Credit supply during a sovereign debt crisis

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Abstract

We study the effect of the increase in Italian sovereign debt risk on credit supply on a sample of 670,000 bank-firm relationships between December 2010 and December 2011, drawn from the Italian Central Credit Register. To identify a causal link, we exploit the lower impact of sovereign risk on foreign banks operating in Italy than on domestic banks. We study firms borrowing from at least two banks and include firm x period fixed effects in all regressions to controlling for unobserved firm heterogeneity. We find that Italian banks tightened credit supply: the lending of Italian banks grew by about 3 percentage points less than that of foreign banks, and their interest rates were 15-20 basis points higher, after the outbreak of the sovereign debt crisis. We test robustness by splitting foreign banks into branches and subsidiaries, and then examine whether selected bank characteristics may have amplified or mitigated the impact. We also study the extensive margin of credit, analyzing banks' propensity to terminate existing relationships and to grant new loan applications. Finally, we test whether firms were able to compensate for the reduction of credit from Italian banks by borrowing more from foreign banks. We find that this was not the case, so that the sovereign crisis had an aggregate impact on credit supply.

JEL Classification: G21, F34, E44, E51.

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1 Introduction[1]

Since the outburst of the 2011 sovereign debt crisis, much debate has revolved around the impact that increased country risk could have on financial intermediaries' balance sheets, in particular on their funding costs and on their capacity to grant credit to firms and households for investment and consumption.

As sovereign bonds yields raise and sovereign ratings deteriorate, sources of funding become indeed more scarce and more costly: availability of wholesale funding markets, especially uncollateralized, becomes much thinner and banks' capacity to access collateralized lending decreases, as the value of eligible collateral, typically sovereign bonds, drops. Moreover, bank profitability may be reduced, in particular if sovereign bonds are held in banks' trading books which are marked-to-market. These factors all contribute to transmit tensions from the sovereign bond markets to banks' ability to supply credit and to the cost of credit for borrowers. Hence, a credit crunch may occur at a time in which governments may tighten fiscal policy to combat the sovereign tensions, triggering or amplifying a contraction in economic activity. Finally, higher sovereign yields may also impair the transmission mechanism of monetary policy, in particular within a monetary union: policy rate changes may not affect banks funding costs if the latter are increasingly driven by domestic sovereign yields.

Despite its relevance, there is limited empirical evidence on the direct and causal impact that sovereign shocks exert on credit supply. Identifying this effect is indeed particularly challenging, since banking and sovereign crisis tend to be intertwined, reinforcing each other through strong feedback effects (Reinhart and Rogoff 2009, Acharya et al. 2012).

First, it is difficult to isolate an exogenous sovereign shock: typical patterns suggest that sovereign debt crises are fuelled by banking crises, as governments disburse vast amounts of money to rescue troubled intermediaries. Second, sovereign and banking crises are often accompanied by recessions, when demand for credit typically drops, thus making difficult to disentangle supply from demand effects.

In this paper we overcome these identification challenges thanks to the nature of the shock and the richness of our data.

The outburst of the sovereign crisis in Italy was fairly exogenous with respect to the lending policies of Italian banks. Both low growth and high public debt are long-standing features of the Italian economy. The Italian banking system did not represent a source of instability for public finances (see, among others, IMF 2010 Article IV consultation on Italy) and Italy did not experience a housing bubble. Italian sovereign spreads increased sharply since the beginning of July 2011, without any specific domestic event triggering it: the stalemate in negotiations on Greek sovereign debt fuelled fears of a break-up of the Euro-area which were transmitted

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to Italian sovereign yields, while those of "core" European countries remained stable. Then, adopting a quasi-experimental methodology, we exploit the sudden and sharp increase in the yield on Italian sovereign debt of July 2011. The semester between December 2010 and June 2011 represents the pre-crisis period, and the one between June and December 2011 represents the crisis period.

Our data of about 670,000 bank-firm relationships from the Italian Credit Register allow us to properly distinguish supply from demand. We restrict our analysis to firms borrowing from at least two banks. In this way we fully control for firm observed and unobserved heterogeneity by plugging firm-fixed effects (with a methodology akin to that pioneered by Khwaja and Mian (2008)).

To identify the effect of the sovereign shock, we need to compare lending to the same firm by two or more banks that have been affected by the crisis to a different degree. To define "more" and "less" affected banks, we exploit the presence of foreign banks in the Italian market. Foreign banks, being headquartered in countries where the sovereign risk increased significantly less, were indeed way more shielded by the impact of sovereign tensions than Italian banks. Since the variation of the shock was primarily across countries, we believe that the heterogeneity between Italian and foreign banks is the dimension that most appropriately captures the differential impact of the shock. Although not fully insulated by the shock, foreign banks provide a good counterfactual to assess how the rise in sovereign spreads modifies credit supply decisions.

We find significant evidence of credit restrictions after the sovereign crisis. Italian banks decreased credit and increased interest rates charged to non-financial firms more than foreign banks. These results are confirmed if we use the change in the spread between yields on 10-year government bonds of headquarter's country and the German Bund of corresponding maturity to measure more directly the increase in funding cost by bank's nationality.

We also examine if the sovereign crisis had an impact on the extensive margin of credit. To this aim, we test whether Italian banks terminated relationships and rejected new loan applications more than foreign banks, as the risk on the Italian sovereign increased. We find that the sovereign debt crisis reduced the willingness of Italian banks to terminate existing relationships, whereas they drastically decreased the probability of accepting new applications. We also test if domestic banks charged higher interest rates on new term loans than foreign banks, and we find that this is the case.

Having found that there has been a significant credit tightening of Italian banks vis à vis foreign banks, we test whether this effect is in fact driven by bank characteristics that might have changed over time at a different extent across Italian and foreign banks. We then estimate the baseline model including a set of bank balance sheet characteristics: bank capitalization (the Tier 1 ratio), bank size, the ratio of sovereign securities from European troubled countries (GIIPS) to total assets, and the ratio between wholesale funding and total assets. The last two variables are especially important because they capture the extent to which banks might be affected by the sovereign crisis. We find that the interaction between the dummy domestic and the dummy crisis is still significant and its coefficient is of similar size as in the baseline

regression; furthermore no bank variable is statistically significant. Therefore, there seems to be a country-specific effect common to Italian banks: even if they had the same capital position and funding structure as foreign banks, they would still be tightening credit to a larger extent.

Finally, we test whether firms were able to compensate the reduction of credit by Italian banks through increased credit from foreign banks. We estimate an aggregate effect of the sovereign shock on credit supply to Italian firms. We obtain an unbiased estimate of this aggregate effect by plugging firm effects estimated from our baseline regression at the bank-firm relationship-level into a firm-level equation in which the dependent variable is the growth of credit granted to firms by the full set of lending banks. Our results suggest that firms have not been able to fully substitute credit from domestic banks with credit from foreign banks. The sovereign crisis has therefore had a negative aggregate impact on credit supply.

The paper is structured as follows: the next section examines the related literature, section 3 discusses the empirical strategy, section 4 presents the dataset and the main descriptive statistics, section 5 contains the results of our baseline specification, section 6 illustrates results on alternative versions of baseline, section 8 examines the extensive margin, section 8 explores bank heterogeneity, section 9 presents the result on the aggregate effect, section 10 concludes.

2 Related Literature

Our contribution is related to three streams of literature. First, we contribute to the studies on the real effects of sovereign debt crises and sovereign defaults. Arteta and Hale (2008) examine how access to foreign credit to the private sector varies during sovereign debt crises. They group micro-level data on bond issuance and foreign syndicated bank loan contracts of firms into different export and non-export sectors. They find systematic evidence of a decline in foreign credit over the period between 1984 and 2004 for 30 emerging markets in the aftermath of a sovereign debt crisis. Borensztein and Panizza (2009) investigate whether default episodes give rise to a credit crunch: using industry-level data available for 149 countries over the period 1975-2000, they test whether defaults have a significantly larger effect on sectors that are more heavily dependent on external finance. Their results indicate that defaults have a limited impact on credit supply. Furceri and Zdzienicka (2011) evaluate the overall losses in terms of output that debt crises exert over the short and medium term, on a panel of 154 countries from 1970 to 2008. They find that the effects are sizeable, both the contemporaneous ones (6 percentage points) and those observed in the medium term over a 10 year horizon (up to 10 percentage points of GDP). De Paoli et al. (2009) look at the effects of debt crises on output; running a counterfactual analysis on 40 episodes of sovereign debt crises they also find that the output losses are prolonged and large. Yet, reductions in output seem to be significantly more pronounced when debt crises are associated with a banking and/or currency crises, which occur for over half of the crises in the sample. Albertazzi et al. (2012), in contemporaneous work on Italian data take a macro perspective. They run bank-level regressions of the volume of outstanding loans and of the level of interest rates on the level of the BTP-Bund spread. They find that a rise in the spread is followed by an increase in the cost of credit to firms and

households, and by a reduction in lending growth.

We contribute to this literature by evaluating how the recent sovereign debt crisis, by increasing banks' funding cost, has been transmitted to bank lending, in terms of both quantities and prices. The originality of our contribution lies in three aspects. First, we study the effect of an episode of sovereign debt crisis that can be considered fairly exogenous with respect to the banking sector; in this way we are able to isolate the effect of sovereign tensions from the often concurring banking crises. Moreover, we provide evidence about a sovereign crisis affecting a developed country which is part of a currency union, where the risk of a currency crisis is basically non-existent and monetary policy is determined by all member countries. As a consequence, the analysis of the sovereign crisis in Italy represents an ideal laboratory for studying the impact of sovereign tensions on credit supply. Secondly, by relying on a unique dataset on bank-firm relationships, we are able to fully control for firm-level unobserved heterogeneity, thus isolating the impact of supply from the impact of demand factors and properly addressing the endogeneity issues that typically challenge the studies of the effect of financial crises based only on macro or bank-level data. Third, we concentrate on the initial phase of a sovereign crisis, and not of a country sovereign default. This allows us to zoom into the mechanisms that drive the transmission of sovereign tensions to the real sector, thus feeding back into larger public deficits.

Second, our paper is also broadly related to the literature on global banks and on the international transmission of shocks. This literature has mostly focussed on how foreign banks might have contributed to "export" tensions affecting the domestic market, thus highlighting a mechanism of international transmission of shocks. In their seminal papers, Peek and Rosengren (1997, 2000) examine the impact of the fall of Japanese stock prices of the 1990s on cross-border lending by Japanese banks. They show that Japanese bank branches operating in the U.S. tightened their credit supply. Popov and Udell (2010), based on survey data on SME financing on 14 CEE countries in the period 2005-2008, find evidence of international transmission of financial distress in the early stage of the crisis, with Western European banks restricting credit supply more than domestic banks. Cetorelli and Goldberg (2011) show that the transmission of shocks spurred by global banks to emerging economies in the 2007-2009 crisis was large. Using bilateral country-level data they show that the impact occurred not only through contraction of cross-border loan supply by foreign banks and foreign banks' affiliates, but also by domestic banks that suffered a funding shock due to the reduction of inter-bank cross–border lending. Schnabl (2012) examines the impact that a negative liquidity shock to international banks such as the 1998 Russian default had on credit to Peruvian firms. Using bank-level data, he finds that the impact was significant. The transmission of the shock occurred through foreign inter-bank funding and the effect was strongest for domestic firms that were borrowing internationally. Analyzing data on cross-border syndicated lending by 75 banks to 59 countries over the period 2000-2009, De Haas and Van Horen (2012) find that banks that were more severely affected by funding constraints have reduced their lending abroad significantly. Finally Kalemli-Ozcan et al. (2012) take a broader perspective and show that during the 2007-2009 crisis the impact of financial integration on output cycles has changed as opposed to the period 1970-2007: whereas

before 2007 tighter financial linkages were associated with more divergent output cycles, in more recent years they were correlated with greater synchronization.

