Sovereign debt exposure and the bank lending channel: impact on credit supply and the real economy

Online Appendix

Margherita Bottero, Simone Lenzu, and Filippo Mezzanotti

OA.1 Banks' sovereign holdings and the burst of the European sovereign crisis

OA.1.1 Institutional background on the burst of the European Sovereign crisis

In this Appendix, we complement the discussion in Section 2.1 by providing a more detailed discussion of the events that led to the onset of the Sovereign crisis as well as the main implications of this event for European banks.

Until late 2009, neither financial markets nor the media appeared to be particularly concerned with the sustainability of sovereign debt in peripheral European countries. Since the introduction of the euro, the yields of 10-year bonds issued by European countries had always been low and stable.[65] However, after the parliamentary elections held in Greece in October 2009, the newly elected government acknowledged budget misreporting in previous years. As a consequence, Greece had to recognize a larger-than-expected fiscal deficit, generating concerns about the health of the Greek economy and the solvency of its sovereign debt.[66] The situation became even more dramatic in the spring of 2010. On April 23, the Greek government requested an EU/IMF bailout package to cover its financial needs for the remainder of the year. A few days later, on April 27, Standard & Poor's downgraded Greece's sovereign debt rating to BB+ ("junk

[65] The convergence began right after the institution of the European monetary union and was interrupted only by a short-lived increase in the interest rates of peripheral countries in the second half of 2008 driven by bank bailouts in Ireland and Greece (Acharya et al. 2011).

[66] After a series of upward deficit revisions, the Greek government estimated the deficit at 12.7 percent of GDP for 2009, up from 7.7 percent in 2008. See Lane (2012) for a detailed description of the European sovereign crisis.

bond").[67] In response to these events, yields on Greek government bonds rose sharply, barring the country's access to capital markets.

As we discussed in the body of the paper, the Greek crisis is regarded as a sovereign-risk *wake-up call* (Goldstein 1998, Giordano et al. 2013), which increased investors' sensitivity to country-specific macroeconomic fundamentals and prompted a general reassessment of country-specific default risk across the euro area (Acharya and Steffen 2015; Augustin et al. 2014; Abbassi et al. 2014). In particular, shortly after the events in Greece, investors began to be concerned with the solvency and liquidity of the public debt issued by other European countries, starting with Ireland and Portugal, then spreading soon thereafter to Spain and Italy (Angelini et al. 2014). In the case of Italy, the spread between the Italian BTP and the German Bund (henceforth BTP–Bund spread) increased from 85 bps at the end of the first quarter of 2010 to almost 160 bps in the third quarter of the same year (Figure OA.1), and it continued to rise after this date. To put the economic magnitude of this change in perspective, this jump corresponds to an increase of almost two standard deviations in spread since 2005.

This "wake up" call hypothesis is also consistent with evidence coming from the analysis of the correlation between the sovereign bond spreads of EU countries around these events. Table OA.1 reports the spread between Greek and Italian sovereign bonds (over German) across different periods. The key finding is that after the 2010 Greek bailout, the correlation between Italian and Greek spreads rose dramatically, consistent with the idea that the tensions in Greece spilled over to other European countries, driving upward the yields on their sovereign securities.[68]

The sudden change in the risk profile of government securities had a direct negative effect on the balance sheets of banks holding these assets. The CDS on 5-years bonds issued by large Italian banks spiked soon after the Greek bailout (Figure 2b). In particular, looking at the quarters before and after the Greek bailout, the average CDS of the top-five Italian banks rose by 78 percent, over 2.3 times its historical standard deviation.[69] Survey measures confirm the significant impact of the sovereign crisis on banks activity. In September 2010, participants at the European Bank and Insurance CEO Conference stated that the fear that originated from sovereign markets was the biggest threat to bank share prices (Figure OA.2a).[70] The same survey shows that investors ranked banks in countries most affected by the sovereign shock – Italy,

