THE 2014 RUSSIA SHOCK AND ITS EFFECTS ON ITALIAN FIRMS AND BANKS

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ABSTRACT

We study how a demand shock in an export market propagates to the exporting country's banking system. Using the dual shocks of sanctions and falling oil prices suffered by Russia in 2014, we investigate the effects on Italian firms and banks more exposed to the Russian market. This event implied a sharp decline in sales for firms with a significant share of sales to Russia, but it did not affect the overall amount of credit available to them. Banks relatively more exposed to Italian exporters to Russia cut their overall credit supply, especially vis-à-vis ex ante risky borrowers, but continued to provide credit towards firms moderately hit by the trade shock, in an attempt to let them cope with the liquidity shortfall. Our results suggest that banks mitigate trade shocks for certain hit firms, while at the same time propagate them to other firms not directly affected by the shock.

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1 Introduction

In mid-2014 Russia suffered from the dual shocks of sanctions and lower oil prices, leading to a sharp fall of its imports from the rest of the world. This large import contraction hit exporters from several countries, including Italy, whose sales to Russia (the third largest extra-EU market for Italy's exports) fell by almost 35 per cent over two years. This episode represents an interesting case study to trace out how a demand shock propagates to the exporting country's banking system. Specifically, we investigate how this negative shock to export market opportunities for Italian companies affected banks' credit supply towards different firms.

Our analysis makes use of uniquely detailed data on the exposure of Italian firms and banks to the Russia shock. Specifically, we combine credit register data, customs data on the universe of exports and imports of goods, banks' and firms' balance sheet data. We identify Italian exporters for which sales to the Russian market accounted for a significant share of their turnover as those disproportionately hit by the shock, and compute a bank-level measure of exposure to the shock based on the credit share of these exporters over the total amount of credit granted to non-financial companies (NFCs). Our identification relies on a difference-in-difference strategy, covering the quarters immediately before and after the shock (which mainly took place in the second half of 2014), and estimate the effect of the Russia shock on credit supply using an approach in the spirit of Khwaja and Mian (2008).

The 2014 Russia shock shares a few similarities with the Russia-Ukraine war in 2022, but there are significant differences. Both events represent reasonably exogenous unexpected shocks to the revenues of affected firms, generating a sudden liquidity shortfall and a likely increase in their risk of insolvency. However, they differ in terms of magnitude, as the scope of trade and financial sanctions implemented in 2014 was much more limited compared to those in 2022, and context, as the latter was accompanied by a steep surge in energy costs which affected the Italian economy in a more pervasive way. For both reasons, the 2014 Russia shock allows a more precise identification of the shock and its transmission over the credit market. The 2014 Russia shock also shares a few simi-

larities with the Covid-19 shock, as both represent a negative shock to firms' revenues. However, in contrast to the pandemic shock, the 2014 Russia shock was not accompanied by any exceptional public support measure (e.g. loan moratoria, public guarantees on new credit, grants, exceptional temporary lay-off schemes), and as such it provides some hints on how bank credit would have adjusted absent any policy support measure.

Our results provide several insights on how a trade shock affects both firms and banks. First, we explore the real effects of the shock on the performance of severely hit-firms, namely those in the top decile of the distribution of the share of total revenues coming from the Russian market (henceforth *hit-borrowers*). At end-2016 these firms suffered from a significant decline in revenues (-17 per cent) relative to pre-shock levels. This reflected lower sales to Russia but also to other foreign destinations and, marginally, lower domestic revenues. The drop in turnover was accompanied by an increase in leverage, lower liquidity and a higher propensity to default on their loans (around 2 per cent more over a three-year horizon relative to other comparable firms before the shock).

Second, we study the implications of the Russia shock in terms of the availability of credit for more affected firms, further exploring whether banks changed their overall lending policies. We find that for *hit-borrowers* the total amount of available credit, as measured by the sum of outstanding credit and loan commitments, did not decrease *vis-à-vis* firms that were not directly hit by the shock. On the contrary, the former experienced a significant increase especially in drawn credit, mostly due to a more intense utilization of credit lines to cope with the increased liquidity needs. On banks' side, we find a spillover effect for banks more exposed to *hit-borrowers*: a one standard deviation increase in this bank exposure (around 0.45 percentage points) is associated to a 0.8 percentage point decrease in credit supply with respect to the universe of their NFCs borrowers. Understandably, the magnitude of the effect is relatively small as for all banks the shock affected only a modest portion of their overall loan portfolio towards NFCs. We interpret the negative spillover effect of the Russia shock on the credit supply of more exposed banks as related to the bank capital channel (Bernanke and Lown, 1991; Peek and Rosengren, 1995; Thakor, 1996; den Heuvel, 2006), stressing the contractionary effects of negative shocks to

capital on bank credit supply.[1] To the extent that the heightened credit risk of exporters to Russia implied higher future losses, our shock was equivalent to a negative shock to the prospective capital position of the bank.

Third, the Russia shock had an impact on the allocation of credit among more affected banks and firms. After the shock *hit-borrowers* were granted a disproportionate amount of credit from banks relatively more exposed to the Russia shock. At the same time, these banks cut their lending to *non hit-borrowers*, suggesting a negative spillover of the shock to non-affected borrowers. Importantly, we find that this re-allocation of credit supply operated by banks more exposed to the Russia shock mainly involved borrowers that were already risky before the trade shock. In turn, as *hit-borrowers* are a small share of NFCs (0.45 per cent), and on average less risky than the other firms, the estimated net effect of the credit reallocation is an overall reduction in the riskiness of the corporate loan portfolio of more exposed banks.

Moreover, these banks provided more credit support only to *hit-borrowers* with a moderate level of exposure to Russia (i.e. firms for which exports to Russia were between 9 and 30 per cent of their total turnover), whereas they actually provided relatively less credit than other lenders to firms with very high levels of sales concentration in Russia, as the shock was likely to lead to a permanent impairment of their performance. In this respect, higher lending to *hit-borrowers* from banks more exposed to the Russia shock does not seem to be a purely zombie lending phenomenon. Indeed, not only *hit-borrowers* were international exporters with better ex ante characteristics relative to the population of Italian firms, but only those moderately affected by the Russia shock received relatively more credit from more exposed banks, as presumably these firms had more chances to promptly redirect sales in other markets, justifying banks' liquidity support as their business viability was presumably not fundamentally threatened by the shock.

Overall, the credit reallocation enacted by more exposed banks across different borrowers suggests the implementation of a credit strategy aimed at supporting firms more

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[1]The capital channel rests on two main features that find real-world support: the imperfect substitutability among banks' liabilities, in particular between debt and equity, due to financial frictions (e.g. moral hazard or asymmetric information), and the existence of capital regulation. The weaker a bank's balance sheet, the greater an adverse shock to capital would reduce bank lending because of the capital requirement and the cost of issuing new equity.

affected by the Russia shock, while simultaneously implementing a de-risking strategy on the rest of their corporate loan portfolio. This lending pattern can be considered consistent with the bank capital channel. Indeed, more exposed banks could have been relatively more affected by the default of *hit-borrowers*, and in turn had a higher incentive to limit future losses from firm insolvencies – that would end up worsening their capital position – through the continued provision of credit to still viable *hit-borrowers*, in an attempt to let them cope with the liquidity shortfall; at the same time, these lenders also tried to preserve their capital position by reducing exposures to other (non-affected) risky firms.

Our interpretation that lending strategies reflect the working of the bank capital channel is supported by some results exploring the lending response towards the subset of riskier borrowers, i.e. those firms for which the lending supply shall be more sensitive if the bank capital channel is at work. In specifications that saturate the model with bank-firm, firm-time and bank-time fixed effects to control for multiple sources of (time invariant and time-varying) unobserved heterogeneity, we show that lending towards riskier borrowers is relatively lower: i) for the bank most exposed to the Russia shock among the lenders providing credit to each borrower; ii) for more exposed banks that face the Russia shock with lower initial levels of capital. Moreover, our results are robust to the inclusion of variables capturing bank specialization in specific economic sectors or trade finance activities (Paravisini et al., 2015), as well as a dummy for the main lender that proxies the effect of relationship lending (Petersen and Rajan, 1994; Berger and Udell, 1995).[2]

Our work contributes to several lines of research. First, our result that banks more exposed to the Russia shock extended relatively more credit to *hit-borrowers* is related to the recent papers by Favara and Giannetti (2017), Giannetti and Saidi (2018) and Galaasen et al. (2020) on the credit effects of shocks to firms' performance. The former two papers point out that lenders with high market shares in distressed sectors of the economy have a higher incentive to internalize negative spillovers due to fire sales episodes on collateral assets, and in turn provide more liquidity in an attempt to attenuate insolvencies.

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[2]The relationship lending theory suggests that banks' credit support to firms with liquidity shortfalls is idiosyncratic and not linked to considerations related to the overall bank loan portfolio. In other words, if our results were spurious as simply reflecting the existence, before the shock, of a relationship lender, then after the inclusion of this variable our measure of bank exposure to the Russia shock should not be statistically significant. On the contrary, we find that our results continue to hold.

Whereas the fire sales channel point out the importance of the *market* share of loans that each lender has in specific sectors, we instead highlight the role played by the share of loans to Italian exporters to Russia, a measure that is closely related to banks' exposure to the shock. Similarly, Galaasen et al. (2020) show how bank level negative shocks to larger firms, so called "granular credit risk", lead to a reduction in the interest rates charged on new loans to these affected borrowers but, crucially, to a tightening of credit supply conditions for smaller firms.

Our work is also related to the paper by Federico et al. (2019) analyzing the exposure of Italian banks to the China shock and the subsequent loan portfolio adjustments. Our paper provides a complementary perspective: whereas Federico et al. (2019) focus on an import competition shock, we look at an export demand shock. Moreover, the two shocks differ in terms of timing and propagation: in contrast to the gradual and cumulative nature of the China shock, the Russia shock was a much smaller shock, but severely hitting in a short window of time a specific group of firms that were particularly exposed to an export market.[3]

A third related line of research focuses on how banks and firms react to liquidity shortfalls, a literature that has seen a rapid development after the Covid-19 shock (Chodorow-Reich et al., 2021; Li et al., 2020; Kapan and Minoiu, 2020). Relative to these works, our episode provides insights on the credit dynamics for a smaller subset of firms, but without the presence of the generous public support programs implemented immediately after the pandemic broke out.

The rest of the paper is structured as follows. Section 2 provides a background of the two shocks hitting the Russian economy in 2014 and of the exposure of Italian exporters. Section 3 describes the data sources. Section 4 presents the econometric strategy. Section 5 reports the main results. Section 6 discusses the robustness of our findings. Finally, Section 7 concludes.

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[3]A different strand of literature looks at the economic effects of sanctions (including Crozet and Hinz (2020) on international sanctions *vis-à-vis* Russia in 2014, and Crozet et al. (2021) for a broader set of sanctions). However, this literature has typically focused only on the effects on firms, neglecting spill-overs to the banking sector.

2 Background

2.1 The 2014 Russia shock

After almost 15 years of largely uninterrupted growth, in 2014 the Russian economy was hit by two large shocks. The first is related to the international sanctions introduced by a large number of countries following the Russian annexation of Crimea in February-March 2014. The sanctions were imposed by the United States, the European Union and other countries between March and April 2014. The measures were then intensified during the early summer of 2014. Sanctions included: an embargo on arms, dual-use goods and specific mining equipment; restrictions on the issuance and trade of financial instruments with maturity of more than 30 days to selected Russian state-owned banks and energy companies; travel bans, asset freezes and payments restrictions against a number of Russian individuals and entities.[4] In August 2014 Russia responded with sanctions against a number of countries, including a counter-embargo on certain food and agricultural imports from the United States, the European Union and other countries.

The second shock was the sharp decrease in oil prices, which fell by half between June and December 2014 (Figure 1). A variety of factors played a part, including demand weakness and increased supply (especially in countries not belonging to the OPEC). Russia, as a major exporter of energy products, was hit hard by the collapse in oil prices: the deterioration in the terms of trade was equivalent to 30 per cent. Lower oil prices and sanctions put significant pressure on the ruble, which recorded a sharp depreciation towards the end of 2014, and also contributed to the recession in 2015, when GDP contracted by 4 per cent. The external adjustment was mainly driven by a deep import contraction: import volumes fell by 25 per cent in 2015.

The collapse in oil prices differentiates the 2014 Russia shock from the one following Ukraine's invasion in 2022; in the latter case energy prices accelerated an already increasing trend that started in 2021 as world economies gradually came out of the most intense phase of the Covid 19 pandemic. In this respect, the 2014 Russia shock considered in

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[4]The sanctions by the European Union and United States continue to be in effect to this date; further extensions have been introduced over the subsequent years and they were further scaled up following the Ukraine invasion in 2022.

this paper combines two elements – heightened trade obstacles and the sharp decline in oil prices – that both unambiguously lower the Russian demand for imported products; hence, it represents a negative demand shock from Italy's perspective. On the other hand, Italian firms' input costs, especially those related to energy prices, were not negatively affected by the 2014 Russia shock, in contrast to what happened in 2022.

This negative demand shock to export market opportunities hit all the main countries selling to Russia, including Italy. Russia was an important destination market for Italian exports of goods. In 2013 it was the eighth market in terms of export value and the third extra-EU market (after the United States and Switzerland; Table 1). Exporters to Russia were mainly selling industrial machinery (more than one quarter of total exports to Russia), wearing apparel and leather (jointly accounting for about one fifth), furniture and electrical equipment (each accounting for about 6 per cent; Table 2).

