Trade Shocks and Credit Reallocation

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Abstract

The effect of trade liberalization on welfare and economic activity remains one of the most important questions in economics. The literature identifies a number of key determinants that reduce the potential gains from trade, by focusing on frictions to labor mobility across regions or sectors. This paper contributes to this debate by exploring a novel channel, namely the reallocation of credit in the aftermath of a trade shock. We find that there are endogenous financial frictions that arise from trade liberalization, because banks can be negatively affected by a trade shock through the portfolio of firms they lend to,. Using data from the Italian credit registry, matched with bank and firm level data, we follow the evolution of bank and firm activities prior to and after the entry of China into the WTO. We identify the sectors most affected by import competition from China and estimate the transmission of this trade shock from firms to their lending banks, and the consequence of the shock on banks' lending to other firms. We find that, controlling for credit demand, banks exposed to the China shock decrease their lending relative to non-exposed banks. Importantly, this lending is reduced both for firms exposed to competition from China and to those that are not and that we should expect to expand. The main mechanism is related to the reduction of the core capital of banks, and their resulting funding capacity, through the rise of non-performing loans. We quantify the impact of this effect on real outcomes such as employment, investment, and output. We find relevant aggregate effects such that employment would have been between 1.2% and 3.0% higher if these financial frictions were less binding.

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1 Introduction

The effect of trade liberalization on welfare and economic activity remains one of the most important questions in economics. Prominent theories of international trade show that one of the main impacts of free trade on welfare is to improve the efficient allocation of resources within countries. The arguments supporting gains from the so-called reallocation channel are typically based on long-term equilibira with perfect factor mobility. However, there is large evidence in the literature of a slow adjustment of labor markets to trade shocks, which is associated to frictions in labor mobility due to geographical barriers or sector-specific skills. These labor market frictions hinder gains from trade and are central in the policy debate.[1] The results in the literature show that the impact of trade depends crucially on the ease of factors of production to move across firms, sectors and regions, according to the changing pattern of comparative advantages. The paper contributes to this debate by analyzing a novel friction that may hinder gains from trade: the reallocation of credit across firms and sectors in the aftermath of a trade shock.

The point of our paper is that banks can be indirectly affected by trade liberalization, depending on the sectoral composition of their portfolio of loans. Given the role of credit for both investments in physical capital and working capital, an effect on the *supply of credit* due to trade liberalization could potentially restrain the reallocation channel and gains from trade. To assess this hypothesis we investigate how China's accession to the WTO affects the supply of credit by banks to firms and the resulting consequences on the real economy for the case of Italy. As Figure 1 shows, after that China entered in the WTO at the end of 2001, there was an acceleration of imports from China, whereas exports to China were not particularly affected. Following the approach by Autor et al. (2013), we identify the sectors most affected by import competition from China and estimate bank exposure to this trade shock by looking at the share of loans to firms in the more affected sectors. Then, we analyze the patterns of credit supply across banks with different degrees of exposure to the trade shock.

[1] While employment falls in industries more exposed to import competition, there is no evidence of large movements of workers towards other, non-exposed, industries. More frequent labor market outcomes for workers in sectors exposed to trade shocks include instead longer unemployment spells, lower labor force participation and, to some extent, shift towards non-tradable industries. See among others Topalova (2010), Menezes-Filho and Muendler (2011), Autor et al. (2013) , Kovak (2013) , Dix-Carneiro (2014) , Autor et al. (2014), Acemoglu et al. (2016), Hakobyan and McLaren (2016), Dix-Carneiro and Kovak (2017) , Utar (2018).

The key contribution of the paper is to uncover the presence of endogenous financial frictions arising from trade shocks. We find that banks more exposed to the trade shock reduce the supply of credit relative to other banks. Importantly, these banks reduce credit both to firms subject to competition from China, which should shrink, and to firms that are not affected by China and that should actually expand. More specifically, we find that the supply of credit by exposed banks decreases for firms in manufacturing industries not subject to competition from China (also once we account for input-output linkages); in exporting sectors where Italy has a comparative advantage; to the more productive firms within sectors; and to firms in the service sector. This contraction in credit has real effects on firm outcomes and it leads to significant aggregate losses in terms of employment, investments, and output.

For our analysis we rely on the credit registry data for Italy and match it to banks and firms balance sheet. Our dataset covers the universe of loans to firms above €75,000 that were made in Italy between 1998 and 2007. We then exploit bank and firm identifiers to link the credit data with detailed information about all banks operating in Italy and the universe of incorporated firms. This allows us to analyze credit patterns controlling for key bank characteristics and looking into real outcomes such as firm output, investment and employment.

We begin by confirming that banks in Italy tend to specialize in industries. As found in Paravisini et al. (2017), banks are typically heterogeneous in their lending patterns and tend to be skewed towards specific industries in which they specialize. We find a number of banks with portfolios heavily concentrated, through their related firms, in industries most affected by the rise in competition from China. Our source of variation of bank exposure to the trade shock relies on the share of loans that, before China accession to the WTO, banks had in sectors that turn out to be more severely affected by competition from China. Then, we compare the evolution of the allocation of credit across banks with different degrees of exposure.

We firstly use the Khwaja and Mian (2008) within estimator to isolate supply and demand of credit. We find that more exposed banks decrease credit to firms, such that a bank with a 10p.p. increase in exposure to the trade shock reduce its credit by 3.5%, relative to the other banks supplying credit to the same firm. The magnitude of this credit contraction is lower than estimates from the global financial crisis as in Chodorow-Reich (2014) for the US and Cingano et al. (2016)

for Italy, but it is nonetheless sizeable. Importantly, this reduction affects both firms exposed and non-exposed to competition from China. This effect holds not only for manufacturing firms subject to low competition from China, but also for firms in sectors where Italy has a comparative advantage to export, for high productivity firms, and for firms in the service sector. This implies that there are negative financial spillovers to firms not directly affected by Chinese competition and that should actually expand their absorption of resources.

We investigate if the source of these spillovers comes from local general equilibrium effects, as firms in sectors not affected by competition from China can suffer a contraction of credit because located in provinces with a high degree of exposure to China. However, we find that this is not the case as firms not subject to competition from China, located in provinces with low China exposure, still face a reduction in the relative supply of credit from more exposed banks. This suggests that the the transmission mechanism of credit contraction comes from the internal capital market of banks and not from local general equilibrium factors. Moreover, this result highlights that, while the labor effects of a trade shock tend to be localized in a specific area, the credit effects of a trade shock run through bank balance sheets and turn out to be more nationally widespread as banks operate in multiple regions.

The Khwaja and Mian (2008) within estimator captures changes in the share of credit that a firm gets from banks with different degrees of treatment. However, it may be the case that a firm could compensate for the loss in credit from exposed banks with an increase in loans coming from banks with low exposure. To analyse the total effect on credit, we compute the exposure of firms to the bank lending channel of the trade shock, as the weighted average of the exposure of all the banks lending to the firm. Then, we look at the effect of this measure on the total credit that a firm receives. We find that firms are unable to compensate for the lower share of credit they get from exposed banks, as firms more exposed to the bank lending channel get less credit in aggregate relative to other firms and this applies both to firms subject and not subject to competition from China. These findings suggest that credit relations tend to be sticky and that information frictions prevent banks and firms to form a new relation timely, especially for small and medium firms.

Then, we analyze the aggregate real effect of the contraction in credit. We find that lower credit translates into lower output, investment, and employment. Following Chodorow-Reich (2014) we

run some back of the envelope calculation taking as a counterfactual a setting where firm exposure to the bank lending channel of the trade shock is minimal. We compute what the employment, output, and investment level would be if all firms were as exposed to the bank lending channel as the firms in the bottom decile of exposure. We find that, over the period 2002-2007, employment would have been about 2.2 percentage points higher. Sectors subject to competition from China account for about two-thirds of the employment decline (1.5 p.p.) and those not exposed to China for the remaining third (0.7p.p.). While the normative significance of the employment decline of firms subject to China competition is hard to underpin, as we may have expected a decline despite the bank exposure, the employment contraction of firms not-exposed to China highlights how the bank lending channel of a trade shock can hinder resource reallocation. Similar effects are found for investments and revenues.

In order to investigate the mechanisms that drive our results, we exploit detailed information on banks' balance sheets. Firstly, we observe that in sectors subject to higher competition from China (above median), the level of non-performing loans (NPLs) increases by 40% in the period after China's entry to the WTO. This is not the case for the sectors subject to lower competition. Then we look at the relation between bank exposure and NPLs controlling for bank characteristics, bank fixed effects and year dummies. We find that bank exposure is associated to higher NPLs ration by banks after China entrance in the WTO and to a reduction in the core capital of banks, whereas we do not find an effect on deposit or interbank funding. This suggests that the main channel goes to a reduction in the core capital of banks, due to the NPLs, and that these banks become more fund constrained. As a validation of this mechanism, we find that banks that entered the post-shock period with a higher tier 1 capital ratio, so with a higher buffer before the regulatory requirement, reduce credit significantly less relative to other banks, and for high levels of tier 1 ratio the effect of bank exposure on the supply of credit becomes insignificant.

The results of the paper are likely to extend to other countries where banks have some degree of loan concentration in certain industries and banks are the main source of funding for firms. Importantly, our findings are consistent with the prediction of classical banking models such as Froot et al. (1993), Holmstrom and Tirole (1997), Froot and Stein (1998) and Deyoung et al. (2015), which reinforces the generality of our results. In these models banks face two main frictions: costly external funding and illiquid loans (i.e. banks cannot fully sell the loans they made, as not all risk

associated to a loan can be hedged in the capital markets). After a shock, banks typically shift away from assets positively correlated with their net worth. If some firms are hit by a trade shock from China, and their process of adjustment is uncertain, banks with a higher share of loans to these firms should adjust their portfolio and move away from firms subject to competition from China (more strongly than non-exposed banks) and at the same time increase loans to the other firms. However, if banks suffer from losses that cannot be immediately restored due to costs in raising capital, they might be unable to increase credit to less exposed firms, which is in fact what we find in the paper.[2]

The paper contributes to several strands of the literature. First, the paper is linked to the core question of how the economy adjusts to trade shocks. This literature has largely focused on the (slow) reallocation of workers across sectors as in Autor et al. (2014), Acemoglu et al. (2016), Dix-Carneiro (2014) , Menezes-Filho and Muendler (2011), Utar (2018); or across regions in Autor et al. (2013), Dix-Carneiro and Kovak (2017), Hakobyan and McLaren (2016), Kovak (2013) , Topalova (2010). There is only very limited evidence on capital reallocation after trade shocks, even though, as argued by Dix-Carneiro (2014) , quantifying the mobility of capital, and its interaction with labor mobility frictions, is essential to understand the full transitional dynamics of the economy after a trade shock. A notable exception is Antras and Caballero (2009) who focus on the effects of a trade shock on international capital flows across countries, and also Lanteri et al. (2019) who look at the reallocation of machines and physical capital in Peru after the China shock.

Our paper is also related to the burgeoning literature on the financial and real implications of shocks to banks (Khwaja and Mian, 2008; Paravisini, 2008; Amiti and Weinstein, 2011; Schnabl, 2012; Chodorow-Reich, 2014; Paravisini et al., 2015; Baskaya and Kalemli-Ozcan, 2016; Huber, 2018; Amiti and Weinstein, 2018). With respect to this line of research, the shock to banks in our study comes from the real sector rather than from the financial sector per se, as in the case of the global financial crisis, or from natural experiments such as earthquakes or nuclear bombing, as in the case of Khwaja and Mian (2008) and Baskaya and Kalemli-Ozcan (2016). This is all the more important as trade is a pervasive and important policy issue. Therefore, understanding how trade liberalization affects banks, credit allocation, and firm activities provides a novel contribution.

[2]Over time banks should be able to restore their core funding, so the credit effect of a trade shock should fade away over the medium run. Unfortunately, we are unable to analyze the medium-long run effects because of the global financial crisis hitting the banking system in 2008.

Finally, the paper is related to recent studies that look at how banks transmit liquidity shocks across markets (Gilje et al., 2016; Romero Cortés and Strahan, 2017; Bustos et al., 2017). As larger banks operate in several markets, positive or negative shocks that hit a specific region change the availability of funding or the demand for credit from customers operating in the region; as a consequence, the bank might change its lending decisions vis-a-vis customers in other regions, and thus transmit shocks across regions. With respect to this literature, we investigate banks' capital reallocation after being exposed to a specific trade shock, and hence add evidence on the banking sector's broader contribution to the structural adjustment of an economy after trade liberalization.

The rest of the paper is structured as follows. Section 2 describes the data. Section 3 explains the empirical strategy and presents the results the identification issues. Section 4 reports the baseline results on the intensive and extensive margins of credit; Section 5 discusses the robustness of our results to other confounding factors and looks at heterogenous effects across firms; Section 5.2 looks at the geographical dimension of the bank lending channel; Section 6 estimates the effects on total credit and the aggregate real effects on output, investment and employment; Section 7 focuses on the mechanism behind our results; Section 8 concludes.

2 Data and Measurement

2.1 Data sources

Our analysis is based on a matched bank-firm dataset containing loans for a large sample of Italian companies. The final dataset is obtained by combining four sources: credit register; banks' balance sheets data; firms' balance sheets data; data on imports of goods, by product, source and destination country.

The first source is the Italian Credit Register administered by the Bank of Italy, which contains a monthly panel of the outstanding debt of every borrower (firms or individuals) with loans above EUR 75,000 with each bank operating in Italy. We focus on corporate borrowers and build an annual bank-firm panel, where loans are measured as the outstanding credit granted at the end of a given year. The baseline estimates are run on the subset of firms in the manufacturing sector. We also report results including firms in non-manufacturing sectors. As banks use the credit register

in order to assess the creditworthiness of their current or prospective borrowers, its data quality is very high.

Banks' balance sheet data are from the Bank of Italy Supervisory reports, which provide detailed data on banks' assets and liabilities. Firms' balance sheet data (including variables such as revenues, investment, employment, wage bill) are taken from the CERVED database, which covers the universe of incorporated firms in Italy. We match the bank-firm loan data to banks' and firms' balance sheet data using unique bank and firm identifiers, respectively.

Finally, we use data from the UN Comtrade Database on Italy's (as well as other advanced economies') imports from China at the six-digit Harmonized System (HS) product level. We convert the product classification to the more aggregate NACE 4-digit using concordance tables provided by Eurostat. This information is needed to identify the exposure of firms and banks (via their loan portfolio) to the China shock (see subsection 2.2).

Table 1 shows the summary statistics of banks and firms characteristics in our sample. The unit of observation in our empirical analysis is at the bank-firm annual level. The dataset includes, on average, 504 banks and about 86 thousand manufacturing firms. Multiple banking is very common in Italy, also among small firms (Detragiache et al. (2000)). About 75% of firms in our sample borrow from two or more banks and the average number of banking relations per firm is 3.4. As we discuss in the following sections the fact that firms borrow from multiple banks is an essential feature of our identification strategy.

