The Trade Channel of Macroprudential Policies: Evidence from Spain's Export and Import Partners*

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Abstract

We exploit a one-time, unexpected increase in loan provisions in Spain to study the impact of macroprudential policies on international trade. Using data from the Spanish credit register matched with firm-level customs records from 2009 to 2013, we find that Spanish importers and exporters relying on banks most affected by the policy faced significant reductions in credit supply. These firms subsequently experienced a substantial contraction in trade flows. By leveraging bilateral trade data at the country and 2-digit product level, we further show that overall Spanish imports decreased following the policy, which indicates limited trade reallocation across domestic firms. The decline in Spain's demand for imported goods led to a contraction in the total exports of Spain's main trading partners.

Keywords: Macroprudential policies, regulatory spillovers, international trade.
JEL Codes: F14, F36, F42, G21, G28.

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1 Introduction

Following the Global Financial Crisis, there has been a broad international consensus on the need for macroprudential policies to enhance financial stability and mitigate systemic risk. For example, in the EU banking sector, the Capital Requirements Directive and Regulation (CRD/CRR) have led to higher capital requirements, improved capital quality, and increased liquidity buffers over the past decade. Moreover, during the COVID-19 crisis, many countries released countercyclical capital buffers (CCyB) to support lending, and these buffers have recently entered their accumulation phase. Despite the widespread adoption of prudential instruments globally and a substantial body of literature documenting their effectiveness in mitigating vulnerabilities, potentially unintended effects, such as cross-border spillovers, remain partially understood.[1]

This paper provides novel evidence of an international trade channel through which macroprudential policy spillovers occur. A priori, it is not clear whether macroprudential regulations can spill over through international trade flows. On the one hand, tighter credit conditions may have a greater impact on firms engaged in international trade than on those focused on the domestic market due to higher working capital requirements and higher default risk associated with international trade (e.g., Amiti and Weinstein (2011)). On the other hand, firms engaged in international trade are typically larger (e.g., Eaton et al. (2011)) and may have access to multiple sources of external financing. As a result, the impact of domestic banking regulations on international trade activities is uncertain. Furthermore, even if firms engaged in international trade are affected by domestic macroprudential regulations, foreign countries might be able to substitute sales across markets (Almunia et al. (2021)). For instance, a reduction in Spanish demand for Brazilian products could be offset by higher sales of Brazilian companies to France. Therefore, whether domestic bank regulations, such as macroprudential policies, spill over to other countries through international trade flows remains an empirical question.

To investigate this, we exploit the sudden and unexpected increase in loan loss provisions for

[1] See, for example, Araujo et al. (2020) for a meta-analysis of the empirical literature on macroprudential policy.

the construction and real estate sectors in Spain in 2012 (Jiménez et al., 2017; Tripathy, 2020). By leveraging granular credit registry data from Spain, which includes almost the entire universe of exporters and importers, along with firm-level customs data, and combining it with cross-country trade flow information, we estimate the impact of macroprudential regulation on the following outcomes: (1) credit supply to firms engaged in international trade; (2) import demand and export supply of Spanish firms; and (3) total Spanish imports and foreign countries' international sales.

Our analysis follows a multi-step approach. First, using data from the Spanish Central Credit Register (CIR), we extend the findings of Jiménez et al. (2017) by showing that firms involved in international trade also face tighter lending standards due to the increase in provisions to their banks. Specifically, we construct a measure of bank-level exposure to the policy, defined as the share of a bank's outstanding debt in the construction and real estate industries. Next, employing a difference-in-differences approach, in line with Khwaja and Mian (2008), we estimate the bank lending channel associated with the policy by comparing the outstanding debt of firms with highly treated banks relative to those with less treated banks, before and after the policy, while accounting for firm-level credit demand shocks. Our results in this first stage are statistically significant and show that a one standard deviation increase in bank exposure reduces credit supply to firms engaged in international trade by 2.6% compared to other banks lending to the same firm. A similar effect is observed when credit supply to exporters and importers is analyzed separately (2.8% and 2.4%, respectively).

To account for the possibility that importers or exporters might exploit their larger number of banking relationships and substitute credit from highly exposed banks with that from less exposed banks, we estimate the effect of bank loan loss provisions on firm's total debt. To this end, we construct a firm-level measure of exposure that equals the weighted average bank exposure, with weights defined by the share of banks in the firm's total debt. The main challenge of this identification approach is to account for time-varying demand shocks. To address this, we add firm-cluster fixed effects based on the firm's size, province, and industry (Degryse et al., 2019).

Again, our results are statistically significant. We find that a one standard deviation increase in the firm's exposure to the policy would have decreased its total bank debt by approximately 2.2% compared to firms within the same cluster. This effect is 2.5% for exporters and 2.7% for importers, respectively. Thus, our results indicate that credit substitution is limited, and lending relationships actually matter for the transmission of bank-level shocks on exporters and importers' total debt.

In the second step, we combine CIR data with Spanish customs records –available at the firm, 2-digit harmonized system (HS) product code, country, and year levels– and estimate the impact of the policy on firm-level trade outcomes. We compare the evolution of total exports and imports of highly exposed firms relative to less exposed ones, before and after the policy. As in the previous step, we use a difference-in-differences approach and a firm-level measure of exposure to the policy. We exploit the granularity of our customs data to include a battery of fixed effects following Paravisini et al. (2015). We add firm-country-product fixed effects to account for time-invariant factors such as a firm's knowledge of a particular product-market, as well as country-product-time effects, to capture supply shocks at the country of origin (when the Spanish firm is an importer) and demand shocks at the destination country (when the Spanish firm is an exporter). Again, to control for variations in the local demand (supply) of imported (exported) goods, we add province-industry-time fixed effects. We find a significant impact of the increase in loan loss provisions on trade flows of Spanish firms. In particular, a one standard deviation increase in the exposure of a firm to the policy would have resulted in an 8.3% decrease in imports and a 4.3% decrease in exports. Moreover, our results are also significant at the extensive margin, indicating that firms that were one standard deviation more exposed to the policy were 1.8% and 2.9% more likely to exit exporting and importing markets, respectively. Additionally, more exposed importers were 1.5% less likely to enter new markets after the policy implementation. Thus, our results are consistent with a trade finance channel through which domestic bank shocks affect the purchases and sales of goods by domestic exporters and importers in foreign markets (Amiti and Weinstein (2011), Paravisini et al. (2015), Xu (2022), Kabir et al. (2024).).

Third, we focus our analysis on Spanish importers and study the extent of import reallocation across Spanish firms and, then, across Spain's trade partners. Since the decline in trade flows of highly exposed firms can be offset by less exposed firms taking over their market share, it is not obvious that our firm-level results imply that overall Spanish trade flows decrease in response to the policy. Moreover, even if this was the case, Spain's trade partners could find alternative destinations for their exports, remaining unaffected by the Spanish shock. In this step, we account for these general equilibrium forces using BACI data, which includes trade flows by country of origin, destination, and 2-digit product level.

We construct a measure of exposure to the policy at the product level that depends on how reliant Spanish importers of a particular product are on funding obtained from exposed banks. That is, if Spanish importers of textiles depend heavily on financing from highly exposed banks, then textile products are highly exposed to the macroprudential regulation. First, we propose a difference-in-differences specification and compare the evolution of Spain's total imports of highly exposed products relative to less exposed ones, before and after the policy implementation. Our identifying assumption is that, in the absence of the policy, Spanish imports of highly exposed goods would have evolved similarly to less exposed goods. The main concern with this assumption is that our estimation can be biased if, around the policy announcement, differently exposed products are subject to different shocks. To address this concern, we propose a triple difference-in-differences approach in which we compare the evolution of Spanish imports of differently exposed goods to the imports of a set of comparable countries in the spirit of Autor et al. (2013). By exploiting this additional dimension, we can saturate our specification with product-time fixed effects, accounting for any unobserved time-varying shock at the product level. We also account for any shock taking place at the destination level.

Our results show that there is limited reallocation of imports across Spanish firms. We find that a one standard deviation higher product exposure is associated with a statistically significant 0.9% decline in Spanish imports, relative to other comparable countries' imports of the same products

after the policy implementation.

Next, we study whether Spain's trade partners can reallocate the decline in their exports to Spain towards other countries. To do so, we proceed in two steps. First, using BACI data, we build a panel of exports by country of origin, destination, and product, and corroborate our previous results. That is, we use a triple difference-in-differences specification as before, and estimate the impact of product-level exposure on countries' exports of highly exposed products to Spain, relative to less exposed goods, and relative to exports of the same products to a comparable set of countries. This specification allows us to include time-varying fixed effects at the product and origin levels, as well as time-invariant product, origin, and destination fixed effects. We find that countries reduce their exports of highly exposed products to Spain relative to other comparable destinations after the policy implementation. One standard deviation higher product exposure is associated with a statistically significant 0.3% decline in exports to Spain, relative to exports to comparable countries.

Second, we aggregate our panel of exports at the country of origin and product level, and explore whether countries can insulate from the contraction of Spanish imports by reallocating sales towards other destinations. Using a difference-in-differences specification, we compare countries' total exports of highly exposed products relative to less exposed ones before and after the policy implementation. We find that one standard deviation higher product exposure is associated with a decline of 0.1% in countries' exports.