Italy's exports to Russia fell by almost 35 per cent in value terms between 2013 and 2015 (Figure 1).[5] The decrease was broad-based across sectors (Table 2, col. 4). Exports fell not only in products directly hit by the EU embargo and by the Russian counter-embargo, but also in the vast majority of the remaining products.[6]

2.2   Macroeconomic and financial conditions in Italy

The Russia shock occurred as the Italian economy was just starting to recover after the double-dip recession related first to the Global Financial Crisis in 2008-09 and then to the euro-area sovereign debt crisis in 2011-12. Italy's GDP in 2014 was 8 per cent lower than in 2007 and the prolonged recession period had hit hard all the various sectors of the economy. Export activity was among the more dynamic components, thanks to both world demand and price competitiveness, in a context of growing heterogeneity in export performance.

The double-dip recession had major repercussions not only on the country's economic

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[5]As a benchmark, Italy's world exports increased by 6 per cent during the same period, in a context of a global trade slowdown.

[6]Products hit by the EU embargo and by the Russian counter-embargo (identified following the product list provided by Crozet and Hinz (2020), accounted for a very small fraction of Italian firms' total exports to Russia (0.9 and 1.7 percentage points, respectively). For this reason we focus not only on products hit by sanctions but on the entire set of products traded with Russia.

activity but also on the financial sector, which was deeply affected in particular by the sovereign debt crisis. In the second half of 2011 the yield spread between the 10-year maturity Italian bond and the corresponding German benchmark had reached levels well above 500 basis points (bps; Figure 2). After the Italian public authorities implemented a series of structural fiscal reforms, and also thanks to the monetary policy interventions of the Eurosystem, the sovereign spread steadily decreased from mid-2012, falling below 200 bps in early 2014.

These developments affected first and foremost the cost and availability of funding for Italian banks (Battistini et al., 2014; Adelino and Ferreira, 2016). The asset side of banks was also initially hit by the losses on the Italian sovereign bonds held in the trading book, but sovereign spreads returned to pre-crisis levels by mid-2014 and subsequently reached levels that were even lower than before the shock; in turn, Italian banks ended up realizing gains on their sovereign bond holdings.

Importantly, the spike in sovereign yields was followed by a severe recession in 2012-13 (with a cumulative negative growth over the two years slightly below 5 per cent). The increased credit risk of loans to domestic customers gradually pushed up banks' non-performing loan ratios (NPLs), further weakening their balance sheets. The feeble credit demand due to the economic slowdown as well as lenders' higher funding costs and lower risk tolerance led to a sharp drop in outstanding credit, especially to non-financial companies (for which the cumulative negative growth in the 2012-15 period was slightly below 10 per cent). Furthermore, the significant deterioration in banks' asset quality took place while banks were called to comply with the increasingly stringent capital requirements enacted by EU legislators (since January 2014) in compliance with the previously announced Basel III agreements. While credit dynamics to the private sector remained subdued, retail deposits kept growing, also thanks to the lower attractiveness of net of tax yields on alternative investments (Carletti et al., 2021); as a result, since 2012 there was a gradual decline in the loan-to-deposit ratio and a simultaneous increase in sovereign debt holdings. Figure 3 displays these different patterns for the cross-section of banks between the 2nd semester of 2012 and the 1st semester of 2016.

On the onset of the Russia shock Italian banks were therefore dealing with the conse-

quences of a major systemic shock that impaired banks' financial intermediation capacity through different liquidity and risk channels (Bocola, 2016) leaving no lender virtually unaffected. Importantly, the sovereign debt crisis was a systemic shock hitting domestic lenders in a similar manner: Bofondi et al. (2017) find that the credit tightening involved all Italian domestic alike and individual bank characteristics, such as holding of sovereign bonds from European peripheral countries, have, if at all, very little explanatory power. Indeed, all domestic exposures experienced a significant increase in their credit risk, with little differences between debt and loan instruments.

The Russia shock—a minor shock *per se* involving only exporters to Russia—affected instead banks heterogeneously depending on their ex ante exposure to a specific group of Italian firms. Importantly, the pairwise correlations between our variable of bank exposure to the Russia shock and measures of bank balance sheet strength, size, funding and lending orientation are not statistically significant (Table 3),[7] pointing to the rather orthogonal nature of the Russia shock with respect to the sovereign debt crisis.

Overall, the Russia shock hit Italian banks at the time of a delicate recovery phase after two systemic shocks. Italian banks' risk bearing capacity was limited and the responsiveness of their lending policies to heightened credit risk was likely to be particularly high. In this context, we expect that even a relatively small exogenous shock increasing the riskiness of a subset of borrowers can reasonably trigger spillover effects and an overall change in lending policies, especially towards ex ante riskier firms.

3   Data

Our data set comprises granular information derived from multiple sources. First, we draw data on credit relationships between banks and NFCs from the Bank of Italy Credit Register. It includes the universe of credit exposures exceeding the €30,000 threshold (differentiated by type of loan instrument) and reported on a monthly basis by all Italian

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[7]We only find a negative correlation between the share of sovereign debt holdings and our exposure variable, but if anything this would run against our results. Indeed, by the time the Russia shock hit in mid-2014, yields on Italian government bonds were such that Italian banks already realized gains on sovereign bonds bringing potential benefits to the risk bearing capacity of banks' balance sheets.

banks and non-bank financial intermediaries. We aggregate loans to firms at the banking group level with a break-down by credit granted and credit outstanding, i.e. the amount agreed and the amount effectively drawn by the borrower; the two variables may substantially differ, especially for credit lines. Credit granted and outstanding are further broken down by instrument (credit lines and term loans), and for export purposes (trade finance). All the credit relationships are further characterized by additional attributes, named *Loan-level controls*, that include the share of collateral over total loan amount granted, the share of bad debts in total borrowing, the share of NPLs in total borrowing, and the share of trade finance in total borrowing. We exclude borrowers with non-performing loans (NPLs) in the pre-shock period as their credit relations are usually frozen and do not react to new shocks.

The second main source of data covers trade in goods and is provided by the Customs and Monopolies Agency. The dataset includes annual exports and imports by firm, product and counterpart country and covers almost the universe of Italian exporters and importers (with the exception of sole proprietorships).[8] Products are defined at the 8-digit level of the Combined Nomenclature (NC8) classification. Firms are reported with a unique identifier (VAT code) that can be easily matched to the credit register and firm balance sheet data.

The data set is further enriched by details on firms' characteristics from the Cerved data base that provides on a yearly basis balance sheet information for the universe of Italian corporations. Our starting sample consists of 540,000 firms for which we have information on total assets, share of liquid assets, financial leverage and riskiness.

The last pillar of our data set are bank-level information obtained from supervisory statistics. Bank data are aggregated at the banking group level, if applicable, or at bank level in the case of stand-alone intermediaries, and include the universe of banks and non-bank financial intermediaries belonging to banking groups. In total our sample includes around 620 banks. The balance-sheet indicators include total assets, capital and reserves to total assets ratio, loan-to-deposit ratio, share of loans to households and non-

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[8]Sales to extra-EU countries are collected through the Extrastat system, which covers all transactions above EUR 10 thousands. Sales to intra-EU countries are instead collected through Intrastat surveys, on a monthly, quarterly or annual basis depending on the reporting thresholds.

financial firms on total assets, share of government debt securities over total assets, non-performing loans (NPLs) ratio.

Table 4 reports summary statistics for the variables. Table 5 provides a description of the variables and data sources.

4 Empirical strategy

4.1 The trade shock

Our empirical strategy starts from the identification of Italian firms that exported to Russia. In 2013 sales to Russia accounted for 2.8 per cent of Italy's overall exports of goods (0.7 percentage points in terms of GDP).

Our sample includes around 22,000 firms exporting to Russia between 2011 and 2013. The share of exports to Russia over total sales varies significantly across firms. We identify a subset of 3,095 firms, for which exports to Russia account for at least 9 per cent of their total sales (including domestic sales) in at least one of the three years before the shock. We use this threshold – which roughly coincides with the last decile of the overall distribution of exporters to Russia – to define the subset of firms that were more severely hit by the Russia shock.[9] In our specifications we use the latter variable to improve the interpretation of the magnitude of the coefficients and to take into account possible non-linear effects. Given our focus on their credit relations, we label these firms as *hit-borrowers*. On average, for these firms the Russian market accounts for 18 per cent of total sales in the years before the shock, compared to less than 0.01 per cent for non-hit firms. Within the group of *hit-borrowers*, for a quarter of them at least 22 per cent of their sales comes from Russia, whereas for one tenth of them the percentage rises to more than 38 per cent. Throughout the paper we also divide *hit-borrowers* in two sub-groups: *medium-hit borrowers* with a moderate exposure (exports to Russia between 9 and 30 per cent of total sales) and *high-hit borrowers* with a high or very high exposure (exports to Russia between 30

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[9]In unreported regressions we verify that all our results are qualitatively confirmed if we adopt a continuous measure of exposure to Russia (the ratio of exports to Russia on sales) rather than the discrete measure.

and 100 per cent of total sales), where the former group represents slightly more than two-thirds of *hit-borrowers* and the latter accounting for the remaining part.

Importantly, *hit-borrowers* were not uniformly distributed across Italy (Figure 4), but were concentrated in selected parts of the country, especially in the Centre-East and North-East regions of Italy (mainly Marche, Emilia Romagna, Veneto). This presumably reflects various factors, such as industry specialization, agglomeration economies, and lower distance from the Russian market. For instance, the most exposed province is Fermo (in the Marche region), where *hit-borrowers* (mainly firms specialized in the shoe-making industrial district) account for 11 per cent of sales by firms in all sectors in the same province. Together with the concentration of exports to Russia in selected sectors (as seen in Table 2), this generates a considerable degree of heterogeneity across firms, and, as we will see in the next Subsection, across banks that are differently exposed to Italian exporters to Russia.

Table 6 compares selected pre-shock firm-level characteristics between *hit-borrowers* and three alternative comparison groups: all other exporters, all other firms in the manufacturing sector and finally the entire population of firms in all sectors. Exporters in general are known to be larger, more productive and financially sounder compared to non-exporters. The subset of firms with a relatively large exposure to the Russian market are no exception. They also record larger sales and assets compared to firms in the manufacturing sector or in all sectors. In terms of financial health, *hit-borrowers* have a higher liquid assets ratio, lower leverage and lower probability of being classified as a riskier firm[10] compared to firms in the manufacturing sector or in the entire economy. With respect to exporters, *hit-borrowers* share many characteristics, but differ in terms of their considerably larger export-to-sales ratio (roughly 50 per cent, compared to less than 20 per cent among other exporters) and their lower leverage. Overall, the subgroup of *hit-borrowers* certainly does not show ex ante any characteristic that is typically associated with "zombie" firms (Caballero et al., 2008; Acharya et al., 2019; Schivardi et al., 2020).

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[10]Riskiness is based on the Cerved score, which is in turn derived on the basis of the Altman (1968) methodology resulting in the classification of firms into 9 increasing risk classes from 1 to 9. In particular, we generated a $RISKIER$ variable which is equal to one if the firm is classified in the most vulnerable categories, i.e. the risk classes between 7 and 9.

4.2 Methodology

As a preliminary step, we verify that the Russia shock was indeed a negative demand shock using the following cross-sectional first-differences regression:

$$\Delta Y_i = \beta HitBorrower_i + \gamma X_i + \alpha_j + \alpha_p + \epsilon_i \qquad (1)$$

where ΔY_i is the change in an outcome variable for firm i such as firm revenues ($\Delta Sales$), financial leverage ($\Delta Leverage$), liquidity ($\Delta Liquidratio$), classification in bad debt status ($Bad\ debt$) or other non-performing loan status ($OtherNPL$). For the first three variables all changes are considered with respect to the end-2016 value relative to the two-year average pre-shock (i.e. 2012-13). The $Bad\ debt$ and $OtherNPL$ variables are instead dichotomous dummy variables and the regression model is effectively a linear probability model. The variable $HitBorrower_i$ is a dummy equal to one if the firm's exports to Russia before the shock amounted to 9 per cent or more of its total sales (including domestic sales) in at least one of the three years before the shock. The regression controls for firm-level control variables X_i, sector j (NACE 2-digit) and province p fixed effects.[11]

Moving to the core of our empirical strategy, we then focus on credit dynamics. As the drop in Italian exports took place over the second half of 2014 (Figure 1), stabilizing thereafter on lower levels, we consider a one-year period before the shock (Q3-2013 - Q2-2014), and a one year and a half period after (the 6 quarters Q3-2014 - Q4-2015, $Post$ period thereafter), coinciding with the second half of 2014, during which the drop in exports materialized, and the entire 2015. We start considering how credit changed for *hit-borrowers* relative to other firms after the Russia shock. For this purpose, we use quarterly firm-level data on stocks of outstanding and granted credit and estimate the following regression:

$$lnC_{it} = \beta HitBorrower_i \times Post_t + \gamma X_{it} + \alpha_i + \alpha_{jt} + \alpha_{pt} + \epsilon_i \qquad (2)$$

where α_i is a time-invariant firm fixed effect, $Post_t$ is a dummy variable equal to one from

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[11]The specification in first difference implicitly controls for time-invariant characteristics at the firm-level, e.g. differences in energy intensity across firms.

the third quarter of 2014 to the last quarter of 2015 and zero before, X_{it} firm time-varying controls, α_{jt} and α_{pt} are sector-time and province-time fixed effects.