2.2 Defining firm and bank exposure to the China shock

To implement our empirical approach, we firstly need to identify those borrowers that were more likely to be hit by the growth in imports from China and then we need to measure banks' overall exposure to these borrowers. For the first step, we follow closely Autor et al. (2013) in their empirical strategy and compute the following sector-level (4-digit) measure of exposure to the China shock:

$$China_s^{IT} = \frac{\Delta M_{st}^{IT-CH}}{L_{s,1991}^{IT}} \tag{1}$$

The numerator is the variation in Italy's imports from China in a given 4-digit NACE sector s between the years after China's accession to WTO (2002-2007 average) and those before (1994-2001 average).[3] The denominator corresponds to the employment level in the same sector in 1991.[4] According to this measure, the five sectors with the highest exposure to the China shock are 'Coke and oven products', 'Watches and clocks', 'Television and radio receivers', 'Games and toys', 'Other organic basic chemicals'. The least exposed sectors are instead 'Aircraft and spacecraft', 'Carpets and rugs', 'Beer', 'Sugar', 'Distilled alcoholic beverages'. Using this sector-level measure of exposure, we define firm i as subject to the China shock or more simply 'treated' ($D_{is}^{IT} = 1$) if its main sector of activity falls in the upper half of the distribution (i.e. its exposure is above the median values across 4-digit sectors):[5]

$$D_{is}^{IT} = \begin{cases} 1, & \text{if } China_{st}^{IT} > \text{Median} \\ 0, & \text{otherwise} \end{cases} \tag{2}$$

For each bank b, we then measure its exposure to the China shock as the share of its loans to treated firms on its total loans to manufacturing companies. As robustness we also use the share of loans to treated firms relative to total bank's assets and results are confirmed.[6] To attenuate endogeneity issues and possible portfolio adjustments by banks in anticipation of China's entrance into the WTO, we measure banks' exposure averaging the shares over the years 1998-2000.[7]

$$Exposure_b^{IT} = \frac{\sum_i C_{ib} D_{is}^{IT}}{\sum_s C_{sb}} \tag{3}$$

As Table 1 shows, the median bank exposure amounts to 0.358, with a standard deviation

[3] The results are robust to using the variation in imports between 1994 and 2007.

[4] We take the year 1991 because it is the one with census data, before that the raise of China could affect the employment structure by sector. The alternative census year would be 2001, but it is likely to be less exogenous to the raise of China.

[5] As a robustness we also use a continuous measure of firm treatment to compute bank exposure and results are confirmed (see Table A1 in the Appendix).

[6] Table A3 in the Appendix report the results of our baseline specification using the share of loans to treated firms relative to total bank's assets rather than to loans to manufacturing firms.

[7] We prefer to average our measure of bank exposure over multiple years rather than taking a single year (e.g. 1998), so we avoid some bias that may arise from a year specific shock at the beginning of the period. We start from 1998 because it is the first year with data on banks' balance sheet in our sample; and we end in 2000 as it is a year before China access into the WTO, so it is more exogenous than ending in 2001.

of 0.218 (see Figure 2 for the density distribution). In Table 2 we follow the approach of Imbs and Wooldridge (2008) and show the balance of "exposed" (above median exposure) and "non-exposed" (below median exposure) banks by looking at the normalized difference of bank and borrower characteristics over the period 1998-2000. In general a normalized difference of co-variates above 0.25 standard deviations is substantial. In our case, all variables are within this tolerance threshold, althought banks' total assets and the share of core liabilities are close to it. Reassuringly, the characteristics of the borrower across the two groups show a high degree of overlap.

The main concern for identification is related to the growth of Italy's imports from China. This might capture not only a pure 'China supply' effect but also shocks to Italian demand for imports, which could be correlated with lending decisions. In addition, there might be measurement issues, as this measure does not account for Italian exports to third countries being affected by the raise of China. Following Autor et al. (2013), we instrument the trade shock using the variation in imports from China of a set of advanced economies other than Italy (ΔM_s^{OC}).[8]

This instrumental approach aims to recover supply-side determinants, rather than Italian local factors. The motivation is that high income economies are similarly exposed to growth in imports from China that is driven from Chinese supply shocks. The underlying assumptions are that i) industry demand shocks are uncorrelated across countries and ii) demand shocks from Italy do not trigger increasing returns to scale in Chinese manufacturing and do not induce them to export more to other high income countries. It is possible that industry demand shocks across European countries are correlated, so as a robustness we also use US imports only as an instrument and results hold.[9] Moreover, the instrument should capture the effect of Chinese competition that affects Italian firms not only domestically, but also in international markets. Specifically, we compute an industry-level measure of exposure to China shock based on Chinese imports of a group of other countries ($China_s^{OC}$) and use it to identify the corresponding set of 'treated' firms (D_{is}^{OC}).

[8]The countries other than Italy chosen as benchmark are USA, Australia, Denmark, Finland, France, Germany, Japan, New Zealand, Switzerland, and Spain. The results are robust to variations in the set of other countries considered.

[9]Table A2 in the Appendix report the results of our baseline specification using only the US imports from China as an instrument.

$$China_s^{OC} = \frac{\Delta M_{st}^{OC-CH}}{L_{s,1991}^{IT}} \tag{4}$$

$$D_{is}^{OC} = \begin{cases} 1, & \text{if } China_{st}^{OC} > \text{Median} \\ 0, & \text{otherwise} \end{cases} \tag{5}$$

Armed with this different definition of treated firms, we compute a measure of bank exposure which is exogenous to demand developments in Italy ($Exposure_b^{OC}$) and can therefore be used as an instrument in our estimation strategy.

$$Exposure_b^{OC} = \frac{\sum_i C_{ib} D_{is}^{OC}}{\sum_s C_{sb}} \tag{6}$$

Our measure of bank exposure focuses on imports and does not take into account exports. On principle, China entrance in the WTO could create export opportunities for Italian firms and this could potentially have some positive effects for the banks related to these firms, for instance through an increase in deposits or a rise in loans for firms' expansion into China. However, as Figure 1 shows, the share of Italian exports to China after China access into the WTO was not different from the one in the early 1990s, so empirically the export channel is unlikely to be particularly relevant. Moreover, as Borin and Mancini (2016) show, Italian exports to China account for 70% of the Italian content of China's imports; this means that e.g. German exports to China that use Italian intermediates are unlikely to provide a strong boost on the export channel. Finally, for banks the downside of trade liberalization tend to be bigger than the upsides. While firms subject to import competition can affect banks because they don't repay their debt; the profits associated to more exports are more likely to be retained by firms and not necessarily passed to banks. For these reasons, we focus our main analysis on the effects of import competition, but we control for the export channel in the robustness section.

3 Empirical Strategy

For our identification strategy, we exploit the ex-ante heterogeneity across banks in terms of their exposure to the China shock, as defined in Equation (3). The goal of our empirical strategy is to

identify the impact of bank exposure on the supply of credit to firms and the implication that this has on resource reallocation. Figure 3 compares the trends in aggregate lending to Italian manufacturing companies between banks that were ex-ante above median of exposure to the China shock (blue continuous line) and below median (red dashed line). The two time series for aggregate credit are indexed to 100 at the end of 2001. While lending growth was initially very similar across the two groups of banks, since 2002 the two trends start diverging: lending by banks that were more exposed to the China shock grew significantly less compared to lending by non-exposed banks. However, this diverging pattern can be the result of both supply and demand effects, as firms subject to competition from China may shrink and demand less credit, driving the aggregate pattern of more exposed banks.

Therefore, Figure 4 further disaggregates lending by the two groups of banks according to borrowers characteristics. In particular, we distinguish between borrowers operating in sectors with a China shock exposure above median ('treated' firms) and those in sectors below median ('control' firms). In this way we can compare the lending patterns across banks to firms with a similar evolution of credit demand. The figure shows that lending by exposed banks grew more slowly than that by non-exposed banks both for treated and control firms. While these aggregate patterns provide suggestive evidence of differences in credit allocation between exposed and non-exposed banks, the results might be driven by compositional effects, demand shocks, and other multiple factors. We rely on our empirical strategy to properly identify such effects.

3.1 Baseline specification: the intensive margin of credit

Our empirical approach firstly relies on the Khwaja and Mian (2008) estimation that allows to isolate demand and supply effects exploiting the fact that firms borrow from multiple banks. For each bank-firm-year observation our baseline specification is:

$$\ln C_{ibt} = \beta_1 \, Exposure^{IT}_{-i,b} \times Post_t + \beta_2 \, Spec_{ibt} + \boldsymbol{X_b'\delta} \times Post_t + \alpha_{it} + \gamma_{ib} + \epsilon_{ibt} \tag{7}$$

The dependent variable is the log of outstanding credit granted by bank b to firm i at the end of year t. The variable $Exposure^{IT}_{-i,b}$ measures the ex-ante exposure of banks to borrowers that were hit by the China shock (measured using Italian imports from China) and it is interacted with

a dummy equal to one for the years after China's accession to WTO (2002-2007), and zero for the earlier years (1998-2001) ($Post_t$).[10] This is our main variable of interest and we instrument it using a measure of bank exposure computed taking other advanced countries' imports from China ($Exposure^{OC}_{-i,b}$), as defined in Equation 6. The variable $Spec_{ibt}$ is a dummy equal to 1 if a firm operates in a sector where a bank is specialized into, and zero otherwise.[11] $\boldsymbol{X_b}$ is a vector of control variables with the 1998-2000 average of key bank attributes (interacted with a post-period dummy) such as the log-assets as a proxy of bank size; share of NPLs, which captures bank performance and management; bank core liabilities, which control for the funding structure of the bank; and the capital ratio, which controls for the degree of bank leverage. We include a set of firm-bank fixed effects (γ_{ib}), which control for potential non-random matching between firms and banks and all time-invariant factors that may affect the loan level for any bank-firm pair such as relational banking. Finally, we add firm-year fixed-effects (α_{it}), which capture any shock that hits a firm in year t, which affects credit demand (including productivity shocks or demand for goods shocks). Given that our source of variation is at the bank level and the original China shock is defined at the sectoral level, we cluster the standard errors at the bank-sector (2 digits) level. In the baseline specification, the observations are unweighted. However, as a robustness we estimate Equation 7 also weighting observations by log-employment and results are confirmed.[12]

The coefficient of interest is β_1 and it captures the marginal effect of the exposure of bank b on the share of loans that firm i receives from that bank, relative to other banks, after China access in the WTO. In Section 6, we extend our analysis on the aggregate credit that a firm receives, so we can control if lower credit from exposed banks is compensated by higher credit from other banks. As long as we are able to control for the demand of credit, as we argue below, β_1 captures a credit supply shock due to the bank exposure to China access in the WTO. Given the presence of firm-time fixed effects, β_1 is identified exploiting the variation across multiple lenders within

[10] The measure of banks' exposure that we use in the regression is computed from equation 3 leaving out firm i to avoid endogeneity with the dependent variable. In our sample credit to firm i is typically too small to affect the aggregate bank exposure: on average firms account for 0.0001% of bank credit. As a robustness we leave out also the entire sector that a firm belongs to and results hold, see the appendix.

[11] Following Paravisini et al. (2017) a bank is considered to be specialized in one sector if its share of loans in that sector is above the sum of 75th percentile threshold and 1.5 the interquartile range across banks for a given sector-year.

[12] As a robustness, we compute Equation (7) also in first difference taking the average of the pre- and post- period for the variables of interest, as in the original paper of Khwaja and Mian (2008). The advantage of our approach is to make full use of the panel dimension of the data, whereas the advantage of the time collapsing of data is to make standard errors robust to concerns of auto-corrrelation (Bertrand et al., 2004). In the appendix we show that our baseline estimates in first difference obtained running $\Delta \ln C_{ibt} = \beta_1 \, Exposure^{IT}_{-i,b} + \beta_2 \, Spec_{ib} + \boldsymbol{X_b'\delta} + \alpha_i + \epsilon_{ib}$ confirm the results (see Table A5).

firm. Multiple banking is very common in Italy, also among small firms (Detragiache et al., 2000). About 75% of firms in our sample borrow from two or more banks and the average number of banking relations per firm is 3.4.

Equation 7 captures the effect of bank exposure on credit for the average firm in the sample. However, we are interested in disentangling this effect for firms subject to competition from China, which should shrink, and for firms that are not subject to Chinese competition and that should remain unaffected or expand. In order to have a complete picture of the underlying effects, firstly, we look at firms that are in sectors above or below median of exposure to competition from China, as defined in Equation 2. We call the former "treated" firms and the latter "control" firms. Our implicit assumption is that control firms are those towards which resources should be reallocated and hence they should not face a reduction of credit. However, we extend this approach by looking at several groups of firms. We distinguish between firms in sectors where Italy has a comparative disadvantage or a comparative advantage to export. In doing so we discern between the comparative advantage sectors subject to competition from China (treated) and those that are not (control). According to classic models of trade (e.g. Ricardo-Viner) control firms in comparative advantage sectors are the ones that should benefit from China access to the WTO and the resulting overall expansion of global trade. Another important distinction that we look at is between firms with productivity below or higher than their sectoral average. According to models of trade with firms heterogeneity, such as Melitz (2003), we should expect more productive firms to expand and absorb more resources, especially those in sectors not subject to competition from China. Finally, we look at firms in manufacturing and service sector, as the latter should be more isolated from a direct effect of the trade shock and could potentially absorb more resources.[13] In order to analyze the effect of bank exposure across these different groups of firms we run the following specification:

$$\ln C_{ibt} = \sum_d \beta_{1d}\, D_{di} \times\ Exposure^{IT}_{-i,b} \times Post_t + \beta_2\, Spec_{ibt} + \boldsymbol{X_b'\delta} \times Post_t + \alpha_{it} + \gamma_{ib} + \epsilon_{ibt} \quad (8)$$

the coefficient β_{1d} captures the marginal effect of bank exposure to the trade shock on firms in group D_{di}, where the groups are the ones discussed above (e.g. treated and control; comparative advantage and comparative disadvantage, etc.) and D_{di} is a dummy equal to one for firms

[13] In Section 4 we describe more in details the definitions of comparative advantage and productivity that we use for the analysis.

belonging to that group and zero otherwise.

3.2 Identification challenges

Our main identification challenges concern with i) isolating the effects of the trade shock on the supply of credit controlling for firms' demand, ii) addressing issues of endogeneity, iii) addressing the role of possible confounding factors. In order to control for the demand of credit of firms and to isolate the supply effect we rely on the Khwaja and Mian (2008) approach. We include a full set of firm-year fixed-effects (α_{it}) which control for any shock to firms that affect its aggregate credit demand. However, in expectation demand shocks may not be equally distributed across banks (Paravisini et al., 2017), for this reason we add a bank specialization dummy ($Spec_{ibt}$), which captures possible tilts in the demand of credit towards banks specialized in lending to the sector where the firms operates.

Our first concern of endogeneity relates to reverse causality, as bank credit can itself influence Italian imports from China and affect our measure of exposure. To address this issue we use the imports from China of other advanced countries, which are hardly affected by the credit of banks to Italian firms. Moreover, in the regression, which runs at the firm-bank-year level, we leave out the firm credit to compute banks' exposure and as a robustness we leave out also the credit to the entire sector of the firm.