Our paper contributes to this field since, as a tool for identification of the effect of a sovereign shock on credit supply, it compares the patterns of credit granted by domestic and foreign banks. Hence we provide evidence on the lending policy of foreign banks in a country hit by a sovereign crisis showing that the presence of foreign banks may mitigate the impact of sovereign tensions on the supply of credit to domestic firms.

Third, from a methodological point of view, our paper relates to the empirical literature on the bank lending channel that uses credit registry data. Khwaja and Mian (2008) study the impact of an unexpected liquidity shock on credit supply on Pakistani data. They find that banks more exposed to the liquidity shock contracted their supply of credit more. Their paper also makes an important methodological contribution since they propose to control for firm-level unobserved characteristics including firm fixed effects. Jimenez, Ongena, Peydrò, Saurina (2011) and (2012) apply a similar technique to identify the banks' balance sheet channel of monetary policy and to study the effect of monetary policy on banks' risk taking.[2]

3 Empirical strategy

3.1 Issues for identification

Identifying a causal effect of sovereign tensions on credit supply poses important challenges.

First, the shock has to be exogenous with respect to the conditions of domestic banks. Yet sovereign spreads may rise as a consequence of a deterioration in domestic banks' balance sheets, or of the burst of an asset price bubble, which induces governments to bail out financial intermediaries (Acharya et al. 2012 show that government bail-outs of banks lead to higher sovereign spreads). We argue that this was not the case in Italy. During 2010 increasing concerns on the sustainability of public finances in Greece, Ireland and Portugal eventually led these countries to ask for international assistance from the European Union and the International Monetary Fund. Risk premiums on interbank and bond markets rose. Italian banks experienced an increase in the cost of wholesale funding, but their condition was not far from the one of their European peers. The situation changed dramatically from the June 2011, when rapidly deteriorating Greek economic conditions fuelled fears of a Euro-area break-up and triggered contagion to Italy. Between June and July 2011, indeed, S&P downgraded the Greek debt to CCC, the lowest rating for any country it reviews, Greek political instability rose, and announcements of an involvement of the private sector in Greek debt restructuring were made, characterizing it as a "selective default". Fearing that these events might have an impact on Italian sovereign risk, spreads on Italian government debt rose abruptly. Fig. 1 shows the magnitude of the increase in sovereign spreads on Italian 10 year government bonds with respect to the benchmark 10 year German Bund. All the action is concentrated in the second part of

[2] Other papers use a broadly similar identification strategy on Italian data: Bonaccorsi and Sette (2012) who study the bank lending channel during the 2007-2008 crisis and Albertazzi and Marchetti (2010) who study the presence of evergreening by banks after the Lehman default.

2011, when spreads increased sharply since June, reaching 370-390 basis points in September 2011 and a peak of 530 basis points in November. As opposed to what happened in other European countries the increase in sovereign yields can not be attributed to the instability of the financial sector. The weakness of Italian public finances is in fact driven by the high level of public debt and the low growth rate of the economy, which are both long standing features of the Italian economy (Bank of Italy 2011). Moreover, as opposed to what happened in Ireland or Spain, state aid to the banking sector was extremely limited and did not impact significantly on public deficit (see OECD 2009 among others). Fig. 2 shows primary net borrowing as a percentage of GDP of Greece, Ireland, Italy, Portugal and Spain. Public finances deteriorated markedly since 2008 in Ireland, Spain, Greece and Portugal, also as a consequence of bail-outs of troubled domestic banks. By contrast, primary deficit did not change much in Italy, also because the Italian financial sector needed little support to weather the crisis, and the high level of sovereign debt left little room to use fiscal policy to counteract the recession.[3] Finally, Italy did not experience an housing bubble.

On the contrary, increasing sovereign yields did have consequences on the banking system. The CDS spreads on the senior debt of the largest Italian banks rose abruptly leading to increasing difficulties in raising funds in the wholesale markets and rising interest rates on retail funding. The surge in the CDS spread was significantly higher than the one experienced by intermediaries in other developed countries (Fig. 3). Therefore the end of June 2011 can be reasonably identified as the moment in which the Italian banking system was hit by an unanticipated exogenous shock.[4]

A second crucial issue for identification is that sovereign tensions are accompanied by deteriorating economic conditions, inducing firms to scale down their investment plans and decrease demand for credit. Moreover, banks more exposed to sovereign tensions may lend to a different set of firms (e.g. firms with weaker balance sheets, riskier firms, etc.) than banks less exposed to sovereign tensions. Hence, it is critical to properly control for firm level demand for credit, for firms' riskiness, and, more generally, for firm unobserved heterogeneity. The richness of our dataset allows us to do so. Since Italian firms typically resort to multiple lenders (Detragiache et al. 2000, more recently Gobbi and Sette 2011), we identify the impact of sovereign risk on credit supply by comparing the pre-crisis and the crisis patterns of credit supplied to the same firm by two or more banks that have been affected by the sovereign crisis to different degrees. The inclusion of firm-period fixed effects in all regressions, similarly to what Khwaja and Mian (2008) or Jimenez et al. (2012) do, enables us to control for all firm-level unobserved heterogeneity that affects the dynamics of credit granted and of its cost in each period.

Another key condition for estimation of a supply effect is to identify banks, otherwise comparable, that have been differently affected by the shock. Since sovereign tensions were primarily country-specific, we consider Italian banks as the "more affected" group and foreign banks as the "less affected" one. The cross-country variability in the exposure to the shock is indeed quite

[3] Results are qualitatively similar if we use net government borrowing including interest expenses.

[4] Later developments during 2012 may discount deterioration in banks' access to funding, firms' profitability caused by the recession and government measures taken in the Autumn of 2011.

large. In particular, branches and subsidiaries of foreign banks, which hold 8% and 9% of total banking assets, were largely shielded from the Italian sovereign shock. Their lower exposure to the increased risk on the Italian government debt is attributable to a number of reasons. First of all, foreign banks operating in Italy are headquartered in countries where the sovereign risk was more contained, therefore making the chances of a downgrade on banks transmitted by lower ratings on domestic government debt limited. Second, given that the assets portfolio of foreign banks is less concentrated in government bonds of peripheral countries vis à vis Italian banks - holding mostly Italian debt-, the increase in riskiness of their asset side due to sovereign risk over the second half of 2011 was relatively milder. Third and most importantly, although lending to Italian firms, a significant fraction of their liabilities, 70% for branches and 40% for subsidiaries, are represented by interbank transfers from their headquarters that raise funds either in their home country or in the international wholesale markets. This contributed to a much lower increase in funding cost for foreign banks.

Since foreign banks cannot be considered as fully insulated by the sovereign shock, the effect we identify in the paper should be interpreted as a lower bound for the full causal impact of the crisis on lending, given that foreign banks do also tighten credit supply as a consequence of the shock, though modestly. As a robustness check, we also estimate a model using a continuous measure of the impact of the sovereign shock (the change in sovereign spread of the country where the banks is headquartered) which provides results that are both qualitatively and quantitatively consistent with those of the model comparing domestic and foreign banks.

In principle domestic and foreign banks may be different along several dimensions, and comparing them to assess the effect of the increase in sovereign spreads on credit supply may not be warranted. We argue that this is not the case for a number of reasons. First, the Italian banking system is rather sophisticated and Italian banks, especially larger banks, have similar business models, lending technologies, geographical scope as foreign banks, especially subsidiaries. Second, our identification strategy based on comparing lending by different banks to the same firm, allows us to fully control for possible differences in the composition of borrowers across domestic and foreign banks. Moreover, firms borrowing from very different types of banks, e.g. a domestic mutual bank, and a large international group, are rare. Last, but not least, we include bank fixed effects in our regressions, so that we can control for all unobserved heterogeneity among lenders, including notably differences in the ex-ante composition of loan portfolios, lending policies, extension of the network of outlets, etc.

3.2 The model

To identify the effect of the sovereign crisis on credit supply we estimate a model in which the observational unit is a credit relationship between a firm and a bank, and we compare two periods, the first half of 2011 (pre-crisis) and the second half of 2011 (crisis). Using a pre-crisis period allows to control for pre-crisis differences in the supply of credit by Italian and foreign banks. Moreover, it also allows us to include bank fixed effects to control for bank time-invariant unobservables.

The main models we estimate are as follows:

$$\Delta credit_{i,j,t} = \beta_1 domestic_j + \beta_2 domestic_j * crisis_t + \alpha_{i,t} + \varepsilon_{i,j,t} \quad (1)$$

$$\Delta APR_{i,j,t} = \gamma_1 domestic_j + \gamma_2 domestic_j * crisis_t + \alpha_{i,t} + \varepsilon_{i,j,t} \quad (2)$$

where $\Delta credit_{i,j,t}$ is the difference in the log credit granted by bank j to firm i in period t, and $\Delta APR_{i,j,t}$ is the change in the Annual Percentage Rate charged by bank j to revolving credit lines and to term loans granted to firm i in period t[5]. The dummy *domestic* equals 1 if bank j is Italian, zero if the bank is foreign, either as a branch or a subsidiary. The term *domestic*∗*crisis* is an interaction between the dummy *domestic* and the dummy variable *crisis* which equals 1 in the second half of 2011. We also include a full set of firm-period fixed effects, $\alpha_{i,t}$, which control for firm level unobserved heterogeneity in each period (including firm level demand for credit, firm balance sheet conditions, etc.). These fixed effects also absorb the dummy *crisis*, which therefore does not appear in the equations above. The effect is identified on firms that borrow from at least one Italian and one Foreign bank in at least one period.[6] We also run all regressions including bank fixed effects, which control for all bank time invariant unobserved heterogeneity, including systematic differences in banks' business models, geographical reach, etc.[7] Our focus is on the parameters β_2 and γ_2 which capture the differential behavior of Italian banks relative to foreign banks during the crisis.

All regressions also include variables intended to capture the specificity of the relationship between firm i and bank j. The first one is the share of total credit to firm i supplied by bank j (SHARE OF TOTAL CREDIT). Ex ante its expected sign is ambiguous: on the one hand, this variable measures the relative exposure of bank j towards firm i, and this is negatively correlated with loan growth and positively correlated with the change in the interest rate; on the other hand it could be interpreted as a proxy of the strength of the bank-firm relationship, therefore suggesting a positive relationship with credit quantities and possibly negative with interest rates. Moreover SHARE OF TOTAL CREDIT can also partially account for the initial size of the loan. The second variable is the share of drawn over credit granted by bank j to firm i (DRAWN OVER GRANTED). This control measures how intensively available credit lines are used. The third variable is the share of overdraft over total granted credit by bank j to firm i (OVERDRAFT). This regressor aims at controlling for the composition of total credit by different types of loan contracts (term loans, overdrafts, loans backed by account receivables).

[5] The reference rate for loans to non-financial corporations in Italy is the Euribor. In the case of revolving credit lines, this is the 1-month Euribor. Its movements are absorbed by firm*period fixed effects, so that our analysis, at least in the case of revolving credit lines, captures the effects of the sovereign crisis on spreads on loans to non-financial corporations. In the case of term loans, this is made more complicated by the lack of detailed data on the maturity of the loan (we only know whether its maturity is above or below 2 years).

[6] Suppose firm 1 borrows from Italian bank A, and Foreign bank B at June 2011. Our identification compares credit growth (and the interest rate changes) between June and December 2011 by bank A and B to the same firm 1. Then, we also add a pre-crisis period (December 2010-June 2011) to take care of possible different dynamics in credit supply by Italian and Foreign banks, but having repeated observations for the same firm-bank pairs is not strictly necessary for identification purposes.

[7] When we include bank fixed effects they absorb the dummy domestic, as no bank changes status (from domestic to foreign or viceversa) in our sample period.

3.3 Issues for empirical strategy

A key assumption underlying the validity of our identification strategy is that credit growth and the change in interest rate from Italian and foreign banks have a similar trend before the crisis, conditional on all controls.