Again, the validity of our identification strategy relies on the assumption that, absent the policy, exports of highly exposed goods should have followed similar trends than less exposed ones. Since we are interested in the aggregate impact of the policy on countries' exports of goods, we cannot include time-varying product-specific fixed effects. Thus, we provide evidence supporting our identification as follows. We split our sample of country-product pairs into two groups based on whether or not Spain is a relevant buyer. Under our identifying assumption, product exposure should have null effects on exports of country-product cells where Spanish imports are insignificantly small. Consistent with this argument, we find that a one standard deviation higher product exposure to

the policy leads to a 2% decline in countries' exports where Spain is a relevant importer. Meanwhile, in the sample of countries where Spain is a small buyer, we find zero effects of our measure of product exposure to the policy.

Overall, our results provide consistent evidence of the presence of an international trade channel for the transmission of macroprudential regulations. These findings have important policy implications, emphasizing the need for communication and coordination across jurisdictions, as well as encouraging the close monitoring of prudential policy developments of a country's main trading partners, beyond those with direct financial connections.

Contribution to the literature. This paper primarily contributes to the literature on the cross-border transmission of financial shocks. Conventional channels in the literature emphasize asset prices and portfolio effects as key mechanisms for transmitting financial shocks through capital flows, especially in globally integrated financial markets. A second potential channel of propagation of financial shocks is through trade linkages. By constraining banks' lending capacity, financial shocks can lead to a decline in domestic demand, which may then spread across borders through shifts in trade flows (see Agénor and Pereira (2022) for a review of these channels). Our main contribution is to provide empirical evidence of this trade channel and its cross-border impact on trade partners.

The literature on the cross-border effects of bank capital regulation primarily provides evidence on the first transmission channel and its associated welfare effects. From a theoretical standpoint, much of the research focuses on understanding the international spillovers of changes in capital requirements and macroprudential policies on cross-border capital flows (Bahaj and Malherbe, 2024), as well as the strategic interactions between national regulators and the potential welfare gains from cooperation (Korinek, 2017; Faia and Weder di Mauro, 2016; Bolton and Oehmke, 2018; Segura and Vicente, 2019). Empirically, most of the evidence documenting the cross-border effects of bank capital regulation focuses on global banks or subsidiaries of foreign banks using either aggregate country-level credit data or bank-level data (Buch and Goldberg, 2017; Aiyar et al.,

2014; Reinhardt and Sowerbutts, 2015). In this context, the work most closely related to ours is Tripathy (2020), which uses micro-level data on household credit in Mexico to examine whether Mexican subsidiaries of Spanish banks transmit macroprudential regulations from Spain to domestic lending conditions, and ultimately, to economic activity in non-tradable sectors. While they focus on the same regulatory episode we study (Jiménez et al., 2017), their analysis does not address a potential transmission channel through bilateral trade linkages. Their transmission channel relies entirely on the presence of Spanish subsidiaries abroad.

Our paper also contributes to the literature examining the impact of global macroeconomic shocks on tradable firms in foreign countries via their domestic banking system. For instance, through capital flow reversals (Paravisini et al., 2015), multinational banks (Xu, 2022) or correspondent banks that facilitate trade (Borchert et al., 2023).

Our approach is more general, documenting a transmission channel for a domestic financial shock through trade linkages, regardless of the presence of global banks, multinationals, or subsidiaries. In the first stage, our findings align with the well-documented literature on the role of banks in providing debt funding that facilitates trade (Niepmann and Schmidt-Eisenlohr (2017); Ahn and Sarmiento (2019); Amiti and Weinstein (2011); Chor and Manova (2012); Manova (2013); Del Prete and Federico (2014); Paravisini et al. (2015); Demir et al. (2017); Dogan and Hjortso (2024); Kabir et al. (2024)).

However, we go a step further by not only showing that macroprudential regulation affects the trade outcomes of Spanish firms but also documenting a limited reallocation of trade flows across Spanish firms and, depending on Spain's significance as a trade partner, a limited reallocation of exports by Spain's main trade partners. To our knowledge, this is the first paper to document such negative spillovers to countries that are not directly affected by the financial shock.

The rest of the paper is organized as follows: section 2 provides details of our policy experiment; section 3 describes our data; our empirical strategy and results are discussed in section 4; and finally, section 5 concludes.

2 Institutional background

2.1 The provisioning increase for construction and real estate lending

In 2012, the newly formed Spanish government implemented an increase in provisioning levels for exposures to the real estate and construction sectors, based on outstanding credit as of the end of 2011. This policy aimed to facilitate the cleansing of banks' balance sheets. The adjustment constituted a one-time, ad hoc increase in provisions, occurring in two distinct waves.

First, in February, banks were mandated to provision 7% for all performing loans related to construction and real estate. Then, in May, these provisioning levels were further adjusted based on the purpose of the loan: an additional 45% for land, 7% for completed real estate developments, and 22% for real estate projects still in progress. Provisions for non-performing loans (NPLs) in the construction and real estate sectors were also included. Banks were required to comply with these increased provisioning levels by the end of 2012.

The increase in provisioning levels represented a significant shock for Spanish banks. Notably, the impact of the global financial crisis had already depleted banks' provision buffers, limiting their ability to partially comply with the new policy by utilizing these reserves. Consequently, banks' provisions surged by approximately $85 billion, accounting for around 8.5% of Spain's GDP, as documented by Jiménez et al. (2017). This substantial increase adversely affected bank profitability in 2012, as these provisions were categorized as specific provisions.

Following Jiménez et al. (2017), we utilize the pre-policy bank-level exposure to construction and real estate firms as a measure of banks' exposure to the policy. The authors find that banks with greater exposure to the policy tightened their lending standards in the aftermath, negatively affecting the real outcomes of firms predominantly reliant on these banks for financing. In contrast, our analysis focuses on non-financial firms engaged in international trade, and study whether the policy impacted Spanish exports and imports and, through international trade linkages, generated cross-border effects. Importantly, for our identification strategy, the policy specifically targeted non-

tradable sectors such as the real estate and construction industries, which enhances the exogenous nature of the shock for firms engaged in international trade.

Among the 83 banking groups that provide loans to firms engaged in international trade, there are notable variations in their exposures to the construction and real estate sectors. Specifically, banks in the 25th percentile (p25), median (p50), and 75th percentile (p75) allocated 26.5%, 34.9%, and 47.0% of their total loans to the construction and real estate sectors, respectively, compared to their overall lending to non-financial corporations (see Panel C of Table 1).

3 Data

Our analysis combines a variety of databases: (i) the Spanish Central Credit Register (CIR), property of the Bank of Spain; (ii) Spain's balance of payments data, used for the construction of Bank of Spain's official statistics; (iii) supervisory bank balance sheets and income statements, available at the Bank of Spain; and (iv) international trade data from BACI, which contains the universe of bilateral trade flows at the country-product level.

Credit information comes from the CIR, which is an exhaustive database. It contains detailed information on any loan commitment above €6,000 granted to non-financial firms by any credit institution operating in Spain, such as the type of loan, drawn and undrawn amounts, collateral status, maturity, currency, past due status, the lender, and the borrower. The database also contains borrower-related information, such as the firm's industry and province. In addition, we can extend the CIR with customs data and supervisory bank balance sheets, thereby obtaining firms' import, export, and bank characteristics. This step allows us to focus solely on firms engaged in international trade. Furthermore, the CIR enables us to compute banks' exposure to the policy, measured as the ratio of lending to the construction and real estate industries over lending to the corporate sector as of the fourth quarter of 2011.

Utilizing the CIR, we compile comprehensive data on the credit exposure of all firms engaged in international trade and their respective banks. This dataset allows us to assess the impact of

the policy on bank credit supply to these firms. Specifically, we analyze whether banks with a higher share of construction and real estate loans reduced lending to exporters and importers more significantly than banks with a lower share. Furthermore, we study whether firms' total credit decreased more for firms whose lending came primordially from the most exposed banks. This analysis aims to determine if firms were unable to substitute credit from the most exposed banks with that from less exposed ones, thereby indicating potential real effects.

To analyze the impact on international trade, we integrate our customs database with firm's exposure to the policy, computed using the CIR. This unique administrative dataset, which encompasses Spanish imports and exports, is also used to construct the official Spanish Balance of Payments Statistics. For each importer or exporter, we observe the product code (based on the 2-digit Harmonized System Codes-HS), the country of origin or destination, and the transaction year. Our analysis employs data from 2009 to 2013, during which all transactions exceeding €50,000 had to be reported. Despite this threshold, the dataset offers excellent coverage relative to the official Spanish records; for further details, see Almunia et al. (2021) and Gutiérrez and Moral-Benito (2024). This firm-product-country-year dataset enables us to assess whether the increase in provisions affected the import and export growth of firms more dependent on exposed banks. Additionally, we evaluate whether Spanish total exports and imports in a particular market (2-digit product and country) decreased more if firms participating in that market were more reliant on financing from highly exposed banks.

Finally, we use international trade data from BACI (Gaulier and Zignago (2010)), which is an annual panel of bilateral trade flows at the origin-destination-product level. We focus on the period between 2009 and 2013 and define products at the HS-2 digit level to be consistent with our administrative data. Our data includes 96 different products and 223 countries. This dataset enables us to estimate the spillovers effects of macro-prudential policy through international trade linkages. To achieve so, we construct a measure of product exposure to the provisioning shift policy based on bank borrowers' trade flows and bank treatment. We then estimate the impact of our

product exposure on Spanish exports and imports, and its aggregate implications for Spain's main trade partners and competitors.