Another important endogeneity concern is about the randomness of the China shock on banks, as bank exposure to firms subject to competition from China may be related to some key observable or unobservable characteristics that affect credit supply. For instance if the sectors subject to Chinese competition are more traditional and less innovative, banks that have a high share of loans to firms in such sectors may be more risk averse and we would capture the effect of differences in risk aversion rather than the impact of the trade shock. In Table 2 we show the balance between "exposed" (above median exposure) and "non-exposed" (below median exposure) banks. We follow the approach of Imbs and Wooldridge (2008) and by looking at the normalized difference of banks and borrowers characteristics over the period 1998-2000 (pre-shock). As Imbs and Wooldridge (2008) argue a normalized difference of covariates above 0.25 standard deviations

is substantial. In our case, all variables are within this tolerance threshold, although banks' total assets and the share of core liabilities are close to the threshold. These include also observables that are correlated to unobservable characteristics, such as the credit score of borrowers, as a proxy of banks' risk aversion, and banks' profits and share of non-performing loans, which is likely to correlate with managers' quality. Moreover, we saturate the regressions with a series of controls of bank characteristics that should mitigate concerns about omitted variables. Finally, as an additional validation of our empirical strategy, we exploit the panel structure of the data and estimate a dynamic diff-in-diff. This allows to control for different pre-trends across banks, which may be related to banks' characteristics, and to analyze the timing of the effect on China exposure:

$$\ln C_{ibt} = \sum_{q=1998}^{2007} \beta_q \, Exposure^{IT}_{-i,b} \times \mathbb{1}_{t=q} + \beta_2 \, Spec_{ibt} + \sum_{q=1998}^{2007} \boldsymbol{X_b'\delta_q} \times \mathbb{1}_{t=q} + \alpha_{it} + \gamma_{ib} + \epsilon_{ibt} \quad (9)$$

This specification yields a series of estimates of β_q that shows the full dynamics for credit allocation, and how they differ for the years before and after China access into the WTO. Also in this case we instrument the main variable of interest with $Exposure^{OC}_{-i,b}$.

Our identification strategy is challenged also by potential anticipation effects. Our results would be biased if some banks, e.g. the better ones, anticipated the effects of the WTO agreement with China and reduced their exposure to firms that will turn to be subject to Chinese competition. However, as Bloom et al. (2016) show, there was a considerable uncertainty about the conclusion and the details of the trade agreement with China, which makes it hard for banks to predict the effects on the firms they are lending to. Moreover, credit relations tend to be sticky and it is unusual for local branches to cut credit to firms they have been lending to for some time in anticipation of an event with uncertain consequences. Finally, we compute bank exposure by taking the portfolio composition of banks in the period 1998-2000, so between three to one year before the conclusion of the agreement, which could be hardly anticipated at that time.

In relation to identification threats from confounding factors, the presence of firm-time fixed control for causes associated to firms (e..g trends in external financial needs between treated and control firms; historically declining or raising sectors). However, shocks that hit banks at the same time as China access to the WTO, and that affect exposed and non-exposed banks differently, would pose potential threats to identification. We are particularly worried about i) the rise of

Italian banks' cross-border funding, which occurred in the context of growing financial integration in the euro area since 2002; ii) the strong GDP slowdown that hit the Italian economy in 2002-03; iii) and the rise of securitization in the early 2000s. These factors, which are independent from China access into the WTO, may affect bank lending and drive our results. We discuss more in details and test for these factors in Section 5 and we show that our results are robust to these concerns.

A final issue is that Equations 7 and 8 capture the *intensive* margin, as they account only for bank-firm credit relations that exist before and after China entrance in the WTO. However, we are also interested in the effects on the *extensive* margin of credit. For this reason we run the following specification:

$$Entry_{ib}^{post} \ (Exit_{ib}^{post}) = \beta_1 \ Exposure_{-i,b}^{IT} + \beta_2 \ Spec_{ibt} + \boldsymbol{X_b'\delta} + \alpha_i + \epsilon_{ib} \tag{10}$$

where the dependent variable takes the value of one if bank b and firm i starts (exit) a lending relation after 2001. The coefficient of interest β_1 captures the marginal effect of a bank's exposure to the trade shock on the probability that bank b starts (ends) a credit relation with firm i. The specification account for whether the bank is specialized in the sector the firm operates, for bank's pre-characteristics, and for firm fixed effects; errors are clustered at the bank-sector (2-digits) level.[14] We run this specification also disentangling the effects on treated and control firms. In Section 6 we look at the effect of bank exposure on the total credit of firms accounting for both the intensive and extensive margin.

[14] A recent literature argues that, in shift-share designs, it is important to take into account the presence of correlated errors for clusters that have a similar sectoral structure (Adao and Eduardo, 2018; Borusyak et al., 2018; Goldsmith-Pinkham et al., 2018). Clustering standard errors at the bank-sector level goes in that direction. Also, we adjust our baseline estimate for shift-share clustering standard errors and the main results are confirmed.

4 Baseline results

4.1 Intensive margin of credit

Table 3 reports the results of OLS (Column 1) and 2SLS (Column 2) estimates of our baseline equation 7. Firm-time fixed effects, firm-bank fixed effects, bank specialization dummy and bank controls (interacted with the $Post_t$ dummy) are always included. The coefficient of interest on bank exposure is negative and statistically significant in both specifications. This suggests that banks that are exposed to the China shock reduce their lending to manufacturing firms compared to non-exposed banks after China's accession to WTO. The effect is quantitatively significant. The coefficient on the full 2SLS model amounts to -0.064: for a given firm, banks with a shock exposure that is one standard deviation higher than other banks supply 6.4% less credit between the pre- and post-2001 years.[15]

Columns 3 and 4 of Table 3 looks at the effect of bank exposure on treated and control firms, where treatment is defined as being in sectors that face an increase of competition from China above median. The results show that the supply of credit from more exposed banks decreases for both types of firms. The point-estimate of the coefficient is slightly lower for control firms (-0.056 versus -0.075 in the 2SLS specification), but the two coefficients are not statistically different. This finding points to financial spillovers to firms that, although not directly exposed to Chinese competition, end up facing a contraction in lending from banks hit by the trade shock. Given the relevance that credit has for investments and working capital, this is likely to hinder the process of resource reallocation in the aftermath of a trade shock. In Section 6 we analyze more directly the effects of bank exposure on employment and investments for treated and control firms.

The comparison between the coefficient on OLS and that on 2SLS suggests that the degree of endogeneity of Italian imports from China to Italian demand, or at least its effect on credit, is low and the rise in Chinese imports is mostly driven by an exogenous supply shock from China. Moreover, although an exact comparison cannot be made due to different shocks and specifications, the magnitude of our finding is lower than the one estimated for the global financial crisis by Chodorow-Reich (2014) in the US and by Cingano et al. (2016) for Italy (about half the size).

[15] Given the distribution of bank exposure, another way to read the results is that, for a given firm, banks with a 10p.p. higher portfolio exposure to the China shock decrease credit by 3.2% relative to other banks in the post-2001 period.

Figure 5 reports the results for the dynamic diff-in-diff expressed in Equation 9 for the instrumented year-by-year coefficients. The marginal effect of bank exposure on credit supply shows no clear pattern before 2001. The point estimate for 1998 is positive but not statistically different from zero, whereas it is practically zero for the three years before China access to the WTO. In 2002 we start to observe a decline in the supply of credit by exposed banks, but it is not yet statistically different from zero; the coefficient becomes significant after 2003. The point estimates for the years 2003-2007 are not statistically different from each other. Unfortunately, we cannot test for the long-term effects of exposure on credit as the global financial crisis hit banks in 2008 and that would bias our estimates for the years after that.

In the baseline specification, the control group is defined as firms in manufacturing sectors with exposure to competition from China below median. Our implicit assumption is that those are the firms towards which resources should be reallocated and hence they should not face a reduction of credit. We now extend this definition in several ways.

First, we distinguish between firms in sectors where Italy has a comparative advantage or a comparative disadvantage in exporting.[16] Among the sectors with comparative advantage, we identify those subject to competition from China above and below median (treatment and control). Table 4 shows that exposed banks reduce credit also to firms in the strongest exporting sectors, the ones with comparative advantage and not subject to Chinese competition. These are firms where we may have expected an increase in the supply of credit.

The reallocation channel of a trade shock might work not only across sectors but also within sectors, with the more productive firms absorbing the resources of the less productive ones that exit the market in a given sector (Melitz, 2003). Therefore, we look at the effects on credit dividing our sample between firms that have a productivity above and below the average of their sector

[16] Using COMTRADE data, we compute a standard Balassa index of revealed comparative advantage for each 3-digit sector. It corresponds to the ratio between the share of Italian exports in a given sector on world exports in the same sector and the share of Italian aggregate exports on world aggregate exports. We then apply the usual transformation so that the index is bounded between -1 and 1. Italy has a comparative advantage in a sector when the index is above zero, and a comparative disadvantage when the index is below zero. The index refers to the 1994-1998 average. World exports correspond to the sum of exports from 89 countries (i.e. countries for which Comtrade data are available in each year of the reference period).

before China entrance in the WTO.[17] The results in Table 4 shows that also high productivity firms suffer from a credit reduction and this is the case also if firms are not subject to competition from China. This suggests that also the within-sector reallocation can be hindered by banks' exposure to the trade shock.

We then look beyond manufacturing, extending our sample to firms in the service industry.[18] Firms in services are more isolated from a direct effect of the trade shock and they provide a relevant control group, as they could potentially absorb more resources. Column 2 in Table 6 shows the baseline results for firms in the service sector is negative and significant.

These results show that the credit effects of a trade shock generate negative spillovers to firms that could absorb resources in the reallocation process after a trade shock. This holds across several groups of firms that on principle should be gaining from trade liberalization and be the engine of the reallocation channel.

4.2 Extensive margin

We then explore the extensive margin of credit supply. We compute an 'entry' dummy equal to one if a firm has no credit from a bank before 2002 and had credit from the same bank after 2002: this signals the start of a new credit relationship for a given firm-bank pair. Similarly, we compute an 'exit' dummy equal to one if a firm had credit from a bank before 2002 and has no credit from the same bank after 2002 (i.e. the credit relationship has been severed).

Table 7 reports the results of a linear probability model on equation 10. Starting with columns 1-3, we find that banks that are more exposed to the China shock are less likely to start new credit relationships with firms after China's entry into the WTO. This holds not only for treated firms but also for control firms, although the magnitude of the effect is larger (in absolute terms) for the former than for the latter. Exposed banks are also less likely to terminate credit relationships

[17] We compute total factor productivity at the firm level (TFPR) following Levinsohn and Petrin (2003) and Wooldridge (2009). We take the firm average and the sector weighted average TFPR for the period 1998-2000 and we define high vs. low productive firms according to whether they are above or below their sectoral average.

[18] Services include wholesale and retails trade, transportation and storage, accommodation and food service activities, information and communication, and professional, scientific and technical services.

(columns 4-6), but the coefficient on the probability of exit is smaller than that on the probability of entry. This suggests that higher bank exposure is associated with a decrease in the net entry of credit relationships. For the full sample, a one standard deviation increase in bank exposure is associated with a decline in the probability of net entry of 2 percentage points.

5 Robustness

We run an extensive set of robustness checks with alternative measures of firms and banks exposure and with different econometric specifications. Tables A1-A6 in the Appendix report the results, showing that all our main results are unchanged when: i) bank exposure is captured using a continuous measure of the change in imports from China rather than the median cutoff; ii) exposure to competition from China is instrumented using the change in imports of the US only rather than of a larger set of advanced economies; iii) bank exposure is measured as the ratio of loans to treated firms on banks' total assets rather than on banks' corporate loans; iv) bank exposure is measured leaving out credit to the sector where the firm operates; v) a first difference transformation of the baseline Equations 7 and 8 are estimated; vi) observations are weighted by firm size.

In this section we focus instead on three further aspects of our robustness analysis: i) the role of input-output linkages; ii) the geographical dimension of the bank lending channel and iii) confounding factors that could possibly undermine our identification strategy.

5.1 Taking into account input-output linkages

Our baseline definition of firm exposure to the China shock as expressed in Equation 1 and 4 considers only the direct exposure of a given industry, and therefore ignores indirect exposures via input-output linkages. We follow (Acemoglu et al., 2016) and adjust our measure of exposure to account for upstream input-output linkages, in order to capture trade shocks to the purchasers of

a given industry's output.[19] We then compute a new overall indicator of exposure at the sectoral level that is the sum of the direct and upstream measures and recompute the measure of bank exposure on the basis of this new measure.[20] Table 8 confirms the baseline results and we find a negative effect on credit to control firms also once we account for input-output linkages.

5.2 The geographical dimension of the bank lending channel

We now analyse the geographical dimension of the credit effects of a trade shock. The labor effects of a trade shock tend to be concentrated in specific areas (Autor et al., 2013). They can spillover to other sectors through input-output linkages (Acemoglu et al., 2016), but there is not much evidence of spillovers across geographic areas also when we account for these indirect linkages (Adao et al., 2018). However, in the case of the credit effect, banks' balance sheet could be a vehicle of transmission of geographical spillovers, as banks operate across different regions. In order to investigate this possibility, we look at our results across provinces with different degree of exposure. We compute province exposure as the employment weighted average of its sectors' exposure to the China shock as defined in Equation 4. If the credit effects of the trade shock were local, we should see no effects in provinces with low degree of exposure to China.

Table 9 reports the baseline results from Equation 7 and 8 dividing our sample between firms located in provinces above and below median of exposure to the China shock. We see that there are negative and significant credit effects for firms located both in high and in low exposed provinces. The magnitude of the point estimate of the effect for treated firms in high exposed provinces (-0.082) is larger than the one for control firms in low-exposed provinces (-0.041), but the two coefficients are not statistically different. These results suggest that the credit effects of the trade shock are not localized, but they tend to be geographically distributed also to areas with low direct exposure to the trade shock, because of the lending channel effect through exposed banks

[19] For each industry j, we calculate an upstream effect, which is equal to the weighted average change in Chinese imports across all industries that purchase from industry j, where the weight is the share of industry j's total sales that are used as inputs by industry g. To measure these inter-industry linkages, we use the 1995 input-output table, which predates China's entry into the WTO. One limitation is that for Italy this is available at the 2-digit industry only. Therefore, we assume that for a given 4-digit industry its input and output shares are proportional to the corresponding shares of its 2-digit industry.

[20] The correlation between the baseline measure of bank exposure and the new one is 0.83. At the industry level, about 10 per cent of sectors shift classification.

operating in different provinces.

5.3 Confounding threats to identification

Potential threats to our identification strategy might be related to shocks that hit banks around the time of China access in the WTO and that can affect lending decisions of banks with different degree of exposure to China. We are particularly concerned about i) the rise in Italian banks' cross-border funding since 2002, in the context of growing financial integration in the euro area; ii) a sharp slowdown of GDP growth in 2002-03, reflecting the global slowdown following the dot-com bubble and the attacks of September 11; and iii) the raise of securitisation that happened in that period and that would affect bank liquidity and lending capacity.

Figure 6 show the raise in cross-border liabilities that Italian banks experienced since the late 2002. The foreign funding of Italian banks increased from an average slightly above €200 billion in the period 1998-2002 (15% of GDP) to €900 billion in 2007 (56% of GDP). This increase in foreign funding was not unique to Italy, but was common to other European periphery countries such as Spain and Portugal and it was part of a loose global financial cycle. Our concern is that banks more exposed to the China shock could be the ones that benefited less from these capital inflows, so that our results are not driven by the exposure that a bank has to China, but to the boom of international capital flows that happens around that time. Cingano and Hassan (2019) analyze the effect of these capital inflows on bank lending and firm activities. Their preliminary findings show that the share of foreign liabilities that a bank has on its balance sheet in the 1998-2001 period is a valid instrument to capture the share of the overall capital inflows that a bank would get in the 2002-2007 period. In Table 10 as a robustness we run our baseline specification adding the share of foreign liabilities pre-2001 as a control and the results are confirmed.