A first graphical evidence on this assumption can be seen in Figures 4 and 5. Figure 4 shows the 6-month change in the log credit granted by Italian and Foreign banks. While prior to the crisis the two series moved similarly, since June 2011, credit from domestic banks decreased at a much faster rate than credit from foreign banks. Figure 5 shows the change in the Annualized percentage rates on revolving credit lines for domestic and foreign banks. Prior to June 2011, the two series moved together. After the crisis, both Italian and foreign banks raised the cost of credit, but Italian banks did so at a faster pace than foreign banks.

These graphs suggest that before the crisis Italian and foreign banks behaved similarly. However, no adjustment is made for the variability accounted for by the controls included in the regression, and in particular for the different composition of firms borrowing from the two types of banks. Hence, we also show the dynamics of credit granted and of its cost as deviations from firm-period averages. We expect credit from domestic and foreign banks, net of firm effects, to move similarly until June 2011, and to start diverging afterwards. This is precisely what happens, as shown in figure 6. Likewise, divergence in the patterns of cost of credit occurs after June 2011, as shown in figure 7. These are the graphical counterparts of equations 1 and 2 (see also Khwaja and Mian 2008 for a similar representation of the data).

It is important to keep in mind that all our regressions also include bank fixed effects, hence we are already controlling for bank-specific time-invariant trends. The requirement for a common trend then only applies to how much Italian and foreign banks' trends depart from their time-invariant component before and after the crisis.

4 Data and descriptive statistics

Dataset. We use a unique dataset containing information at the bank-firm relationship level on credit quantities and prices.

We obtain data on individual bank-firm relationships from the Italian Credit Register (CR). This source lists all outstanding loan amounts above 30,000 Euros (less than 40,000 USD) that each borrower (both firms and households) has with banks operating in Italy, including branches and subsidiaries of foreign banks. Intermediaries are required by law to report this information. Data are available at monthly frequency and are of very high quality since intermediaries use the CR as a screening and monitoring device for borrowers.[8] Loans are distinguished into three classes: revolving credit lines, term loans, and loans backed by account receivables. The dataset includes both granted and drawn amounts. We focus our study on credit granted, as this better

[8] The CR also contains information on the borrowers' sector of activity (industry, defined at the 4-digit Nace level), location (province), type of business entity (corporations, limited partnerships, general partnerships, sole proprietorships, etc.).

captures a decision of bank to supply credit. Drawn credit is influenced by the decision of the borrower to use available lines, and this is largely affected by demand.

We also use information on interest rates charged by a representative sample of banks (103 Italian banks and 10 branches and subsidiaries of foreign banks) to Italian borrowers. These data are included in a sub-section of the Credit Register ("Taxia database"), and are available at quarterly frequency.

Den consolidated and unconsolidated (in case of stand-alone banks) balance sheets for Italian banks from the Supervisory Reports submitted by the intermediaries to the Bank of Italy, which is in charge of banking supervision in the country. We obtain consolidated balance sheet data for foreign banks from Bankscope.

Finally, data on sovereign yields, which we use to compute spreads, are from Thomson Datastream.

We merge these different data using the unique bank identification number, and the data on sovereign yields using the bank headquarter home country code.

Data on credit quantity and interest rates are collected at December 31, 2010, June 30, 2011 and December 31, 2011. We do not extend our sample beyond December 2011, because on December 22nd the ECB enacted Long Term Refinancing Operations (LTRO), which eased tensions in funding markets, and thus confounded the effect of the sovereign shock. Yet, this may be a period worth studying as future research to assess the effect of the LTRO on credit supply. We do not extend the sample before 2010 to reduce the risk that our results are influenced by other events or developments occurring in previous periods. However, our results are robust to extending the sample to include 2010.

Bank balance sheet information refers to December 31 2010 and to June 30 2011.

Sample. We include all non-financial firms with outstanding credit in the CR, including very small firms, such as sole proprietorships. We exclude firms with bad loans outstanding at the beginning of each period, since these are officially classified as losses and banks will not grant further credit to these firms until the procedure to recover at least part of the outstanding amount is completed.

To control for firm unobservable heterogeneity we select only firms borrowing from at least two banks. Since our identification strategy relies on a comparison between the behavior of foreign and Italian banks lending to the same firm, we select firms that borrow from at least one Italian and one foreign bank. This yields 664,198 bank-firm relationships over the two periods (331,635 in the crisis period and 332,563 in the pre-crisis period), involving 164,470 firm-period couples (82,077 firms in the pre-crisis period, 82,393 in the crisis period, overall 92,620 distinct firms sampled at least in one period). Basic statistics of the firms included in the sample are shown in Column 1 of Table 1. The sample of firms borrowing from at least one domestic and at least one foreign bank is broadly representative of the population of firms with at least two lending relationships (Column 2 of Table 1). Firms included in our sample are larger (measured by the amount of credit granted), more located in the North of the country, the richest area of Italy where subsidiaries and branches of foreign banks are mostly based, active more in the industrial and agricultural sectors (this mainly reflects the geographical location

Table 1: Descriptive Stastistics of Firms in the sample

	Sample Firms	**Other firms in the CR** (with more than 1 bank)
Credit Granted - Median - December 2011 (euros)	870,470	417,485
Credit Granted - Median - June 2011 (euros)	814,225	403,644
Number of banks - December 2011	4.02	2.68
Number of banks - June 2011	4.05	2.68
Sector (percent of firms)		
Agriculture	8.31	5.20
Construction	11.59	14.25
Energy	0.56	0.43
Industry	29.28	27.82
Service	50.27	52.30
Area (percent of firms)		
North	62.97	59.22
Center	18.21	22.30
South	18.83	18.48

of firms in the North of the country) than the average firm in the CR that borrows from at least two banks.[9] Despite being larger than the average firm in the CR, firms in our sample are small. The median total credit granted is around 850,000 euros, the mean is around 6.5 million.

Dependent variables. We compute the log differences in outstanding credit in each bank-firm relationships between June 2011 and December 2010 and between December 2011 and June 2011 to obtain the growth rate of loans in the pre-crisis and in the crisis periods, respectively. We control for mergers and acquisition among banks, so that if a firm had a relationship with a bank, and the bank disappears because it is acquired or merged, we can track whether there is a new relationship with the newly formed bank, or with the acquirer, in which case we consider the relationship as still existing. We aggregate credit at the banking group level, so if a firm borrows from two banks belonging to the same banking group, we consider this as a single relationship. We do so since lending and funding policies are typically decided at the banking group level, and we believe this is the relevant unit of observation to analyze the dynamics of credit supply.

For the same periods we also compute the change in the Annual Percentage Rate (APR) on revolving and term loans. The APR is the actual interest rate paid by firms and is computed by dividing the amounts due (that may be gross or net of fees and commissions) by the products (outstanding amounts multiplied by the days the amount was outstanding). This gives an average annual percentage rate on the loan. Rates on term loans are a less precise measure

[9] Focusing on firms with at least two banks is not particularly restrictive, since multiple banking is mainly determined by firm size.

Table 2: Descriptive Stastistics of Main Dependent Variables

	Mean	**Median**	**p25**	**p75**	**StdDev**	**N Obs**
6-month log changes						
ΔLog Credit	-0.054	0	-0.086	0	0.422	664,198
ΔLog Credit - Pre crisis	-0.041	0	-0.081	0	0.412	332,563
ΔLog Credit - Crisis	-0.066	0	-0.092	0	0.431	331,635
6-month changes, percentage points						
ΔAPR - Revolving	0.61	0.54	0.08	1.12	1.40	203,042
ΔAPR - Revolving - Pre crisis	0.40	0.40	0.00	0.86	1.35	100,791
ΔAPR - Revolving - Crisis	0.82	0.77	0.22	1.37	1.40	102,251
6-month changes, percentage points						
ΔAPR - Term Loans	0.39	0.33	0.17	0.50	0.63	134,323
ΔAPR - Term Loans - Pre crisis	0.33	0.31	0.18	0.42	0.53	66,832
ΔAPR - Term Loans - Crisis	0.45	0.35	0.16	0.57	0.71	67,491

of cost of credit than rates on revolving credit lines, because they depend on the maturity of the loan, which we do not observe, and also on the collateral posted, since they are typically collateralized. Then, our main results are based on rates on revolving credit lines, and results on term loans provide additional supporting evidence. We choose to use APR net of fees and commissions, because these are typically applied on credit granted while the interest rates we observe are estimated on the basis of the actual usage of the credit line. Then, if a credit line is used for a relatively small amount and for a very short period of time both the flow of interest rates paid and the products are small. As a consequence fees and commissions are large relatively to both interest rates and products leading to extremely large APR. However, for robustness purposes, we also estimate our baseline regressions for interest rates gross of fees and commissions. Our preferred measure of cost of credit is the APR on revolving credit lines.

Descriptive statistics. Descriptive statistics for the three main measures of credit supply we use in the paper are shown in Table 2. Credit contracted, on average, in both periods, but the contraction was larger after the crisis. Interest rates increased more after the crisis than in the pre-crisis period. This is true for both revolving credit lines and for term loans. The former can be renegotiated at short notice by banks, and this explains why in the post-crisis period rates on revolving credit lines grow more than term loans, whose conditions are more stable over time.

The dynamic of both credit granted and interest rates charged by Italian banks has been different from that of foreign banks after the crisis. As shown in Table 3, the growth rate of credit granted by Italian banks dropped from -3.7 to -7.0%, while that by foreign banks stood at -5.5% after the crisis, just 0.3 percentage points less than prior to the crisis. This suggests that the sharp increase in the spread on Italian sovereign debt did not affect the lending supply of foreign banks very much, so that the effect we identify in equation 1 by comparing domestic and foreign banks represents mostly the reaction of the former to the shock.

By the same token, domestic banks increased interest rates sharply during the crisis. Foreign banks also raised rates on revolving credit lines, while those on term loans changed very little.

Table 3: Credit Supply by Italian and Foreign Banks (simple average)

	Italian	**Foreign**
6-month log changes		
ΔLog Credit - pre crisis	-0.0373	-0.0516
ΔLog Credit - post crisis	-0.0704	-0.0547
6-month changes, percentage points		
ΔAPR - Revolving - Pre crisis	0.43	0.34
ΔAPR - Revolving - Crisis	0.89	0.62
6-month changes, percentages		
ΔAPR - Term Loans - Pre crisis	0.34	0.30
ΔAPR - Term Loans - Crisis	0.52	0.30

Then, our estimates in equation 2 may represent a lower bound for the full effect the sovereign shock on rates on revolving credit lines.

Of course, this evidence is only suggestive, as firms borrowing from foreign banks may be different from firms borrowing from Italian banks, in terms of lower demand for credit and higher risk. Regression analysis takes care of these possibilities.

Table 4 shows the distribution of bank-firm relationships by home country of the lender. More than a quarter of the relationships are from foreign banks. The majority are French owned. Then, German, American, Austrian, Spanish, Dutch and British banks hold more than 2,000 relationships. Banks from Japan, Switzerland, and Slovenia are less represented. Table 4 also shows the change in the spread of the 10 year sovereign security over the 10 year German Bund, between the average of January and the average of March 2011 for the pre-crisis period, and between the average of July 2011 and the average of September 2011 for the crisis period. It can be seen that this spread increased sharply, by almost 200 basis points, for Italy (see also Figure 1), for Slovenia (110 basis points), Japan and Spain (98 and 83 basis points, respectively). Prior to the crisis, spreads changed little, and in some instances, they decreased.

Our sample includes 567 banks, 49 of which foreign. Descriptive statistics of banks' balance sheet variables are shown in Table 5.

There is large variability in banks' balance sheet structure and size. Larger banks rely more on interbank funding, are less capitalized, have a smaller exposure to troubled sovereign securities than smaller banks.

Table 6 shows descriptive statistics of the main bank variables distinguishing between Italian and Foreign banks. The statistics are computed over both the crisis and pre-crisis period (data shown in Table 5 indicate that there is little difference across periods).