Next, we focus on how banks that were relatively more affected by the Russia shock adjusted their credit supply. To this end, we compute the following measure of pre-shock bank exposure:

$$BankExposure_b = \frac{\sum\limits_{i} C_{ib} \frac{ExpRussia_i}{Sales_i}}{\sum\limits_{i} C_{ib}} \tag{3}$$

which corresponds for each bank b to a weighted average of the share of exports to Russia over total sales for all its borrowers, where weights C_{ib} account for the share that a given firm's credit has over total credit provided by the bank. This is a continuous measure of the weight of loans to exporters to Russia in a bank's overall loan portfolio to firms.

The degree of heterogeneity in bank exposure to exporters to Russia is relatively large. For the vast majority of lenders, exposure is low, given that banks usually tend to have a diversified portfolio. Nevertheless, banks in the upper part of the distribution of $BankExposure_b$ record more significant values (Figure 5). These are typically local or regional banks operating in areas specialized in products that are among the top exports to Russia.

We estimate the effect of the Russia shock on banks' credit supply, following the Khwaja and Mian (2008) approach:

$$lnC_{ibt} = \beta BankExposure_b \times Post_t + \gamma \mathbf{Z}_{ibt} + \alpha_{it} + \alpha_{ib} + \epsilon_{ibt} \tag{4}$$

where the dependent variable is the log stock of loans granted by bank b to firm i at time t. The main explanatory variable is the interaction between $Bankexposure_b$[12] and the $Post_t$ dummy, which is equal to one from the third quarter of 2014 onward and zero before. We control for firm-time fixed effects, absorbing time-varying shocks to credit demand at the firm level, and for bank-firm fixed effects, taking into account time-invariant factors underlying the matching between firms and banks. The inclusion of firm-time fixed effects in our baseline specification implies that the estimation sample only includes firms

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[12]Our main results are qualitatively unchanged when substituting the continuous variable $BankExposure_b$ with a dummy taking value of 1 for banks in the top decile of its distribution (material available upon request).

with multiple lenders (around 50 per cent of the firms in the original sample but receiving around 90 per cent of total granted credit). The $\mathbf{Z}_{ibt}$ vector includes bank and loan controls. The former control for pre-shock bank characteristics, interacted with the $Post_t$ dummy (assets, loan-to-deposit ratio, share of loans to households and non-financial firms, capital ratio, share of government securities holdings, NPL ratio). The latter control for time-varying loan-level characteristics (share of collateral, share of trade finance, share of bad debts, and share of other NPLs in total credit granted to the borrower).

Lastly, we explore the interaction between more affected firms (*hit-borrowers*) and bank exposure. Specifically, we estimate the regression model:

$$lnC_{ibt} = \beta BankExposure_b \times Post_t + \beta BankExposure_b \times Post_t \times HitBorrower_i + \gamma \mathbf{Z}_{ibt} + \alpha_{it} + \alpha_{ib} + \epsilon_{ibt}$$

(5)

where the triple interaction term $BankExposure_b \times HitBorrower_i \times Post_t$ captures potential differences in the lending response of more affected banks with respect to *hit* and *non hit-borrowers*. To explore the channels of the effects across firms with different risk profiles we perform an analogous regression adding an additional interaction to $BankExposure_b \times Post_t \times HitBorrower_i$ with a dummy for riskier firms. Similarly, in a robustness check we test whether our results are driven by relationship lending, and we add an additional interaction with a dummy identifying for each firm its main lender.

5 Main results

We proceed to present our main results as follows. First, we provide an overall view of the impact that the shock had on firms more exposed to the Russian market by comparing the post-shock evolution of several firm outcome variables (sales, leverage, liquidity, loan default) relative to the one observed for other comparable firms. Second, we consider how the shock changed the dynamics of credit, both in terms of granted and outstanding amounts, for banks and firms that were more severely hit by the shock. Third, we investigate how lenders differently affected by the Russia shock adjusted their credit supply to firms that were more severely hit by the shock *vis-à-vis* other firms. This last analysis is

crucial to understand how the concentration of credit, and the related loan default risk, gets redistributed across the banking system after a subset of firms suffers from a large negative shock on their business operations.

5.1 Real effects on *hit-borrowers*

Table 7 provides an overview of the different performance of *hit-borrowers* after the Russia shock. We consider a cross-sectional regression model for the post-shock change of several outcome variables between the average of the two-year pre-shock period and its 2016 value: revenues ($\Delta Sales$), financial leverage ($\Delta Leverage$), liquidity ($\Delta Liquidratio$), classification in bad debt status ($Bad\ debt$) or other non-performing loans ($Other NPL$). All regressions include sector and province fixed effects, together with several firm control variables.[13]

We find that *hit-borrowers* display a substantial worsening of their performance – the drop in firm sales relative to other comparable firms amounts to 17 per cent over a three-year period[14] – and a heightened financial vulnerability as pointed out by the increase in financial leverage and by the decrease in liquidity. As a result, we also find a substantially higher likelihood of being insolvent on debt obligations: the estimated transition to either bad debt or other milder NPL statuses is on average almost 2 percentage points higher than for other comparable firms.[15] This deterioration in the economic and financial performance of *hit-borrowers* is not due to a composition effect: the ex-ante share of riskier firms in the sub-group of *hit-borrowers* is lower than in the entire population of NFCs, and we include in our specifications several firm-level controls, together with industry and province fixed effects. Moreover, the results entirely hold if we restrict the sample to firms with sound financial conditions (as measured by the Cerved rating score) before the Russia shock.

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[13]Firm-level controls include pre-shock assets, sales, leverage, liquid ratio and riskier status (see Table 5). The number of *hit-borrowers* in these regressions is around 2,300 firms, because for some companies full balance sheet data for the pre-shock years and for 2016 was not available.

[14]Sales of *medium hit-borrowers* declined on average by 9 per cent, whereas those of *high hit-borrowers* declined by 37 per cent.

[15]These transition probabilities increased by 1.7 and 2.4 percentage points for *medium hit-borrowers* and *high hit-borrowers*, respectively.

Table 8 further investigates the decline in firm sales. We first decompose total sales in domestic sales and exports (columns 2 and 3). Given that this analysis focuses on exports, we restrict the sample to exporting firms (around 62,000 firms). The results show that the decline in sales was driven by exports, which fell by more than 40 per cent for *hit-borrowers*, compared to other exporters.[16] The coefficient on domestic sales is negative and slightly above conventional significance thresholds. Columns 4 and 5 further decompose export performance according to the destination of sales (Russia and the rest of the world, respectively).[17] Interestingly, *hit-borrowers* recorded a statistically significant decline also in sales towards other foreign destinations (by more than 10 per cent). This is consistent with the hypothesis that the negative liquidity shock arising from the sudden contraction of sales in the Russian market might have hindered the export performance in other markets, by reducing the cash flow available for investment and/or working capital. The results that export sales in foreign markets are affected by the liquidity shock more than domestic ones is consistent with the higher financial needs typically associated with export activities.[18]

Overall, this evidence points out that the Russia shock represented a severe challenge to the business of a subset of Italian firms. In contrast to other recent shocks (e.g. Covid-19 pandemic, 2022 energy shock) in which firms widely benefited from generous public support programs (e.g. legislative moratoria, public guarantees, grants), there was no specific policy intervention to attenuate the impact of the Russia shock on *hit-borrowers*. Therefore, the 2014 Russia shock represents an interesting episode to analyse how credit supply and the structure of lending relations change in response to a negative demand

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[16]This evidence shows that exporters to Russia recorded a significantly inferior performance compared to other exporters. Therefore, our definition of *hit-borrowers* captures a group of firms subject to an idiosyncratic shock arising in one of their main outlet markets, and not a generic shock to exporting firms related to the global trade slowdown in 2014-15.

[17]The number of observations in column (4) is significantly lower than the 22,000 firms that exported to Russia in 2011-13 reported in the previous Section because a relatively large number of those firms did not export to Russia in 2016.

[18]In unreported estimates we replicate the specifications in columns (4) and (5), exploiting the full detail by product and country available in customs data. We compute the dependent variable as the log change in exports for each product-country combination (as opposed to the log change in total exports). This specification allows us to control for demand shocks at the product-country level. The results are consistent with the more aggregate evidence reported in Table 8. We also decompose exports in the intensive and extensive margins, and find that both contribute to the decline in exports.

shock that affects a subgroup of Italian firms, without public support measures alleviating the adverse effects.

5.2   Credit effects on *hit-borrowers* and banks

We now turn to consider how the worsened business performance of *hit-borrowers* influenced the amount of credit available to them, as measured by the amount of granted loans, as well as their actual draw-down of credit, as measured by the outstanding loan amount. Initially, we rely on a firm level analysis to capture the overall change in credit, i.e. irrespective of any change in the distribution of loan amounts across lenders, an important issue that we explore later.

Notwithstanding the severity of the shock, *hit-borrowers* did not suffer, on average, from a contraction in the overall amount of credit available in the post-shock period. Granted credit slightly increased compared to non-hit firms (Table 9, panel a), and outstanding credit (i.e. drawn credit) increased even more (Table 9, panel b): on average, the growth in outstanding credit was 8.3 percentage points higher than that observed for *non hit-borrowers*.[19] The increase was especially marked for credit lines, the most suitable loan instrument to cope with liquidity needs; no such increase is instead observed for trade finance loans, presumably reflecting the difficulties to find new business opportunities abroad so as to substitute for the lost export sales to Russia.[20]

Next, we consider whether the Russia shock had effects on the credit supply of the banks more (indirectly) exposed to Russia through bank-firm links. Specifically, we test whether higher bank exposure had an effect on their overall credit supply (Table 10) gradually adding controls to the specification. Column 1 only includes firm-time and bank-firm fixed effects. Loan-level controls are included in column 2, whereas loan-level and bank-level controls are included in column 3 (our baseline specification).

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[19]Outstanding credit increased by about 7 and 12 percentage points for *medium hit-borrowers* and *high hit-borrowers*, respectively.

[20]We have also explored the hypothesis that *hit-borrowers* might have increased their trade credit exposure *vis-à-vis* their suppliers, in addition to increased bank borrowings. We estimate equation (1) using the change in account payables on revenues as the dependent variable. The coefficient is not significantly different from zero, suggesting that *hit-borrowers* did not increase their reliance on trade credit in order to offset the liquidity shortfall.

We find that in the post-shock period – between the third quarter of 2014 and the last quarter of 2015 – banks relatively more exposed to the Russia shock cut lending relative to less exposed banks. A one standard deviation increase in $BankExposure$ is associated to a 0.8 percentage-point decrease in credit supply after the shock. Columns 4-6 explore the effect of the Russia shock on the supply of various forms of credit. Specifically, we separately consider credit lines, term loans and export loans as the dependent variable instead of total loans. The coefficients on $BankExposure$ are always negative and particularly large for revocable credit lines and export loans.

For robustness purposes we analyze the dynamics of the coefficient associated to $BankExposure$ through a specification in which this variable is interacted with dummies for each quarter in our sample period (Figure 6). The two red vertical lines highlight the period in which the dual external shock hit the Russian economy, i.e. between Q2-2014 and Q4-2014 (trade sanctions were introduced between April and August and the sharp decrease in oil prices took place in the second half of 2014). Their credit supply starts declining in Q1-2015, reaching a plateau around the end of 2015. Figure 6 also suggests that there was no significant difference in the credit supply of more exposed banks, relative to that of less exposed banks, before the shock. This provides support to the parallel trend assumption, i.e. the level of exposure to Russian exporters did not matter for banks' lending policy before the shock took place.

5.3 Heterogeneous effects among firms

We now turn to consider how banks adjusted their loan portfolio allocation in the aftermath of the Russia shock with respect to several firms' subsets, and notably towards *hit* and *non hit-borrowers*. To do so we initially consider the triple interaction among $BankExposure$, a dummy $Post$ for the period after the shock and another dummy $HitBorrower$ to identify *hit-borrowers*. The results are reported in Table 11 (column 1). Relative to other lenders, banks more exposed to the Russia shock reduced their credit supply to *non hit-borrowers*, in line with the results above and the fact that these are the vast majority of firms. The interaction with the $HitBorrower$ dummy is instead positive and signifi-

cant, suggesting that they increased their granted credit to *hit-borrowers* relative to other lenders. A one standard deviation in $BankExposure$ is associated with a 2.1 percentage points increase in credit to *hit-borrowers* and with a decrease of 0.9 percentage points towards other borrowers.

We then investigate the extent of the heterogeneity within *hit-borrowers*, dividing them in *medium hit-borrowers* and *high hit-borrowers*. Table 11 (column 2) shows that the positive credit supply shock only involved *medium hit-borrowers*, whereas the coefficient on the interaction with *high hit-borrowers* is not statistically different from zero, thus indicating that the relative credit supply of more exposed banks towards the latter group of borrowers was similar to the one - slightly more restrictive relative to the one of less exposed lenders - found with respect to *non hit-borrowers* (the reference category). This is consistent with the interpretation that exposed banks were more willing (relative to other lenders) to financially support only the subset of *hit-borrowers* with reasonable prospects of diversification and recovery (i.e. those whose exposure to the Russian market was not at extremely high levels of concentration).