The second confounding factors that threatens our identification is related to the business cycle weakness. In fact, Italy experienced a sharp slowdown of GDP in 2002-03, reflecting the post-2001 deceleration in world trade and downward pressures in global financial markets. We are concerned that the decrease in lending by exposed banks that we associate to the trade shock is actually capturing a heterogenous exposure to the GDP slowdown across banks. To control for

this, we use balance sheet data to identify the sectors that experienced a decrease in revenues in the period 2002-03 relative to 2000-01 (i.e. the sectors more strongly subject to GDP slowdown). We then compute the share of loans to those sectors that banks have in their portfolio and regress it on the exposure to the China shock. We find that a 10% higher exposure to China is correlated to a 1% higher share of exposure to the slowdown, which suggests a potential small confounding effect. Therefore, as an additional control in Table 10, we add the average share of loans to the declining sectors in the years 1998-2000 (interacted with a post-dummy) in the regressions and the results hold.

The third confounding factors that threatens our identification is related to the raise in securitization in the early 2000. Securitization affects the liquidity that is available to banks for lending and other activities, so if banks exposed to China have different degree of securitized loans, our results can be biased. To control for this, we compute the average share of securitized lending by bank in the years 1998-2000 and add it as a control (interacted with the post-dummy) in our baseline regression.[21] Table 10 shows that also controlling for this confounding factor does not change our results in a significant way. The last column of Table 10 controls for all these possible confounding factors at the same time and the baseline results are confirmed. We report only the results for the full sample, but the baseline results hold also if we distinguish between treated and control firms.

6 Aggregate credit effects and real outcomes

Our previous estimates show a significant negative effect of bank exposure to the China shock on the relative supply of credit to firms. However, these estimates do not necessarily imply a negative effect on firms' overall credit availability. Given that multiple banking is fairly common among Italian borrowers, firms might have been able to offset the lower credit that they received from an exposed bank with higher credit from non-exposed banks. To assess this possibility, we build a loan-size weighted average of firm exposure to treated banks as:

[21] As a robustness we also take the share of securitized loans in the year 2001, as the degree of securitization in the period 1998-2000 was still relatively low.

$$Exposure\ Firm_i = \sum_b Exposure^{IT}_{-i,b} \ \frac{Credit_{ib}}{Total\ Credit_i} \tag{11}$$

Using this firm-level measure of exposure to the credit supply shock, we run the following regression at the firm-year level:

$$\ln C_{ist} = \beta_1\ Exposure\ Firm_i \times Post_t + \gamma_i + \hat{\alpha_{it}} + \delta_{st} + \epsilon_{ist} \tag{12}$$

The overall amount of loans received by firm i at year t is regressed on firm fixed effects, sector-time fixed effects and the interaction between firm exposure to credit supply shock and the post-2001 dummy. This specification includes also the firm-time fixed effects estimated in Equation 7, as a proxy of credit demand by firms. We run this specification for the full sample of firms and also with the interaction terms that allow us to distinguish between different groups of firms as discussed in Section 3.1.

Table 11 shows the 2SLS results of 11 for the relevant groups of firms. In column one we look at the full sample, in column 2 we report the results for treated and control firms, in column 3 we focus on firms in sectors with comparative advantage to export and not subject to competition from China, in column 4 to firms that have high productivity and that are in control sectors, and in column 5 we focus on the marginal effect of firms in services.[22] The coefficients are negative and significant across all groups of firms. Only firms in the baseline control group and those in a comparative advantage sector seem to compensate, to some extent, the lower credit from exposed banks with higher credit from non-exposed banks, as the coefficient in the aggregate specification is smaller than in the intensive number. However, firms are unable to really offset the negative supply effect from exposed banks, probably as a consequence of informational frictions that prevent firms to easily switch banks in the short-run.

Next, we analyze how firms' exposure to the bank lending channel affects real outcomes such as employment, investments, and revenues. Table 12, 13, 14 report the marginal effects on these real variables controlling for firm and sector-time fixed effects. We find that higher exposure to the bank lending channel is associated to lower employment, investments, and revenues by firms.

[22] Each column refers to a different specification of Equation 12, where we actually replicate the group splits presented in Tables 3, 4, 5, and 6, but we report the coefficients only for the relevant group that we would expect to expand.

The effects are statistically significant and quantitatively important. For firms in the control group (column 2) and firms in the service sector (column 5) the effects tend to be smaller, but they are nonetheless not negligible. Noticeably, both high productive control firms and comparative advantage control firms are negatively affected by the real effects of the bank lending channel. These results suggests that exposure to the bank lending channel hinders not only the reallocation of credit, but also of employment and investments, towards firms that should not be affected by the China shock and that should actually expand.

To get a sense of the aggregate magnitude of these real effects, we consider a counter-factual scenario in which firms' exposure to the credit shock arising from bank exposure to China is equal to the bottom 10% of firms exposed. In other words, we assign this counter-factual threshold to all firms with higher exposure than the threshold (i.e. $Exposure\ Firm_i^{CF} <= 0.25$ for all firms). As in Chodorow-Reich (2014), we derive the counter-factual outcome (for each variable Y_{it}: e.g. employment, revenues, etc.) as the fitted value outcome, adjusted for the difference in firm exposure between the counter-factual and the actual value, multiplied by the estimated coefficient on firm exposure for firms in the control and treated group (based on the results of equation 12):

$$\ln \widehat{Y_{it}^{CF}} = \ln \widehat{Y_{it}} + \widehat{\beta_1} * (Exposure\ Firm_i^{CF} - Exposure\ Firm_i) \tag{13}$$

Total losses in the sample are then equal to the sum across all firms in the sample of the difference between the counter-factual outcome and the fitted value outcome:

$$Aggr\ Losses = \sum_i (\widehat{Y_{it}^{CF}} - \widehat{Y_{it}}) \tag{14}$$

Using the estimates for treated and control firms in Tables 12, 13, 14 , we are able to quantify the confidence interval for the aggregate losses in sample due to frictions. In the case of employment, aggregate losses over the period amount to between 1.2% and 3.0% percentage points. For investments and revenues, the confidence interval is between 1.4% and 3.5%percentage points. There are two main caveats. First, this is a partial equilibrium approach, which assumes total effects to be equal to the sum of direct effects measured at each firm. Second, these estimates refer to the aggregate effects in the sample, which may differ from the aggregate effects in the entire population of firms. Importantly, about two-thirds of these effects come from treated firms, whereas control firms accounts for one-third of the total effect. The decline of employment and investments by

treated firms is something that eventually may have happened in any case given their exposure to competition from China. Therefore, it is hard to asses the normative implications for the decline of these firms. However, the negative impact on real variables for control firms is the highlight of the negative implication of bank exposure to a trade shock.

7 The underlying mechanism: bank exposure to China shock and NPL

In this section we investigate the mechanism that links the trade shock that hit firms in certain sectors with the patterns of credit allocation of banks particularly exposed to these firms. To do so we exploit detailed information on banks' balance sheet. Figure 7 reports the evolution of the value of non-performing loans of firms in sectors subject to competition from China above or below median. We see that the patterns of non-performing loans across the two groups diverge remarkably in the years after 2003. They both spike in 2003 due to the GDP slowdown of Italy, but for control firms they decline remarkably after that. For firms in sectors above median the aggregate value of non-performing loans turns to be 40% higher in the period 2002-2007 relative to the years 1998-2002.

In order to test more formally the link between bank exposure and NPLs, we run the following specification:

$$NPLs\ Ratio_{bt} = \beta_1\ Exposure_b^{IT} \times Post_t + \boldsymbol{X_b'\delta} \times Post_t + \gamma_b + \alpha_t + \epsilon_{bt} \tag{15}$$

the dependent variable is the share of non-performing loans on total assets in banks' balance sheet. This is regressed on our measure of bank exposure as defined in Equation 3, which as usual is instrumented with Equation 6. We also control for a vector of bank characteristics pre-2002 (interacted with a dummy for the years post 2002), bank fixed effect and time dummies; we cluster the standard errors at the bank level.

Table 16 (column 1) shows that a 10p.p. higher bank exposure to the trade shock is associated

with a 0.3p.p. increase in the NPLs' ratio, which is equivalent to a 18% increase in NPLs for the average bank. This suggests that indeed the raise in NPLs can be an important channel that explain the contraction in credit supply by exposed banks. In order to analyze this point further, we replicate our baseline regression adding an interaction term of lagged NPL ratio with bank exposure such that:

In order to investigate this further, we look at the relation of bank exposure with other key bank balance sheet variables, such as bank deposits, interbank funding, and core capital by running bank level estimates as in Equation 15. Table 16 shows that bank exposure to the China shock is neither associated with a response of deposits by households and firms, nor does it affect the funding the bank receives on the interbank market. However, we find that more exposed banks suffer a decrease in the core capital ratio, which is of similar magnitude as the raise in the NPL ratio.

The findings in Table 16 suggests that banks more exposed to China suffer from higher NPLs, which lead to a contraction in their core capital and affect the lending capacity of banks. If this were the main mechanism, we should observe that the effect of bank exposure to China on the supply of credit is lower for banks with a higher buffer relative to the regulatory threshold of capital requirement. To test for this hypothesis, we run the baseline specification in Equation 7 interacting bank exposure with the 1998-2000 average of tier 1 capital ratio of banks relative to their risk-weighted assets, which had a minimum requirement of 6%. This variable is a proxy for the lending space that banks can have in case they are hit by a negative shock. The results in Table 17 shows a positive coefficient of bank exposure to China interacted with the tier 1 capital ratio and this is significant for the full sample and for firms in the control group. The estimates imply that for banks with a tier 1 ratio above 9%, which corresponds to the top quintile of banks in the sample, bank exposure to the China shock no longer has a significant negative effect on the supply of credit. These results are consistent with the idea that banks' lending capacity is key for understanding the driver of bank exposure to the China shock and the supply of credit.

To better understand the mechanism of our findings, we replicate the baseline results of Equation 7 by type of bank. We distinguish in particular between standard private banks, branches of foreign banks operating in Italy, cooperative banks, and mutual banks. As Table 18 shows private

banks are the ones that provide the highest share of credit, followed by cooperative banks, foreign banks and mutual banks. All type of banks have similar degree of exposure to the China shock. Finally, mutual banks are the ones that tend to be more concentrated in specific geographic areas.

Table 19 shows that the baseline results are confirmed for private, cooperative banks, and, to some extent, mutual banks. However, foreign banks behave differently. They increase lending to treated firms helping them leaning against the wind and they do not change significantly their lending towards control firms. Table 20 shows that foreign banks more exposed to the China shock do not face an increase in NPLs (as treated firms are still being financed) and they do not suffer from a contraction in core capital. Foreign banks typically face lower costs of funding, as they can access funds from their headquarter abroad. This again confirms that the availability of funds for banks for exposed to the China shock is a key drivers of our results.

Overall the results suggest that firms that are subject to stronger competition from China increase their NPLs hitting the banks they borrow from. These banks suffer from a contraction in their core capital and, unless they entered the shock period with a buffer of tier 1 capital ratio well above the regulatory requirement, their overall funding capacity decreases and this leads them to cut credit.

8 Concluding Remarks

This paper highlights a novel channel that can affect gains from trade: endogenous financial frictions that arise from trade liberalization, which hinder the reallocation channel after a trade shock. Focusing on China access into the WTO as an exogenous shock and using detailed credit, firm, and bank data for Italy, we find that banks that were exposed to borrowers more strongly hit by competition from China decrease their lending relative to less exposed banks. This effect is robust to an extensive set of controls - including firm-time fixed effects, firm-bank dummies, and several bank characteristics - and various possible confounding factors. This negative effect on credit supply does not involve only firms that are directly hit by competition from China but also firms that are not affected by China and that should actually expand.

This novel channel has relevant macroeconomic implications. We find that firms are unable to hedge against lower credit from exposed banks by borrowing more from non-exposed banks. This translates into real negative effects on firm revenues, investments, employment, and productivity. The aggregate magnitude of these real effects is sizeable and comparable to roughly half the size of the effects of the global financial crisis. The main channel behind the credit effect seems to run through NPLs: as import competition leads to higher NPLs for highly exposed firms, the balance sheet of exposed banks suffers from losses that lead to an erosion of core capital, which in turn leads to an adjustment of their lending pattern.

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Table 1: Summary statistics

	Unit	Mean	S.D.	p25	p50	p75
Bank characteristics						
Total Assets	€Millions	4,701	36,002	109	229	535
Liquid Assets	% Assets	30.5	14.1	21.8	27.9	37.9
Nonperforming Loans	% Assets	2.6	2.6	1.1	1.9	3.3
Credit to Firms	% Assets	37.6	13.1	28.8	39.3	47.3
Profits	% Assets	1	0.5	0.7	1	1.2
Core capital	% Assets	1.4	3.2	0.01	0.2	1.5
Core Funding	%Liabilities	52.5	17.7	44.4	51.9	64.4
Bank exposure to China	% Loans	35.8	21.8	21.8	35	48
Firm characteristics						
Bank Credit	€Millions	0.82	3.74	0.27	0.38	0.57
Revenues	€Millions	4,173	5,673	743	1,751	4,708
Fixed Assets	€Millions	870	1,388	71	258	928
Gross operating margin	% Revenues	7.9	2.4	7.1	7.6	8.3
Credit Score	Units	5.4	0.6	5.1	5.4	5.7

Note: The table reports relevant statistics (1998-2007, average) of banks and firms in the firm-bank matched sample. Bank balance sheet data are from the Supervisory Reports submitted by banks to the Bank of Italy. Credit data are from the Italian Credit Register. Firm balance sheet data are from CERVED. Liquid assets include cash, interbank deposits, and bond holdings. Core funding refers to deposits. Firms' credit score is computed by CERVED based on past defaults and firms' balance sheet information.

Table 2: Balancing tests

		Exposed Banks		*Non-exposed banks*		Normalized
	Unit	Mean	S.D.	Mean	S.D.	difference
Bank characteristics						
Total Assets	€Millions	5,780	3,671	3,430	1,228	0.22
Liquid Assets	% Assets	18.5	11.7	19.9	11.9	-0.12
Nonperforming Loans	% Assets	3.2	4.9	3.3	3.5	-0.02
Credit to Firms	% Assets	39.9	13.9	38.0	14.2	0.13
Profits	% Assets	1.5	0.8	1.8	2.4	-0.16
Core capital	% Assets	2.1	5.1	1.6	5.9	0.09
Core Funding	%Liabilities	55.5	19.4	60.3	18.2	-0.25
Borrower characteristics						
Bank Credit	€Millions	0.80	2.1	0.84	4.8	-0.01
Revenues	€Millions	5,230	3,780	4,864	3,942	0.09
Fixed Assets	€Millions	1,337	1,050	1,387	1,070	-0.04
Gross operating margin	% Revenues	7.9	6.9	8.3	2.5	-0.07
Credit Score	Units	5.3	0.6	5.4	0.7	-0.09

Note: The table reports relevant balance sheet characteristics of banks and of their average borrower (1998-2000 average), dividing the sample between exposed and non-exposed banks. Exposed (non-exposed) banks have a share of loans to firms subject to competition from China above (below) median over the period 1998-2000. The last column shows the Normalized difference between the two groups as specified in Imbs and Wooldridge (2008); an absolute value above 0.25 indicates an imbalance between the two groups.