Foreign banks are on average larger, less capitalized, rely more on interbank funding, are less exposed to troubled sovereign securities. The relatively low standard deviation and the small interquartile range of all variables suggest that foreign banks are a more homogeneous

Table 4: Home Country of Banks included in the sample and changes in spreads

Country	**Number of relationships**	**%**	**ΔSpread - Pre crisis**	**ΔSpread - crisis**
			basis points	basis points
Austria	8,395	1.26	-0.4	32.7
Switzerland	207	0.03	-9.4	45
Germany	22,846	3.44	0	0
Spain	4,353	0.66	3.2	83
France	134,954	20.32	-3.7	38
UK	2,312	0.35	-44	34
Japan	463	0.07	-13	98
Netherlands	2,908	0.44	5.1	15
Slovenia	42	0.01	-7.6	110
United States	9,339	1.41	-37	7.8
Total foreign	185,819	27.98		
IT	478,379	72.02	12	192

Table 5: Balance Sheet Variables of Banks

		Mean	**Median**	**p25**	**p75**	**StdDev**
	T1 Ratio %	17.1	13.9	11.1	18.5	14.0
Pre-Crisis	Interbank/Assets %	5.6	2.7	0.92	6.17	9.11
Period	Exposure to Giips/Assets %	13.8	11.9	6.8	18.4	10.2
(Dec 2010)	Log Assets	6.9	6.0	5.0	6.9	3.7
	T1 Ratio %	16.8	13.9	11.2	18.5	11.9
Crisis	Interbank/Assets %	5.3	2.7	0.82	6.7	8.2
Period	Exposure to Giips/Assets %	13.6	11.5	6.7	17.8	9.9
(June 2011)	Log Assets	6.9	6.0	5.0	6.9	3.7

Table 6: Balance Sheet Variables of Banks

		Mean	**Median**	**p25**	**p75**	**StdDev**
	T1 Ratio %	17.2	14.2	11.3	19.0	13.3
	Interbank / Assets %	4.6	2.4	0.75	5.55	7.94
Italian	Exposure to Giips / Assets %	14.4	12.3	7.5	18.7	9.8
	Log Assets	6.0	5.8	4.9	6.7	1.55
	T1 Ratio %	12.8	11.4	10.4	13.6	5.2
	Interbank / Assets %	18.3	17.7	11.2	23.9	9.3
Foreign	Exposure to Giips / Assets %	1.64	0.88	0.19	2.22	2.03
	Log Assets	19.7	20.3	18.1	20.9	1.6

Table 7: Descriptive Statistics of Relationship-Level Controls

		Mean	Median	p25	p75	StdDev
whole sample	Share %	24.4	17.6	8.5	34.7	21.1
	Drawn/Granted %	63.7	75.0	35.7	97.8	35.7
	Share overdraft %	23.7	9.1	1.5	30.7	31.9
Italian	Share %	23.6	16.8	8.2	33.1	20.8
	Drawn/Granted %	62.2	71.5	33.4	96.2	35.8
	Share overdraft %	24.4	10.0	2.3	32.2	32.0
Foreign	Share %	27.3	20.0	8.5	41.7	23.2
	Drawn/Granted %	69.6	87.6	43.2	100	13.3
	Share overdraft %	21.9	5.0	0	25.9	32.1

group than Italian banks. Larger Italian banks have a balance sheet structure similar to that of foreign banks. In our regressions, systematic differences across banks are controlled by bank fixed effects.

Finally, we describe basic statistics of the relationship-level control variables included in our regressions (Table 7). Banks hold on average one fourth of credit in each relationship. The median share stands at about 17%. Firms draw on average about 64% of available credit, but the median firm draws 74% of it. Finally, overdraft facilities are on average 24% of total credit, 9.1% at the median. Italian banks tend to have a lower share of credit, the ratio of drawn to granted credit is lower for Italian banks, the share of revolving credit lines is higher for Italian banks. The differences in the means of these variables between Italian and foreign banks, while not large in absolute value, are statistically significant. Then, we include these variables as controls in the regression analysis.

5 Baseline model

5.1 Credit quantity

Results from the estimation of equation 1 are displayed in table 8.[10]

Columns 1 and 2 show the effect of the dummy *domestic* on the growth of credit granted. Before the crisis there is no difference between Italian and foreign banks. During the crisis, the behavior of the two types of banks is in fact different: credit granted by Italian banks grew by about 3 percentage points less than credit granted by foreign banks. These results are robust to the inclusion of bank fixed effects (column 2), which absorb the dummy *domestic*. Bank fixed effects control for differences in bank balance sheet structure[11] (bank's balance sheet structure did not change much between December 2010 and June 2011), bank organizational structure, and other bank-level time invariant unobserved heterogeneity, including bank-specific trends in

[10] We double cluster standard errors at the bank and at the firm level.

[11] The inclusion of bank fixed effects allows us to totally control for time invariant differences in bank characteristics, such as the riskiness or sectoral concentration of bank loan portfolios.

loan growth. Yet we do not observe much difference in the coefficients in the two specifications, and this suggests that the "domestic bank" variable of column 1 is already accounting for most of the cross-sectional heterogeneity across banks.

5.2 Interest rates

We now move to study the impact of the sovereign crisis on the cost of credit, by comparing the behavior of foreign and Italian banks in the pricing of loans, estimating equation 2.

Table 9 shows results of regressions on the change in the Annual Percentage Rate (net of fees and commissions) on revolving credit lines in columns 1 and 2 and on term loans in columns 3 and 4, without and with bank fixed effects, respectively. Domestics banks increased rates on revolving credit lines by about 20 basis points more than foreign bank lending to the same firm. The size of the coefficient of the interaction *domestic*crisis* changes very little if bank fixed effects are included. We run the same regression on the change in interest rates on term loans. Domestic banks increased rates on term loans by about 15 basis points more than foreign banks lending to the same firm. Interestingly, the dummy *domestic* is not significant neither in regressions on the change in rates on revolving credit lines, nor on the change in rates on term loans, indicating that prior to the crisis, domestic and foreign banks did not price credit differently. Overall, these results indicate that after the crisis Italian banks increased the price of credit more than foreign banks.

Regarding relationship-level controls, the share of credit held by the bank is not statistically significant. By contrast, the share of credit granted by the bank as revolving credit lines is positive and significant. This captures the extent of bank's unsecured exposure to the firm, and this explains the positive sign of the control. Finally, the ratio of drawn to granted credit is also significant, although this has different sign in regressions on revolving credit lines (positive) with respect to those on term loans (negative). This has to do with the fact that regressions on the change in interest rates are conditional on credit being granted to the firm. Then, if a firm is already using extensively its available credit, it may obtain further term loans posting collateral, which yields lower rates; if instead it obtains revolving credit lines (unsecured) it faces higher rates.

5.3 Robustness

We perform a series of checks to test the robustness of our main results.

First, we use credit drawn as an alternative measure of credit growth. Credit drawn is much more affected by firm demand for credit than credit granted. Even including firm-period fixed effects, credit drawn still partly reflects a decision of the firm, rather than a supply-side (bank) decision. Results are shown in columns 3 and 4 of Table 8. Overall, credit is drawn less intensely from domestic banks, providing a picture consistent to the one coming from the analysis of credit granted.

Second, we perform a placebo experiment, using the periods before June 2011 to test whether the difference between domestic and foreign banks in fact occurred after the burst of the sov-

ereign crisis. As regards credit quantity, we use data from 2010, setting the fictitious event at June 2010. Then, we add the first half of 2011, and we set the event at June 2010 or at December 2010. In all cases (Table 10) neither the dummy domestic, nor the interaction between the dummy domestic and the dummy post-event are significant. Coefficients are also small in size. As regards the cost of credit, our data start on March 2010. Then, we use the second half of 2010 and the first half of 2011, setting the event at December 2010.[12] Results for the change in the APR on revolving credit lines are broadly similar to those on quantities, and thus omitted.

These results also provide support to the common trend assumption, suggesting that prior to June 2011, credit supply from domestic and foreign banks was not different.

Third, we also estimate the baseline regressions on Annual Percentage Rates gross of fees and commissions. These are an important component of the cost of credit. Results are shown in Table 11.[13] It can be seen that estimates are essentially unchanged: the coefficient of the dummy Italian banks interacted with the dummy crisis in the regression on the gross APR on revolving credit lines is larger, since revolving credit lines are particularly prone to the effect of peaks of usage, which determine very large effective gross rates in our data. The coefficient of the dummy *domestic*, interacted with the dummy crisis, in the regression on the gross APR on term loans is instead similar to that of the regressions on the net APR.

We perform some additional robustness checks (not shown in the paper to contain its length, but available from the authors): we estimate the models excluding Spanish banks since these have also been affected by the crisis[14]; we trim or winsorize the change in log credit when it is above or below the 1st and 99th percentile; we estimate the models excluding the relationship level controls since these may be correlated with previous period growth of credit. In all cases results continue to hold.

6 Alternative specifications of baseline model

6.1 Subsidiaries and branches of foreign banks

We also investigate whether our results are driven by systematic differences between branches and subsidiaries of foreign banks, by running separate regressions, where either branches or subsidiaries represent the foreign banks group. Our results suggest that the overall mitigating effect of foreign banks was mostly due to subsidiaries, possibly because they are able to rely more upon soft information than branches.

In this section we test whether results are robust to a finer definition of foreign banks. These include both subsidiaries and branches. However, their operational and financial structures are

[12] We also run regressions including the second quarter of 2010, setting the event at June 2010 and nothing changes. However, in this case we compare a 3-month change in the APR between June 2010 and March 2010 with 6-month changes over the following periods.

[13] The change in the gross APRs on revolving credit lines is winsorized at the 5th-95th percentile: these correspond to -33.8 and 27.0 percent. The change in the gross APRs on term loans is winsorized at the 1th-99th percentile: these correspond to -1.92 and 3.25 percent.

[14] In the second half of 2011, the increase in the delta-spread of Spanish sovereign securities was much smaller than the corresponding rise on the Italian Btp , as Table 3 shows.

quite different. While subsidiaries are very similar to domestic banks in terms of extension of their network of outlets and business model, branches often are specialized in specific market segments (e.g. syndicated loans, leasing, etc.), and concentrate their activity in certain areas of the country. Subsidiaries and branches also differ in the way they obtain funding. Branches typically obtain most of their funding as transfers from the headquarter, while subsidiaries rely relatively more on retail funding.

Table 12 shows results. Columns 1 to 3 display estimates from regressions run on the subsample of firms borrowing from at least one domestic bank and at least one subsidiary of foreign banks (branches of foreign banks are excluded). Results are similar to those of the baseline regressions, both for credit growth and for the cost of credit. Domestic banks grant less credit, and raise the cost of term loans more than subsidiaries of foreign banks.

Columns 4 to 6 display estimates from regressions run on the subsample of firms borrowing from at least one domestic bank and at least one branch of foreign banks (subsidiaries are excluded). In this case, we find that domestic banks raise the cost of revolving credit lines more than branches of foreign banks, while there seems to be no difference in the credit quantity supplied and in the interest rate on term loans.

Overall these results suggest that the effect we find in the main regression on the growth of credit granted is mainly driven by a different behavior of Italian banks relative to subsidiaries of foreign banks. By contrast, we find no significant difference in credit supply between domestic banks and branches of foreign banks, despite the fact that the latter enjoy better access to funding than domestic banks. Results on the cost of credit indicate that foreign banks, both subsidiaries and branches, appear to increase the cost of credit less than Italian banks. We interpret these results as evidence that the type of presence in the Italian market is relevant for the decision about the quantity of credit granted. Subsidiaries of foreign banks have a more extensive network of outlets and have therefore the possibility to collect more soft information on borrowers than branches of foreign banks. Conditional on granting credit, the pricing policy depends mostly on the cost of funding which was lower for both subsidiaries and branches of foreign banks during the crisis.