Column 3 of Table 11 instead investigates the heterogeneity within *non hit-borrowers*, by diving them in the four sectors of the economy (manufacturing, construction, services, and other sectors). The results suggest that the credit contraction with respect to *non hit-borrowers* occurred across all the main sectors of the economy, with the construction sector being relatively more strongly affected by the negative credit supply shock.

We then classify firms according to their riskiness and find that banks more exposed to the Russia shock predominantly reduced credit towards borrowers with a low credit rating ($Riskier firm$) already before the shock (Table 11, column 4). This result is consistent with our previous finding pointing to a more negative credit supply shock in the construction sector, as in Italy firms in this sector tend to be on average more financially vulnerable.

Importantly, although banks more exposed to the Russia shock cut relatively more credit towards risky borrowers, this lending strategy did not apply towards ex ante riskier *hit-borrowers*, as we find that these firms are actually the ones driving the results on the relative expansion of credit supply towards *hit-borrowers* (Table 11, column 5). In other

words, those *hit-borrowers* that were already ex ante more vulnerable, and presumably also with less chances to obtain additional loans from other lenders after the shock, were also the ones receiving relatively greater credit support by banks more exposed to the Russia shock.

Figure 7 provides further evidence on the dynamics of the credit reallocation between *hit* and *non hit-borrowers* undertaken by these banks: before the shock their lending strategies were broadly similar to the ones of other lenders, for both categories of borrowers; afterwards, instead, their credit supply increased for *hit-borrowers* (although remaining below the statistical significance threshold relative to the last pre-shock quarter), whereas it gradually decreased for *non hit-borrowers*. The timing of more exposed banks' reaction also differs between *hit* and *non hit-borrowers*. Credit supply to the former reacts earlier, already in Q3-2014, consistently with the fact that these firms are those directly hit by the trade shock; in contrast, the credit supply tightening to the latter occurs later, as banks adjust their loan portfolio to the shock through their lending policy. Consistently with the results on riskier firms (Table 11, column 5), for banks more exposed to the Russia shock the divergence in lending patterns between *hit* and *non hit-borrowers* is sharper if we restrict the sample to the subset of ex ante riskier firms.

5.4   The Russia shock and the bank capital channel

To further explore the differential lending response of more exposed banks towards both riskier and *hit-borrowers*, we consider a specification that – exploiting the within-firm differences in exposure to the Russia shock among its lenders – allows including, on top of bank-firm and firm-time fixed effects, bank-time fixed effects. In this way, we exploit heterogeneity at the bank-firm-time level that make it possible to further saturate the model. The inclusion of this additional set of fixed effects controls for potential unobservable idiosyncratic factors affecting the overall lending policy at the bank level, in the spirit of the methodology first proposed by Amiti and Weinstein (2018), that may not be entirely captured by the bank level controls included in our baseline specification. In practice, the regression model estimates the coefficients of the interaction between $Post$, either the

dummy to identify riskier firms ($Riskier\ firm$) or *hit-borrowers* ($HitBorrower$) and dummies varying at the bank-firm-time level that assume the value of 1 for the lender with the highest ($H - ExpLender$) or lowest ($L - ExpLender$) value of $BankExposure$ among the firm's lenders. In this way, we estimate the relative difference in lending behaviour that are not explained by either time invariant bank-firm characteristics, firm time-contingent demand factors and the overall bank loan supply in a given quarter. Table 12 reports the results.[21] We find that in the aftermath of the shock the most (least) exposed lender reduced (increased) lending to riskier firms relative to other banks lending to the same borrower. The magnitude of the coefficients is around -1 percentage point for $H - ExpLender$ and +2.3 percentage points for $L - ExpLender$.[22] In other words, banks relatively more (less) exposed to the Russia shock were relatively less (more) willing to extend credit to riskier borrowers. We then replicate the analysis interacting the dummy for *hit-borrower*: we do find a negative and statistically significant coefficient for $L - ExpLender$, as implied by our baseline results, whereas the coefficient for $H - ExpLender$ is positive but not statistically significant.

We interpret the previous evidence on the relation between banks' exposure to the Russia shock and the differences in banks' lending policies, especially towards riskier firms, after the shock as consistent with credit adjustments driven by a bank capital channel. Indeed, banks more exposed to the shock might have found more convenient, relative to other lenders, to provide credit to *hit-borrowers* so as to avoid, at least in the short-term, their default. Indeed, this boils down to which banks have higher incentives to provide credit to firms facing a temporary liquidity shock: the higher the bank exposure to these firms the higher the cost – absent their liquidity support – of their (simultaneous) default in terms of profits and, ultimately, capital. At the same time, more exposed banks implemented a de-risking strategy by reducing credit to all borrowers that were already

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[21]In unreported results, available upon request, we also include a dummy for the main lender, namely the bank with the highest lending exposure towards the borrower. The coefficients for $H - ExpLender$ and $L - ExpLender$ are virtually unchanged.

[22]The coefficients would be equal and with opposite sign if each firm in the sample had exactly two lenders; however, more than half of the firms in the estimation sample have at least three lenders so the coefficients differ. In this respect, the fact that both the coefficients for $H - ExpLender$ and $L - ExpLender$ are statistically significant – and with the expected signs – represents a sanity check of the robustness of this specification.

risky before the shock. This loan portfolio adjustment across NFCs borrowers aimed at reducing the impact of the heightened credit risk due to the increased exposure towards *hit-borrowers*. Overall, the estimated coefficients imply that on average the net effect for more exposed banks is an overall de-risking of their NFCs' loan portfolio, as for all banks *hit-borrowers* represented a small share of their NFCs' loans.

To explore the plausibility of the bank capital channel as an explanation of the observed lending patterns across banks, we consider how the response of lenders similarly affected by the Russia shock differ as a function of the pre-shock bank characteristics. In particular, we consider the potential heterogeneous response towards riskier borrowers as the bank capital channel shall disproportionately affect lending patterns towards them.

Our specification builds on the one proposed by Jiménez et al. (2014), and it includes bank-firm, firm-time and bank-time fixed effects to granularly control for bank-firm, firm and bank level heterogeneity in credit supply, and considers for the identification of the bank capital channel the triple $Post$ x $Riskier$ x $BankVar$ and quadruple $Post$ x $BankExposure$ x $Riskier$ x $BankVar$ interaction terms (Table 13). In this setting the estimated coefficients capture the within bank post-shock differences in lending towards riskier borrowers as a function of each bank characteristic (triple interaction), further exploring whether the response also varied with the exposure to the Russia shock (quadruple interaction). For instance, negative coefficients both for the triple and quadruple interaction terms for a certain bank variable suggest that banks with higher levels of the latter were on average disproportionately tightening lending towards riskier firms relative to other less risky borrowers (triple interaction), and especially so if the lender was more ex ante exposed to the Russia shock (quadruple interaction). As a result, to test whether the Russia shock lending adjustments may be rationalized by a bank capital channel, we should expect the quadruple interaction terms to be positively (negatively) associated with bank variables associated to bank balance sheet strength (weakness).

To simplify the exposition of these results, Figure 8 displays the marginal effects on granted credit of 1 standard deviation (s.d.) difference in each bank characteristics for two different base levels of $BankExposure$, corresponding to the values of the 10th and 90th percentile of its distribution. Importantly, we find that banks more hit by the Rus-

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sia shock and with ex ante higher (lower) capital positions were on average relatively more (less) willing to extend credit to riskier borrowers: the estimated coefficients imply that a 1 s.d. increase in capital ratio for low level of exposure to the Russia shock (at the 10th percentile of $BankExposure$) should result in a cross-sectional difference across lenders below 1 percentage point; this difference among lenders with different capital ratios would increase to 2.7 percentage points if banks were ex ante more exposed to the Russia shock (at the 90th percentile of $BankExposure$). An analogous result holds for banks with a higher share of government securities because the latter, being not directly exposed to the risk of an asset quality deterioration in the corporate sector, also proxy a higher risk bearing capacity for banks stemming from the bank asset side composition. We do not find instead that the effects of the NPL ratio, the loan-to-deposit ratio and the share of loans to households and non-financial companies vary with differences in the exposure to the Russia shock. Overall, this evidence suggests that lenders more hit by the Russia shock engaged in a less intense de-risking strategy when they started from more solid balance sheet conditions in terms of prospective risk bearing capacity. In turn, we interpret this evidence as consistent with the workings of the bank capital channel.

6   Robustness checks

In this section we present a series of robustness tests to rule out that our results are driven by alternative mechanisms.

Relationship lending. We consider whether our main results may depend on the fact that more exposed banks are also on average more likely to be the main relationship lender (Petersen and Rajan, 1994; Berger and Udell, 1995) of *hit-borrowers*, and as such be more likely to accommodate firms' idiosyncratic credit demand shocks. We include in our baseline specification the interaction of a dummy for the main lender – defined as the bank holding the higher share of borrower's bank credit pre-shock – with the $HitBorrower$ and $Post$ variables. Table 14 (column 1) shows that the main lender grants more credit to the borrower after the shock; however, the coefficients related to both $BankExposure$ and its interaction with $HitBorrower$ remain roughly unchanged

relative to our baseline specification. This evidence suggests that relationship lending is not a plausible explanation for the divergence in lending behaviour by banks differently affected by the Russia shock.

Bank sectoral and trade finance specialization. We consider as a robustness whether bank specialization in trade finance activities (Crozet and Hinz, 2020) or some economic sectors (Paravisini et al., 2015) alternatively explain the lending patterns observed and in particular the credit reallocation between *hit* and *non hit-borrowers* undertaken by the banks more exposed to the Russia shock.[23] Table 14 (columns 2 and 3 respectively) show that both the magnitude and statistical significance of coefficients related to $BankExposure$ and its interaction with the $HitBorrower$ dummy are roughly unchanged once inserting in the regression model proxies for either type of specialization.

Direct bank exposures to Russia. Our main variable of interest, $BankExposure$, only takes into account the indirect exposure of each bank to the Russia shock through their lending to Italian exporters to Russia. However, banks may also hold direct exposures to Russian branches and subsidiaries. These exposures may also potentially affect their lending policies towards Italian firms via the bank capital channel. To rule out the possibility that our results only depend on such direct exposures, rather than from the indirect exposures through *hit-borrowers*, we run our main specifications excluding from the sample the Italian banks with branches or subsidiaries in Russia.[24] Table 15 (column 1) shows that the results are in line with our earlier results: banks more exposed to the Russia shock cut lending relatively more to *non hit-borrowers*, whereas the opposite credit pattern takes place towards *hit-borrowers*.

Import linkages. The large rouble depreciation in 2014 might have benefited firms and sectors importing inputs from Russia (although only a small share of imports is invoiced in the Russian currency, as a large majority of imports is settled in U.S. dollars and euro). Italy's imports from Russia are highly concentrated in a small number of sectors

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[23]Banks are considered specialized in trade finance if they are in the top decile of the distribution of trade finance loans. Banks are specialized in a given industry if the bank's share of lending to the industry is larger than the 75th percentile plus 1.5 interquartile ranges of the distribution across banks. We consider a three-year rolling average.

[24]The two largest Italian banking groups, Intesa Sanpaolo and UniCredit, are the only ones with Russian subsidiaries.

(mainly natural gas, oil, metals and metal products). We run the baseline specification on credit supply after dropping these sectors and find that our results are confirmed (Table 15, column 2).

Geographical linkages. The decrease in the credit supply of more exposed banks towards *non hit-borrowers* might reflect local general equilibrium effects, with *non hit-borrowers* located near to clusters of hit firms suffering from lower demand from hit firms' workers and owners. We divide firms in two sub-groups depending on whether they are located in the top quintile of provinces in terms of hit firms' sales-weighted share on total firms in the province (*hit-areas*) or in other provinces (*non hit-areas*). Importantly, we find that exposed banks decrease credit supply to *non hit-borrowers* in *non hit-areas*, where spillovers due to geographical linkages should be very limited (Table 15, column 3).

Input-output linkages. We also use regional input-output tables, available from the European Commission, to identify firms operating in regions-industries that are likely to be upstream suppliers of *hit-borrowers*.[25] The results show that the negative credit supply shock affects in equal proportions *non hit-borrowers* that are likely to be upstream suppliers as well other *non hit-borrowers* (Table 15, column 4). This suggests that our results are not driven by input-output transmission channels.

Oil price shock. The steep fall in oil price might affect the activity of Italian firms and sectors not only via the decrease in Russia's import demand but also through other channels; for instance, sectors with a high energy intensity might benefit from cheaper oil prices. We compute a measure of bank exposure to energy-intensive sectors (defined on the basis of energy use per unit of value added). We find that the inclusion of this control does not change our coefficients related to $BankExposure$ (Table 15, column 5).[26]

Trade in services. The sharp decline in Russian import demand affected not only goods but also services. Specifically, travel expenditures by Russian visitors in Italy (the main component in Italy's exports of services to Russia) fell by about 35 per cent in value

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[25]We first compute, for each region-sector, the share of *hit-borrowers* on total sales and identify the top decile of the distribution as *hit regions-sectors*. We then compute, for each region-sector, the share of output sold to *hit regions-sectors* and classify firms in the top decile of the distribution as upstream suppliers of *hit-borrowers*.