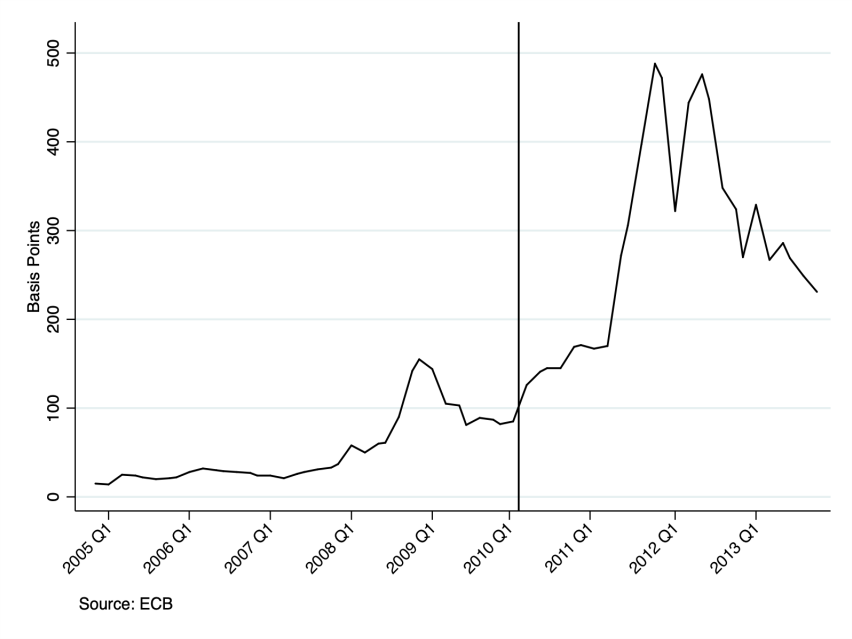
[67] There was also another downgrade of Greece by Fitch in December 2009, bringing Greece below A- for the first time in the decade.

[68] Until the beginning of 2009, the two spreads were very small, and they strongly co-moved together. This pattern changes when, in the fall of 2009, the news regarding the fiscal misconducts of Greece starts to become public. While the Greek spread started to increase, the Italian one remained stable. As a consequence, the correlation during this window is much lower and not significantly different from zero. However, in the second quarter of 2010, when the shock to sovereign risk was transmitted to other European countries, including Italy, the correlation increased again, remaining at this high level thereafter.

[69] Using a wider set of banks, this result is also confirmed by Albertazzi et al. (2014).

[70] "Competing in the age of austerity," Bank of America Merrill Lynch Banking & Insurance CEO Conference, London, 29 September 2010. Source: http://ftalphaville.ft.com/2010/10/04/359726/european-bank-watch-past-present-and-future/

Figure OA.1: 10y Italian Spread, longer window



This Figure shows the dynamics of the spread between the yield of 10-year Italian zero-coupon bonds and that of 10-year zero-coupon bonds issued by Germany. Data from ECB. The time considered is 2005-2013.

Greece and Portugal – among the financial institutions with the worst expected performance (Figure OA.3b). Lastly, Italian banks also paid a higher cost in the interbank market lending after the Greek bailout (Abbassi et al. 2014).

Table OA.1: **Correlation between the Italian and Greek spread**

Period	2006-2009Q1	2009Q2-2010Q1	2010Q2-2011Q1	2011Q2-2012
$\hat{\rho}$	0.984***	0.264	0.778***	0.641***
(p-value)	0.000	0.361	0.002	0.002