4 Empirical strategy and results

Our study centers on determining whether prudential policy adoptions in a country can have cross-border effects through international trade linkages, which can be empirically challenging. First, through deteriorating macroeconomic conditions, external conditions can lead to prudential policy interventions, making it harder to identify a causal effect of macroprudential policies. Second, there exist difficulties in isolating shocks occurring in destination and origin countries, such as demand shocks for imported goods or supply shocks for exported goods, which complicates disentangling these factors from the effect of the policy intervention.

Our identification strategy addresses these concerns by exploiting two key ingredients: (i) an unexpected macroprudential regulatory shock targeting non-tradable industries and (ii) a rich database that allows us to control for observed and unobserved shocks in the destination and origin countries for which Spanish firms export and import, respectively.

The prudential regulatory shock we analyze is the one-time sudden increase in construction and real estate credit provision rates in 2012. As explained in section 2, banks were required to temporally increase their provisions based on all their lending exposure to construction and real estate firms as of 2011q4. Importantly, as pointed out by Jiménez et al. (2017), the increase was relevant, unexpected, and a one-time raise for banks. Crucially, for our identification, this raise targeted a non-tradable sector in Spain, such as construction and real estate. Thus, our analyzed shock was fairly exogenous to the global economic cycle.

Additionally, we exploit the structure of our granular customs dataset for Spanish firms. In particular, we include a comprehensive set of time-invariant and time-varying fixed effects to disentangle our estimates from potential omitted factors as in Paravisini et al. (2015).

Our analysis proceeds in several steps. First, using bank-firm-level information, we analyze

whether more exposed banks reduced lending to export and import firms. Next, leveraging our firm-product-country-year dataset, we study the policy's effect on Spanish firms' imports and exports. Finally, using our country-product-year panel of trade flows, we estimate the effects of the policy shift in Spain on exports and imports of Spain's main trade partners and competitors.

4.1 Effect on credit supply to exporters and importers

The increase in provisions for the stock of construction and real estate loans as of 2011q4 aimed to favor the disposal of bad loans from balance sheets. As shown by Jiménez et al. (2017), banks that were more exposed to the policy reduced their lending supply compared to less exposed banks. Because it was not central to their analysis, the authors do not explore whether firms engaged in international trade faced tighter lending standards.

We begin our analysis by exploring whether banks reduced lending supply to firms engaged in international trade after the policy. In particular, we employ bank-firm credit data for these firms before and after the policy intervention and assess whether credit provided by more exposed banks grew at a slower pace or not. This dataset contains 149,371 observations from 83 banks lending to 32,967 exporting and importing firms.[2] Specifically, we estimate the following model:

$$\Delta y_{f,b} = \theta \times Exposure_b + controls_{b,f} + \alpha_f + \varepsilon_{f,b}, \tag{1}$$

where the dependent variable is the mid-point growth of credit granted by bank b to firm f between 2011 and 2012 (before and after the policy intervention).[3] The mid-point growth is computed as the year-to-year change in lending volume over the midpoint of lending between the two years, as in Cortés et al. (2020). *Exposure* is the exposure of bank b to the policy, which is measured as the ratio of construction and real estate lending over lending to the corporate sector of bank b as of the end of 2011. Furthermore, we add a set of bank and bank-firm controls measured with information

[2] We exclude importing and exporting firms in construction or real estate.
[3] When computing credit growth rates, we handle bank mergers between 2011 and 2012.

as of the end of 2011. In particular, bank characteristics include the logarithm of bank assets, ROA, NPL, liquidity, and capital ratios, and a dummy variable that indicates whether the bank is a rural bank; bank-firm characteristics contain the collateralization rate, the ratio of long-term lending, the share of firm's f NPLs with the bank, and the share of lending coming from bank b out of firm f's bank lending. Finally, we control for firm credit demand by adding firm fixed effects (Khwaja and Mian, 2008).[4] To aid in the interpretation of our coefficient of interest, θ, we standardized banks' exposure. Consequently, θ measures how a one standard deviation increase in bank's b dependence on the construction and real estate industries affects firm's f credit growth relative to its other lenders following the policy implementation.

Additionally, we measure the effect of the policy on firms' total debt. In particular, firms could have substituted credit from more affected towards less affected banks, lessening the impact of the policy on their total credit. However, if switching had been costly, the policy adoption could have impacted firms' total lending, opening the possibility for real effects. In fact, for the sample of Spanish firms with balance-sheet information, Jiménez et al. (2017) show that the policy had adverse real effects. Nonetheless, as importers and exporters were larger and had more lending relationships, they could have offset the impact of the policy on their total lending. We explore such possibility by estimating the next equation:

$$\Delta y_f = \theta \times Exposure_f + controls_f + \alpha_{c(f)} + \varepsilon_f, \tag{2}$$

where the left-hand side variable is the mid-point growth rate of total bank credit of firm f between 2011 and 2012. To calculate exposure to the policy at the firm level, we proceed to compute the average of the exposure of banks lending to firm f using as weights the outstanding credit as of the end of 2011 to firm f from each of its banks. We consider the same controls as in equation (1) by taking a weighted average using weights equal to the outstanding credit as of the end of

[4]Since firms engaged in international trade typically borrow from multiple banks, around a 30% of firms engaged in international trade borrowing from a bank in 2011 were with a single bank.

2011 of banks actively lending to firm f. Finally, to control for demand shocks, we add firm-cluster fixed effects, which we build by using the firm's size, province, and industry (Degryse et al., 2019). Therefore, θ measures the impact of the policy on firms' total debt. A negative and significant coefficient would suggest that firms engaged in international trade and more dependent on exposed banks were unable to mitigate the negative supply shock relative to firms operating within the same cluster.

[Table 2]

Columns (1) to (3) of Table 2 present the regression results for the model specified in equation (1). We conduct the regressions using the sample of exporters and importers in column (1), the sample of exporters in column (2), and the sample of importers in column (3). We additionally investigate whether more exposed banks were more likely to terminate the lending relationship in columns (4) to (6). To analyze this, we replace the dependent variable with a dummy variable, taking the value one if the lending relationship ended and zero otherwise.

Results show an economically meaningful impact of the policy on credit supply to exporters and importers. Our results indicate that a one standard deviation increase in bank exposure would have decreased credit supply to a firm engaged in international trade by 2,6% compared to other banks lending to the same firm, which was economically significant considering that the median mid-point credit growth was -6,6% (see Panel A of Table 1). Furthermore, when analyzed separately in columns (2) and (3), we observe a similar negative impact on credit supply to exporters and importers (2,8% and 2,4%, respectively). Finally, results in columns (4) to (6) suggest that the decrease in credit supply happened mainly at the intensive margin.

[Figure 1]

Additionally, Figure 1 provides supporting evidence that banks tightened their lending supply in response to the shift in provisions. Particularly, we estimate a modified version of specification

(1), where the dependent variable is the mid-growth rate of outstanding credit between each firm-bank pair between the respective quarter and 2011Q4. For reference, the estimated coefficient for 2012Q4 coincides with the estimated coefficient in column (1) of Table 2. The dashed lines represent the 5%-95% confidence interval, with standard errors double-clustered at the bank and firm levels. Notably, prior to the policy event, the most affected banks did not significantly reduce lending more than others. However, following the increase in provisioning, these banks significantly curtailed their credit supply.

[Table 3]

In Table 3, we present the results for equation (2) and assess whether firms could have smoothed the negative credit supply shock by borrowing from less affected banks. As before, we separate our results for three samples: exporters and importers (columns (1) and (2)), exporters (columns (3) and (4)), and importers (columns (5) and (6)). We add firm-cluster fixed effects in our regressions to better isolate demand shocks (columns (2), (4), and (6)). However, to avoid dropping many observations, we also consider province-industry fixed effects in columns (1), (3), and (5).

Results in Table 3 suggest that exporting and importing firms' total bank debt decreased as a result of the policy. In particular, column (2) indicates that a one standard deviation increase in the exposure of all banks lending to a firm would have decreased the firm's total bank debt in 2012 by approximately 2,2% compared to firms within the same cluster. Similarly, columns (4) and (6) report a decrease of 2,5% and 2,7% for exporters and importers, respectively. Our results that include firm-cluster fixed effects are similar to the ones that only include province-industry fixed effects (columns (1), (3), and (5)), suggesting that both forms of controlling for demand shocks are comparable. Furthermore, Figure 2 indicates that the decrease in firms' total bank debt was attributable to the increase in provisions. This is evidenced by the negative and significant effect observed only in 2012Q3 and 2012Q4, with no such effect occurring prior to these quarters.

[Figure 2]

Our results extend the findings in Jiménez et al. (2017). The authors find a general decline in credit to non-financial firms due to the implemented policy in 2012. We complement their findings by showing that Spanish firms engaged in international trade also faced tightened lending standards due to the provisioning increase in 2012. This led to an overall decrease in firms' bank debt and potentially affecting their trade activity, which we analyze in the subsequent section.

4.2 Effect on firm-level trade outcomes

Next, we examine whether the increase in provisions influenced the growth of import and export values for those firms that were more reliant on banks significantly impacted by the policy.