[26]We consider only bank exposure to energy-intensity sectors because firm-level differences in energy intensity are already absorbed by firm-time fixed effects.

terms between 2013 and 2015. Exposure to Russian travellers was heterogeneous across provinces: the share of Russian travellers' expenditure on total foreign traveller's expenditure before the shock was negligible in most provinces, but it was as high as 40 per cent in selected destinations that were very popular among Russian tourists. We compute a measure of bank exposure to services sectors hit by the Russia shock as a weighted average of loans to hotels and restaurants, with weights corresponding to the share of Russian travellers' expenditure on total foreign travellers' expenditure in each province. We find that the coefficients related to $BankExposure$ are roughly unaffected (Table 15, column 6).

7 Conclusions

This paper uses the dual shocks of sanctions and falling oil prices suffered by Russia in 2014 as an exogenous event that sharply reduced sales opportunities for Italian firms previously exporting in the Russian market. This allows us to investigate how a trade shock in an export market propagates to the exporting country's banking system, specifically through banks with a NFCs loan portfolio disproportionately oriented toward firms exporting to Russia.

We first confirm that firms heavily exporting to Russia displayed a substantial worsening of their performance after the shock, in terms of lower revenues and higher financial vulnerability. Credit demand increased, especially for loan instruments such as credit lines that are better suited to cope with liquidity needs. Banks that were relatively more exposed to Italian exporters to Russia cut their overall credit supply, in particular *vis-à-vis* borrowers that were not directly hit by the Russia shock (especially ex ante risky firms). At the same time, exposed banks expanded credit towards firms moderately hit by the Russia shock, in an attempt to accommodate their liquidity needs and prevent a generalized solvency crisis that may have a non-negligible impact on their capital position. The empirical evidence is consistent with the bank capital channel: banks more exposed to the surge in credit risk due to the Russia shock attempted to reduce their loans towards risky firms; at the same time, these banks had higher incentives to avoid the default of

firms moderately hit by the Russia shock, thus they provided, relative to other lenders, more liquidity support to these exporters.

Overall, our findings suggest that events that lead to a sudden drop in firm revenues, such as the Russia shock, might not only have an impact on firms that are directly hit by the shock, but they may also propagate to the rest of the economy through the financial sector, as more exposed banks adjust their loan portfolio including *vis-à-vis* non-hit firms. The evidence is to a large extent consistent with the results reported by Federico et al. (2019), who analyze banks' reaction to an import competition shock rather than an export demand shock.

A relevant implication of our work is that the transmission of trade shocks through the financial sector does not necessarily have to pass through global banks. Local or regional banks that are specialized in lending to export companies – as often occurs because of agglomeration economies, geographical advantages or specialization in bank lending – might act as a propagation channel for the rest of the economy. The overall magnitude of these effects obviously depend on the size of the trade shock, and in our case study it was relatively moderate thanks to the widely diversified structure of Italian exports. Nevertheless, our findings suggest that a trade shock of a much larger magnitude might lead to more disruptive effects for the economy also through the propagation operated by the banking system towards borrowers not directly hit by the shock.

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8 Tables and figures

Figure 1: **Italy's monthly exports to Russia and oil price**

This figure depicts Italy's monthly exports to Russia in value terms (index March 2014=100) and the average Brent crude oil price (in USD). Source: Datastream, Istat. The vertical lines refer to the period included between June 2014 and December 2014, when the drop in exports materialized in relation to the dual shocks of international sanctions and fall in oil prices.

Table 1: **Italy's exports of goods by destination market: 2013**

This table reports export value (in EUR bln) and percentage share on total exports for the top 10 destination markets of Italy's exports of goods in 2013.

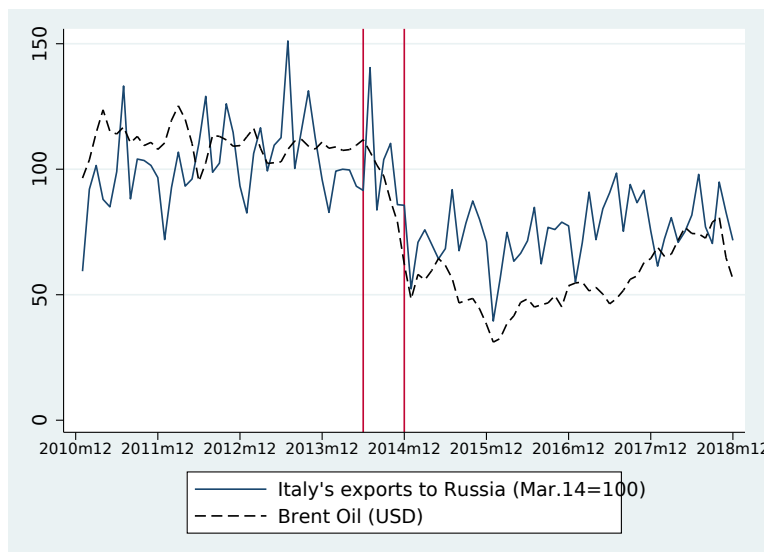|	Value (EUR bln)	% on total
Germany	48	12.5
France	42	10.8
United States	27	7.0
Switzerland	20	5.3
United Kingdom	19	5.0
Spain	17	4.4
Belgium	11	2.9
Russia	**11**	**2.8**
Turkey	10	2.6
China	10	2.5
Rest of the world	172	44.3
Total	387	100.0

Table 2: **Italy's exports of goods to Russia by industry**

This table reports export value (in EUR mln) and percentage share on total exports for the top 10 sectors of Italy's exports of goods to Russia in 2013.

| | Year 2013 | | Year 2015 | |
| | Value | % on total | Value | % ch. 2013-15 |
	(1)	(2)	(3)	(4)
Machinery	2,892	26.9	2,239	-22.6
Wearing apparel	1,316	12.2	776	-41.1
Leather	811	7.5	442	-45.6
Furniture	686	6.1	454	-33.8
Electrical equipment	656	6.1	460	-29.9
Chemicals	581	5.4	514	-11.5
Metal products	571	5.3	311	-45.5
Motor vehicles	557	5.2	158	-71.7
Food products	440	4.1	267	-39.4
Non-metallic mineral products	301	2.8	194	-35.6
Other sectors	1,961	18.2	1,280	-34.8
Total	10,772	100.0	7,093	-34.1

Figure 2: **Yield spread between Italian and German 10-year sovereign bonds**

This figure depicts the difference between the average monthly yield on Italian and German 10-year sovereign bonds.

Source: own elaboration on European Central Bank data.

Table 3: **Correlation matrix between bank variables pre-Russia shock**

This table reports the pairwise correlations among the average pre-shock levels (computed for each bank over the Q4-2012 to Q2-2014 period) for the bank variables listed in Table 5.

	Log total assets	Share loans to HH and NFC	Loan-to-deposit ratio	Capital ratio	Share govt securities	NPL ratio	Bank exposure
Log total assets	1.00						
Share loans to HH and NFC	0.09	1.00					
Loans-to-deposit ratio	0.27***	0.33***	1.00				
Capital ratio	-0.54***	-0.14***	-0.02	1.00			
Share govt securities	-0.17***	-0.44***	-0.39***	0.10*	1.00		
NPL ratio	-0.04	0.23***	0.02	0.19***	0.10*	1.00	
Bank exposure	0.07	0.05	0.07	-0.09	-0.13**	-0.05	1.00

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 3: **Time evolution of the distribution for the main banking variables**

This figure depicts the box plot of the cross-sectional time evolution of the bank variables (except *BankExposure* that does not vary over time) listed in Table 5.
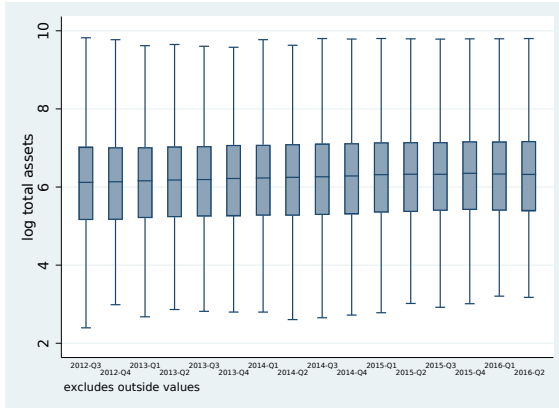
Log total assets
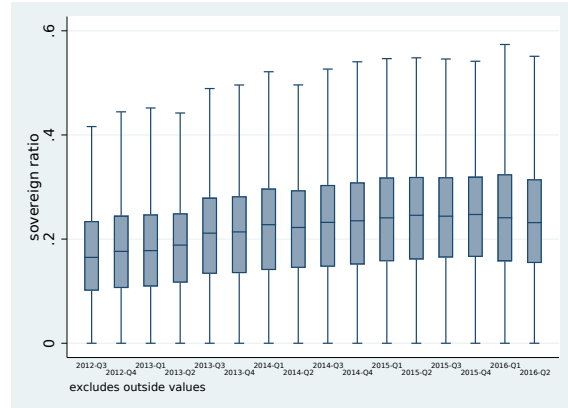
Share of govt securities

Share of loans to households and non-financial companies

Loans-to-deposit ratio

NPL ratio

Capital ratio

Table 4: **Summary statistics**

This table reports summary statistics on the main variables used in the econometric analysis. All the variables are further described in Table 5.

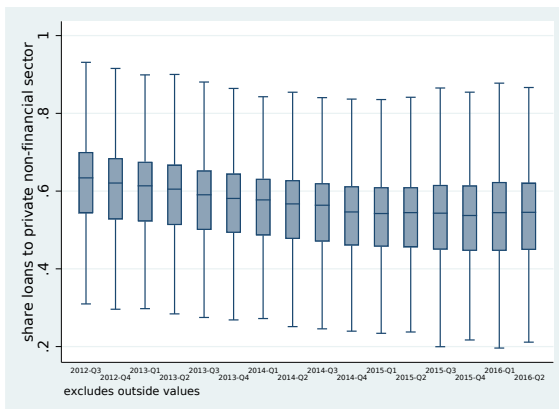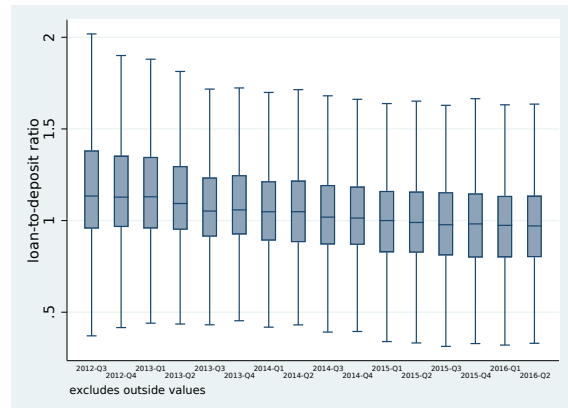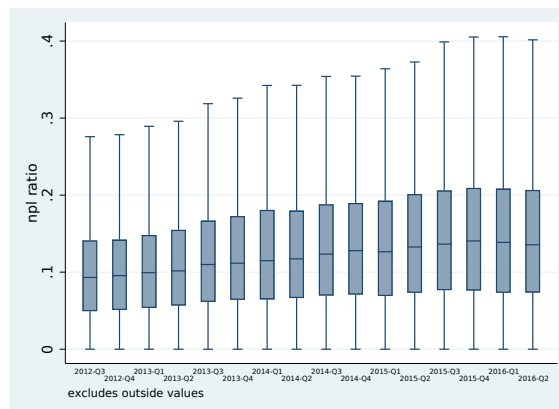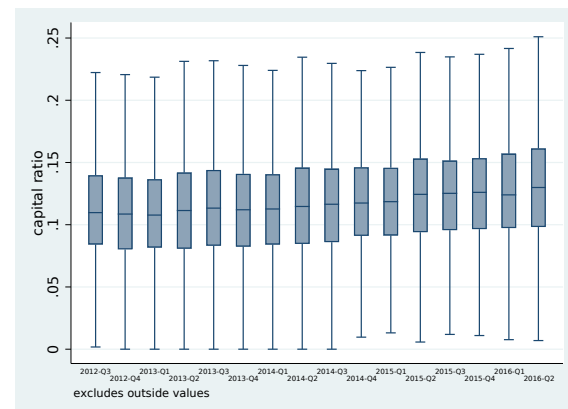|	Count	Mean	Percentiles			Standard deviation
			25th	50th	75th	
Bank-firm level						
Log credit granted	7169789	12.2729	11.2252	12.1402	13.1224	1.4136
Log credit lines granted	6057137	11.8482	10.8198	11.7753	12.6792	1.3932
Log term loans granted	4084343	11.8508	10.7329	11.7452	12.9012	1.7179
Log credit granted for exports	462790	11.6803	10.8198	11.8845	12.8866	2.0516
Log credit outstanding	7317345	11.6271	10.6793	11.6315	12.7194	1.8560
Log credit lines outstanding	4949024	10.8457	10.1205	11.1075	12.1187	2.1298
Log term loans outstanding	3693711	11.7313	10.6439	11.6274	12.7954	1.7378
Log credit granted for exports	340650	11.6221	10.5815	11.6228	12.6849	1.6359
Share of collateralized loans	7169789	0.1369	0.0000	0.0000	0.0000	0.3161
Share of trade finance	7169789	0.0386	0.0000	0.0000	0.0000	0.1417
Share of bad debts in total borrowing	7317345	0.1312	0.0000	0.0000	0.0000	0.3375
Share of other NPL in total borrowing	7317345	0.0445	0.0000	0.0000	0.0000	0.2043
Bank level						
Bank Exposure	618	0.1779	0.0017	0.0664	0.2149	0.4497
Log assets	594	6.3026	5.1580	6.1601	7.0787	1.6249
Capital ratio	594	0.1157	0.0817	0.1106	0.1411	0.0644
Share of govt securities	594	0.1925	0.1219	0.1975	0.2628	0.1170
Share of loans to HH and NFC	594	0.5725	0.5073	0.6001	0.6627	0.1563
Loans-to-deposit ratio	594	1.1541	0.9412	1.0866	1.2981	0.4078
NPL ratio	594	0.1175	0.0587	0.1065	0.1656	0.0811
Firm level (all firms)						
Hit borrower (0/1)	684956	0.0045	0.0000	0.0000	0.0000	0.0671
Exports to Russia / Sales	22521	0.0325	0.0007	0.0049	0.0241	0.0841
Log sales	538033	6.3553	5.3119	6.3324	7.3909	1.7397
Log exports	90817	4.3893	2.1644	4.7074	6.8429	3.2849
Log assets	558339	6.6866	5.6559	6.5694	7.5984	1.5335
Riskier firm (0/1)	684956	0.2083	0.0000	0.0000	0.3529	0.3299
Leverage	555743	14.9075	2.2647	5.1000	12.6287	197.1987
Liquid ratio	539481	0.0968	0.0138	0.0450	0.1248	0.1321
Firm level (hit borrowers)						
Exports to Russia / Sales	3095	0.1775	0.0748	0.1187	0.2224	0.1609
Log sales	3012	7.5783	6.5331	7.6535	8.6572	1.7092
Log exports	2719	6.8889	5.7548	7.0806	8.2603	2.1207
Log assets	3027	7.7249	6.6744	7.6677	8.6546	1.528
Riskier firm (0/1)	3095	0.2416	0.0000	0.0000	0.4505	0.3372
Leverage	3051	7.8640	2.3935	4.4956	10.1310	44.5467
Liquid ratio	3023	0.1137	0.0191	0.0588	0.1555	0.1363