6.2 A continuous measure of exposure to sovereign risk

We also test the model using a continuous measure of banks' exposure to sovereign tensions:

$$\Delta credit_{i,j} = \beta_1 \Delta spread_j + \alpha_i + \varepsilon_{i,j} \quad (3)$$

$$\Delta APR_{i,j} = \gamma_1 \Delta spread_j + \alpha_i + \varepsilon_{i,j} \quad (4)$$

where $\Delta spread$ is the change in the spread with the German Bund on the 10 year sovereign securities of the country in which bank j is headquartered.[15] For this purpose we limit our

[15] This is computed as the difference between the monthly average of September 2011 and the monthly average of June 2011. We do so in order to avoid possible endogeneity issues, as the burst of the sovereign debt crisis occurred during the third quarter of 2011, and later developments may have been affected by the worsening of the business cycle, at least in Italy.

attention to the June - December 2011 period. To identify the impact of a change in the sovereign risk premia it is indeed more useful to exploit the cross-sectional variation of the delta spread during the crisis. Our focus is on the parameters β_1 and γ_1, which capture the elasticity of lending and interest rates to increased home-country sovereign risk. This exercise is also useful to take care of the possibility that foreign banks react to the shock: this model estimates the effect of an increase in banks' home country spread on credit supply, and it amounts to compare the behavior of banks hit by shocks of different intensity.

Results are shown in Table 13 and are consistent with those found with the baseline model. A 100 basis points increase in the spread leads to a 1.3 percentage points lower credit growth. This is a sizable effect, as the mean log change in credit is -6.7 per cent. The same increase in spread leads to interest rates higher by 16 and 11 basis points for revolving credit lines and term loans, respectively.

Importantly, the model predicts that the increase in the Italian sovereign spreads between July and September (192 basis points) leads to a lower credit supply by -2.5 percentage points, and to a raise in rates on revolving credit lines and term loans by 31 and 20 basis points, respectively. These effects are very similar to those estimated in the baseline model. This suggests that the estimates of the baseline model are very close to the full effect of a rise in sovereign spreads on credit supply, and the effect of the shock on foreign banks, less affected (the "control" group) is very limited. Perhaps, only the effect on the change in rates on revolving credit lines is underestimated by the baseline model.

We also estimate the above model on our initial panel, including the pre-crisis period and bank fixed effects, and results are unchanged.

7 Extensive margin

The extent to which banks decide to terminate existing relationships and to start new relationships are important determinants of borrowers' access to credit. When an existing relationship is cut, borrowers may need to look for alternative funding sources or scale down investment. When a new relationship is started, borrowers get a significant boost in their access to credit; moreover, this may represent a positive signal of borrower's ability to stay in business for other financiers, suppliers and customers.

As an additional extension, we study whether the sovereign debt crisis also affected the propensity of banks to terminate relationships and to accept applications for new loans. We also study whether the sovereign debt crisis affected the interest rates charged on new term loans.

As a first step, we estimate equations for the probability that a relationship is terminated. To this aim, we define a dummy variable taking value 1 if a bank-borrower relationship had positive credit granted only at the beginning of the period and value 0 if credit granted was positive at both periods. We compare the probabilities that a foreign and an Italian bank terminate a relationship with the same firm, by estimating a linear probability model which allows to include firm-period fixed effects. Table 14 shows that domestic banks are less likely to

cut credit than foreign banks (columns 1 and 2, the latter includes bank fixed effects). Italian banks are about 1.6 percentage points less likely to terminate a relationship than foreign banks after the sovereign crisis started (on average about 7.5 percent of the relationships in place at June 2011 have been terminated by December 2011).

As a second step we examine the "extensive margin" of credit, in particular whether Italian and foreign banks were more, less, or equally likely to grant loans to new clients. In line with Jimenez *et al.* (2012), we use data on loan applications recorded in the CR in order to analyze the probability of acceptance/refusal of new credit. Every time a bank requests information on a borrower, the query is recorded in the CR, together with the motivation of the request, typically a loan application by a new client. This allows us to recover the number of applications for a loan made by each borrower to each bank in every period. We collect data on all the requests recorded between October 2010 and March 2011 and between July 2011 and December 2011, pre-crisis and crisis period, respectively. For each application we check if the bank granted any credit to the loan applicant in the sample period and in the following three months. Hence, a loan application submitted to a bank, say, in December 2010, is classified as accepted if we observe that the bank grants credit to the borrower in any point in time between the time of the request and March 2011. Our dependent variable is a dummy equal to 1 if the application of firm j to bank i is accepted, 0 otherwise. A stand-out descriptive feature of the frequency of accepted applications is that overall it has sharply dropped during the crisis, to 9 per cent between June 2011 and March 2012 from the 37 per cent observed in the three previous quarters.

We estimate a linear probability model. We also include firm fixed effects in some specifications to fully control for firm heterogeneity. However, this may induce a selection bias since the effect is identified on firms that make loan applications to at least two banks over a relatively limited period. The reason for applying twice might precisely be that the first application has been denied. Results are shown in columns 3 and 4 of Table 14. All regressions include bank fixed effects. Column 3 shows results without firm-period fixed effects, thus including also firms that make only one loan application in each period. Column 4 include firm-period effects, and the analysis is done on firms that made loan applications to at least two different banks in each period.[16] Results indicate that after the crisis the willingness to accept a loan application by Italian banks decreased more than that of foreign banks. An inspection of descriptive statistics suggests that the effect comes from foreign banks remaining equally selective in accepting loan applications over time and Italian banks becoming way more selective after the sovereign crisis burst.[17]

The combination of the results for credit growth, for the probability that a relationship is terminated, and for the probability that a new loan is accepted provides an elaborate picture. Foreign banks, those that were less affected from increases in sovereign spreads, are more ag-

[16] In this case identification is achieved thanks to firms applying for a loan to at least one foreign and at least one italian bank in each period.

[17] This is corroborated by regressions excluding bank fixed effects, but including a dummy for domestic banks: the latter is positive and significant, indicating that domestic banks were more likely to accept a loan application than foreign banks in the pre-crisis period. After the crisis this gap was filled because Italian banks reduced significantly their willingness to accept a new loan application.

gressive in cutting credit relationships and, furthermore, before the crisis they were less likely to accept a loan application than Italian banks. However, conditional on relationships being in place, foreign banks provide more credit than Italian banks. This suggests that foreign banks became more selective with their borrowers, yet once they have established a relationship they support their borrowers more. Possibly foreign banks have a tougher budget constraint than Italian banks, and are more able to cut more fragile relationships**.** This finding can be interpreted in the perspective of relationship lending: since foreign banks have stepped into the Italian market only in the second half of the 2000s, they have had relatively less opportunities to develop long-term bank-firm relationships. This possibility is in line with the results of De Haas and Van Horen (2012), who show that after Lehman's default, foreign banks continued to lend more to countries where they have longer lending experience.

As a last step, we study whether domestic and foreign banks charged different interest rates on new term loans. We use the data included in the Taxia dataset on the Annual Percentage Rates gross of fees and commissions charged on new term loans. In this case, we study the level of interest rates, and not the change, since these data are relative to specific loans, and not to outstanding balances. To avoid the possible influence of seasonal effects, we compare the level of interest rates charged on loans granted in the fourth quarter of 2011 with those granted in the fourth quarter of 2010. Results are shown in column 5 and 6 of Table 14. Column 5 does not include firm fixed effects, and thus include all term loans granted. Column 6 includes firm-period fixed effect and thus is estimated on the subsample of firms that obtain two new term loans in a quarter. Results indicate that the interests charged by domestic banks on new term loans have been about 35 basis points higher than those charged by foreign banks. This is consistent with the results we found in the regressions on the change in the cost of existing loans. The other controls behave as expected: the dummy crisis is positive and highly significant, indicating that interest rates on new term loans increased during the crisis (the effect is large, about 130 basis points, although this is not a pure supply effect). The size of the loan is significant only in the regression that does not include firm-period effect. Therefore, it likely proxies for the size of the firm. The negative sign of its coefficient thus indicates that larger firms are charged lower rates.

8 Bank heterogeneity

We showed that the sovereign crisis, that hit domestic banks, had an effect on their supply of credit: their credit growth was lower than that of foreign banks after the crisis. We now proceed onto studying whether this effect was in fact driven by bank characteristics that might have changed over time with a different extent across Italian and foreign banks.

In particular, we focus on bank capitalization (the Tier 1 ratio), bank size, the ratio of sovereign securities from European troubled countries (GIIPS) to total assets, and the ratio between wholesale funding and total assets. The last two variables are especially important because they capture the extent to which banks might be affected by the sovereign crisis. The higher the exposure to European "peripheral" countries, the higher the losses banks recorded in

their balance sheets, and the more the cost of funding increased, as fears mounted that banks could face large losses. However, portfolio holdings of government bonds constitutes a form of collateral available for refinancing from the central banks, and for collateralized interbank borrowing. Wholesale funding is the most volatile source of funding, and it dried-up sharply in the second half of 2011.

Hence, we test whether our result on credit tightening by Italian banks compared to foreign ones holds even including bank balance-sheet characteristics in our baseline equations. This should take into account the possibility that our results on the interaction domestic*crisis are due to a spurious correlation between being a foreign bank and having a balance-sheet structure changing over time. This is not the case, since, as shown in Table 15, the interaction remains significant and negative in the regression on credit quantity growth and significant and positive in the regression for the change in the interest rates on revolving credit lines.[18] This means that, even if they had the same capital position and funding structure at the onset of the crisis of foreign banks, Italian banks would still be restricting credit more after the crisis burst: there appears to be a country-specific effect common to all Italian banks.

9 The aggregate effect

The empirical analysis discussed so far shows that domestic banks contracted credit growth and increased the cost of credit more than foreign banks after the burst of the sovereign debt crisis. These results are based on coefficients estimated comparing the behaviour of a domestic and a foreign bank lending to the same borrower ("within"), and therefore reflect partial equilibrium outcomes. However, firms might compensate the reduction in credit from domestic banks with increased loans from foreign banks that were not directly hit by the sovereign debt crisis.

Estimates from a simple firm-level regression is likely to be biased, though, because changes in the log of total credit at the firm level also reflect firm-level demand for credit, changes in firm financial strength, etc. A method to estimate the unbiased firm-level ("aggregate") impact of the supply shock induced by the crisis on the growth of credit commitments has recently been proposed by Jimenez et al. (2010). However, their methodology does not allow to easily obtain standard errors of the firm-level effects, and thus to conduct inference. In this paper, we use an alternative estimation procedure.[19] We first estimate firm-fixed effects from our base model at the bank-firm level. Then we plug these estimates of firm effects in a firm-level equation in which the dependent variable is the growth of total credit granted to firms by banks (including new relationships) and bank balance sheet controls are computed as averages weighted by the initial credit granted. Standard errors are estimated by block-bootstrapping at the bank level, to take into account the fact that firm fixed effects are estimated regressors.[20]

Formally, from the base model (equation 1), we obtain an estimate of firm-period fixed effect

[18] For term loans, the interaction is not significant, although still positive.

[19] A first version of this methodology appears in the June 2012 version of Bonaccorsi di Patti and Sette (2012).

[20] This approach is similar in spirit to that proposed by Abowd, Kramarz and Margolis (1999) to estimate worker effects in their study of wage premia.

$\widehat{\alpha}_{i,t}$. As a second step we estimate

$$\Delta credit_{i,t} = \beta_1 \overline{domestic_i} + \beta_2 \overline{domestic_i} * crisis_t + \widehat{\alpha}_{i,t} + \varepsilon_{i,t}$$

where $\overline{domestic_i}$ is the average at the firm level of the dummy *domestic* weighted by the share of credit to the firm held by each bank. A more thorough description of this approach can be found in the Appendix.