Table 3: Baseline results

Dependent : $\ln C_{ibt}$	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
$Exposure^{IT}_{-i,b} \times Post_t$	-0.071***	-0.064***		
	(0.008)	(0.012)		
$Exposure^{IT}_{-i,b} \times Post_t \times Control_i$			-0.066***	-0.056***
			(0.009)	(0.014)
$Exposure^{IT}_{-i,b} \times Post_t \times Treated_i$			-0.076***	-0.075***
			(0.013)	(0.026)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
			First stage	
$Exposure^{OC}_{-i,b} \times Post_t$		0.64***		
		(0.02)		
$Exposure^{OC}_{-i,b} \times Post_t \times Control_i$				0.68***
				(0.02)
$Exposure^{OC}_{-i,b} \times Post_t \times Treated_i$				0.57***
				(0.04)
AR-Wald test, F		16.8		10.2
Observations	2,000,410	2,000,410	2,000,410	2,000,410
$Adj.R^2$	0.83	0.83	0.83	0.83

Note: The table reports the coefficients of the baseline specification in Equation 7 (Columns 1 and 2) and in Equation 8 (Columns 3 and 4). In Columns 3 and 4 firms are grouped into treated and control, according to the degree of exposure to Chinese competition of their sector as defined in Equation 4 (above and below median split). The dependent variable is the log of outstanding credit between bank b and firm i in year t, $\ln C_{ibt}$. The variable $Exposure^{IT}_{-i,b}$ captures bank exposure to China entrance in the WTO, as defined in Equation 3. In columns (2) and (4) this is instrumented with the variable $Exposure^{OC}_{-i,b}$, where bank exposure is defined using imports from China of other advanced countries, as defined in Equation 6. $Spec_{bst}$ is a dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Bank controls include bank characteristics pre-2001 interacted with a post-2001 dummy, these are log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects and firm-bank dummies. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Table 4: Baseline results: comparative advantage

Dependent : $\ln C_{ibt}$	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
$Exposure^{IT}_{-i,b} \times Post_t \times Comp.\ Advantage_i$	-0.069***	-0.073***		
	(0.01)	(0.018)		
$Exposure^{IT}_{-i,b} \times Post_t \times Comp.\ Adv.\ Control_i$			-0.054***	-0.053***
			(0.011)	(0.018)
$Exposure^{IT}_{-i,b} \times Post_t \times Comp.\ Adv.\ Treated_i$			-0.083***	-0.095***
			(0.016)	(0.03)
$Exposure^{IT}_{-i,b} \times Post_t \times Comp.\ Disadvantage_i$	-0.073***	-0.04*	-0.073***	-0.04*
	(0.013)	(0.02)	(0.013)	(0.02)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
			First stage	
$Exposure^{OC}_{-i,b} \times Post_t \times Comp.\ Advantage_i$		0.62***		
		(0.03)		
$Exposure^{OC}_{-i,b} \times Post_t \times Comp.\ Adv.\ Control_i$				0.70***
				(0.02)
$Exposure^{OC}_{-i,b} \times Post_t \times Comp.\ Adv.\ Treated_i$				0.54***
				(0.05)
$Exposure^{OC}_{-i,b} \times Post_t \times Comp.\ Disadvantage_i$		0.67***		0.67***
		(0.02)		(0.02)
AR-Wald test, F		10.2		8.4
Observations	1,780,145	1,780,145	1,780,145	1,780,145
$Adj.R^2$	0.83	0.83	0.83	0.83

Note: The table reports the coefficients of the baseline specification in Equation 8 and firms are grouped according to the comparative advantage and competition from China of their sector. Comparative advantage firms are those in sectors where the Balassa (bounded) index of revealed comparative advantage is above 0. Control (treated) firms are those in sectors with exposure to China below (above) median as defined in Equation 4. The dependent variable is the log of outstanding credit between bank b and firm i in year t, $\ln C_{ibt}$. The variable $Exposure^{IT}_{-i,b}$ captures bank exposure to China entrance in the WTO, as defined in Equation 3 and it instrumented with the variable $Exposure^{OC}_{-i,b}$, where bank exposure is defined using imports from China of other advanced countries, as defined in Equation 6. Other bank controls include bank characteristics pre-2001 interacted with a post-2001 dummy, these are log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects, firm-bank dummies, and a dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Table 5: Baseline results: firm productivity

Dependent : $\ln C_{ibt}$	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
$Exposure^{IT}_{-i,b} \times Post_t \times High\ Productivity_i$	-0.069***	-0.068***		
	(0.01)	(0.018)		
$Exposure^{IT}_{-i,b} \times Post_t \times High\ Prod.\ Control_i$			-0.059***	-0.060***
			(0.011)	(0.018)
$Exposure^{IT}_{-i,b} \times Post_t \times High\ Prod.\ Treated_i$			-0.082***	-0.078**
			(0.016)	(0.03)
$Exposure^{IT}_{-i,b} \times Post_t \times Low\ Productivity_i$	-0.072***	-0.058***	-0.072***	-0.058***
	(0.009)	(0.018)	(0.009)	(0.016)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
			First stage	
$Exposure^{OC}_{-i,b} \times Post_t \times High\ Productivity_i$		0.62***		
		(0.02)		
$Exposure^{OC}_{-i,b} \times Post_t \times High\ Prod.\ Control_i$				-0.67***
				(0.02)
$Exposure^{OC}_{-i,b} \times Post_t \times High\ Prod.\ Treated_i$				0.55***
				(0.04)
$Exposure^{OC}_{-i,b} \times Post_t \times Low\ Productivity_i$		0.66***		0.66***
		(0.02)		(0.02)
AR-Wald test, F		9.2		8.3
Observations	2,000,410	2,000,410	2,000,410	2,000,410
$Adj.R^2$	0.83	0.83	0.83	0.83

Note: The table reports the coefficients of the baseline specification in Equation 8 and firms are grouped according to their productivity and to competition from China of their sector. High (low) productivity firms are those with a log TFPR above (below) their sectoral average for the period 1998-2000. Control (treated) firms are those in sectors with exposure to China below (above) median as defined in Equation 4. The dependent variable is the log of outstanding credit between bank b and firm i in year t, $\ln C_{ibt}$. The variable $Exposure^{IT}_{-i,b}$ captures bank exposure to China entrance in the WTO, as defined in Equation 3 and it instrumented with the variable $Exposure^{OC}_{-i,b}$, where bank exposure is defined using imports from China of other advanced countries, as defined in Equation 6. Other bank controls include bank characteristics pre-2001 interacted with a post-2001 dummy, these are log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects, firm-bank dummies, and a dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Table 6: Baseline results: services vs. manufacturing

Dependent : $\ln C_{ibt}$	(1) OLS	(2) 2SLS
$Exposure^{IT}_{-i,b} \times Post_t \times Services_i$	-0.059***	-0.046***
	(0.005)	(0.009)
$Exposure^{IT}_{-i,b} \times Post_t \times Manufacturing_i$	-0.062***	-0.055***
	(0.006)	(0.01)
Bank-firm specialization	✓	✓
Bank controls	✓	✓
Firm-time F.E.	✓	✓
Firm-bank F.E.	✓	✓
Instrument		*First stage*
$Exposure^{OC}_{-i,b} \times Post_t \times Services_i$		0.78***
		(0.01)
$Exposure^{OC}_{-i,b} \times Post_t \times Manufacturing_i$		0.71***
		(0.02)
AR-Wald test, F		14.4
Observations	3,639,824	3,639,824
$Adj.R^2$	0.83	0.83

Note: The table reports the coefficients of the baseline specification in Equation 8 and firms are grouped between services and manufacturing. The dependent variable is the log of outstanding credit between bank b and firm i in year t, $\ln C_{ibt}$. The variable $Exposure^{IT}_{-i,b}$ captures bank exposure to China entrance in the WTO, as defined in Equation 3 and it instrumented with the variable $Exposure^{OC}_{-i,b}$, where bank exposure is defined using imports from China of other advanced countries, as defined in Equation 6. Other bank controls include bank characteristics pre-2001 interacted with a post-2001 dummy, these are log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects, firm-bank dummies, and a dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Table 7: Firms entry and exit (2SLS)

Dependent: $Entry_{ib}$ & $Exit_{ib}$	*Entry*		*Exit*	
	(1)	(2)	(3)	(4)
$Exposure^{IT}_{-i,b} \times Post_t$	-0.052***		-0.03***	
	(0.007)		(0.005)	
$Exposure^{IT}_{-i,b} \times Post_t \times Control_i$		-0.04***		-0.025***
		(0.008)		(0.006)
$Exposure^{IT}_{-i,b} \times Post_t \times Treated_i$		-0.068***		-0.036***
		(0.01)		(0.009)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm F.E.	✓	✓	✓	✓
Time F.E.	✓	✓	✓	✓
		First stage		
$Exposure^{OC}_{-i,b} \times Post_t$	0.66***		0.66***	
	(0.015)		(0.015)	
$Exposure^{OC}_{-i,b} \times Post_t \times Control_i$		0.70***		0.70***
		(0.02)		(0.02)
$Exposure^{OC}_{-i,b} \times Post_t \times Treated_i$		0.63***		0.63***
		(0.02)		(0.02)
AR-Wald test, F	51.8	26.2	27.5	16.4
Observations	426,732	426,732	426,732	426,732
$Adj.R^2$	0.40	0.40	0.36	0.31

Note: The table reports the coefficients of the extensive margin specification in Equation 10. The dependent variable is a dummy that takes the value of 1 if firm i starts (entry) or ends (exit) a credit relation with bank b after China entrance to the WTO. The variable $Exposure^{IT}_{-i,b}$ captures bank exposure to China entrance in the WTO, as defined in Equation 3 and this is instrumented with the variable $Exposure^{OC}_{-i,b}$, where bank exposure is defined using imports from China of other advanced countries, as defined in Equation 6. Other bank controls include bank characteristics pre-2001 interacted with a post-2001 dummy, these are log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm fixed effects, year dummies, and a dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Table 8: Bank exposure accounting for upstream linkages

Dependent : $\ln C_{ibt}$	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
$Exposure^{IT}_{-i,b} \times Post_t$	-0.056***	-0.068***		
	(0.007)	(0.015)		
$Exposure^{IT}_{-i,b} \times Post_t \times Control_i$			-0.052***	-0.078***
			(0.009)	(0.020)
$Exposure^{IT}_{-i,b} \times Post_t \times Treated_i$			-0.060***	-0.054**
			(0.012)	(0.024)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
			First stage	
$Exposure^{OC}_{-i,b} \times Post_t$		0.60***		
		(0.03)		
$Exposure^{OC}_{-i,b} \times Post_t \times Control_i$				0.62***
				(0.02)
$Exposure^{OC}_{-i,b} \times Post_t \times Treated_i$				0.57***
				(0.05)
AR-Wald test, F		18		10
Observations	2,000,410	2,000,410	2,000,410	2,000,410
$Adj.R^2$	0.83	0.83	0.83	0.83

Note: The table reports the coefficients of Equation 7 (Columns 1 and 2) and Equation 8 (Columns 3 and 4), where bank exposure is based on sectors' sum of direct and upstream exposure to the China shock. In Columns 3 and 4 firms are grouped into treated and control, according to the degree of direct and upstream exposure to Chinese competition of their sector (above and below median split). The dependent variable is the log of outstanding credit between bank b and firm i in year t, $\ln C_{ibt}$. The variable $Exposure^{IT}_{-i,b}$ captures bank exposure to China entrance in the WTO, as defined in Equation 3. In columns (2) and (4) this is instrumented with the variable $Exposure^{OC}_{-i,b}$, where bank exposure is defined using imports from China of other advanced countries, as defined in Equation 6. $Spec_{bst}$ is a dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Bank controls include bank characteristics pre-2001 interacted with a post-2001 dummy, these are log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects and firm-bank dummies. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Table 9: Geographical heterogeneity

Dependent variable: $\ln C_{ibt}$	*High exposed provinces*		*Low exposed provinces*	
	(1)	(2)	(3)	(4)
	Full sample	Treated vs. Control	Full sample	Treated vs. Control
$Exposure^{IT}_{-i,b} \times Post_t$	-0.075***		-0.054***	
	(0.023)		(0.016)	
$Exposure^{IT}_{-i,b} \times Post_t \times Control_i$		-0.07***		-0.041**
		(0.02)		(0.018)
$Exposure^{IT}_{-i,b} \times Post_t \times Treated_i$		-0.082*		-0.070***
		(0.04)		(0.026)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-Time F.E.	✓	✓	✓	✓
Firm-Bank F.E.	✓	✓	✓	✓
			First stage	
$Exposure^{OC}_{-i,b} \times Post_t$	0.57***		0.68***	
	(0.03)		(0.02)	
$Exposure^{OC}_{-i,b} \times Post_t \times Control_i$		0.51***		0.74***
		(0.054)		(0.02)
$Exposure^{OC}_{-i,b} \times Post_t \times Treated_i$		0.62***		0.62***
		(0.02)		(0.04)
AR-Wald test, F	20	16.2	20.4	14.1
Observations	1,038,614	1,038,614	960,145	960,145
$Adj.R^2$	0.90	0.90	0.90	0.90

Note: The table reports the coefficients of the baseline specification in Equation 7 and in Equation 8, but we split the sample of firms by the exposure to competition from China of their province. We compute a province exposure as the value-added weighted average of its sectors' exposure to the China shock as defined in Equation 4 and we divide the sample between firms in provinces that are above and below median of exposure. The dependent variable is the log of outstanding credit between bank b and firm i in year t, $\ln C_{ibt}$. The variable $Exposure^{IT}_{-i,b}$ captures bank exposure to China entrance in the WTO, as defined in Equation 3 and this is instrumented with the variable $Exposure^{OC}_{-i,b}$, where bank exposure is defined using imports from China of other advanced countries, as defined in Equation 6. Other bank controls include bank characteristics pre-2001 interacted with a post-2001 dummy, these are log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects, firm-bank dummies, and a dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Table 10: Robustness to potential confounding factors (2SLS, full sample)

Dependent variable: $\ln C_{ibt}$	(1) Baseline	(2) Foreign funding	(3) Recession	(4) Securitization	(5) All
$Exposure^{IT}_{-i,b} \times Post_t$	-0.064***	-0.062***	-0.063***	-0.051***	-0.051***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Foreign\ Funding\ Share_b \times Post_t$		0.20***			-0.03
		(0.06)			(0.06)
$Recession\ Share_b \times Post_t$			-0.22***		-0.34***
			(0.05)		(0.05)
$Securitization\ Share_b \times Post_t$				-0.95***	-1.03***
				(0.08)	(0.08)
Bank-firm specialization	✓	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓	✓
Firm.bank F.E.	✓	✓	✓	✓	✓
			First stage		
$Exposure^{OC}_{-i,b} \times Post_t$	0.68***	0.63***	0.68***	0.68***	0.63***
	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)
AR-Wald test, F	23.2	24.4	23.9	27.5	20.1
Observations	2,000,419	2,000,419	2,000,419	2,000,419	2,000,419
$Adj.R^2$	0.82	0.82	0.83	0.83	0.83