Table 5: **Description of the variables**

This table reports the description of the variables used in the econometric analysis and their sources. Summary statistics on all the variables are provided in Table 4.

Variable	Description	Source
Bank-firm level		
Credit granted	Credit granted by banks to non-financial corporations	
Credit outstanding	Credit outstanding, i.e. the amount effectively drawn by the borrower	
Share of collateralized loans	Share of collateralized loans in total loans granted by the bank to the firm	Credit register
Share of trade finance	Share of trade finance loans in total loans granted by the bank to the firm	
Share of bad debts in total borrowing	Share of bad debts in total loans granted by the bank to the firm	
Share of other NPLs in total borrowing	Share of other non performing loans in total loans granted by the bank to the firm	
Bank level		
Bank exposure	Weighted average of the share of exports to Russia in total sales of firms borrowing from the bank in the three years preceding the Russia shock (2011-2013; weights are based on the share of the borrowing firm in bank loan portfolio	Credit register and CMA
Log assets	Logarithm of bank assets	
Capital ratio	Ratio of capital and reserves to (unweighted) assets	
Share of govt securities	Share of government debt securities holdings in total assets	Bank supervision statistics
Share of loans to HH and NFC	Share of loans to households and non-financial corporations and households in total assets	
Loan-to-deposit ratio	Ratio of loans to deposits	
NPL ratio	Ratio of non-performing loans to total loans	
Firm level		
Hit borrower	Indicator variable equal to one if the share of exports to Russia in total sales is 9 percent or more in at least one of the three years preceding the Russia shock (2011-2013)	Customs and Monopolies Agency (CMA)
Log exports	Logarithm of firm exports	
Log sales	Logarithm of firm sales	
Log assets	Logarithm of firm assets	
Riskier firm	Indicator variable equal to one if the firm is classified at least as vulnerable according to the Cerved score based on the Altman methodology	Cerved
Leverage	Assets-to-equity ratio	
Liquid ratio	Share of deposits and other liquid assets in total assets of firms	
Lenders exposure	Average exposure of banks lending to the firm, which is calculated as the average bank exposure weighted for the share of the lending bank in firm's total borrowing.	Credit register and CMA

Table 6: **Hit borrowers: pre-shock characteristics**

This table reports selected pre-shock characteristics for *hit-borrowers*, compared to the rest of the population of exporters, firms in the manufacturing sector and firms in all sectors. Hit borrowers are excluded from columns (2), (3) and (4).

	Hit borrowers (1)	Exporters (2)	Manufacturing (3)	All sectors (4)
Log sales	7.66	7.85	7.18	6.52
Log assets	7.75	7.83	7.33	6.86
% exports on sales	50.66	18.97	12.73	4.17
Liquid ratio	0.12	0.09	0.09	0.09
Leverage	7.00	9.82	8.61	14.28
Riskier firm (0/1))	0.25	0.23	0.28	0.28
No. observations	3,095	88,095	95,658	428,197

Figure 4: **Exposure to the Russia shock by province**

This figure depicts exposure to the Russia shock by province. Exposure to the Russia shock is measured as the sales-weighted average share of *hit-borrowers* (defined as in Table 5).
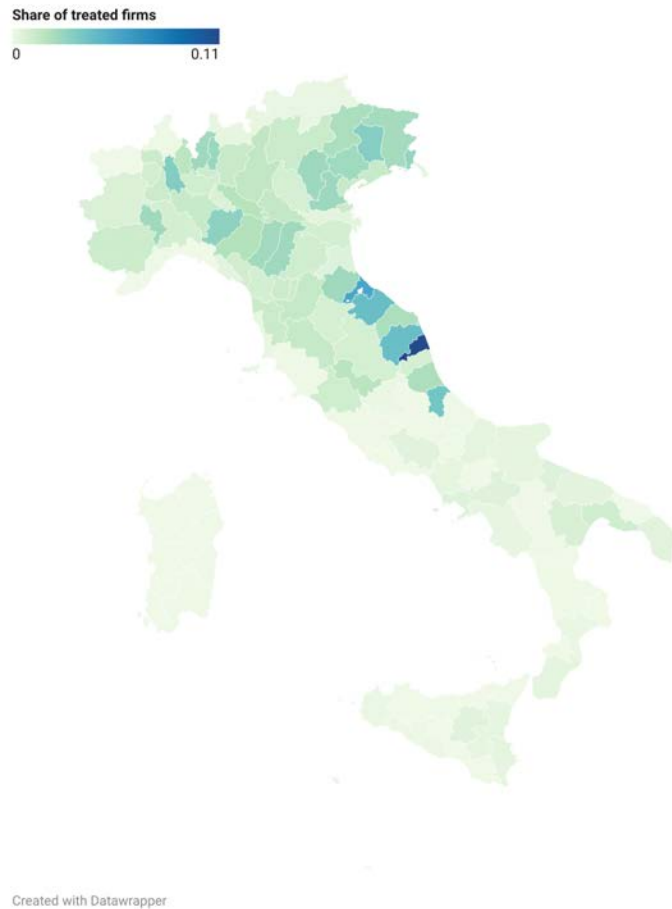
Figure 5: **Banks' exposure to the Russia Shock**

This figure depicts the kernel density estimation of the distribution of the exposure of Italian banks to the Russia shock of 2014. The method of calculation of the variable is illustrated in Table 5.
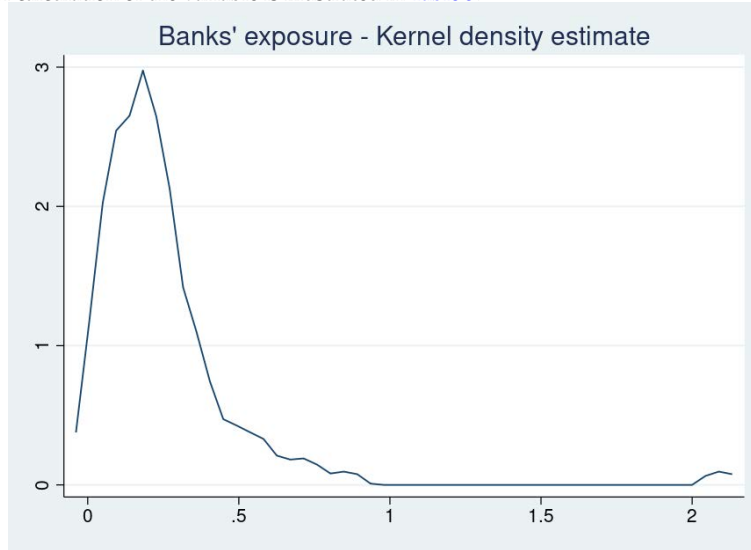

Banks' exposure - Kernel density estimate

Table 7: *Hit-borrowers'* **outcomes after the shock**

This table reports the estimation results of a linear fixed effects model on a cross-section of firms. In the first three models the outcome variables are the change in log sales, leverage and liquid ratio between the average of the two-year pre-shock period (2012-13) and the value at the end of 2016. The last two models are linear probability models with a dichotomous outcome variable equal to one if the firm is reported as having bad debts or other non performing loans in the Credit Register at the end of 2016. The main explanatory variable is $HITBORROWER$, an indicator variable which is equal to one if the share of exports to Russia in total sales is 9 percent or more in at least one of the three years preceding the Russia shock (2011-13). All the specifications include fixed effects at province and sector level and controls for the average pre-shock levels of the firm variables listed in Table 5. Standard errors are clustered at the sector-province level. *, ** and *** denote respectively 10 per cent, 5 per cent and 1 per cent significance levels.

	(1) Δ Sales	(2) Δ Leverage	(3) Δ Liquid ratio	(4) Bad debt	(5) Other NPL
HITBORROWER	-0.1667***	3.5221***	-0.0119***	0.0190***	0.0176***
	(0.0445)	(1.1099)	(0.0035)	(0.0047)	(0.0066)
Firm controls	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes
N	305312	316971	299810	346335	346335
adj. R^2	0.063	0.087	0.019	0.046	0.069

Table 8: *Hit-borrowers'* domestic sales and exports after the shock

This table reports the results of a linear fixed effects model on a cross-section of firms. The outcome variables in columns (1)-(5) are the change in total sales, domestic sales, exports, exports to Russia and exports to the rest of the world (ROW), respectively. The outcome variables are defined as the change between the average of the two-year pre-shock period (2012-13) and the value at the end of 2016. The main explanatory variable is $HITBORROWER$, an indicator variable which is equal to one if the share of exports to Russia in total sales of the firm is 9 percent or more in at least one of the three years preceding the Russia shock (2011-13). All the specifications include fixed effects at province and sector level and controls for the average pre-shock levels of the firm variables listed in Table 5. Columns (3)-(5) also include product-country fixed effects. Standard errors are clustered at the sector-province level. *, ** and *** denote respectively 10 per cent, 5 per cent and 1 per cent significance levels.

	(1) Δ Total sales	(2) Δ Domestic sales	(3) Δ Exports	(4) Δ Exports to Russia	(5) Δ Exports to ROW
HITBORROWER	-0.1726***	-0.0843*	-0.4019***	-0.7470***	-0.1067***
	(0.0360)	(0.0445)	(0.0554)	(0.0692)	(0.0332)
Firm controls	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes
N	61838	61327	61833	9826	61436
adj. R^2	0.038	0.026	0.009	0.014	0.008

Figure 6: **Effects of the shock on credit supply over time**

This figure depicts the point estimate and the 95 per cent confidence interval of the coefficients of the linear regression of the logarithm of credit granted by banks to non-financial corporations on the interaction between $BANKEXPOSURE$ and the time dummies for the quarter between Q3-2013 (-3 on the x-axis) and Q4-2015 (6 on the x-axis). The two vertical red lines identify the time interval in which the dual external shock hit Russia (between Q2-2014 and Q4-2014). The specification corresponds to the one whose results are reported in column (3) of Table 10 with the $POST$ variable being replaced by a vector of time dummies.
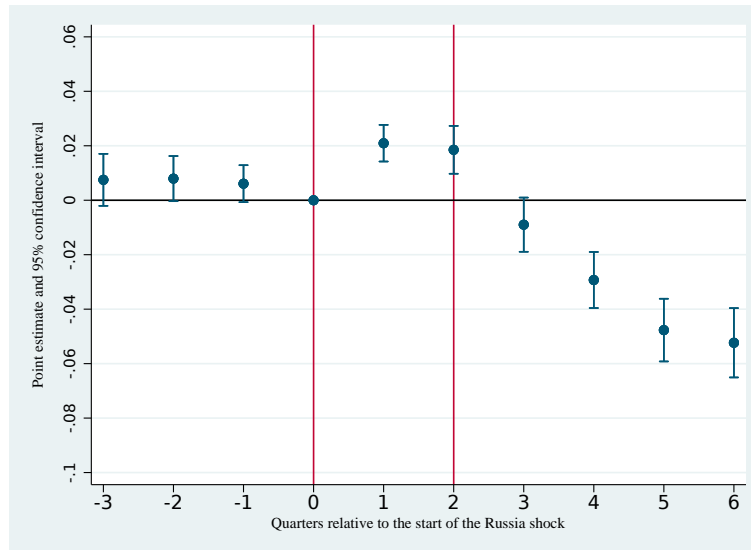
Table 9: *Hit-borrowers'* **credit borrowing after the shock**

This table reports the results of a panel linear fixed effects model estimated over the period from Q3-2013 to Q4-2015 where the outcome variable is the logarithm of the overall stock of credit granted (panel a) and credit outstanding (panel b) by all banks to each non-financial corporation. Results are also reported for the loan break down, i.e. credit lines, term loans and loans granted for export purposes (trade finance). The main explanatory variable is the interaction between $HITBORROWER$ (an indicator variable which is equal to one if the share of exports to Russia in total sales is 9 percent or more in at least one of the three years preceding the Russia shock (2011-2013)) and $POST$ (equal to one from Q3-2014 onward and zero before). All the specifications include firm, sector-time, province-time fixed effects and lagged time-varying controls for the firm level variables listed in Table 5 (Firm time-varying controls). Standard errors are clustered at the sector-time and province-time level. *, ** and *** denote respectively 10 per cent, 5 per cent and 1 per cent significance levels.

