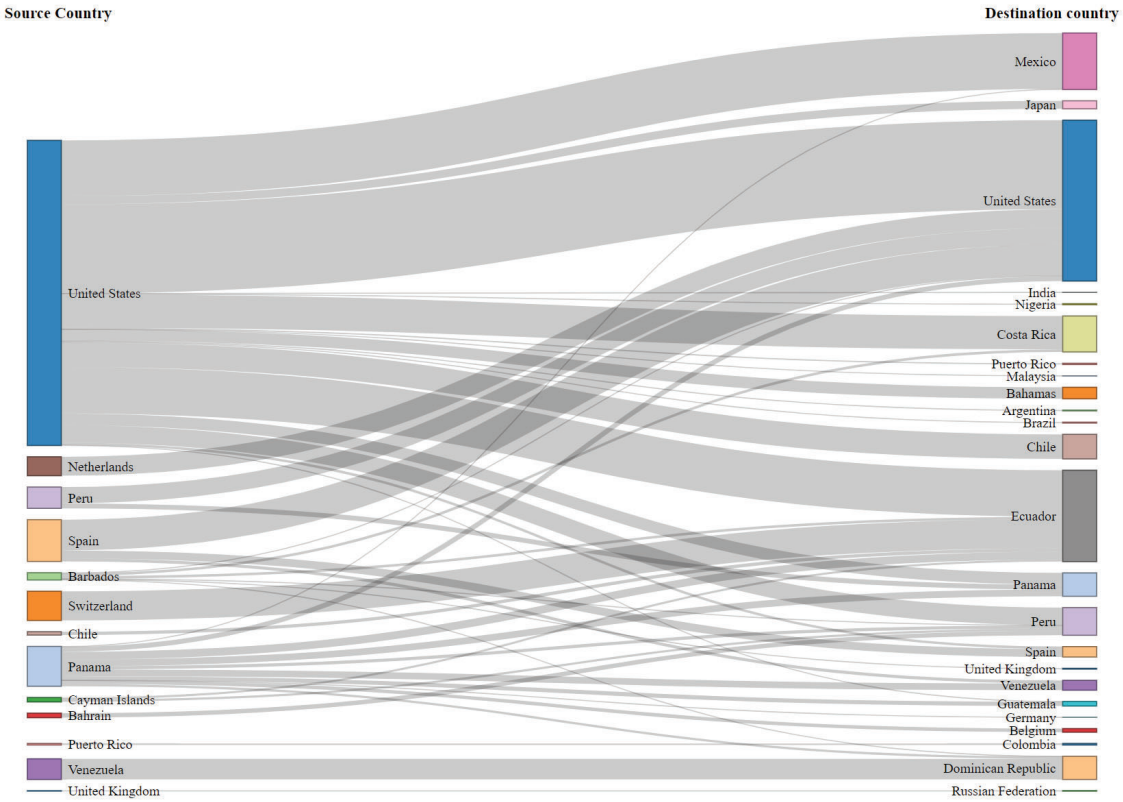
Notes: This figure shows the relationship between the main source of cross-border trade credit for working capital (country of origin, left axis) and the main export destination of firms (right axis) for 2019Q4 (ex-ante). Firms are grouped by source of financing and export destination, that is, the amounts of credit received by firms with the same source and the same export destination are grouped in this relationship. The figure shows the grouped amounts of the relationship on the financing side (in USD millions). It shows the intensity of the relationship between external financing and export destination.

Figure A.4: Cross border bank credit for working capital and destination of exports (2017Q4)



Notes: This figure shows the relationship between the main source of cross-border bank credit for working capital (country of origin, left axis) and the main export destination of firms (right axis) for 2017Q4 (ex-ante). Firms are grouped by source of financing and export destination, that is, the amounts of credit received by firms with the same source and the same export destination are grouped in this relationship. The figure shows the grouped amounts of the relationship on the financing side (in USD millions). It shows the intensity of the relationship between external financing and export destination.

Figure A.5: Cross border bank credit for working capital and destination of exports (2019Q4)



Notes: This figure shows the relationship between the main source of cross-border bank credit for working capital (country of origin, left axis) and the main export destination of firms (right axis) for 2019Q4 (ex-ante). Firms are grouped by source of financing and export destination, that is, the amounts of credit received by firms with the same source and the same export destination are grouped in this relationship. The figure shows the grouped amounts of the relationship on the financing side (in USD millions). It shows the intensity of the relationship between external financing and export destination.