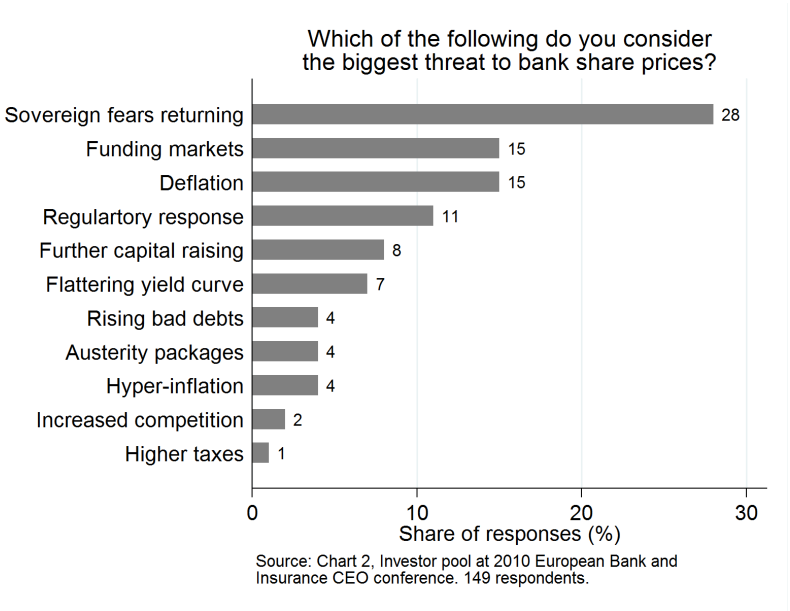
This table reports the the correlation between the Italian and Greek spread over German bonds, calculated for four different temporal windows. We use monthly yields on zero coupon bonds with 10 yeas maturity. Data is publicly available on the ECB web page. *** denotes significance at the 1% level, ** at the 5%, and * at the 10%.

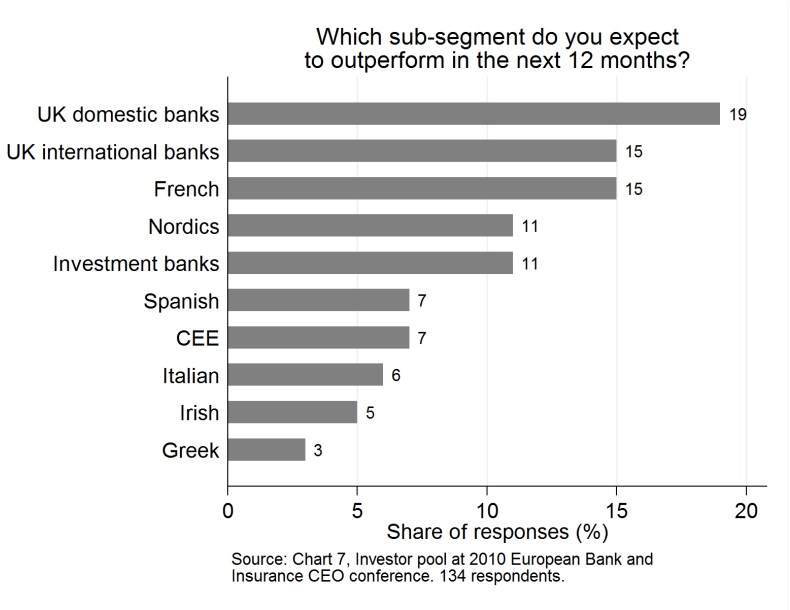
OA.1.2 Sovereign Holdings and Banks: A Cross-Country Comparison

Focusing on Italy, we are able to exploit the Italian Credit Register data and therefore we can provide a very detailed and precise account of the effects of sovereign holdings during a period of macroeconomic distress. However, this choice may generate concerns regarding the external validity of our results. First, it is important to highlight that regulation is relatively