To such end, we employ our customs data, which is available at the firm, country, 2-digit product, and year level. We leverage the comprehensive structure of this dataset to estimate the effect of increased provisions on firms' exports and imports. In particular, we estimate the following equation

$$y_{f,c,g,t} = \alpha_{f,c,g} + \alpha_{c,g,t} + \alpha_{p(f),i(f),t} + \theta \times Exposure_f \times Policy_t + \varepsilon_{f,c,g,t}, \tag{3}$$

where our dependent variable is the mid-point growth rate between firm f's exports (imports) of product g to (from) country c in year t and the 5-year average of exports (imports) of such a product to (from) that country during 2009 and 2013, that is,

$$y_{f,c,g,t} = \frac{Z_{f,c,g,t} - \overline{Z}_{f,c,g}}{1/2(Z_{f,c,g,t} + \overline{Z}_{f,c,g})},$$

where $\overline{Z}_{f,c,g} = 1/5 \sum_{t=2009}^{2013} Z_{f,c,g,t}$ for Z =Exports, Imports. Notably, this dependent variable enables us to capture market entries and exits, which are indicated by a zero value in exports or imports. *Exposure* is defined as in equation (2), and *Policy* is a dummy variable that takes value one after 2012 and 0 otherwise. Furthermore, we include a rich set of fixed effects following Paravisini et al. (2015). First, we add firm-country-product fixed effects to capture omitted factors that do not vary over time, such as the firm's knowledge of the market for product g in country c.

Second, we include country-product-year fixed effects. In the case of exports, it captures demand shocks for product g at destination country c, whereas, in the case of imports, it captures supply shocks for product g in the country c of origin, such as variations in transport costs. Thus, we compare the export (import) value of product g to (from) country c with that of firms exporting (importing) such good to (from) the same destination. Finally, we augment the regression with province-industry-year fixed effects. Such addition seeks to capture variations in the local demand for imported goods and supply conditions for exported goods. Hence, we now compare the export (import) value of product g to (from) destination (origin) country c with that of firms operating within the same province and industry. Standard errors are double-clustered at the firm level and the firm's main bank level. Given the granularity of our data, we exclude from the sample the smallest transactions of firm's exports to, or imports from, a market (country-product) representing less than 1% of the total exported or imported value between 2009 and 2013. Such a restriction is equivalent to excluding from the sample firms' exports to a market that, on average, exported less than 29,000 euros per year between 2009 and 2013. For firms' imports, this restriction applies to markets where the average imported value was about 35,000 euros per year. In this way, we avoid the potential contamination of our results by very small and significantly volatile trade flows.

Our data on exports (imports) contains 659,910 (566,170) observations coming from 25,173 (23,029) firms exporting (importing) 99 different products to (from) 189 (167) countries between the years 2009 and 2013. In our sample, firms frequently enter and exit exporting and importing markets. For instance, conditional on participating in a market, firms on average exited approximately 35% of the time from an exporting or importing market during 2009 and 2013. Conversely, conditional on not participating in a market, firms on average entered around 35% of the time (see Panel C of Table 1). This indicates that the dynamics of trade flows at the firm level are significant not only at the intensive margin but also at the extensive margin, which our dependent variable allows us to capture.

[Table 4]

The results of this analysis are presented in Table 4. In columns 1 and 2, we use the mid-point growth rate, as presented in equation 2, as the dependent variable, which allows us to incorporate both the intensive and extensive margins. In columns 3 to 6, we disentangle the policy effect along the extensive margin by employing binary indicators of entry and exit to a particular market. *Entry* takes the value of one if exports (imports) by firm i of product g to (from) country c are positive at time t, conditional on exports (imports) being zero in the previous period. Conversely, *Exit* takes the value of one if exports (imports) by firm i of product g to (from) country c are zero at time t, conditional on exports (imports) being positive in the previous period.

The results indicate a significant impact of the increase in provisions on the trade flows of firms engaged in international trade, with a more pronounced effect on imports. Column 1 shows that, following the implementation of the policy, a one standard deviation increase in a firm's exposure to banks heavily involved in the construction and real estate industries would have resulted in a 4.3% decrease in exports, as indicated by the statistically significant coefficient at conventional levels. This effect is even more pronounced for imports, where the decrease would have been 8.3%. Furthermore, along the extensive margin, we also observe significant effects. Specifically, firms that were one standard deviation more exposed to the affected banks due to the policy were 1.8% and 2.9% more likely to exit an exporting and importing market, respectively, following the increase in provisions (see columns 5 and 6 of Table 4). Regarding entering new markets, we only observe a significant effect for imports, where firms were 1.5% less likely to enter new markets after the policy (see column 4 of Table 4).

[Figure 3]

Figure 3 provides supporting evidence regarding the impact of the increase in provisions on export and import growth at the firm-country-product-year level. Specifically, we re-estimate specification (3) by replacing the interaction term of $Exposure \times Policy$ with the interaction of *Exposure* and a set of time dummies for each year, using 2011 as the baseline. As observed, imports reacted negatively to firms' exposure only following the implementation of the policy, relative to the levels

at the end of 2011, with no pre-trends observed. A similar pattern occurs for exports, although a slight recovery is noticeable in 2013.

Overall, the results in this subsection indicate that the increase in provisions induced a negative credit supply shock, leading to a decrease in the supply of exports and demand for imports among Spanish firms engaged in international trade.

4.3 Effect on Spanish imports and international trade reallocation

In this section, we estimate to what extent Spanish trade partners are affected by the increase in Spanish loss provisions through international trade linkages. Notice that, the decline in trade flows of Spanish firms that are highly exposed to the policy through their banks do not necessarily imply that Spanish trade flows, as a whole, are declining. For example, the contraction of highly exposed firms' imports of machinery for the wine industry can be offset, in equilibrium, by an expansion of less exposed firms' imports that become more competitive as their banks were less affected by the policy.[5] Thus, a small or even null response of Spanish imports can be consistent with our findings. On the other hand, even if Spanish imports do respond significantly to the increase in provisions, foreign countries could find ways to reallocate their exports to other countries. A salient explanation for this is that exporters might face increasing marginal costs, which might lead to trade flows reallocation after a demand shock in a given location (Almunia et al. (2021)).

To test the role of these general equilibrium forces in shaping the transmission of macro-prudential policies across countries, we use BACI data, which includes information on the value of trade flows by country of origin, destination, and product (defined by the Harmonized System code of 2007). This is a yearly panel, and we focus on the period 2009-2013. Given the level of aggregation of the

[5]This is particularly important for firms engaged in international trade. Since they are typically large, they could take over the market share of competitors who are facing negative shocks.

data, we construct a measure of exposure to the policy at the product-level as follows:

$$\text{Exposure}_g = \sum_b w_b^g \times \text{Exposure}_b \,, \text{ where } w_b^g = \frac{\sum_f L_{fb} \times M_f^g}{\sum_b \sum_f L_{fb} \times M_f^g} \tag{4}$$

L_{fb} represents the outstanding debt that firm f holds with bank b, and M_f^g denotes firm f's imports of product g. This measure represents the weighted average of the exposure of banks lending to firms importing good g. The weights (w_b^g), which sum to one across all banks, reflect each bank's relative importance as a credit provider for financing imports of good g. We use information as of the end of 2011, before the policy adoption, to compute this measure of exposure. Thus, products are highly exposed to the policy if firms importing them depend more on highly exposed banks.

We start by studying the role of import reallocation across Spanish firms. To do so, we compare the evolution of Spain's total imports of highly exposed products relative to less exposed ones, before and after the policy, estimating the following difference-in-differences specification:

$$\frac{M_{gt} - \overline{M}_g}{(M_{gt} + \overline{M}_g)/2} = \beta_t \times \text{Exposure}_g + \delta_g + \delta_{x(g)t} + u_{cgt} \tag{5}$$

where M_{gt} denote Spanish imports of product g in year t. Thus, our dependent variable is the mid-point growth rate of Spanish imports. We include time-invariant product fixed effects denoted by δ_g, and time-varying fixed effects for different product bins denoted by $\delta_{x(g)t}$.[6] Our parameter of interest β_t measures the yearly effect of our product-level treatment on Spanish imports.

Our identifying assumption is that, absent the policy, Spanish imports of highly exposed products should have evolved in similar trends with Spanish imports of less exposed goods. Thus, a key concern with our specification is that products could be exposed to different shocks around the time of the policy implementation, potentially biasing our estimation results. We address this issue by using a sample of *comparable countries*[7] and estimating the following triple difference-in-differences

[6] Specifically, we divide products based on the share of Spain in world imports of a given product.

[7] We consider the sample of developed countries in Autor et al. (2013) and the set of European Union founders

specification:

$$\frac{M_{cgt} - \overline{M}_{cg}}{(M_{cgt} + \overline{M}_{cg})/2} = \gamma_t \times \text{Exposure}_g \times \mathbb{1}[c = \text{Spain}] + \delta_{cg} + \delta_{gt} + u_{cgt} \tag{6}$$

Our parameter of interest, γ_t, measures the impact of product exposure on Spanish imports relative to that of other comparable countries. Notice that we identify this parameter by comparing Spanish imports of highly exposed products relative to less exposed goods, before and after the policy implementation, relative to comparable countries' imports of the same goods over the same time period. Thus, our specification allows us to account in a fully flexible way for any time-varying shock taking place at the product level by including the corresponding fixed effects δ_{gt}, making our identifying assumption less demanding.