Results are shown in Table 16. Column 1 shows results without the estimated firm effects. The interaction term between the dummy domestic and the dummy crisis is negative and significant. This indicates that firms are not able to fully substitute credit from domestic banks by increasing credit from foreign banks. However, as argued above, this result is likely biased. In column 2 we show estimates including the firm effect. Now, the dummy domestic is still negative and significant, although the size of the coefficient is smaller. This suggests that when taking into account firm unobservables, including firm-level demand for credit, the supply effect is smaller. It is nevertheless still large: if the share of credit a firm obtained before the crisis from domestic banks increases by one standard deviation (12 percentage points), credit growth after the crisis is about 0.4 percentage points lower. This is large as the median credit growth in the crisis period is -3.1 percent (the mean is -4.8 percent).

We also computed the aggregate effect on the basis of the methodology proposed by Jimenez et al. (2010). In this case, the coefficient of the dummy domestic bank is -0.042. The coefficient estimated through our two-step approach, -0.033, is not statistically different from this value.

Finally, the estimated firm fixed effect is highly significant and positive, indicating that this is likely capturing firm-level demand for credit.

These results suggest that firms have not been able to fully substitute credit from domestic banks with more credit from foreign banks, and the sovereign crisis has therefore had an aggregate impact on credit supply.

10 Concluding remarks

In this paper, we study the impact of the recent sovereign debt crisis on the lending activity of Italian banks. To this aim, we exploit the variability observed between different categories of banks operating in Italy in quantities lent, interest rates charged, willingness to accept new applications and to terminate existing relationships over the transition between the pre-crisis and the crisis periods. We exploit the heterogeneous impact of the crisis across Italian and foreign banks operating in Italy.

Our results show that Italian banks tightened their supply of credit after the sovereign crisis burst, both in terms of quantities and prices. Lending by Italian banks grew by 3 percentage points less and the interest rates charged were 15 to 20 basis points higher with respect to foreign banks operating in Italy. Our estimates fully control for firm unobserved heterogeneity, by including firm-time fixed effects, and also hold when capturing bank unobserved heterogeneity through bank fixed effects.

We also analyze whether firms have been able to fully substitute for the decrease in lending of Italian banks during the crisis by increasing lending by foreign banks, thus keeping firms' access to credit substantially shielded from sovereign tensions. We find that in fact this was not the case: substitution was not complete and therefore the sovereign crisis exerted a significant aggregate effect on credit supply.

We test our results across a wide set of robustness checks. In particular we find that the difference between Italian and foreign banks does not seem to be due to differences in banks balance sheet characteristics. We also find that Italian banks increased the growth of credit less than subsidiaries of foreign banks. By contrast, we find no significant difference in credit granted between domestic banks and branches of foreign banks, despite the fact that the latter enjoy better access to funding than domestic banks. By contrast, both subsidiaries and branches, appear to increase the cost of credit less than Italian banks.

Besides analyzing the terms of existing credit relationships, our investigation also explores the differential behavior of Italian and foreign banks in accepting new loan applications and terminating existing relationships as the sovereign crisis burst. These results are particularly insightful, as they show that foreign banks, while tightening credit less with respect to Italian banks, did not relax their selectivity criteria during the crisis; if any, they increased it, being more likely to cut credit and maintaining very high rejection rates. An interpretation of this finding could be that foreign banks "flew to quality" during the crisis, by concentrating on supporting less fragile borrowers. This story suggests an examination of firms' characteristics, which we intend to pursue as a further extension of our work, by studying whether foreign and Italian banks behave differently depending on firms' riskiness (z-score, leverage, profits), liquidity, and opacity (size, age, tangible to total assets).

References

[1] Abowd, J., Kramarz, F. and D. Margolis (1999) "High Wage Workers and High Wage Firms", *Econometrica*, 67(2), 251-334.

[2] Acharya, V., Drechsler, I., and P. Schnabl (2012) "A Pyrrhic Victory? Bank Bailouts and Sovereign Credit Risk", *Working Paper NYU.*

[3] Albertazzi, U. and D.J. Marchetti (2010) "Credit Supply, Flight to Quality and Evergreening" *Bank of Italy Working Paper* No. 756

[4] Albertazzi, U., Ropele, T., Sene G., and F. Signoretti (2012) "The impact of the sovereign crisis on the lending activity of Italian banks", Bank of Italy, Occasional Paper No.133.

[5] Arteta, C. and G. Hale (2008) "Sovereign debt crises and credit to the private sector" *Journal of International Economics* 74: 53-69

[6] Bank of Italy, Annual Reports, various years.

[7] Bonaccorsi di Patti, E. and E. Sette (2012) "Bank Balance Sheets and the Transmission of Financial Shocks to Borrowers: Evidence from the 2007-2008 Crisis" *Bank of Italy Working Paper* No. 848.

[8] Borensztein E. and U. Panizza (2009) "The Costs of Sovereign Default" *IMF Staff Papers* Vol. 56, No. 4

[9] Cetorelli, N., and L. S. Goldberg (2011) "Global Banks and International Shock Transmission: Evidence from the Crisis" *IMF Economic Review* 59: 41-76.

[10] De Haas, R. and N. Van Horen (2012) "International Shock Transmission after the Lehman Brothers Collapse Evidence from Syndicated Lending" *American Economic Review Papers & Proceedings,* 102, 231-237.

[11] De Paoli, B., G. Hoggarth and V.Saporta (2009) "Output costs of sovereign crises: some empirical estimates" *Bank of England Working Paper* No. 362.

[12] Detragiache, E., P. Garella and L. Guiso (2000) "Multiple versus Single Banking Relationships: Theory and Evidence" *Journal of Finance* 55: 1133-1161.

[13] Furceri, D. and A. Zdzienicka (2011) "How Costly Are Debt Crises?" *IMF Working Paper* No. 280

[14] Gobbi, G. and E. Sette (2011) "Do Firms Benefit from Concentrating their Borrowing? Evidence from the Great Recession" Bank of Italy, mimeo.

[15] Jimenez, G., A. Mian, A., J. Peydrò, and J. Saurina (2010), "Local versus Aggregate Lending Channel: the Effects of Securitization on Corporate Credit Supply", mimeo.

[16] Jimenez, G., S. Ongena, J. Peydrò, and J. Saurina (2012), "Credit Supply: Identifying Balance-Sheet Channels with Loan Applications and Granted Loans", *American Economic Review* forthcoming.

[17] Jiménez, G., S. Ongena, J. Peydrò, and J. Saurina (2011), "Hazardous Times for Monetary Policy: What do 23 Million Loans Say About the Impact of Monetary Policy on Credit Risk-Taking?", mimeo.

[18] Kalemli-Ozcan, S., E. Papaioannou and F. Perri (2012) "Global Banks and Crisis Transmission", NBER Working Paper 18209.

[19] Khwaja, A. I. and A. Mian (2008) "Tracing the Impact of Bank Liquidity Shocks: Evidence from an Emerging Market" *American Economic Review* 98 (4): 1413–1442.

[20] Peek, J. and E. S. Rosengren (1997) "The International Transmission of Financial Shocks: The Case of Japan," *American Economic Review* 87: 495-505.

[21] Peek, J. and E. S. Rosengren (2000) "Collateral Damage: Effects of the Japanese Bank Crisis on Real Activity in the United States," *American Economic Review* 90(1): 30-45

[22] Popov, A. and G. F. Udell (2010) “Cross-border banking and the international transmission of financial distress during the crisis of 2007-2008” *ECB Working Paper* No. 1203.

[23] Reinhart, C.M. and K.S. Rogoff (2009) "This Time is Different: Eight Centuries of Financial Folly" Princeton University Press

[24] Schnabl, P. (2012) “The International Transmission of Bank Liquidity Shocks: Evidence from an Emerging Market” *Journal of Finance,* 67, 897-932.

A Appendix

A.1 Derivation of the aggregate effect

The relationship level equation is the following

$$\Delta credit_{i,j,t} = \beta_1 domestic_j + \beta_2 domestic_j * crisis_t + \alpha_{i,t} + \varepsilon_{i,j,t}$$

where $\Delta credit_{i,j,t}$ is the growth rate of credit to firm i by bank j at time t. Then, we take the average of both sides of this equation weighted by the share of credit held by each bank as follows:

$$\sum_{j=1}^{n_i} \Delta credit_{i,j,t} * \frac{credit_{j,t}}{\sum_{j=1}^{n_i} \Delta credit_{i,j,t}} = \beta \sum_{j=1}^{n_i} domestic_j * \frac{credit_{j,t}}{\sum_{j=1}^{n_i} \Delta credit_{i,j,t}} +$$

$$\beta \sum_{j=1}^{n_i} domestic_j * crisis_t * \frac{credit_{j,t}}{\sum_{j=1}^{n_i} \Delta credit_{i,j,t}} + \sum_{j=1}^{n_i} \frac{credit_{j,t}}{\sum_{j=1}^{n_i} \Delta credit_{i,j,t}} \alpha_{i,t} + \sum_{j=1}^{n_i} \frac{credit_{j,t}}{\sum_{j=1}^{n_i} \Delta credit_{i,j,t}} \varepsilon_{i,j,t}$$

where $\sum_{j=1}^{n_i} \frac{credit_{j,t}}{\sum_{j=1}^{n_i} \Delta credit_{i,j,t}} = 1$. Simple algebra shows that the left hand side is the growth rate of total credit obtained by firm i at time t. Then this yields:

$$\Delta credit_{i,t} = \beta_1 \overline{domestic_i} + \beta_2 \overline{domestic_i} * crisis_t + \widehat{\alpha}_{i,t} + \nu_{i,t}$$

which is the equation for the growth of credit at the firm level we are interested to estimate. To obtain the $\widehat{\alpha}_{i,t}$ we estimate them from the relationship-level equation. These estimates are unbiased and consistent as the number of banks increases (provided that the number of firms does not go to infinity). As the $\widehat{\alpha}_{i,t}$ are estimated in the relationship level equation, standard errors need to be estimated by bootstrapping to obtain correct estimates of the variance-covariance matrix. This equation is exactly valid for the growth rate of credit. We approximate it by the log change in credit, in the estimation.

To estimate the full aggregate effect, we also take into account that part of the growth of credit is due to the starting of new credit relationships. Our approach is valid as long as the firm-specific effect is the same for old as for new relationships, possibly up to a noise term uncorrelated with both the other regressors and the firm effect. This is reasonably true for firm-specific characteristics such as firm riskiness. It must also be true for firm demand for credit, which must not be bank specific. This, however, is an identifying assumption that must hold throughout our analysis, also when we study credit supply at the bank-firm relationship level.