Note: The table reports the coefficients of the baseline specification in Equation 7 to which we add controls for potential confounding factors. The dependent variable is the log of outstanding credit between bank b and firm i in year t, $\ln C_{ibt}$. Results are for the full sample of firms, but they deliver similar results if we look at treated and control firms. The variable $Exposure^{IT}_{-i,b}$ captures bank exposure to China entrance in the WTO, as defined in Equation 3 and this is instrumented with the variable $Exposure^{OC}_{-i,b}$, where bank exposure is defined using imports from China of other advanced countries, as defined in Equation 6. Other bank controls include bank characteristics pre-2001 interacted with a post-2001 dummy, these are log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects, firm-bank dummies, and a dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Table 11: Total effect on firms' credit (2SLS)

Dependent: $\ln C_{it}$	(1)	(2)		(3)	(4)	(5)
	Full-sample	Control	Treated	Comparative Adv. Control	High Product. Control	Services
$Exposure_i^{IT} \times Post_t$	-0.057***	-0.045***	-0.071***	-0.047**	-0.064***	-0.094***
	(0.014)	(0.015)	(0.016)	(0.018)	(0.015)	(0.016)
Credit demand	✓	✓	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓	✓	✓
Firm-F.E.	✓	✓	✓	✓	✓	✓
Sector-time F.E.	✓	✓	✓	✓	✓	✓
First stage						
$Exposure_i^{OC} \times Post_t$	0.65***	0.85***	0.87***	0.93***	1.03***	0.65***
	(0.02)	(0.03)	(0.04)	(0.04)	(0.03)	(0.016)
AR-Wald test, F	12.1	11.2		7.2	14.2	25
Observations	461,936	461,936		408,458	461,936	912,091
$Adj.R^2$	0.96	0.96		0.94	0.95	0.96

Note: The table reports the coefficients of the aggregate specification in Equation 12 by looking at the marginal effects for different groups of firms. In Columns 3 to 5 we show the marginal effect for the relevant group of firms of the respective regressions (the full results for each column are available upon request). The dependent variable is the log of total outstanding credit of firm i in year t, $\ln C_{it}$. We split the sample between firms that are in sector whose exposure to China competition is above median (treated firms) and below median (control firms), as defined in Equation 1. The variable $Exposure_i^{IT}$ captures a loan-size weighted average of firm exposure to treated banks as defined in Equation 11 and this is instrumented by measuring bank treatment using imports from China of other advanced countries. All regressions include firm fixed effects, sector-time dummies, and the firm-time fixed effects estimated in Equation 7 as a proxy of credit demand, a vector of weighted average lender characteristics pre-2001 (log-assets, share of NPLs, core-funding ratio, and the capital ratio). Standard errors are clustered at the sector-main bank. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Table 12: Real effects on firms: employment

Dependent: $\ln C_{it}$	(1)	(2)		(3)	(4)	(5)
	Full-sample	Control	Treated	Comparative Adv. Control	High Product. Control	Services
$Exposure_i^{IT} \times Post_t$	-0.081***	-0.06***	-0.10***	-0.07**	-0.11***	-0.024*
	(0.018)	(0.02)	(0.02)	(0.02)	(0.02)	(0.012)
Firm-F.E.	✓	✓	✓	✓	✓	✓
Sector-time F.E.	✓	✓	✓	✓	✓	✓
			First stage			
$Exposure_i^{OC} \times Post_t$	0.65***	0.84***	0.83***	0.89***	1.04***	0.63***
	(0.02)	(0.03)	(0.04)	(0.04)	(0.02)	(0.08)
AR-Wald test, F	12.1	9.56		7.3	54	18.7
Observations	461,936	461,936		408,458	461,936	912,091
$Adj.R^2$	0.96	0.91		0.92	0.91	0.90

Note: The table reports the marginal effect of firms' exposure to the bank lending channel of the trade shock on the log of total employment. The explanatory variable $Exposure_i^{IT}$ captures a loan-size weighted average of firm exposure to treated banks as defined in Equation 11 and this is instrumented by measuring bank treatment using imports from China of other advanced countries. Control (treated) firms are those in sectors with exposure to China below (above) median as defined in Equation 4. All regressions include firm fixed effects, sector-time fixed effects, and a weighted average of firms' lenders characteristics pre-2001 (log-assets, share of NPLs, core-funding ratio, and the capital ratio). Standard errors are clustered at the sector-main bank. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Table 13: Real effects on firms: investments

Dependent: $\ln C_{it}$	(1)	(2)		(3)	(4)	(5)
	Full-sample	Control	Treated	Comparative Adv. Control	High Product. Control	Services
$Exposure_i^{IT} \times Post_t$	-0.11***	-0.072***	-0.16***	-0.09**	-0.14***	-0.038*
	(0.025)	(0.02)	(0.04)	(0.024)	(0.02)	(0.02)
Firm-F.E.	✓	✓	✓	✓	✓	✓
Sector-time F.E.	✓	✓	✓	✓	✓	✓
			First stage			
$Exposure_i^{OC} \times Post_t$	0.65***	0.84***	0.81***	0.88***	1.04***	0.62***
	(0.02)	(0.03)	(0.04)	(0.04)	(0.03)	(0.07)
AR-Wald test, F	11.6	8.3		6.2	36	12.6
Observations	461,936	461,936		408,458	461,936	912,091
$Adj.R^2$	0.96	0.987		0.88	0.88	0.87

Note: The table reports the marginal effect of firms' exposure to the bank lending channel of the trade shock on the log of investment. The explanatory variable $Exposure_i^{IT}$ captures a loan-size weighted average of firm exposure to treated banks as defined in Equation 11 and this is instrumented by measuring bank treatment using imports from China of other advanced countries. Control (treated) firms are those in sectors with exposure to China below (above) median as defined in Equation 4. All regressions include firm fixed effects, sector-time fixed effects, and a weighted average of firms' lenders characteristics pre-2001 (log-assets, share of NPLs, core-funding ratio, and the capital ratio). Standard errors are clustered at the sector-main bank. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Table 14: Real effects on firms: revenues

Dependent: $\ln C_{it}$	(1)	(2)		(3)	(4)	(5)
	Full-sample	Control	Treated	Comparative Adv. Control	High Product. Control	Services
$Exposure_i^{IT} \times Post_t$	-0.104***	-0.06**	-0.16***	-0.08**	-0.13***	-0.03*
	(0.02)	(0.02)	(0.03)	(0.03)	(0.015)	(0.017)
Firm-F.E.	✓	✓	✓	✓	✓	✓
Sector-time F.E.	✓	✓	✓	✓	✓	✓
			First stage			
$Exposure_i^{OC} \times Post_t$	0.65***	0.84***	0.81***	0.88***	1.03***	0.62***
	(0.02)	(0.03)	(0.03)	(0.04)	(0.02)	(0.07)
AR-Wald test, F	15.2	10.6		8.2	40.1	13
Observations	461,936	461,936		408,458	461,936	912,091
$Adj.R^2$	0.96	0.96		0.88	0.88	0.84

Note: The table reports the marginal effect of firms' exposure to the bank lending channel of the trade shock on the log of revenues. The explanatory variable $Exposure_i^{IT}$ captures a loan-size weighted average of firm exposure to treated banks as defined in Equation 11 and this is instrumented by measuring bank treatment using imports from China of other advanced countries. Control (treated) firms are those in sectors with exposure to China below (above) median as defined in Equation 4. All regressions include firm fixed effects, sector-time fixed effects, and a weighted average of firms' lenders characteristics pre-2001 (log-assets, share of NPLs, core-funding ratio, and the capital ratio). Standard errors are clustered at the sector-main bank. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Table 15: Real effects and firms' mitigating factors, employment (2SLS, full sample)

Dependent variable: $\ln C_{ibt}$	(1) Baseline	(2) Collateral	(3) Leverage	(4) Risk	(5) Profitability	(6) All
$Exposure_i^{IT} \times Post_t$	-0.081******	-0.062***	-0.063***	-0.051***	-0.051***	-0.051***
	(0.018)	(0.01)	(0.01)	(0.01)		(0.01)
$Tangible\ capital_{i,t-1}$		0.20***				-0.03
		(0.06)				(0.06)
$Debt\ Revenue_{i,t-1} \times Post_t$			-0.22***			-0.34***
			(0.05)			(0.05)
$Credit\ Score_{i,t-1}$				-0.95***		-1.03***
				(0.08)		(0.08)
$ROA_{i,t-1}$				-0.95***	-1.03***	
					(0.08)	(0.08)
Bank controls	✓	✓	✓	✓	✓	✓
Firm F.E.	✓	✓	✓	✓	✓	✓
Sector-time	✓	✓	✓	✓	✓	✓
			First stage			
$Exposure_{-i,b}^{OC} \times Post_t$	0.68***	0.63***	0.68***	0.68***	0.63***	0.63***
	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)
AR-Wald test, F	23.2	24.4	23.9	27.5	32	20.1
Observations	461,936	461,936	461,936	461,936	461,936	461,936
$Adj.R^2$	0.82	0.82	0.83	0.83	0.83	0.83

Note: The table reports the marginal effect of firms' exposure to the bank lending channel of the trade shock on the log of total employment controlling for different firms' characteristics that may affect the transmission of the bank lending channel into real effects. The explanatory variable $Exposure_i^{IT}$ captures a loan-size weighted average of firm exposure to treated banks as defined in Equation 11 and this is instrumented by measuring bank treatment using imports from China of other advanced countries. All regressions include firm fixed effects, sector-time fixed effects, and a weighted average of firms' lenders characteristics pre-2001 (log-assets, share of NPLs, core-funding ratio, and the capital ratio). Standard errors are clustered at the sector-main bank. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Table 16: Bank exposure and balance sheet effects

	(1)	(2)	(3)	(4)
Dependent variable:	NPLs	Core funding	Interbank	Core capital
$Exposure_b^{IT} \times Post_t$	0.03***	-0.01	0.02	-0.034**
	(0.008)	(0.02)	-0.012	-0.015
Bank controls	✓	✓	✓	✓
Bank F.E.	✓	✓	✓	✓
Time F.E.	✓	✓	✓	✓
	First stage			
$Exposure_b^{OC} \times Post_t$	0.48***	0.48***	0.48***	0.48***
	(0.02)	(0.02)	-0.02	-0.02
K-P Wald rk F	57	57	57	57
Observations	5,014	5,014	5,014	5,014
$Adj.R^2$	0.84	0.84	0.84	0.84

Note: The table reports the coefficients of a specification similar to Equation 15, where various source of funding of banks are the dependent variables. These are i) the core funding (deposits), ii) domestic interbank lending, iii) foreign funding, iv) core capital. All variables are expressed as a share of bank overall liabilities. The variable $Exposure_b^{IT}$ captures bank exposure to China entrance in the WTO, as defined in Equation 3 and this is instrumented with the variable $Exposure_b^{OC}$, where bank exposure is defined using imports from China of other advanced countries, as defined in Equation 6. Other bank controls include bank characteristics pre-2001 interacted with a post-2001 dummy, these are log-assets, core-funding ratio, and the capital ratio. All regressions include bank fixed effects and year dummies. Standard errors are clustered at the bank level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Table 17: Baseline results: the interaction with Tier 1 capital ratio (2SLS)

	(1)	(2)	
Dependent variable: $\ln C_{ibt}$	Full-sample	Control firms	Treated firms
$Exposure^{IT}_{-i,b} \times Post_t$	-0.135***	-0.15***	-0.12***
	(0.028)	(0.03)	(0.05)
$Exposure^{IT}_{-i,b} \times Post_t \times Tier\ 1\ Ratio_b$	1.135***	1.37***	1.04
	(0.36)	(0.39)	(0.68)
$Tier\ 1\ Ratio_b \times Post_t$	0.74***	0.593***	0.851***
	(0.22)	(0.23)	(0.42)
Bank-firm specialization	✓	✓	✓
Bank controls	✓	✓	✓
Firm-time F.E.	✓	✓	✓
Firm.bank F.E.	✓	✓	✓
		First stage	
AR-Wald test, F	20.1	14	
Observations	2,000,410	2,000,410	
$Adj.R^2$	0.87	0.90	

Note: The table reports the coefficients of the baseline specifications in Equation 7 and 8 by adding an interaction term with the Tier 1 Ratio of banks. We look at the full sample (specification 1) and distinguishing treated and control firms (specification 2). The dependent variable is the log of outstanding credit between bank b and firm i in year t, $\ln C_{ibt}$. The variable $Exposure^{IT}_{-i,b}$ captures bank exposure to China entrance in the WTO, as defined in Equation 3 and this is instrumented by measuring bank treatment using imports from China of other advanced countries, as defined in Equation 6. $Tier\ 1\ Ratio_b$ captures the ratio of banks' Tier 1 capital on their risk weighted assets as an average of the 1998-2000 period. Bank controls include bank characteristics pre-2001 interacted with a post-2001 dummy, these are log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects and firm-bank dummies. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Table 18: Bank relevance and exposure

	Market share (pre-2002)	Average exposure to China
Private banks	0.69	0.39
		(0.19)
Foreign banks	0.05	0.41
		(0.27)
Cooperative banks	0.23	0.42
		(0.13)
Mutual banks	0.03	0.34
		(0.22)

Note: The table reports the market shares and the average exposure to China of different type of banks: standard private banks, foreign banks operating in Italy, cooperative banks, and mutual banks.