[Table 5]

We report our results in Table 5. Our benchmark specification, shown in column (3), indicates that one standard deviation higher exposure leads to a 0.9 percent decline in Spanish imports after the policy, relative to other comparable countries' imports of the same products. Figure 4 plots the event study graph associated with our average effect. We find that product exposure has statistically insignificant effects before the policy, consistent with our identifying assumption, while after the policy, products that are highly exposed exhibit a persistent decline in Spanish imports relative to other comparable countries. Columns (1) and (2) in Table 5 report our estimated average effect in different specifications, where we partially exclude some high-dimensionality fixed effects, showing similar results. Finally, Table 6 reports our estimates of the standard difference-in-differences specification described in equation (5), showing similar patterns: Spanish imports of highly treated products decline, while imports of comparable countries remain stable after the policy. Figure 5 shows the event-study graph with no evidence of pre-trends.[8]

as *comparable countries* in our benchmark estimation.

[8] Notice that standard errors are larger in this specification, since we estimate each coefficient using 96 observation corresponding to HS 2-digit products.

[Figure 4]

Our results indicate that reallocation is limited across Spanish firms. Thus, the decline in imports generated by lower credit associated with higher provisions generates a decline in Spanish imports as a whole. We now study whether Spain's trade partners can adjust to the reduction of Spanish imports by increasing sales to other countries. We proceed in two steps. First, we use country-of-origin × destination × product level data to estimate the effect of product exposure on exports to Spain relative to exports to comparable countries. Then, we aggregate our data at the country-of-origin × product level to estimate whether total exports respond to our product-level measure of exposure, or instead, whether countries can reallocate sales.

We construct a panel of exports by country of origin and product using BACI data and estimate the impact of the policy by comparing countries' exports of products that were more exposed to the policy relative to those that were less exposed. We deal with potential shocks taking place at the product level by using the same sample of comparable countries as before, which allows us to estimate the following triple difference-in-differences equation:

$$\frac{X_{ocgt} - \overline{X}_{ocg}}{(X_{ocgt} + \overline{X}_{ocg})/2} = \lambda_t \times \text{Exposure}_g \times \mathbb{1}[c = \text{Spain}] + \delta_{ocg} + \delta_{ot} + \delta_{gt} + u_{ogt} \tag{7}$$

Where our dependent variable is the mid-point growth rate of exports from country o of product g to country c in year t, relative to its average value over time. Our parameter of interest λ_t measures the impact of product exposure on countries' exports. We include time-invariant fixed effects by country of origin × destination × product to account for level effects. Furthermore, we introduce time-varying fixed effects by country of origin to control for any shock taking place at Spain's trade partners. Finally, our triple difference-in-differences specification allows us to control for product-specific time-varying shocks, making our identifying assumption less demanding, as we discussed before. Our benchmark specification excludes agricultural, farming, and oil products, to avoid movements in exporters of commodities over time, and to focus primarily on the manufacturing

industry. We weight our regressions by the value of country-of-origin exports before the policy, to ensure our results are not driven by very small countries.

[Table 7]

We report our results in Table 7. Our benchmark specification, shown in column (3), indicates that one SD higher exposure is associated with a 0.3 percent decline in exports to Spain after the policy, relative to exports to comparable countries. We plot the event-study graph associated with this average effect in Figure 6. We find that product exposure has statistically insignificant effects before the policy, consistent with our identifying assumption. We report estimation results of additional specifications, where we partially exclude fixed effects, in columns (1) and (2) of Table 7, showing similar patterns.

[Figure 6]

Our results indicate that loan provisions impacted other countries' exports to Spain, relative to comparable destinations, and these effects are not driven by any shock taking place at the country-of-origin nor product levels. It is worth noticing that our results are consistent with those reported in Table 5, where we estimated the response of Spanish total imports, without considering the country of origin of those imports. However, our results do not imply that loan provisions spillover to other countries. They are actually consistent with countries reallocating sales of exposed products away from Spain towards other destinations. If this were the case, the spillover effect of Spanish loan provisions might be limited or negligible. To test whether countries can reallocate exports, we aggregate our data at the country of origin $\times$ product level, and estimate the following difference-in-differences specification:

$$\frac{X_{ogt} - \overline{X}_{og}}{(X_{ogt} + \overline{X}_{og})/2} = \rho_t \times \text{Exposure}_g + \delta_{og} + \delta_{ot} + u_{ogt} \tag{8}$$

Our dependent variable is the mid-point growth rate of total exports of product g shipped by country o in year t, relative to its average value over time. We include time-invariant fixed effects

by country of origin × product, and time-varying fixed effects at the country of origin level. Thus, our parameter of interest ρ_t estimates the impact of the policy by comparing countries' total exports of highly exposed products relative to less treated ones, before and after the policy.

[Table 8]

We report our results in Table 8. Column (1) shows that products with one SD higher exposure exhibit a 1.4 percent contraction in countries' exports after the policy. Figure 7 plots the event-study graph associated with our average effect. We observe that the contraction of exports for highly exposed products occurs after the policy implementation, while exports of differently exposed products evolved in parallel trends before 2011, consistent with our identifying assumption. Our estimation results indicate that countries cannot reallocate exports. Thus, loan provisions had important spillover effects on other countries through the international trade channel.

However, as we discussed above, the decline in exports could be associated with confounding factors such as product-level shocks taking place around the policy implementation date. We provide further support for our identification by splitting our sample of country × product cells into two groups, based on whether Spain is a relevant buyer or not.[9] Our argument is that, if Spain is not a main buyer, our measure of product exposure must have small effects on countries' total exports. Or equivalently, our results reported in column (1) must be driven by country × product cells where Spain is a main buyer. We estimate the impact of product exposure to Spanish loan loss provisions separately for these two groups. Column (2) considers country-of-origin × product bins where Spain is a small buyer, and shows that, indeed, effects are statistically insignificant. On the other hand, column (3) shows that one SD higher exposure leads to a 2 percent decline in countries' exports where Spain is a relevant importer. Thus, the contraction in exports of highly exposed products reported in column (1) is driven by the decline in Spanish imports associated with increasing loan provisions.

[9] We compute the share of Spain in world total imports of country × product sales, and split observations into two groups relative to the median share of 1 percent. Thus, we define that Spain is a main importer in a given country × product cell if Spanish imports represent at least one percent of world total imports.

[Figure 7]

Overall, our results indicate that macro-prudential policies can spillover to other countries through international trade linkages. First, following the unexpected increase in loan loss provisions for the construction and real estate industries, we find a decline in Spanish total imports of highly exposed products. This result indicates that less exposed firms were not able to compensate the contraction of highly exposed companies' imports. Second, countries cannot offset this contraction by reallocating sales away from Spain towards other countries, either. Consequently, countries for which Spain is a main trade partner exhibit a reduction in total exports.

5 Conclusions

This paper provides novel evidence of an international trade channel through which domestic macro-prudential policies can have cross-border spillover effects. Using rich Spanish administrative and customs data, we show that financial regulations targeting the domestic banking sector, can have unintended effects on the trade flows of countries that rely heavily on Spain as a key trading partner.

We investigate this by examining the sudden and unexpected increase in loan loss provisions for Spain's construction and real estate sectors in 2012. Using granular datasets –including credit registry information on nearly all Spanish exporters and importers, firm-level customs data, and cross-country trade flow data–we estimate the impact of this policy on various outcomes. Specifically, we explore its effects on (1) the credit supply to firms engaged in international trade, (2) firm-level import demand and export supply, and (3) overall Spanish imports and total exports from Spain's trade partners.

First, using data from the Spanish Central Credit Register (CIR), we extend previous findings in the literature by showing that the increase in loan loss provisions led to tighter lending standards for firms involved in international trade. These firms experienced significant reductions in credit supply and faced constraints in substituting credit through other bank lending relationships.

Second, by linking CIR data with Spanish customs records, we assess the policy's impact on firm-level trade outcomes. Our results show a substantial contraction in trade flows after the policy implementation –both at the intensive and extensive margins –supporting the existence of a trade finance channel. This suggests that domestic banking shocks can directly affect the purchases and sales of goods by exporters and importers in international markets.

Finally, using BACI data on trade flows by country of origin, destination, and product, we examine the extent of import reallocation within Spain and among Spain's trade partners. Our findings indicate limited reallocation of imports both within Spanish firms and across Spain's trade partners, especially for product-country pairs where Spain is a major buyer. This implies that the negative effects of the macroprudential policy on the total exports of Spain's trade partners were not easily offset by shifting trade to alternative markets.

Overall, our findings highlight the presence of an international trade channel for the transmission of macroprudential policies, with important policy implications. These results stress the need for communication and coordination across jurisdictions to mitigate potential cross-border spillovers of domestic prudential measures.