	(1) Total loans	(2) Credit Lines	(3) Term Loans	(4) Trade finance
(a) Credit granted				
POST x HITBORROWER	0.02084*	0.0091	0.0326*	-0.0100
	(0.0108)	(0.0124)	(0.0155)	(0.0299)
Firm controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Sector x Time FE	Yes	Yes	Yes	Yes
Province x Time FE	Yes	Yes	Yes	Yes
N	3419307	2970920	2488910	260631
adj. R^2	0.957	0.951	0.921	0.870

	(1) Total loans	(2) Credit Lines	(3) Term Loans	(4) Trade finance
(b) Credit outstanding				
POST x HITBORROWER	0.0832**	0.1357**	0.0596**	-0.0051
	(0.0270)	(0.0487)	(0.0183)	(0.0284)
Firm controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Sector x Time FE	Yes	Yes	Yes	Yes
Province x Time FE	Yes	Yes	Yes	Yes
N	3249106	2474945	2371099	185248
adj. R^2	0.902	0.821	0.912	0.878

Table 10: **Credit supply - Baseline**

This table reports the results of a linear fixed effects model estimated over the period from Q3-2013 to Q4-2015 where the outcome variable is the logarithm of the total stock of loans granted by banks to non-financial corporations. Columns (2)-(3) gradually introduce to the specification the time-varying firm-bank controls and the interaction between $POST$ (a dummy taking value of 1 from Q3 onward and zero before) and the pre-shock average bank level variables listed in Table 5. Columns (4)-(6) report the results for the loan breakdown, i.e. credit lines, term loans, and loans granted for export purposes (trade finance). All the specifications include bank-firm and firm-time fixed effects. Standard errors are clustered at the bank-firm and firm-time level. *, ** and *** denote respectively 10 per cent, 5 per cent and 1 per cent significance levels.

| | (1)) | (2) | (3) | (4) | (5) | (6) |
	Total loans	Total loans	Total loans	Credit Lines	Term Loans	Trade finance
POST X BANKEXPOSURE	-0.0438***	-0.0431***	-0.0184***	-0.0311***	-0.0120	-0.0735***
	(0.0043)	(0.0042)	(0.0042)	(0.0048)	(0.0107)	(0.0284)
SHARE OF COLLATERALIZED LOANS		0.2961***	0.2959***	-0.0696***	0.3948***	0.0447
		(0.0058)	(0.0058)	(0.0056)	(0.0097)	(0.0341)
SHARE OF TRADE FINANCE		0.0000***	0.0000***	0.0000***	-0.0000***	0.0000***
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
SHARE OF BAD DEBTS		-1.6704***	-1.6719***	-0.4700***	-0.8920***	-0.6004***
		(0.1578)	(0.1577)	(0.1305)	(0.1324)	(0.0013)
SHARE OF OTHER NPLs		-0.1073***	-0.1075***	-0.1132***	-0.0170***	-0.0775***
		(0.0042)	(0.0042)	(0.0064)	(0.0060)	(0.0293)
POST X LOG ASSETS			0.0107***	-0.0058***	0.0295***	0.0142***
			(0.0005)	(0.0006)	(0.0010)	(0.0039)
POST X SHARE LOANS TO HH AND NFC			0.2746***	-0.0608***	0.3366***	0.0836
			(0.0114)	(0.0159)	(0.0225)	(0.1051)
POST X LOAN TO DEPOSITS			-0.0193***	0.0348***	-0.0466***	-0.0522**
			(0.0023)	(0.0033)	(0.0046)	(0.0237)
POST X CAPITAL RATIO			0.1201***	-0.0749***	0.3594***	0.6396***
			(0.0214)	(0.0283)	(0.0429)	(0.1819)
POST X SHARE GOVT SECURITIES			0.3992***	0.0906***	0.4520***	0.1086
			(0.0136)	(0.0164)	(0.0314)	(0.1029)
POST X NPL RATIO			-0.0013	0.1687***	-0.1093***	-0.2152**
			(0.0122)	(0.0150)	(0.0295)	(0.1058)
Bank x firm	Yes	Yes	Yes	Yes	Yes	Yes
Firm x time	Yes	Yes	Yes	Yes	Yes	Yes
N	5424360	5424360	5424360	4511316	2873813	360555
adj. R^2	0.9482	0.9486	0.9486	0.9280	0.8918	0.8260

Standard errors in parentheses
* $p < .10$, ** $p < .05$, *** $p < .01$

Table 11: **Credit supply - Heterogeneity among borrowers**

This table reports the results of a linear fixed effects model estimated over the period from Q3-2013 to Q4-2015 where the outcome variable is the logarithm of the stock of loans granted by banks to non-financial corporations. Column (1) considers the triple interaction between $BANKEXPOSURE$, $HITBORROWER$ and $POST$ (equal to one from Q3-2014 onward and zero before). Column (2) further differentiates $HITBORROWER$ between $MEDIUMHITBORROWER$ (exports to Russia between 9 and 30 per cent of total sales) and $HIGHHITBORROWER$ (exports to Russia above 30 per cent). Column (3) distinguishes *non-hit borrowers* based on their economic sector (manufacturing, construction, services and others). All the specifications include bank-firm and firm-time fixed effects as well as controls for the time varying bank-firm controls (Loan-level controls) and the interaction between $POST$ (a dummy taking value of 1 from Q3 onward and zero before) and the pre-shock average bank level variables listed in Table 5 (Bank-level controls). Standard errors are clustered at the bank-firm and firm-time level. *, ** and *** denote respectively 10 per cent, 5 per cent and 1 per cent significance levels.

	(1) Hit borrowers	(2) Medium and high-hit borrowers	(3) Non-hit borrowers	(4) Riskier	(5) Riskier and hit-borrowers
POST X BANKEXPOSURE	-0.0209*** (0.0043)	-0.0208*** (0.0043)		-0.0071 (0.0053)	-0.0078 (0.0054)
POST x BANKEXPOSURE x HITBORROWER	0.0678*** (0.0204)		0.0469** (0.0200)		
POST x BANKEXPOSURE x MEDIUMHITBORROWER		0.1071*** (0.0314)			
POST x BANKEXPOSURE x HIGHHITBORROWER		-0.0247 (0.0341)			
POST x BANKEXPOSURE x MANUFNONHIT			-0.0629*** (0.0210)		
POST x BANKEXPOSURE x CONSTRUCTIONNONHIT			-0.1187*** (0.0235)		
POST x BANKEXPOSURE x SERVICESNONHIT			-0.0615*** (0.0210)		
POST x BANKEXPOSURE x OTHERNONHIT			-0.0233 (0.0286)		
POST x BANKEXPOSURE x RISKIER FIRM				-0.0180** (0.0089)	-0.0327*** (0.0092)
POST x BANKEXPOSURE X HITBORROWER					0.0212 (0.0283)
POST x BANKEXPOSURE x RISKIER FIRM X HITBORROWER					0.0988** (0.0453)
Bank x firm	Yes	Yes	Yes	Yes	Yes
Firm x time	Yes	Yes	Yes	Yes	Yes
Loan-level controls	Yes	Yes	Yes	Yes	Yes
Bank-level controls	Yes	Yes	Yes	Yes	Yes
N	5424360	5402199	5424360	5147793	5147793
adj. R^2	0.9486	0.9486	0.9486	0.9486	0.9486

Standard errors in parentheses
* $p < .10$, ** $p < .05$, *** $p < .01$

Figure 7: **Effects of the Russia shock on credit supply over time**

This figure depicts the point estimate and the 95 per cent confidence interval of the coefficients of the linear regression of the logarithm of credit granted by banks to non-financial corporations on the interaction between $BANK EXPOSURE$ and the time dummies for the quarter between Q3-2013 (-3 on the x-axis) and Q4-2015 (6 on the x-axis). The two vertical red lines identify the time interval in which the dual external shock hit Russia (between Q2-2014 and Q4-2014). We provide estimates on the full sample and only on the one of riskier firms (i.e. those with Cerved score greater or equal to 7) further distinguishing between *hit* and *non hit-borrowers*. On each sample (all firms or only risky firms) the estimated coefficients are constructed using the coefficients of the interaction terms among $POST$, $BANK EXPOSURE$ and $HIT BORROWER$ analogously to the one reported in column (1) of Table 11 with the $POST$ variable being replaced by a vector of time dummies. All the specifications include bank-firm and firm-time fixed effects as well as controls for the time varying bank-firm controls (Loan-level controls) and the interaction between $POST$ (a dummy taking value of 1 from Q3 onward and zero before) and the pre-shock average bank level variables listed in Table 5 (Bank-level controls). Standard errors are clustered at the bank-firm and firm-time level. *, ** and *** denote respectively 10 per cent, 5 per cent and 1 per cent significance levels.
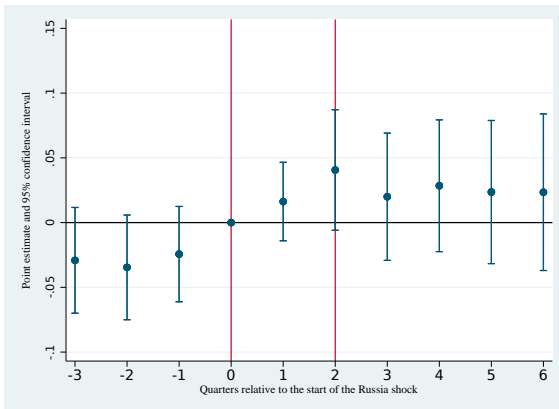
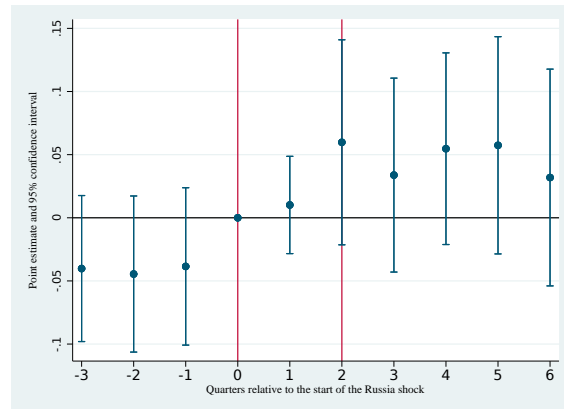## *Nonhit-borrowers*
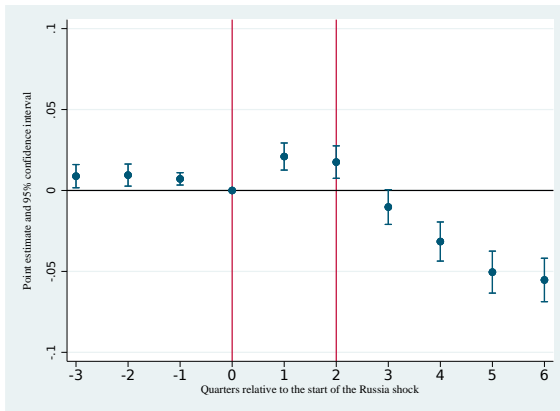
All firms
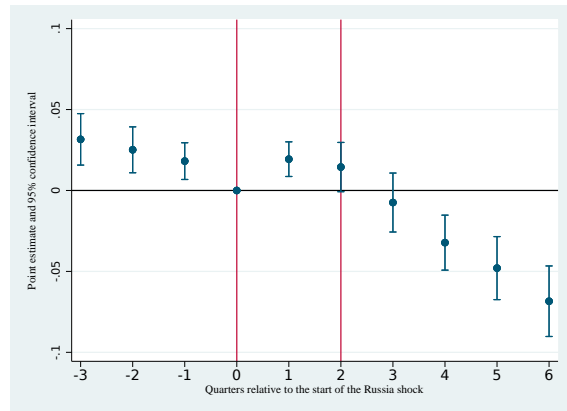
Risky firms

Hit-borrowers

All firms

Risky firms

Table 12: **Credit supply - Bank-time FE and differences across lenders at borrower level**

This table reports the results of a linear fixed effects model estimated over the period from Q3-2013 to Q4-2015 including bank-firm, firm-time and bank-time fixed effects where the outcome variable is the logarithm of the stock of loans granted by banks to non-financial corporations. In each quarter and for each firm the variable $H-EXPLENDER$ ($L-EXPENDER$) is a dummy taking the value of 1 for the lender with the highest (lowest) value of $BANKEXPOSURE$ among the firms' lenders (firm-time fixed effects restrict the sample only to borrowers with multiple lenders). The $H-EXPLENDER$ and $L-EXPENDER$ are always interacted with $POST$ (a dummy equal to one from Q3-2014 onward and zero before). In column (1) and (2) we consider double and triple interaction terms of $H-EXPLENDER$ and $L-EXPENDER$, respectively, with $POST$ (a dummy equal to one from Q3-2014 onward and zero before) and $RISKIER$ (a dummy taking the value of 1 for borrowers with Cerved score greater or equal to 7). In column (3) and (4) we consider double and triple interaction terms of $H-EXPLENDER$ and $L-EXPENDER$, respectively, with $POST$ and $HITBORROWER$ (a dummy equal to 1 if the share of exports to Russia in total sales for the firm was 9 percent or more in at least one of the three years preceding the Russia shock (2011-2013)). All the specifications include bank-firm, firm-time, bank-time fixed effects and the time-varying bank-firm controls (Loan-level controls) listed in Table 5. Standard errors are clustered at the bank-firm, firm-time and bank-time level. *, ** and *** denote respectively 10 per cent, 5 per cent and 1 per cent significance levels.