Figure OA.2: **Investors pool: European Bank and Insurance CEO conference**

(a) **Threat to bank's share prices**

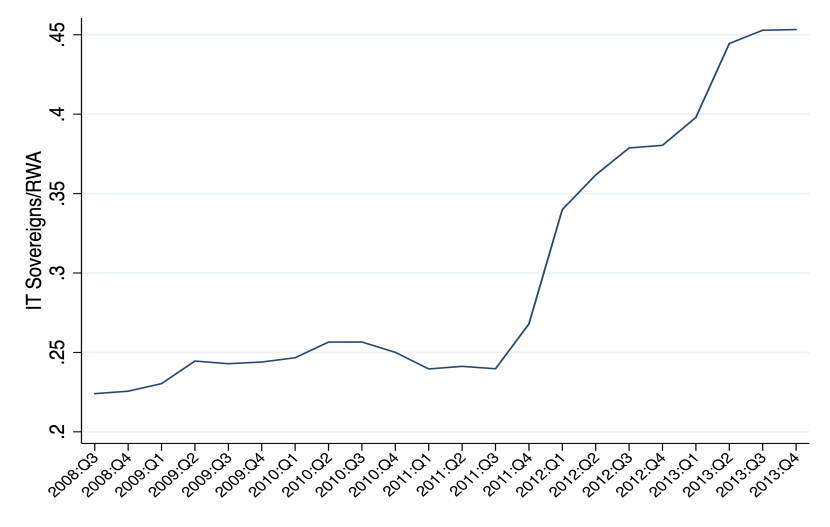




(b) **Expected performance of financial institutions**

These two Figures report the results of a survey of investors conducted during the European Bank and Insurance CEO conference organized in September 2010 in London by Bank of America Merrill Lynch. Source: investor poll conducted during the European Bank and Insurance CEO. Charts available at http://ftalphaville.ft.com/2010/10/04/359726/european-bank-watch-past-present-and-future/.

Figure OA.3: **Time-series Evolution of Aggregate Sovereign Exposure of the Italian Banking System**



This figure shows the time-series evolution of the aggregate Italian sovereign holdings held by Italian banks scaled by the aggregate risk-weighted assets of the Italian banking system.

homogeneous across other developed countries, in particular within Europe. However, to address further concerns, in this section we show that both the characteristics of the banking sector and its exposure to sovereign risk are not substantially different to other Western countries.

We collect data on annual balance sheet and income statement information of banks operating in a large number of countries from Bankscope.[71] We focus on the sub-sample of banks that are active in Europe and the United States, and compared them to Italian banks along a number of dimensions. The summary statistics per country are available in Table OA.2. All data refer to fiscal year 2009, the last one available before the Greek bailout.

A cross-country comparison of capital structure across the financial institutions in our sample (Panel (b)) displays that Italian banks are comparable to other intermediaries in terms of capitalization and maturity of liabilities, especially intermediaries from other European countries. This is not surprising given the emphasis placed on capital requirements by the Basel regulation and the similarities in regulations across Western countries. With the exception of German and British banks, equity is typically around 12-14 percent of total liabilities. The average bank in Italy, France, Ireland and the Netherlands appears to have ample reliance on long-term funding, consistent with the business model prevailing in Europe. In particular, Italian banks have one of the largest share of assets funded by long-term debt, which should make the banking sector overall more resilient to a crisis episode. Furthermore, loans represent a slightly larger share of assets for Italian banks relative to other European countries, but this number is still similar to

[71] Bankscope is a database managed by Bureau van Dijk Electronic Publishing (BvD). This data has been used in other works and its quality has been also recently scrutinized by Gennaioli et al. (2014a).

US banks. At the same time, we do not observe significant differences between Italian banks and the rest of the sample in terms of net income and impaired loans.

Most importantly, Italian banks are not unique in terms of their exposure to sovereign securities. According to Bankscope (Table OA.2, panel a), Italian banks hold around 14 percent of assets in government issued bonds. Sovereign securities represent about 70 percent of Italian banks' security portfolio. Table OA.2 shows that banks tend to be highly exposed to sovereign securities in a large number of countries. In fact, excluding Italy, the average portion of total assets invested in sovereign securities is about 8 percent for the banks in our sample, with banks in US, the Netherlands, Ireland and Greece having around 10 percent of their assets held in government debt.[72]

Bankscope does not provide the share of the total sovereign assets that are issued by the bank's own government. This information is instead provided by Merler and Pisani-Ferry (2012), who collected data on the share of total public debt that is held by domestic banks for a sample of Western countries. In Figure OA.4, we report the share of national debt held by resident financial institutions at the end of calendar years 2008 to 2011. According to these estimates, Italian banks hold 12 percent of outstanding national debt at the end of 2008, and gradually increased their holdings in the following three years, reaching 16.5 percent at the end of 2011. These percentages are not very different from other countries in the euro area - such as France, Ireland and Greece (before 2011). Italian banks hold more debt issued by their own government than intermediaries in the UK, the US and the Netherlands. On the contrary, banks from Belgium, Spain, Portugal and Germany were more exposed to national sovereign debt than Italian intermediaries. Indeed, if we rank these countries according to the percentage of national debt held by domestic banks, the Italian banking system positions itself in the middle of the distribution.