Table 19: Baseline effects on credit by bank type

	(1)	(2)	
Dependent variable: $\ln C_{ibt}$	Full-sample	Control firms	Treated firms
Private Banks	-0.09***	-0.096***	-0.088***
	(0.014)	(0.02)	(0.02)
Foreign Banks	0.07	-0.17	0.22***
	(0.05)	(0.2)	(0.08)
Cooperative Banks	-0.12***	-0.09***	-0.13***
	(0.018)	(0.018)	(0.025)
Mutual Banks	-0.027*	-0.001	-0.019
	(0.014)	(0.024)	(0.027)
Bank-firm specialization	✓	✓	✓
Bank controls	✓	✓	✓
Firm-time F.E.	✓	✓	✓
Firm-bank F.E.	✓	✓	✓
		First stage	
AR-Wald test, F	25.1	15.3	
Observations	1,949,939	15.3	
$Adj.R^2$	0.87	0.90	

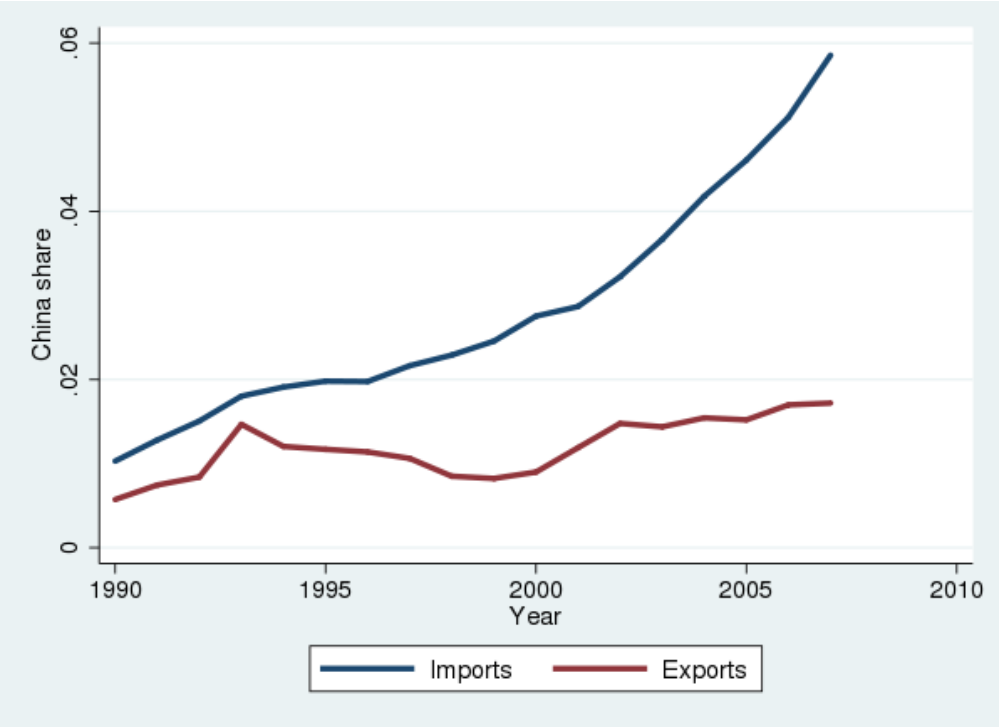
Note: The table reports the coefficients of the baseline specification in Equation 7 by bank type (standard private banks, foreign banks operating in Italy, cooperative banks, and mutual banks). The dependent variable is the log of outstanding credit between bank b and firm i in year t, $\ln C_{ibt}$. In specification (1) we look at the full sample and in in (2) we distinguish the effect for treated and control firms. The variable $Exposure^{IT}_{-i,b}$ captures bank exposure to China entrance in the WTO, as defined in Equation 3. This is instrumented with the variable $Exposure^{OC}_{-i,b}$, where bank exposure is defined using imports from China of other advanced countries, as defined in Equation 6. Bank controls include bank characteristics pre-2001 interacted with a post-2001 dummy, these are log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects, firm-bank dummies, and a dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Table 20: Balance sheet effects by bank type

Dependent variable:	NPLs	Core Capital
Private banks	0.024***	-0.066***
	(0.007)	(0.01)
Foreign banks	0.05	-0.05
	(0.037)	(0.023)
Cooperative banks	0.037***	-0.056***
	(0.006)	(0.016)
Mutual banks	0.047***	-0.018
	(0.006)	(0.014)
Bank controls	✓	✓
Bank F.E.	✓	✓
Time F.E.	✓	✓
	First stage	
AR-Wald test, F	20.27	46.59
Observations	4,965	4,965
$Adj.R^2$	0.61	0.61

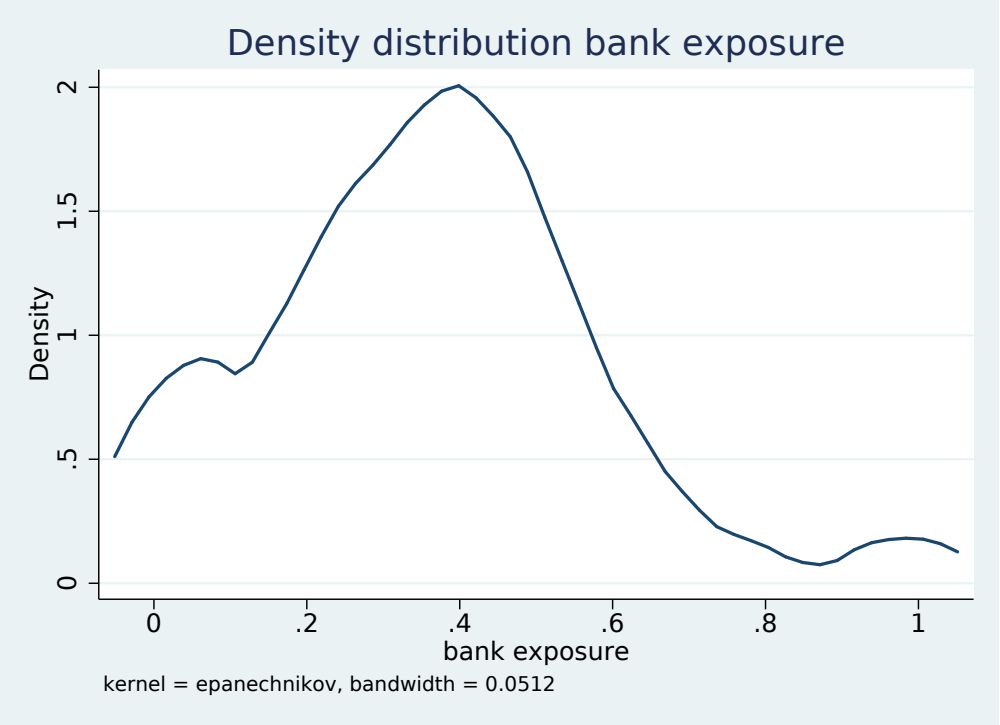
Note: The table reports the coefficients of a specification similar to Equation 15, where NPLs and Core capital are the two dependent variables. Results are presented by bank type (standard private banks, foreign banks operating in Italy, cooperative banks, and mutual banks). The variable $Exposure_b^{IT}$ captures bank exposure to China entrance in the WTO, as defined in Equation 3 and this is instrumented with the variable $Exposure_b^{OC}$, where bank exposure is defined using imports from China of other advanced countries, as defined in Equation 6. Other bank controls include bank characteristics pre-2001 interacted with a post-2001 dummy, these are log-assets, core-funding ratio, and the capital ratio. All regressions include bank fixed effects and year dummies. Standard errors are clustered at the bank level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Figure 1: Italian Import and Export Shares, from and to China



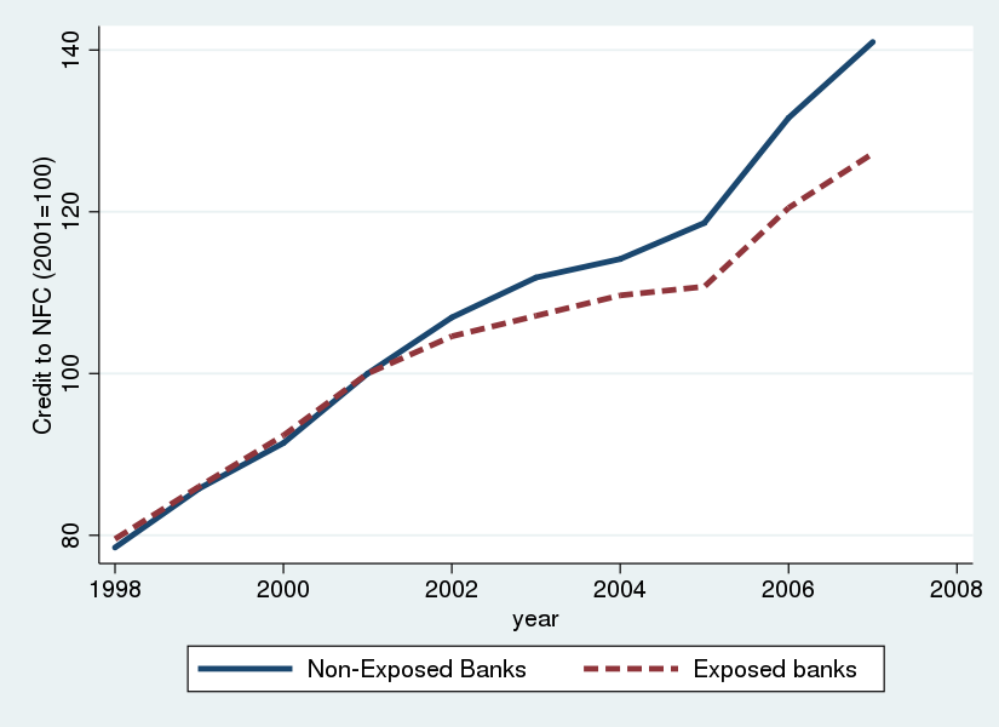
Note: The figure reports the evolution of the share of exports and imports of Italy to and from China relative to total Italian exports and imports. Data from COMTRADE.

Figure 2: Bank exposure: density distribution



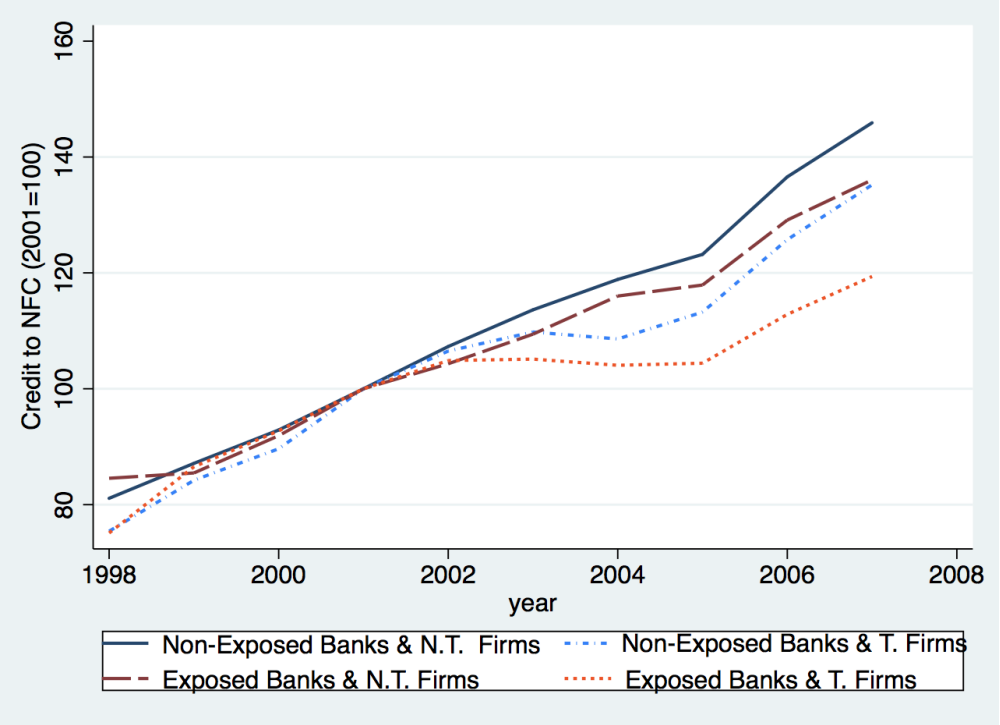
Note: The figure reports the distribution of values of bank exposure to China access in the WTO as defined in Equation 3. Data from the credit registry of the Bank of Italy.

Figure 3: Aggregate credit, exposed vs. non-exposed banks



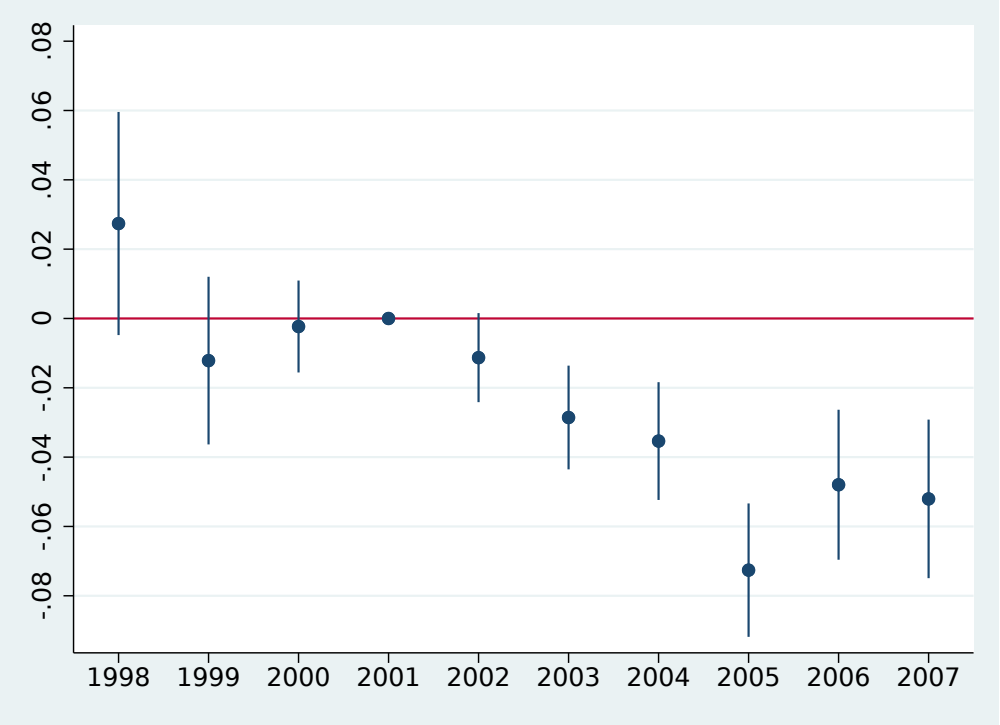
Note: The figure reports the evolution of the total outstanding credit of exposed and non-exposed banks. Bank exposure is defined as in Equation 3 and we divide the sample of banks above and below median of that measure.