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A Figures and tables

Table 1: Summary statistics

	Obs.	Mean	sd	p25	p50	p75
Panel A: *Bank-firm credit data*						
Credit growth (2011:2012)	135,800	-13.65	54.19	-34.32	-6.59	3.07
Termination dummy	149,371	0.09	0.29	0.00	0.00	0.00
Long-term credit ratio	149,371	51.91	42.08	0.00	54.50	100.00
Collateralization rate	149,371	12.38	29.41	0.00	0.00	0.00
Drawn over Granted	149,371	78.51	31.70	65.90	97.78	100.00
NPL ratio	149,371	7.34	25.74	0.00	0.00	0.00
Credit share	149,371	11.50	12.19	2.86	7.13	15.78
Panel B: *Firm data*						
Credit growth (2011:2012)	32,843	-10.77	39.51	-26.02	-8.65	4.88
Panel C: *Bank data*						
Exposure	83	36.22	16.23	25.70	34.78	46.65
Size	83	14.65	2.42	12.78	14.13	16.63
Capital ratio	83	9.80	6.78	6.66	8.05	10.51
Liquidity ratio	83	5.77	5.75	1.83	3.72	8.55
NPL coverage ratio	83	47.05	19.31	35.33	40.57	55.18
ROA	83	-0.00	1.29	0.10	0.26	0.45
NPL ratio	83	5.54	4.30	2.97	5.04	6.75
Rural bank dummy	83	0.47	0.50	0.00	0.00	1.00
Panel D: *Customs data (2009-2013)*						
Exports, mid-point growth	660,120	-90.22	130.19	-200.00	-200.00	38.88
Imports, mid-point growth	566,175	-84.26	128.30	-200.00	-200.00	39.08
Exports, Entry dummy	287,553	0.35	0.48	0.00	0.00	1.00
Imports, Entry dummy	223,581	0.35	0.48	0.00	0.00	1.00
Exports, Exit dummy	240,543	0.37	0.48	0.00	0.00	1.00
Imports, Exit dummy	229,359	0.35	0.48	0.00	0.00	1.00

In Panel A, bank-firm controls are computed using credit information as of the end of 2011. In Panel C, bank variables are calculated using supervisory financial statements as of the end of 2011. All variables are defined in Appendix B.

Table 2: Effect of Shift in Provisions on Lending to Importing and Exporting Firms, Bank-Firm Level Analysis

	Credit Growth Rate			Termination Dummy		
	$X+M$	X	M	$X+M$	X	M
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure	-0.026**	-0.028**	-0.024**	0.009	0.010	0.011
	(0.011)	(0.011)	(0.012)	(0.007)	(0.008)	(0.008)
Controls	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Obs.	135,800	102,317	101,858	149,371	112,593	112,125
R^2	0.32	0.32	0.32	0.26	0.26	0.26

This table contains regression results of lending outcomes from bank b to firm f on a bank exposure variable, controls, and firm fixed effects. The dependent variable in columns (1) to (3) is the mid-point growth rate of firm f's outstanding credit with bank b between 2011 and 2012; whereas in columns (4) to (6), the dependent variable is a dummy that takes the value of one if the existing lending relationship in 2011 terminates in 2012. Columns (1) and (4) include all importing and exporting firms, whereas columns (2) and (5) and (3) and (6) include results for the sample of exporting and importing firms, respectively. *Exposure* is computed as the ratio of construction and real estate lending over lending to the corporate sector of bank b as of the end of 2011. We drop importing and exporting firms in construction or real estate. All regressions include firm fixed effects. All variables are defined in Appendix B. Standard errors are double clustered at the bank and firm levels and reported in parentheses.
$***$ $p < 0.01$, $**$ $p < 0.05$, $*$ $p < 0.10$.

Figure 1: Effect on Lending to Importing and Exporting Firms at the Intensive Margin

This figure plots coefficient estimates of a modified version of the specification (1). Each coefficient corresponds to a different within-firm regression, where the dependent variable is the mid-growth rate of outstanding credit between each firm-bank pair between the respective quarter and 2011q4. As a reference, the estimated coefficient for 2012q4 coincides with the estimated coefficient in column (1) of Table 2. All coefficients are scaled by the corresponding variable's standard deviation. The dashed lines indicate the 5%-95% confidence interval, with standard errors double clustered at the bank and firm level.

Table 3: Effect of Shift in Provisions on Total Bank Debt to Importing and Exporting Firms, Firm Level Analysis

	$X+M$		X		M	
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure	-0.017**	-0.022***	-0.021**	-0.025**	-0.019*	-0.027**
	(0.008)	(0.008)	(0.009)	(0.009)	(0.010)	(0.011)
Controls	Y	Y	Y	Y	Y	Y
Prov.-Ind. FE	Y	N	Y	N	Y	N
cl(f) FE	N	Y	N	Y	N	Y
Obs.	32,843	30,241	23,706	21,750	23,699	21,943
R^2	0.02	0.05	0.03	0.06	0.03	0.05

This table contains regression results of the mid-point growth rate of firm f's total bank debt between 2011 and 2012 on a firm exposure variable, controls, and a set of fixed effects. Firm exposure is computed as the average of the exposure of banks lending to firm f's using as weights the outstanding credit as of the end of 2011. Bank and bank-firm controls are aggregated using lending to firm f as of 2011 as weights. Columns (1) and (2) include all exporting and importing firms, whereas columns (3) and (4) and (5) and (6) only exporters and importers, respectively. In columns (1), (3), and (5), regressions include province-industry fixed effects, whereas, in the remaining columns, firm-cluster fixed effects are added. Firm cluster fixed effects are built using firms' size, province, and industry. We drop importing and exporting firms in construction or real estate. All variables are defined in Appendix B. Standard errors are clustered at the main bank and reported in parentheses.
$***\ p<0.01$, $**\ p<0.05$, $*\ p<0.10$.

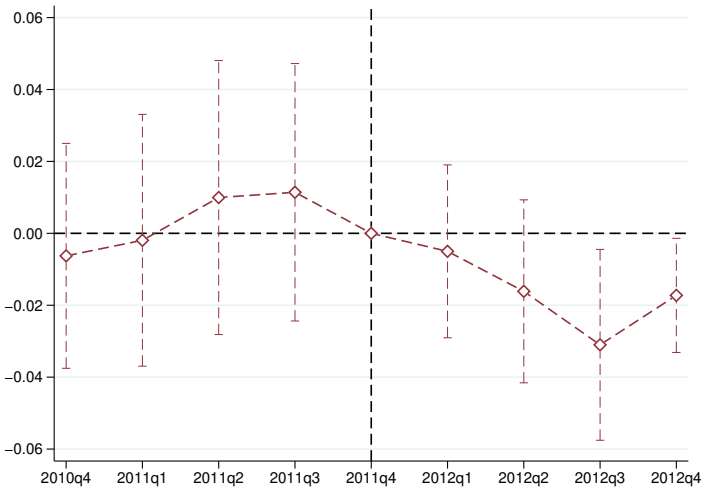


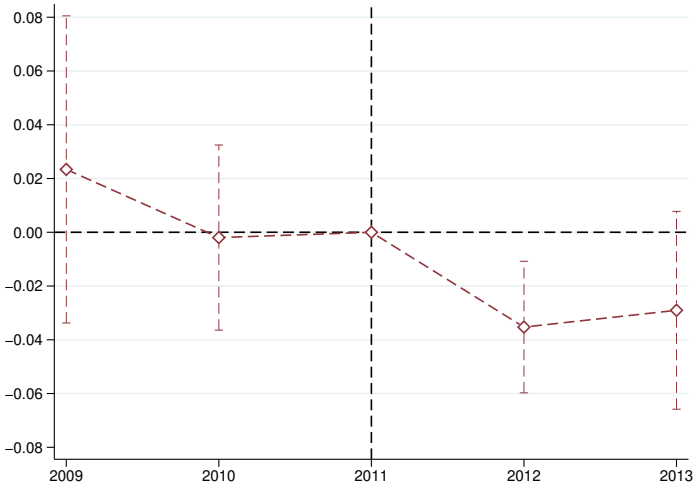
Figure 2: Effect on Total Bank Debt to Importing and Exporting Firms

This figure plots coefficient estimates of a modified version of the specification (2). Each coefficient corresponds to a different firm-level regression, where the dependent variable is the mid-growth rate of firm's f total outstanding credit between the respective quarter and 2011q4. As a reference, the estimated coefficient for 2012q4 coincides with the estimated coefficient in column (1) of Table 3. All coefficients are scaled by the corresponding variable's standard deviation. The dashed lines indicate the 5%-95% confidence interval, with standard errors clustered at the main bank.

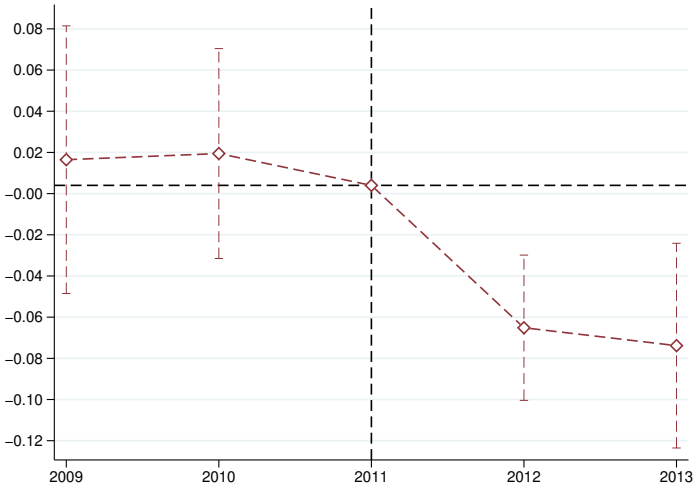
Table 4: Effect on firms' international trade

	Mid-point growth		Entry Dummy		Exit Dummy	
	X	M	X	M	X	M
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure× Policy	-0.043**	-0.083***	0.001	-0.015*	0.018**	0.029***
	(0.020)	(0.024)	(0.006)	(0.008)	(0.009)	(0.008)
Product-Country-Year FE	Y	Y	Y	Y	Y	Y
Province-Industry-Year FE	Y	Y	Y	Y	Y	Y
Product-Country-Firm FE	Y	Y	N	N	N	N
Firm FE	N	N	Y	Y	Y	Y
Obs.	660,120	566,175	282,802	219,219	229,543	221,954
R^2	0.17	0.17	0.16	0.18	0.25	0.23

This table presents the results for trade regressions. In column 1 and 2, we compute the mid-point growth rate between firm's f exports (imports) of product g to (from) country c and the 5-year average of firm's f exports (imports) of the same product to (from) that country, and regress it on the firm's exposure and a set of fixed effects. In columns 3 and 4, we employ a binary indicator that, conditional on not participating in the market the previous year, takes the value of one if the firm enters the market. In columns 5 and 6, we use a binary indicator that takes the value of one if the firm exits the market, conditional on participating in the same market the previous year. *Exposure* is computed as the average of the exposure of banks lending to firm f's using as weights the outstanding credit as of the end of 2011. *Policy* is a dummy variable that takes value one after the provisioning increase. The fixed effects that are included in each regression are noted in the lower part of the table. All variables are defined in Appendix B. Standard errors are double clustered at the main bank and firm level and reported in parentheses.
$***\ p < 0.01$, $**\ p < 0.05$, $*\ p < 0.10$.