B Tables and figures

Figure 1: Spread between 10-year Italian Btp and German Bund (percentage points)

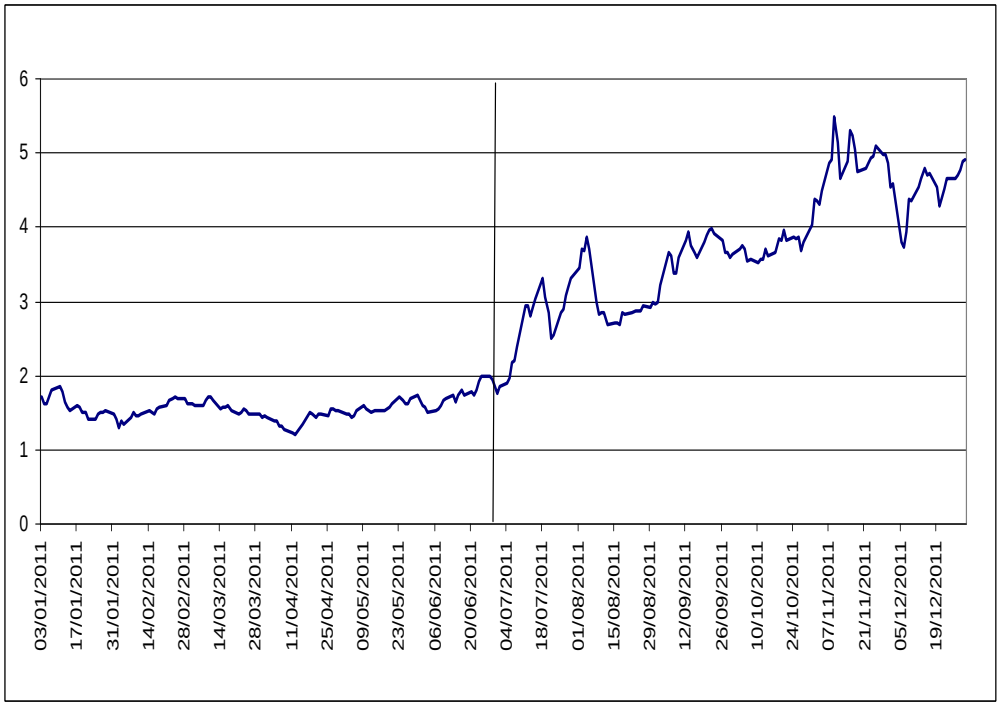

Figure 2: General government primary net borrowing / lending (percent of GDP)

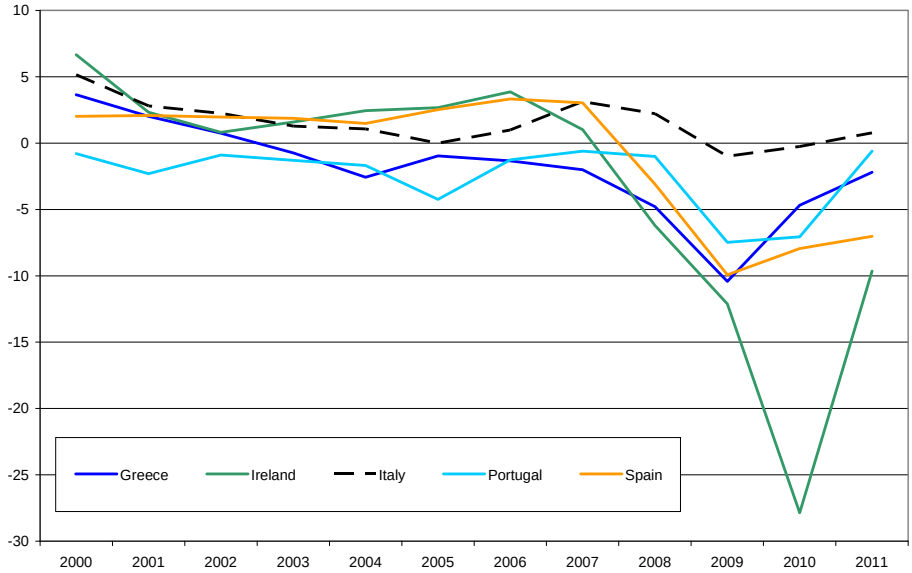

Figure 3: CDS spreads on 5-years senior debt of major banks (basis points)

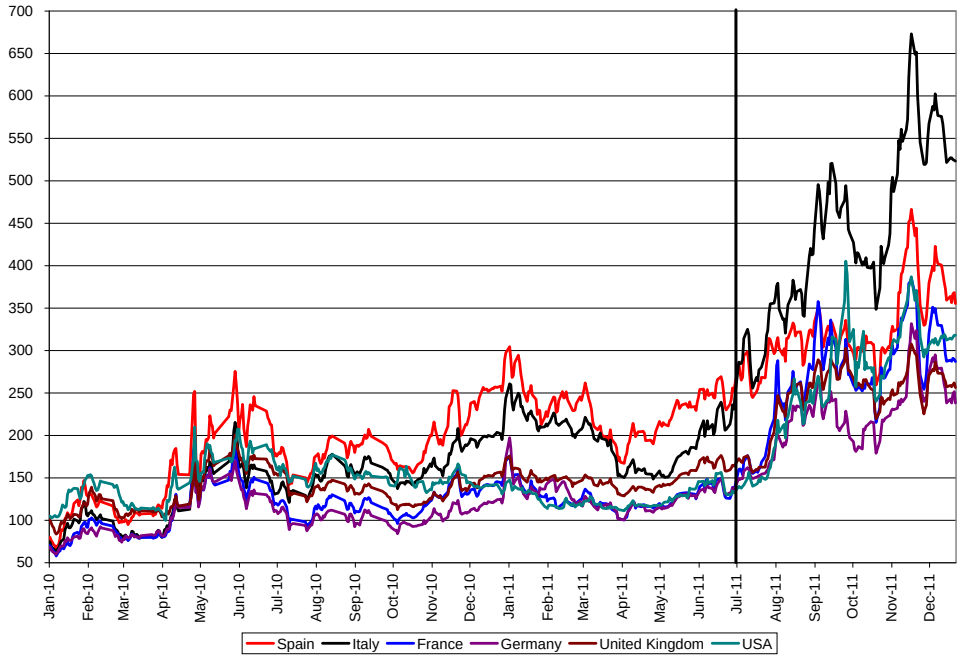

Figure 4: Change of credit granted by Italian and foreign banks (weighted average of log-changes of granted credit in each month relative to June 2011 - log points)

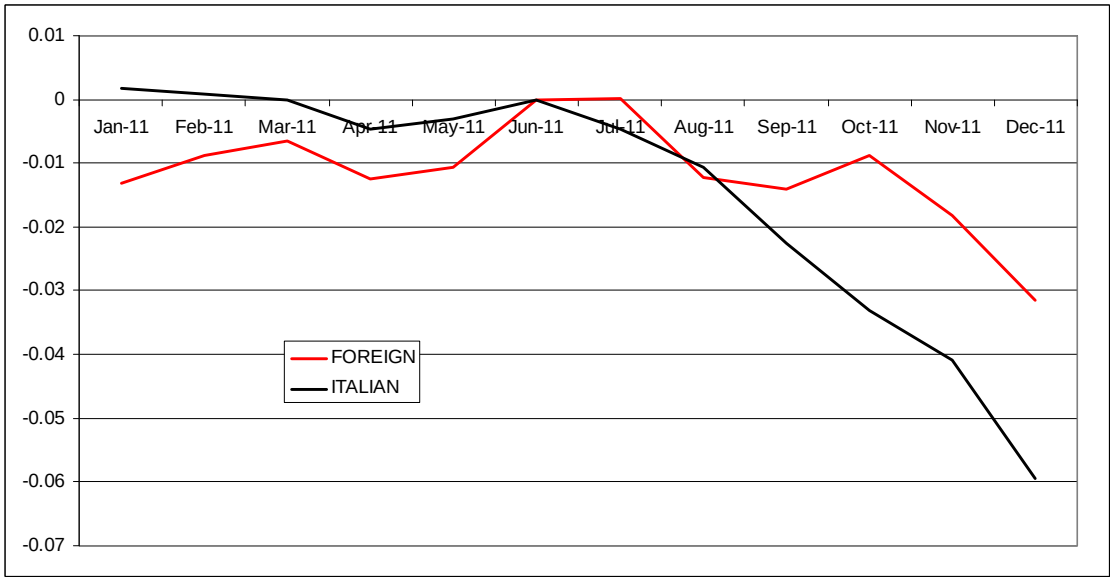

Figure 5: Change in the Annualized Percentage Rate on revolving credit lines (weighted average of changes of APR on revolving credit lines in each month relative to June 2011 - percentage points)

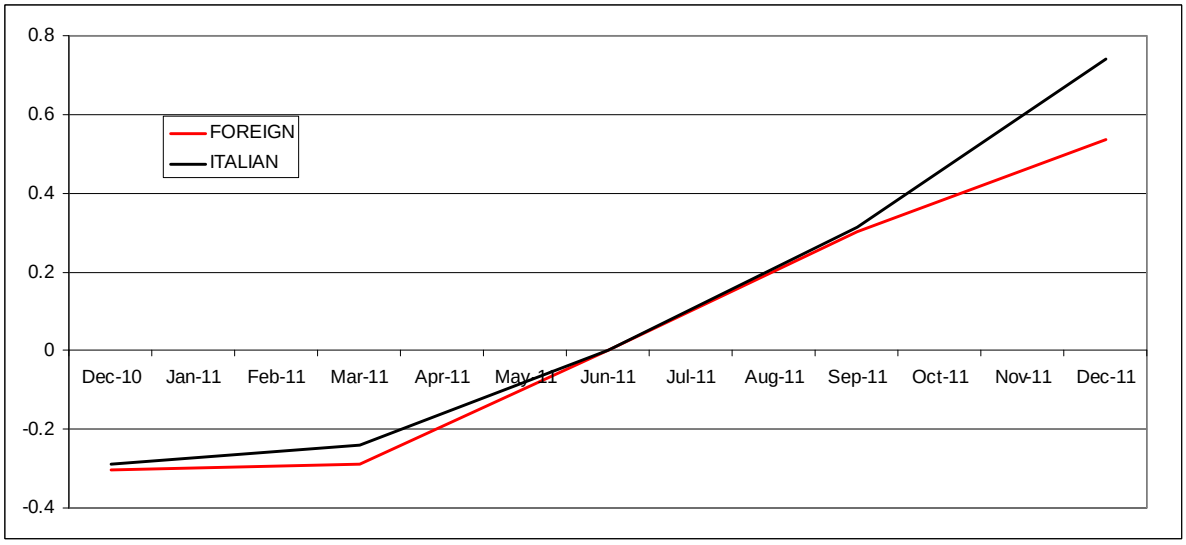

Figure 6: Change in credit granted, net of firms-period effects (growth rates of de-meaned credit granted in each month relative to June 2011 - percentage points)

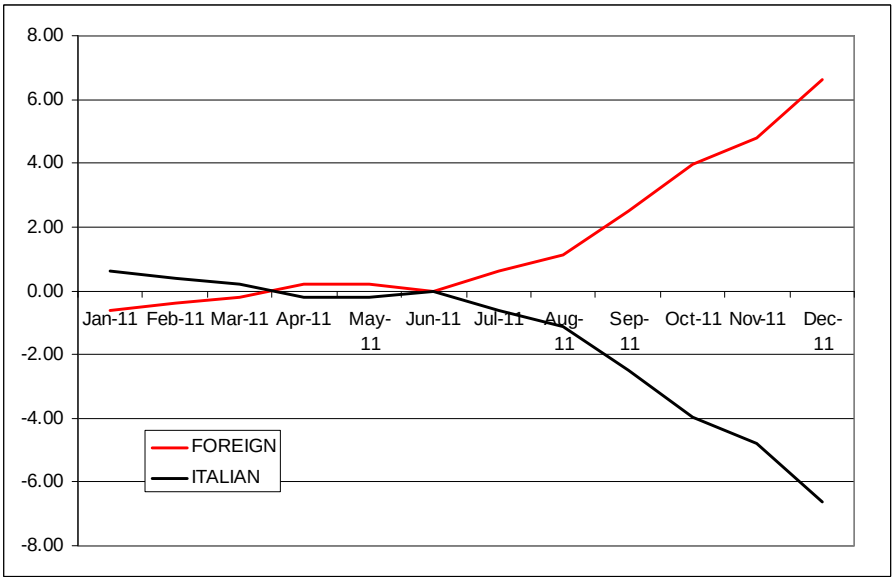

Figure 7: Change in Annualized Percentage Rate on revolving credit lines, net of firm-period effects (rate of change of de-meaned APR on revolving credit lines in each month relative to June 2011 - percentage points)