This descriptive evidence suggests that the Italian banking system shows no anomalies when compared to that of other developed countries, both in terms of profitability and capital structure. On average, Italian banks have a higher fraction of assets represented by sovereign bonds, but this investment strategy is common to other Western countries as well.

OA.2 Additional Analyses

OA.2.1 Semi-parametric estimation of the bank lending channel

This Section provides more details on the semi-parametric tests presented in Figures 3 of Section 3. Furthermore, we provide a robustness test to that result, using a slightly modified method in

[72]For the USA, the variable total government assets is comparable to the variable Treasure and Agency Securities from the Flow of Funds data.

Table OA.2: **International Comparison of Banking Systems**

Panel a: Asset Structure

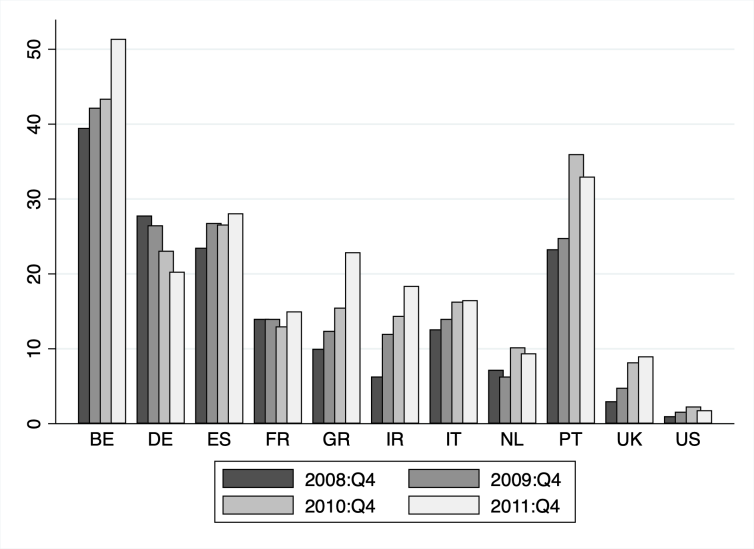
	BE	DE	ES	FR	GR	IE	IT	NL	PT	UK	US
Tot. Sovereign Securities / Tot. Assets	0.18	0.02	0.05	0.06	0.09	0.1	0.14	0.09	0.04	0.07	0.1
	(0.23)	(0.04)	(0.05)	(0.11)	(0.09	(0.21)	(0.11)	(0.08)	(0.06)	(0.09)	(0.11)
Tot. Sovereign Securities / Tot. Securities	0.51	0.07	0.25	0.22	0.49	0.32	0.70	0.43	0.20	0.32	0.58
	(0.32)	(0.12)	(0.23)	(0.28)	(0.28)	(0.27)	(0.28)	(0.24)	(0.20)	(0.32)	(0.33)
Tot. Loans / Tot. Assets	0.42	0.54	0.63	0.58	0.67	0.42	0.66	0.57	0.55	0.45	0.63
	(0.28)	(0.16)	(0.23)	(0.27)	(0.13	(0.31)	(0.19)	(0.25)	(0.27)	(0.28)	(0.17)
Return on Avg. Asset	0.71	0.26	0.36	0.95	-0.13	-1.11	0.38	1.29	0.34	0.08	-0.09
	(2.65)	(0.39)	(0.97)	(3.54)	(1.15	(4.07)	(0.79)	(4.09)	(1.56)	(7.38)	(1.94)
Return on Avg. Equity	6.18	3.86	2.89	5.34	-5.52	-20.01	3.59	4.44	4.78	1.1	-2.33
	(13.53)	(4.8)	(16.9)	(15.48)	(20.68	(61.86)	(6.78)	(14.5)	(10.96)	(32.9)	(24.35)
Net Income / Tot. Assets	0.01	0	0	0.01	0	-0.01	0	0.01	0	-0.14	0
	(0.03)	(0.01)	(0.02)	(0.05)	(0.01	(0.05)	(0.01)	(0.04)	(0.01)	(2.58)	(0.03)
Impaired Loans / Tot. Assets	0.01	0.04	0.03	(0.03	0.07	0.05	0.05	0.02	0.04	0.03	0.03
	(0.01)	(0.03)	(0.02)	(0.04)	(0.06)	(0.07)	(0.04)	(0.01)	(0.05)	(0.06)	(0.03)