(a) Exports



(b) Imports

Figure 3: Effect on exports and imports at the intensive margin (percentage points)

This figure plots coefficient estimates of a modified version of the specification (3). For each year, the coefficient corresponds to the interaction of *Exposure* with the year dummy. Each coefficient measures the impact on firm f's export (or import) growth of good g to (from) country c of one additional percentage point in the firm's f exposure to the policy relative to the year before the policy implementation (i.e., 2011). Panel A shows the results for exports, whereas Panel B shows the results for imports. The blue lines indicate the 5% - 95% confidence interval, with standard errors double clustered at the main bank and firm level.

Table 5: Effects of product exposure to loan provisions on Spanish imports relative to comparable countries

	Imports		
	(1)	(2)	(3)
Treatment$_g$ × $\mathbb{1}[c = \text{Spain}]$× Post$_t$	-0.009***	-0.009***	-0.009***
	(0.002)	(0.002)	(0.002)
Observations	7,200	7,200	7,200
Fixed Effects			
Importer × Product	✓	✓	✓
Year	✓	✗	✗
$x(g)$ × Year	✗	✓	✗
Product × Year	✗	✗	✓

This table contains regression results of the mid-point growth rate of country c's imports of product g on a product-level measure of exposure interacted with a dummy variable that equals one for Spain, and different sets of fixed effects, following equation (6). Product exposure is computed as the weighted average of bank exposure. All specifications include importer × product fixed effects. Column (1) includes year fixed effects, column (2) includes time-varying fixed effects across products where Spain is a main buyer worldwide, and column (3) includes product × year fixed effects. All variables are defined in Appendix B. Standard errors shown in parenthesis are clustered by product.
$***$ $p < 0.01$, $**$ $p < 0.05$, $*$ $p < 0.10$.

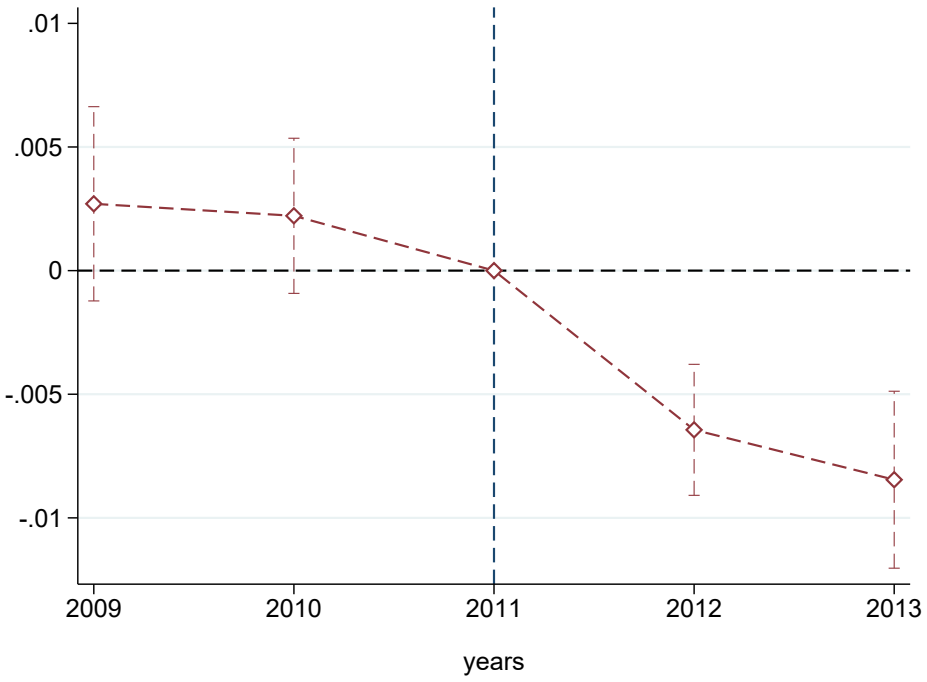


Figure 4: Event-study for the average effect of product exposure to loan provisions on Spanish imports relative to comparable countries

This figure plots coefficient estimates from equation (6). Each dot is the coefficient on the interaction of product-level exposure, year fixed effects, and an indicator equal to one for Spain. The dashed vertical lines indicate 95% level confidence intervals, with standard errors clustered by product.

Table 6: Effects of product exposure to loan provisions on Spanish and comparable countries

	Imports	
	Spain	ROW
	(1)	(2)
Treatment$_g$× Post$_t$	-0.019	0.003
	(0.014)	(0.007)
Observations	470	470
Fixed Effects		
Product	✓	✓
$x(g)$ × Year	✓	✓

This table contains regression results of the mid-point growth rate of imports of product g on a product-level measure of exposure, following equation (5). Product exposure is computed as the weighted average of bank exposure, following equation (4). Column (1) considers imports of Spain as the dependent variable, while column (2) considers imports of comparable countries as the dependent variable. All variables are defined in Appendix B. Robust standard errors are shown in parenthesis.
$***$ $p < 0.01$, $**$ $p < 0.05$, $*$ $p < 0.10$.

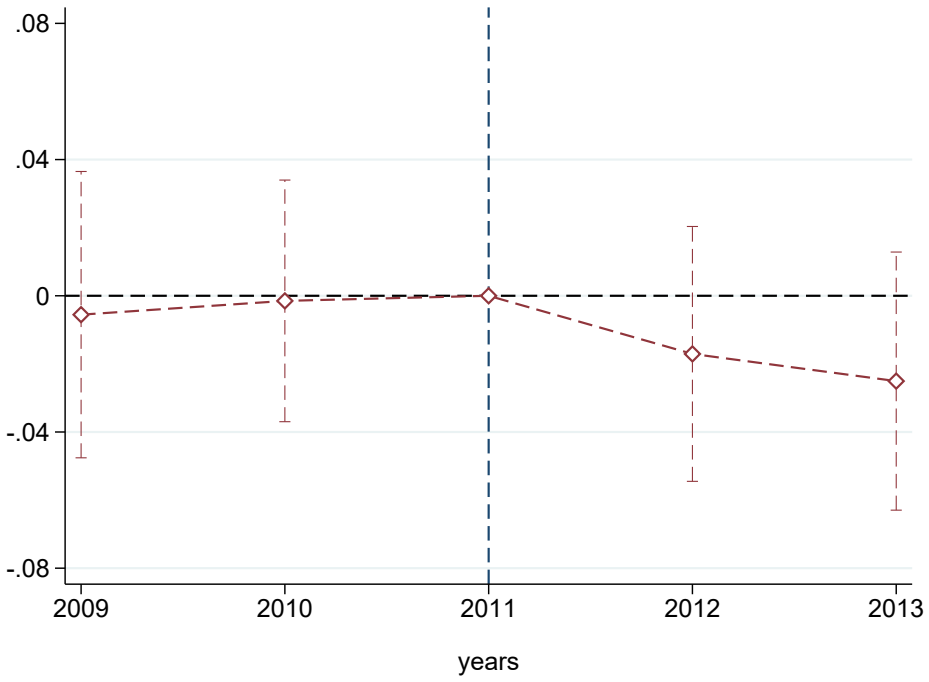


Figure 5: Event-study for the average effect of product exposure to loan provisions on Spanish imports

This figure plots coefficient estimates from equation (5). Each dot is the coefficient on the interaction of product-level exposure and year fixed effects. The dashed vertical lines indicate 95% level confidence intervals, with standard errors clustered by product.

Table 7: Effects of product exposure to loan provisions on countries' exports to Spain relative to comparable countries

	Exports		
	(1)	(2)	(3)
Treatment$_g$ × $\mathbb{1}[c = \text{Spain}]$× Post$_t$	-0.004***	-0.004**	-0.003**
	(0.001)	(0.001)	(0.001)
Observations	355,535	355,535	355,535
Fixed Effects			
Exporter × Importer × Product	✓	✓	✓
Year	✓	✗	✗
Exporter × Year	✗	✓	✓
Product × Year	✗	✗	✓

This table contains regression results of the mid-point growth rate of country o's exports of product g to country c on a product-level measure of exposure interacted with a dummy variable that equals one for Spain, and different sets of fixed effects, following equation (7). Product exposure is computed as the weighted average of bank exposure. All specifications include exporter × importer × product fixed effects. Column (1) includes year fixed effects, column (2) includes time-varying exporter fixed effects, and column (3) includes product × year fixed effects. All variables are defined in Appendix B. Standard errors shown in parenthesis are clustered by product.
$***$ $p < 0.01$, $**$ $p < 0.05$, $*$ $p < 0.10$.