	(1) Risk H-ExpLender	(2) Risk L-ExpLender	(3) Hit-borrower H-ExpLender	(4) Hit-borrower L-ExpLender
H-EXPLENDER	-0.0040 (0.0034)		-0.0017 (0.0026)	
POST X H-EXPLENDER	0.0039* (0.0022)		-0.0007 (0.0018)	
H-EXPLENDER x RISKIER FIRM	0.0042 (0.0051)			
POST x H-EXPLENDER x RISKIER FIRM	-0.0093*** (0.0030)			
L-EXPLENDER		0.0048 (0.0031)		-0.0008 (0.0024)
POST X L-EXPLENDER		-0.0145*** (0.0022)		-0.0047*** (0.0018)
L-EXPLENDER x RISKIER FIRM		-0.0130*** (0.0046)		
POST x L-EXPLENDER x RISKIER FIRM		0.0229*** (0.0024)		
H-EXPLENDER x HITBORROWER			-0.0333 (0.0271)	
POST X H-EXPLENDER X HITBORROWER			0.0022 (0.0130)	
L-EXPLENDER x HITBORROWER				0.0033 (0.0234)
POST X L-EXPLENDER X HITBORROWER				-0.0227** (0.0112)
Constant	12.5248*** (0.0015)	12.5252*** (0.0015)	12.5057*** (0.0016)	12.5061*** (0.0015)
Bank x firm	Yes	Yes	Yes	Yes
Firm x time	Yes	Yes	Yes	Yes
Bank x time	Yes	Yes	Yes	Yes
Loan-level controls	Yes	Yes	Yes	Yes
Observations	5264518	5264518	5549447	5549447
Adjusted R^2	0.949	0.949	0.949	0.949

Standard errors in parentheses
* $p < .10$, ** $p < .05$, *** $p < .01$

Table 13: **Credit supply - Heterogeneity among banks**

This table reports the results of a linear fixed effects model estimated over the period from Q3-2013 to Q4-2015 where the outcome variable is the logarithm of the stock of loans granted by banks to non-financial corporations. The table reports the coefficients of the double and triple interaction terms among $BANKEXPOSURE$, the firm-level dummy $RISKIER$ (taking value of 1 for firms with Cerved score greater or equal to 7) and each bank characteristic in Table 5. The model includes bank-firm, firm-time and bank-time fixed effects. Standard errors are clustered at the bank-firm, firm-time, bank-time fixed effects and the time-varying bank-firm controls listed in Table 5 (Loan-level controls). Standard errors are clustered at the bank-firm, firm-time and bank-time level.*, ** and *** denote respectively 10 per cent, 5 per cent and 1 per cent significance levels.

	(1) Log total assets	(2) Share loans to HH and NFC	(3) Capital ratio	(4) NPL ratio	(5) Share govt securities	(6) Loan to deposit ratio
POST x BANKEXPOSURE X RISKIER FIRM	0.2872***	-0.0897	-0.1190***	-0.0524**	-0.0828***	-0.0494
	(0.0623)	(0.0707)	(0.0348)	(0.0218)	(0.0273)	(0.0419)
POST X RISKIER FIRM X LOG ASSETS	0.0009					
	(0.0021)					
POST X BANK EXPOSURE X RISKIER FIRM X LOG ASSETS	-0.0415***					
	(0.0086)					
POST X RISKIER FIRM X SHARE LOANS TO HH AND NFC		0.0784***				
		(0.0300)				
POST X BANK EXPOSURE X RISKIER FIRM X SHARE LOANS TO HH AND NFC		0.0837				
		(0.1145)				
POST X RISKIER FIRM X CAPITAL RATIO			0.0384			
			(0.0862)			
POST X BANK EXPOSURE X RISKIER FIRM X CAPITAL RATIO			1.0599***			
			(0.3450)			
POST X RISKIER FIRM X NPL RATIO				-0.0099		
				(0.0555)		
POST X BANK EXPOSURE X RISKIER FIRM X NPL RATIO				0.2154		
				(0.2059)		
POST X RISKIER FIRM X SHARE GOVT SECURITIES					0.1218***	
					(0.0368)	
POST X BANK EXPOSURE X RISKIER FIRM X SHARE GOVT SECURITIES					0.3397***	
					(0.1174)	
POST X RISKIER FIRM X LOAN-TO-DEPOSIT RATIO						-0.0288***
						(0.0099)
POST X BANK EXPOSURE X RISKIER FIRM X LOAN-TO-DEPOSIT RATIO						0.0173
						(0.0349)
Constant	12.5381***	12.5222***	12.5336***	12.5327***	12.5294***	12.5423***
	(0.0040)	(0.0046)	(0.0024)	(0.0021)	(0.0023)	(0.0033)
Bank x firm	Yes	Yes	Yes	Yes	Yes	Yes
Firm x time	Yes	Yes	Yes	Yes	Yes	Yes
Bank x time	Yes	Yes	Yes	Yes	Yes	Yes
Loan-level controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5147705	5147705	5147705	5147705	5147705	5147705
Adjusted R^2	0.949	0.949	0.949	0.949	0.949	0.949

Standard errors in parentheses
* $p < .10$, ** $p < .05$, *** $p < .01$

Figure 8: **Marginal effects on credit growth by bank variable and borrowers' risk**

This figure depicts the marginal effects on credit growth to riskier borrowers, computed from Table 13, of 1 standard deviation change in each bank variable for two different levels of the $BANKEXPOSURE$ variable corresponding to the 10th (0.096) and the 90th percentile (0.3612) of the distribution. The asterisk * in the variable names indicates that those bank characteristics for with the quadruple interaction term $POST$ x $BANKEXPOSURE$ x $RISKIER$ x $BANKVAR$ is not statistically significant at least at the 10 per cent level in Table 13.
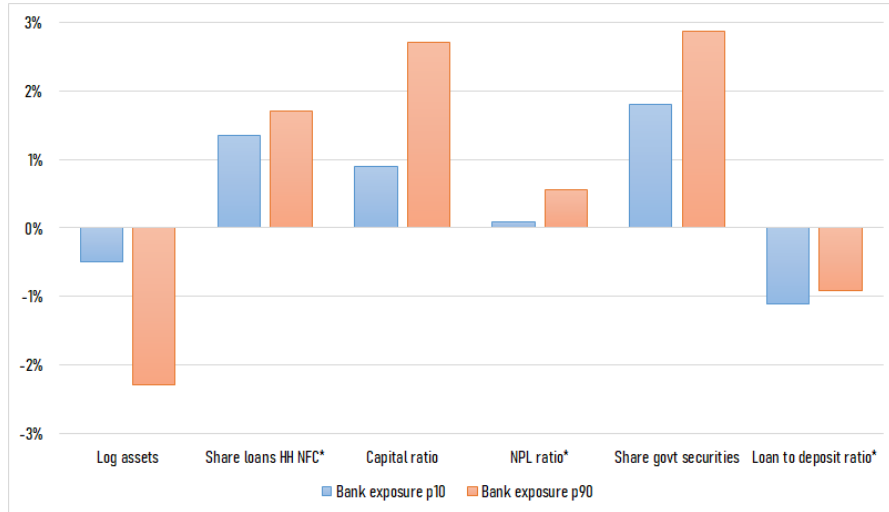
Table 14: **Credit supply - Relationship lending and specialization**

This table reports the results of a linear fixed effects model estimated over the period from Q3-2013 to Q4-2015 where the outcome variable is the logarithm of the stock of loans granted by banks to non-financial corporations. Column (1) includes controls for main lender (a dummy taking the value of 1 for the lender with the highest exposure to the firm). Column (2) includes controls for bank specialization in trade finance. Column (3) includes controls for bank specialization in the firm's sector of activity. All the specifications include bank-firm and firm-time fixed effects as well as controls for the time varying bank-firm controls (Loan-level controls) and the interaction between $POST$ (a dummy taking value of 1 from Q3-2014 onward and zero before) and the pre-shock average bank level variables listed in Table 5 (Bank-level controls). Standard errors are clustered at the bank-firm and firm-time level. *, ** and *** denote respectively 10 per cent, 5 per cent and 1 per cent significance levels.

	(1) Main lender	(2) Trade finance special.	(3) Sector special.
POST x BANKEXPOSURE	-0.0205***	-0.0207***	-0.0229***
	(0.0043)	(0.0043)	(0.0043)
POST x BANKEXPOSURE x HITBORROWER	0.0736***	0.0712***	0.0678***
	(0.0259)	(0.0215)	(0.0202)
POST x MAINLENDER	0.0530***		
	(0.0081)		
POST x MAINLENDER x HITBORROWER	-0.0618		
	(0.0448)		
POST x TRADE FINANCE SPEC.		-0.0012	
		(0.0036)	
POST x TRADE FINANCE SPEC. x HITBORROWER		0.0048	
		(0.0253)	
POST x SECTOR SPEC.			0.0068***
			(0.0013)
POST x SECTOR SPEC. x HITBORROWER			0.0106
			(0.0114)
Bank x firm	Yes	Yes	Yes
Firm x time	Yes	Yes	Yes
Loan-level controls	Yes	Yes	Yes
Bank-level controls	Yes	Yes	Yes
N	5424360	5424360	5424360
adj. R^2	0.9487	0.9486	0.9486

Standard errors in parentheses
* $p < .10$, ** $p < .05$, *** $p < .01$

Table 15: **Credit supply - Further robustness checks**

This table reports the results of a linear fixed effects model estimated over the period from Q3-2013 to Q4-2015 where the outcome variable is the logarithm of the stock of loans granted by banks to non-financial corporations. Column (1) drops banks with subsidiaries in Russia. Column (2) drops the main sectors importing from Russia. Column (3) includes interactions between non-hit borrowers and dummies that identify whether firms are located in hit areas or in non-hit areas. Column (4) includes interactions between non-hit borrowers and dummies that identifty whether firms are likely to be upstream suppliers to hit firms or not. Column (5) adds a control for bank exposure to energy-intensive sectors. Column (6) adds a control for bank exposure to Russian tourism. All the specifications include bank-firm and firm-time fixed effects as well as controls for the time varying bank-firm controls (Loan-level controls) and the interaction between $POST$ (a dummy taking value of 1 from Q3-2014 onward and zero before) and the pre-shock average bank level variables listed in Table 5 (Bank-level controls). Standard errors are clustered at the bank-firm and firm-time level. *, ** and *** denote respectively 10 per cent, 5 per cent and 1 per cent significance levels.

	(1) Subsidiaries in Russia	(2) Imports from Russia	(3) Geographical linkages	(4) Supplier linkages	(5) Bank energy exposure	(6) Bank tourism exposure
POST x BANKEXPOSURE	-0.0222**	-0.0197***			-0.0258***	-0.0210***
	(0.0047)	(0.0043)			(0.0042)	(0.0043)
POST x BANKEXPOSURE x HITBORROWER	0.0574***	0.0688***	0.0476**	0.0468**	0.0789***	0.0677**
	(0.0185)	(0.0199)	(0.0203)	(0.0199)	(0.0252)	(0.0198)
POST x BANKEXPOSURE x HITAREANONHIT			-0.0295			
			(0.0207)			
POST x BANKEXPOSURE x NONHITAREANONHIT			-0.1052***			
			(0.0212)			
POST x BANKEXPOSURE x UPSTREAMNONHIT				-0.0630***		
				(0.0231)		
POST x BANKEXPOSURE x OTHERNONHIT				-0.0683***		
				(0.0205)		
Bank x firm	Yes	Yes	Yes	Yes	Yes	Yes
Firm x time	Yes	Yes	Yes	Yes	Yes	Yes
Loan-level controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank-level controls	Yes	Yes	Yes	Yes	Yes	Yes
Energy intensive controls	No	No	No	No	Yes	No
Russian tourism controls	No	No	No	No	No	Yes
N	3569878	5361957	5424360	5424360	5417842	5424360
adj. R^2	0.9481	0.9480	0.9486	0.9486	0.9486	0.9486

Standard errors in parentheses
* $p < .10$, ** $p < .05$, *** $p < .01$