Figure 4: Aggregate credit, exposed vs. non-exposed banks & treated vs. control firms



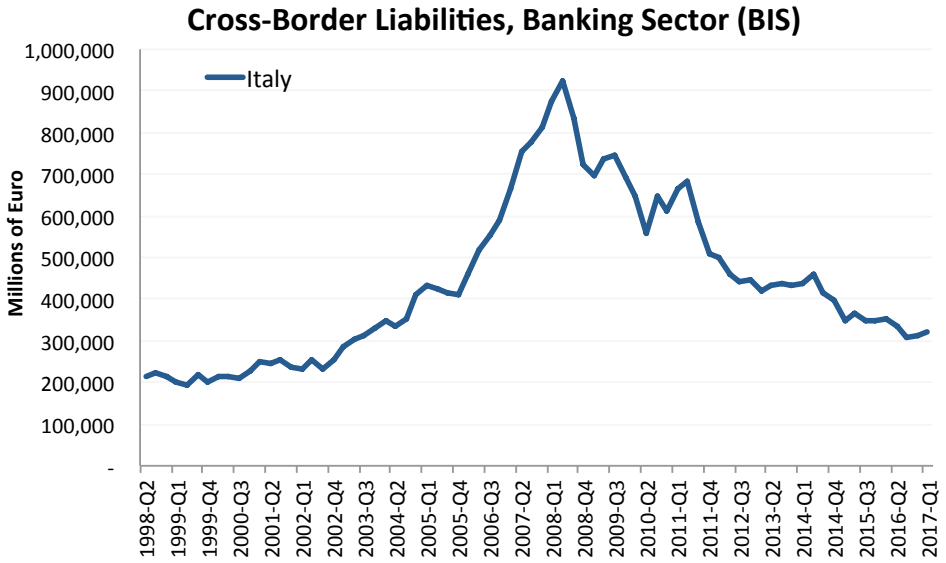
Note: The figure reports the evolution of the total outstanding credit of exposed and non-exposed banks give to treated (T.) and control (N.T.) firms. Bank exposure is defined as in Equation 3 and we divide the sample of banks above and below median of that measure. Firms are defined to be in the treatment or control group according to whether they are in a sector subject to China competition above or below median as defined in Equation 2

Figure 5: Dynamic Diff-in-Diff (95% CI)



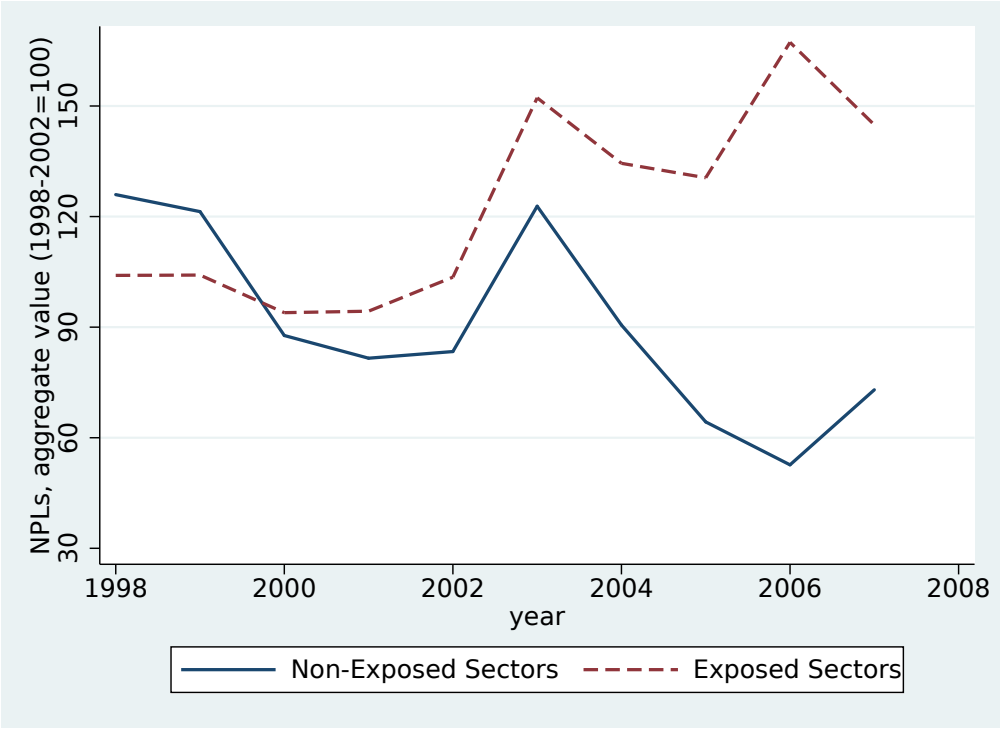
Note: The figure reports the coefficients of the dynamic diff-in-diff regression specified in Equation 9 with 95% confidence interval. The coefficients represent the marginal effect of bank exposure on credit for each year in our sample, taking the year 2001 as baseline (when China joined the WTO). Results are for the full sample of firms, but they are similar if we split the sample between treated and control firms. The variable $Exposure^{IT}_{-i,b}$ captures bank exposure to China entrance in the WTO, as defined in Equation 3 and this is instrumented with the variable $Exposure^{OC}_{-i,b}$, where bank exposure is defined using imports from China of other advanced countries, as defined in Equation 6. We have other controls for bank characteristics pre-2001 interacted with a year dummy, these are log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects, firm-bank dummies, and a dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Standard errors are clustered at the bank-sector (2-digit) level.

Figure 6: Possible confounding factor: cross-border capital flows



Note: The figure reports the evolution of the total outstanding liabilities of Italian banks towards foreign counterparts. Data: Bank of International Settlement.

Figure 7: The underlying mechanism: the role of NPLs



Note: The figure reports the evolution of the total amount of NPLs of firms operating in exposed and non-exposed sectors to China competition. Sector exposure is defined as in Equation 2. The average value of NPLs before 2001 is normalized to 100.

Appendix

Baseline results with alternative variables and specifications

Table A1: Baseline results with a continuous measure of firms' treatment

Dependent : $\ln C_{ibt}$	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
$Exposure^{IT}_{-i,b} \times Post_t$	-0.043***	-0.048***		
	(0.008)	(0.011)		
$Exposure^{IT}_{-i,b} \times Post_t \times Control_i$			-0.055***	-0.058***
			(0.010)	(0.013)
$Exposure^{IT}_{-i,b} \times Post_t \times Treated_i$			-0.028**	-0.036**
			(0.012)	(0.016)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
Instrument: $Exposure^{OC}_{-i,b} \times Post_t$			*First stage*	
$Exposure^{OC}_{-i,b} \times Post_t$		0.68***		
		(0.01)		
$Exposure^{OC}_{-i,b} \times Post_t \times Control_i$				0.72***
				(0.01)
$Exposure^{OC}_{-i,b} \times Post_t \times Treated_i$				0.67***
				(0.02)
F-Stat		19.7		11.2
Observations	1,999,997	1,999,997	1,999,997	1,999,997
$Adj.R^2$	0.83	0.83	0.83	0.83

Note: The table reports the coefficients of a specification similar to Equation 7, where, in order to measure bank exposure, we do not divide sectors between treated and control using a median cutoff, but rather use a continuous measure for sector exposure to competition from China. The dependent variable is the log of outstanding credit between bank b and firm i in year t, $\ln C_{ibt}$. We split the sample between firms that are in sector whose exposure to China competition is above median (treated firms) and below median (control firms), as defined in Equation 1. The variable $Exposure^{IT}_{-i,b}$ is instrumented with the variable $Exposure^{OC}_{-i,b}$, where bank exposure is defined using imports from China of other advanced countries. Bank controls include bank characteristics pre-2001 interacted with a post-2001 dummy, these are log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects, firm-bank dummies, and a dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Table A2: Baseline results with instrument based on U.S. imports only

Dependent : $\ln C_{ibt}$	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
$Exposure^{IT}_{-i,b} \times Post_t$	-0.071***	-0.051***		
	(0.008)	(0.014)		
$Exposure^{IT}_{-i,b} \times Post_t \times Control_i$			-0.066***	-0.047***
			(0.009)	(0.014)
$Exposure^{IT}_{-i,b} \times Post_t \times Treated_i$			-0.077***	-0.055**
			(0.014)	(0.025)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
Instrument: $Exposure^{US}_{-i,b} \times Post_t$			*First stage*	
$Exposure^{US}_{-i,b} \times Post_t$		0.66***		
		(0.02)		
$Exposure^{US}_{-i,b} \times Post_t \times Control_i$				0.70***
				(0.02)
$Exposure^{US}_{-i,b} \times Post_t \times Treated_i$				0.61***
				(0.03)
F-Stat		12.5		7.7
Observations	2,000,410	2,000,410	2,000,410	2,000,410
$Adj.R^2$	0.84	0.83	0.83	0.83

Note: The table reports the coefficients of a specification similar to Equation 7, where bank exposure is instrumented using imports from China of the United States only rather than a group of advanced countries. The dependent variable is the log of outstanding credit between bank b and firm i in year t, $\ln C_{ibt}$. We split the sample between firms that are in sector whose exposure to China competition is above median (treated firms) and below median (control firms), as defined in Equation 1. The variable $Exposure^{IT}_{-i,b}$ captures bank exposure to China entrance in the WTO, as defined in Equation 3. In columns (2) and (4) this is instrumented with the variable $Exposure^{US}_{-i,b}$, where bank exposure is defined using imports from China of the United States (instead of a group of advanced economies as in Equation 6). Bank controls include bank characteristics pre-2001 interacted with a post-2001 dummy, these are log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects, firm-bank dummies, and a dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Table A3: Baseline results with exposure relative to bank total assets

Dependent : $\ln C_{ibt}$	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
$Exposure^{IT}_{-i,b} \times Post_t$	-0.059***	-0.058***		
	(0.004)	(0.004)		
$Exposure^{IT}_{-i,b} \times Post_t \times Control_i$			-0.063***	-0.063***
			(0.004)	(0.005)
$Exposure^{IT}_{-i,b} \times Post_t \times Treated_i$			-0.053***	-0.051***
			(0.005)	(0.004)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
Instrument: $Exposure^{OC}_{-i,b} \times Post_t$			*First stage*	
$Exposure^{OC}_{-i,b} \times Post_t$		1.04***		
		(0.01)		
$Exposure^{OC}_{-i,b} \times Post_t \times Control_i$				1.02***
				(0.01)
$Exposure^{OC}_{-i,b} \times Post_t \times Treated_i$				1.05***
				(0.01)
F-Stat		220.1		112.3
Observations	2,000,410	2,000,410	2,000,410	2,000,410
$Adj.R^2$	0.83	0.83	0.83	0.83

Note: The table reports the coefficients of a specification similar to Equation 7, where bank exposure is measured as the ratio of loans to firms subject to competition from China on banks' total assets rather than on banks' overall loans. The dependent variable is the log of outstanding credit between bank b and firm i in year t, $\ln C_{ibt}$. We split the sample between firms that are in sector whose exposure to China competition is above median (treated firms) and below median (control firms), as defined in Equation 1. The variable $Exposure^{IT}_b$ captures bank exposure to China entrance in the WTO, similarly to definition in Equation 3 but using banks' total assets in the denominator. In columns (2) and (4) this is instrumented with the variable $Exposure^{OC}_b$, where bank exposure is defined using imports from China of other advanced countries, as defined in Equation 6. Bank controls include bank characteristics pre-2001 interacted with a post-2001 dummy, these are log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects, firm-bank dummies, and a dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Table A4: Baseline results with bank exposure leaving sectoral credit out

Dependent : $\ln C_{ibt}$	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
$Exposure^{IT}_{-i,b} \times Post_t$	-0.069***	-0.053***		
	(0.009)	(0.014)		
$Exposure^{IT}_{-i,b} \times Post_t \times Control_i$			-0.071***	-0.053***
			(0.014)	(0.026)
$Exposure^{IT}_{-i,b} \times Post_t \times Treated_i$			-0.067***	-0.053***
			(0.009)	(0.014)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
Instrument: $Exposure^{OC}_{-i,b} \times Post_t$			*First stage*	
$Exposure^{OC}_{-i,b} \times Post_t$		0.64***		
		(0.02)		
$Exposure^{OC}_{-i,b} \times Post_t \times Control_i$				0.71***
				(0.02)
$Exposure^{OC}_{-i,b} \times Post_t \times Treated_i$				0.57***
				(0.03)
F-Stat		13.1		7.9
Observations	2,000,410	2,000,410	2,000,410	2,000,410
$Adj.R^2$	0.84	0.83	0.83	0.83

Note: The table reports the coefficients of a specification similar to Equation 7, where bank exposure is defined by leaving out the sector where the firm operates. The dependent variable is the log of outstanding credit between bank b and firm i in year t, $\ln C_{ibt}$. We split the sample between firms that are in sector whose exposure to China competition is above median (treated firms) and below median (control firms), as defined in Equation 1. The variable $Exposure^{IT}_{-s,b}$ is instrumented with $Exposure^{OC}_{-s,b}$, where bank exposure is defined using imports from China of other advanced economies as in Equation 6). Bank controls include bank characteristics pre-2001 interacted with a post-2001 dummy, these are log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects, firm-bank dummies, and a dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Table A5: Baseline results: First differences

Dependent : $\ln C_{ibt}$	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
$Exposure^{IT}_{-i,b}$	-0.072***	-0.053***		
	(0.008)	(0.014)		
$Exposure^{IT}_{-i,b} \times Control_i$			-0.069***	-0.057***
			(0.009)	(0.012)
$Exposure^{IT}_{-i,b} \times Treated_i$			-0.074***	-0.047*
			(0.013)	(0.025)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
Instrument: $Exposure^{OC}_{-i,b} \times Post_t$		*First stage*		
$Exposure^{OC}_{-i,b}$		0.64***		
		(0.02)		
$Exposure^{OC}_{-i,b} \times Control_i$				0.69***
				(0.02)
$Exposure^{OC}_{-i,b} \times Treated_i$				0.58***
				(0.03)
AR-Wald test, F		12.1		7.3
Observations	194,039	194,039	194,039	194,039
$Adj.R^2$	0.19	0.41	0.19	0.41

Note: The table reports the coefficients of a first-difference transformation of the baseline Equation 7. The dependent variable is the change in the log of outstanding credit between bank b and firm i between the average of 1998-2001 and that of 2002-2007, $\Delta \ln C_{ib}$. We split the sample between firms that are in sector whose exposure to China competition is above median (treated firms) and below median (control firms), as defined in Equation 1. The variable $Exposure^{IT}_{-i,b}$ captures bank exposure to China entrance in the WTO, as defined in Equation 3. In columns (2) and (4) this is instrumented with the variable $Exposure^{OC}_{-i,b}$, where bank exposure is defined using imports from China of other advanced countries, as defined in Equation 6. Bank controls include bank characteristics pre-2001 interacted with a post-2001 dummy, these are log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm fixed effects, and a dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.

Table A6: Baseline results: Weighted Least Squares

Dependent : $\ln C_{ibt}$	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
$Exposure^{IT}_{-i,b} \times Post_t$	-0.072***	-0.067***		
	(0.009)	(0.016)		
$Exposure^{IT}_{-i,b} \times Post_t \times Control_i$			-0.084***	-0.083***
			(0.01)	(0.017)
$Exposure^{IT}_{-i,b} \times Post_t \times Treated_i$			-0.057***	-0.040*
			(0.013)	(0.024)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
Instrument: $Exposure^{OC}_{-i,b} \times Post_t$			*First stage*	
$Exposure^{OC}_{-i,b} \times Post_t$		0.65***		
		(0.02)		
$Exposure^{OC}_{-i,b} \times Post_t \times Control_i$				0.68***
				(0.02)
$Exposure^{OC}_{-i,b} \times Post_t \times Treated_i$				0.60***
				(0.04)
F-Stat		12.1		12.3
Observations	2,000,410	2,000,410	2,000,410	2,000,410
$Adj.R^2$	0.84	0.83	0.83	0.83

Note: The table reports the coefficients of a specification similar to Equation 7, where observations are weighted by the log-employment of firms. The dependent variable is the log of outstanding credit between bank b and firm i in year t, $\ln C_{ibt}$. We split the sample between firms that are in sector whose exposure to China competition is above median (treated firms) and below median (control firms), as defined in Equation 1. The variable $Exposure^{IT}_{-i,b}$ captures bank exposure to China entrance in the WTO, similarly to definition in Equation 3 but using banks' total assets in the denominator. In columns (2) and (4) this is instrumented with the variable $Exposure^{OC}_{-i,b}$, where bank exposure is defined using imports from China of other advanced countries, as defined in Equation 6. Bank controls include bank characteristics pre-2001 interacted with a post-2001 dummy, these are log-assets, share of NPLs, core-funding ratio, and the capital ratio. All regressions include firm-year fixed effects, firm-bank dummies, and a dummy that captures if a firm operates in a sector in which the bank specializes its lending activities. Standard errors are clustered at the bank-sector (2-digit) level. ***significant at the 1% level, ** significant at the 5% level, * significant at the 1% level.