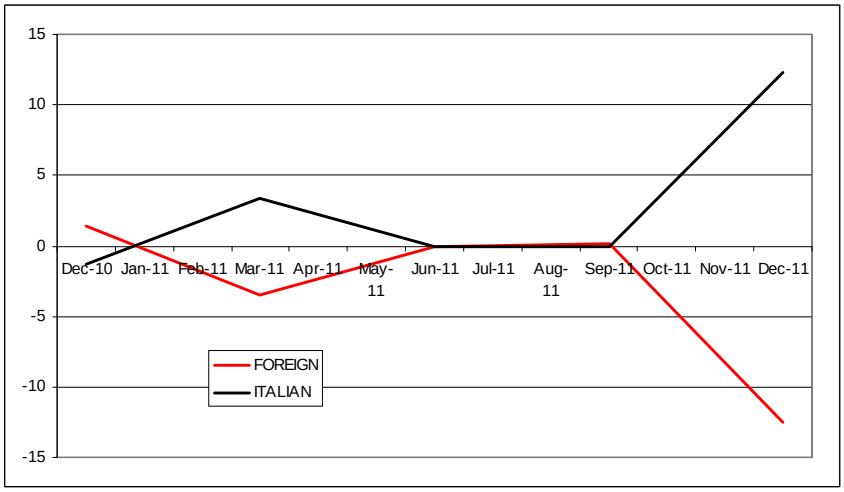

Table 8: Baseline - Credit quantity

DEP VARIABLE	$\Delta LOG(CREDIT) - granted$		$\Delta LOG(CREDIT) - drawn$	
	(1)	(2)	(3)	(4)
DOMESTIC BANK	0.00970		-0.0607***	
	(0.00836)		(0.0140)	
DOMESTIC BANK*CRISIS	-0.0298**	-0.0284**	-0.0525**	-0.0553**
	(0.0116)	(0.0116)	(0.0234)	(0.0233)
SHARE OF TOTAL CREDIT	-0.00119***	-0.00143***	-0.000521*	0.000183
	(0.000162)	(0.000149)	(0.000306)	(0.000248)
DRAWN OVER GRANTED	0.00833	0.0191***	-1.315***	-1.385***
	(0.00733)	(0.00726)	(0.0415)	(0.0379)
OVERDRAFT OVER TOTAL CREDIT	0.131***	0.119***	-0.0308	0.00546
	(0.00925)	(0.0107)	(0.0200)	(0.0227)
FIRM*TIME FIXED EFFECTS	yes	yes	yes	yes
BANK FIXED EFFECTS	no	yes	no	yes
Observations	664,198	664,198	569,608	569,608
R-squared	0.289	0.294	0.342	0.347
Number of Firm-Period Observations	164,470	164,470	146,886	146,886

standard errors clustered at bank and firm level in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 9: Baseline: Interest Rates

VARIABLES	$\Delta APR - REVOLVING$		$\Delta APR - TERM$	
	(1)	(2)	(3)	(4)
DOMESTIC BANK	0.0424		0.0142	
	(0.0614)		(0.0159)	
DOMESTIC BANK*CRISIS	0.208*	0.210*	0.154**	0.154**
	(0.114)	(0.113)	(0.0629)	(0.0626)
SHARE OF TOTAL CREDIT	0.000337	0.000292	9.11e-05	-0.000145
	(0.000409)	(0.000292)	(0.000161)	(0.000181)
DRAWN OVER GRANTED	0.0891***	0.106***	-0.0935***	-0.0620***
	(0.0237)	(0.0201)	(0.0234)	(0.0200)
OVERDRAFT OVER TOTAL CREDIT	0.139***	0.177***	0.0477**	0.0479**
	(0.0288)	(0.0218)	(0.0227)	(0.0205)
FIRM*TIME FIXED EFFECTS	yes	yes	yes	yes
BANK FIXED EFFECTS	no	yes	no	yes
Observations	203,042	203,042	134,323	134,323
R^2	0.319	0.320	0.373	0.370
Number of Firm-Period Observations	51,175	51,175	39,612	39,612

standard errors clustered at bank and firm level in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 10: Placebo Experiment

DEP VARIABLE	$\Delta LOG(CREDIT)$					
	Event June 2010				Event Dec. 2010	
	Only 2010		2010 and H1-2011		2010 and H1-2011	
	(1)	(2)	(3)	(4)	(5)	(6)
DOMESTIC BANK	0.00777		0.00777		0.0107	
	(0.0118)		(0.0119)		(0.0128)	
DOMESTIC BANK*CRISIS	0.00578	0.00651	0.0000939	0.00150	-0.00839	-0.00676
	(0.00452)	(0.00487)	(0.00416)	(0.00435)	(0.00803)	(0.00781)
FIRM*TIME FIXED EFFECTS	yes	yes	yes	yes	yes	yes
BANK FIXED EFFECTS	no	yes	no	yes	no	yes
Observations	688,562	688,562	1,045,143	1,045,143	1,045,143	1,045,143
R^2	0.258	0.263	0.270	0.273	0.270	0.273

standard errors clustered at bank and firm level in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 11: Gross Interest Rates

DEP VARIABLE	$\Delta APR-REVOLVING$	ΔAPR_TERM
	(1)	(2)
DOMESTIC BANK*CRISIS	1.228***	0.153**
	(0.382)	(0.0638)
SHARE OF TOTAL CREDIT	0.00642***	-0.000187
	(0.00146)	(0.000179)
DRAWN OVER GRANTED	0.882***	-0.0638***
	(0.191)	(0.0201)
OVERDRAFT OVER TOTAL CREDIT	1.142***	0.0528**
	(0.164)	(0.0205)
FIRM*TIME FIXED EFFECTS	yes	yes
BANK FIXED EFFECTS	yes	yes
Observations	203,042	134,323
R-squared	0.337	0.372

standard errors clustered at bank and firm level in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 12: Branches and Subsidiaries of Foreign Banks

	SUBSIDIARIES			BRANCHES		
VARIABLES	ΔLOG(CREDIT)	ΔAPR-REVOLV	ΔAPR-TERM	ΔLOG(CREDIT)	ΔAPR-REVOLV	ΔAPR-TERM
	(1)	(2)	(3)	(4)	(5)	(6)
DOMESTIC BANK*CRISIS	-0.0319**	0.208*	0.156**	0.00456	0.374***	0.0841
	(0.0126)	(0.114)	(0.0632)	(0.0222)	(0.136)	(0.0654)
SHARE OF TOTAL CREDIT	-0.00149***	0.000298	-0.000156	-0.00158***	-0.000116	-0.00136***
	(0.000154)	(0.000289)	(0.000183)	(0.000176)	(0.000455)	(0.000247)
DRAWN/GRANTED	0.0207***	0.107***	-0.0617***	0.0140**	0.125***	-0.0846***
	(0.00732)	(0.0199)	(0.0203)	(0.00714)	(0.0171)	(0.0288)
OVERDRAFT/TOTAL CREDIT	0.122***	0.177***	0.0482**	0.131***	0.140***	0.0486
	(0.0109)	(0.0219)	(0.0207)	(0.0128)	(0.0220)	(0.0324)
firm period fe	yes	yes	yes	yes	yes	yes
bank fe	yes	yes	yes	yes	yes	yes
Observations	639,569	202,494	133,513	445,464	132,601	58,819
R^2	0.303	0.320	0.372	0.367	0.336	0.402

standard errors clustered at bank and firm level in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 13: Delta Spread

VARIABLES	$\Delta LOG(CREDIT)$	$\Delta APR - REVOLVING$	ΔAPR_TERM
	(1)	(2)	(3)
DELTA SPREAD	-0.0126**	0.161**	0.107***
	(0.00609)	(0.0795)	(0.0330)
SHARE OF TOTAL CREDIT	-0.00107***	0.00128*	0.000429
	(0.000173)	(0.000741)	(0.000290)
DRAWN OVER GRANTED	0.0136	0.0975***	-0.160***
	(0.0111)	(0.0280)	(0.0351)
OVERDRAFT OVER TOTAL CREDIT	0.149***	0.126***	0.0695
	(0.0146)	(0.0347)	(0.0438)
FIRM FIXED EFFECTS	yes	yes	yes
Observations	331,635	102,251	67,491
R^2	0.280	0.291	0.371

standard errors clustered at bank and firm level in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 14: Extensive Margin

DEP VARIABLE	Prob(cut=1)	Prob(cut=1)	Prob(accept=1)	Prob(accept=1)	APR_TERM	APR_TERM
	(1)	(2)	(3)	(4)	(5)	(6)
DOMESTIC BANK	-0.0190					
	(0.0120)					
DOMESTIC BANK*CRISIS	-0.0156**	-0.0167**	-0.109***	-0.0694***	0.361*	0.307**
	(0.00736)	(0.00754)	(0.0364)	(0.0216)	(0.203)	(0.119)
CRISIS			-0.154***		1.331***	
			(0.0221)		(0.183)	
SHARE OF TOTAL CREDIT	-0.00253***	-0.00207***				
	(0.000149)	(0.0000962)				
DRAWN OVER GRANTED	-0.0125*	-0.0375***				
	(0.00719)	(0.00645)				
OVERDRAFT OVER TOTAL CREDIT	-0.0813***	-0.0531***				
	(0.00617)	(0.00377)				
SIZE OF THE LOAN					-0.594***	-0.0620
					(0.0984)	(0.0714)
FIRM*TIME FIXED EFFECTS	yes	yes	no	yes	no	yes
BANK FIXED EFFECTS	no	yes	yes	yes	yes	yes
Observations	762,478	762,478	926,736	142,940	191608	60147
R-squared	0.407	0.429	0.088	0.110	0.342	0.651
Number of Firm-Period Observations	188,077	188,077		52,521		

standard errors clustered at bank level in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 15: Bank balance sheet structure

VARIABLES	$\Delta LOG(CREDIT)$	$\Delta APR - REVOLVING$	$\Delta APR - TERM$
	(1)	(2)	(3)
TIER 1 RATIO	-0.00661**	-0.0191	0.0443**
	(0.00296)	(0.0883)	(0.0189)
INTERBANK/ASSETS	0.000440	0.0632*	-0.00667
	(0.00223)	(0.0328)	(0.0189)
EXPOSURE TO GIIPS	-0.00477	0.0611	-0.0316*
	(0.00348)	(0.0458)	(0.0182)
TIER 1 RATIO * CRISIS	0.000177	0.0373*	-0.00818
	(0.00129)	(0.0196)	(0.00666)
EXPOSURE TO GIIPS * CRISIS	0.00100	-0.0222	0.00891
	(0.00143)	(0.0156)	(0.00730)
INTERBANK/ASSETS*CRISIS	-0.000221	0.0210	0.00834
	(0.000743)	(0.0134)	(0.00525)
DOMESTIC BANK * CRISIS	-0.0335**	0.432*	0.0787
	(0.0159)	(0.246)	(0.0890)
LOG ASSETS	-0.0551	-4.503	0.369
	(0.151)	(2.819)	(0.723)
SHARE OF TOTAL CREDIT	-0.00145***	0.000409	-0.000720***
	(0.000152)	(0.000270)	(0.000172)
DRAWN OVER GRANTED	0.0196***	0.0948***	-0.0592***
	(0.00733)	(0.0183)	(0.0199)
OVERDRAFT OVER TOTAL CREDIT	0.119***	0.182***	0.0400
	(0.0108)	(0.0219)	(0.0251)
FIRM*TIME FIXED EFFECTS	yes	yes	yes
BANK FIXED EFFECTS	yes	yes	yes
Observations	654,578	210,440	101,150
R^2	0.384	0.414	0.479
Number of Firm-Period Observations	162,128	53,914	32,426

standard errors clustered at bank and firm level in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 16: Aggregate Effect

VARIABLES	$\Delta LOG(CREDIT)$	$\Delta LOG(CREDIT)$
	(1)	(2)
DOMESTIC	-0.0109	0.00328
	(0.0178)	(0.0107)
DOMESTIC*CRISIS	-0.0436***	-0.0331***
	(0.0131)	(0.0103)
CRISIS	0.0104	0.00489
	(0.00931)	(0.00783)
SHARE OF TOTAL CREDIT	-0.00109***	-0.00110***
	(0.000118)	(6.75e-05)
DRAWN OVER GRANTED	-0.0176***	0.0149***
	(0.00419)	(0.00307)
OVERDRAFT OVER TOTAL CREDIT	0.0710***	0.105***
	(0.00590)	(0.00248)
FIRM EFFECT		0.689***
		(0.0265)
Observations	164,470	164,470
R^2	0.017	0.609

Block-bootstrapped (cluster at bank level) standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1