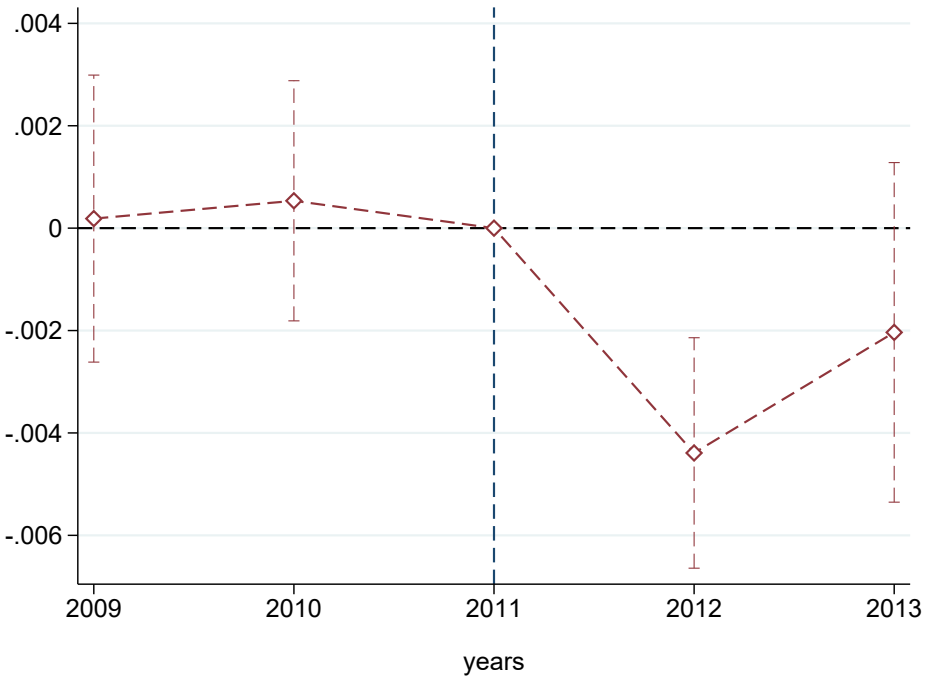


Figure 6: Event-study for the average effect of product exposure to loan provisions on countries' exports to Spain relative to comparable countries

This figure plots coefficient estimates from equation (7). Each dot is the coefficient on the interaction of product-level exposure, year fixed effects, and an indicator equal to one if the country of destination is Spain. The dashed vertical lines indicate 95% level confidence intervals, with standard errors clustered by product.

Table 8: Effects of product exposure to loan provisions on countries' total exports

	Exports		
	(1)	(2)	(3)
Treatment$_g$× Post$_t$	-0.014***	-0.006	-0.020***
	(0.003)	(0.006)	(0.004)
Observations	35,710	17,866	17,750
Fixed Effects			
Exporter × Product	✓	✓	✓
Exporter × Year	✓	✓	✓

This table contains regression results of the mid-point growth rate of country o's exports of product g on a product-level measure of exposure, following equation (8). Product exposure is computed as the weighted average of bank exposure. All specification include exporter × product fixed effects and exporter × year fixed effects. We compute the share of Spain in country-of-origin × product sales, and rank observations accordingly. Then, we split our data into two groups relative to the median share of 1 percent, and define that Spain is a main importer in a given country × product cell if Spanish imports represent at least one percent of world total imports. Column (1) consider all country of origin × product pairs. Column (2) includes only those pairs where Spain is not a main buyer (share below the median of 1 percent), and column (3) includes pairs where Spain is a main buyer. All variables are defined in Appendix B. Robust standard errors are shown in parenthesis.
$***$ $p < 0.01$, $**$ $p < 0.05$, $*$ $p < 0.10$.

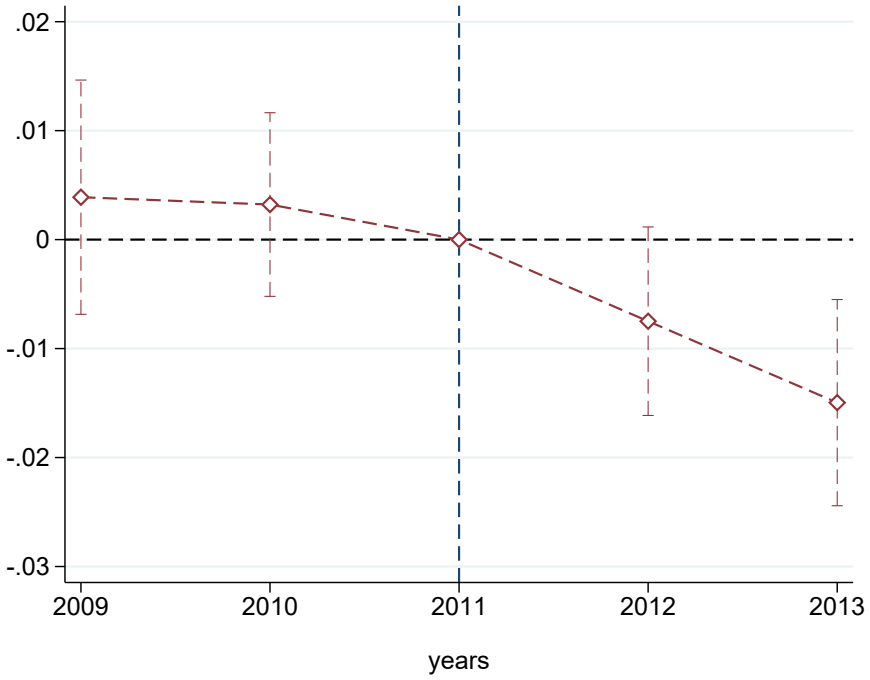


Figure 7: Event-study for the average effect of product exposure to loan provisions on countries' total exports

This figure plots coefficient estimates from equation (8). Each dot is the coefficient on the interaction of product-level exposure and year fixed effects. The dashed vertical lines indicate 95% level confidence intervals, with robust standard errors.

B Variable definitions

Firm-bank variables (Source: Credit Register, Bank of Spain)

- $\Delta y_{f,b}$: The mid-point growth rate of credit granted by bank b to firm f between 2011 and 2012.
- *Termination*: A dummy variable that equals 1 if the bank terminates the relationship with the firm.
- *Long-term credit ratio*: The amount of loans with residual maturity above a year divided by total debt.
- *Collateralization rate*: The amount of collateralized loans divided by total debt.
- *Drawn over Granted*: The amount of drawn credit divided by granted credit (drawn and undrawn).
- *Share of NPLs*: The amount of non-performing loans divided by total debt.
- *Share of loans with bank b*: The total amount of loans from bank b divided by firms' total debt.

Bank variables (Source: Supervisory Reports, Bank of Spain)

- *Exposure*: The amount of loans to the construction and real estate sectors over total lending to non-financial firms as of the end of 2011.
- *Size*: The logarithm of the bank's total assets.
- *Capital*: Book bank equity divided by total assets.
- *Liquidity*: The ratio of liquid assets (cash and balance with central banks, and loans and advances to governments and credit institutions) held by the bank divided by its total assets.
- *NPL coverage*: The ratio of provisions to NPLs.
- *ROA*: Net income divided by assets.
- *NPL ratio*: Non-performing loans as a proportion of the bank's total credit.
- *Rural bank dummy*: Dummy equal to 1 if the bank is a rural bank.

Firm-level variables (Source: Credit Register, Bank of Spain)

- Δy_f: The mid-point growth rate of bank debt of firm f between 2011 and 2012.
- $Exposure_f$: Weighted average of the exposure of banks lending to firm f, using the outstanding credit as of the end of 2011 as weights.

Exports and imports, firm-market level (Source: Customs data, Bank of Spain)

- $Exports$: Exports of the 2-digit-HS product g to country c by firm f at year t.
- $Imports$: Imports of the 2-digit-HS product g from country c by firm f at year t.
- $Entry$: Dummy that takes the value of one if exports/imports in market (g,c) of firm f are greater than zero at year t, conditional on being zero the previous year.
- $Exit$: Dummy that takes the value of one if exports/imports in market (g,c) of firm f are zero at year t, conditional on being positive the previous year.

Bilateral trade flows (Source: BACI)

- $Imports$: Imported value of good g from country c at year t made by Spain, the rest of the world (ROW), or Spain and the ROW.
- $\text{Top}_{c,g}$: Dummy that equals one if Spain ranks at the top 10 buyers in market (c, g).
- $Treatment^g$: Product-level (2-digit-HS) treatment, computed as a weighted average of banks' exposure to the policy, where the weights account for the relative importance of banks as credit suppliers for firms importing good g.
- $Treatment^g_{spec}$: The part of the treatment coming from specialized banks. A specialized bank for a given product is defined as a bank above the 90th percentile in the measure of bank specialization for that product.