Panel b: Liability Structure

	BE	DE	ES	FR	GR	IE	IT	NL	PT	UK	US
Equity / Tot. Assets	0.18	0.08	0.12	0.14	0.12	0.08	0.12	0.16	0.14	0.22	0.11
	(0.23)	(0.04)	(0.05)	(0.11)	(0.09)	(0.21)	(0.11)	(0.08)	(0.06)	(0.09)	(0.11)
Long-term Debt / Tot. Assets	0.11	0.04	0.2	0.17	0.06	0.21	0.3	.19	0.2	0.11	0.05
	(0.14)	(0.07)	(0.18)	(0.8)	(0.04)	(0.27)	(0.14)	(0.21)	(0.17)	(0.19)	(0.1)
(Deposits + Short Term Debt) / Tot. Assets	0.69	0.86	0.78	0.72	0.8	0.61	0.56	0.76	0.64	0.69	0.82
	(0.27)	(0.12)	(0.17)	(0.26)	(0.16)	(0.28)	(0.14)	(1.12)	(0.23)	(0.29)	(0.15)
Tier 1 Ratio	12.99	10.83	10.28	12.39	15.23	12.25	16.14	15.28	12.59	15.22	14.95
	(3.21)	(3.57)	(5.67)	(5.69)	(10.27)	(6.47)	(8.68)	(11.24)	(6.94)	(9.53)	(10.27)

This table presents a sequence of descriptive statistics describing the financial system of 11 countries: Italy (IT), Germany DE), France (FR), Belgium (BE), Netherlands (NL), United Kingdom (UK), United States (US), Greece (GR), Ireland (IE), Portugal (PT) and Spain (ES). Panel a refers to the asset structure, while Panel b focuses on the capital structure of the financial intermediaries operating in each country. All variables are measured at the end of fiscal year 2009. We presents the average and standard deviation (in parenthesis) of the variables of interest across all banks operating in each country. Government bonds are reported at book value. Source: Bankscope.

Figure OA.4: **Holding of Domestic Sovereigns by Domestic Banks**



This graph reports share of domestic public debt held by domestic financial institutions for a selected sample of countries, across different years. Source: Merler and Pisani-Ferry (2012).

Figure OA.5.

We start by sorting banks into *"High Sovereign"* group (our "treatment group") and a *"Low Sovereign"* group (our "control group") based their (conditional) holding of Italian sovereigns in the last quarter before the shock. To do so, we run a cross-sectional regression of $\text{Sovereigns}_{b,2010Q1}$ on a battery of bank-level characteristics and balance sheet variables:

$$\text{Sovereigns}_{b,2010Q1} = \phi_0 + \Gamma \cdot X_{b,2010Q1} + \epsilon_{b,2010Q1}$$

where $X_{b,2010Q1}$ are bank-specific controls measured at the end of the first quarter of 2010. Importantly, this is the same set of controls used in the paper for the rest of the analysis. Then, we extract the estimated residuals of this regression and we classify a bank as *"High sovereign"* whenever $\hat{\epsilon}_{b,2010Q1}$ is above the median of the cross-sectional distribution of residuals, and *"Low sovereign"* otherwise. Sorting banks according to their *residual* sovereign holdings helps us to focus only on the cross-sectional variation of their exposure that is not imputable to different bank-specific characteristics. Furthermore, it allows us to replicate a setting that is similar to the main regression in the paper closely. Second, we aggregate all corporate loans ($\ln(\text{Loans}_{bj,t})$) belonging to our sample that have been granted by banks classified in the two groups by quarter. For graphical clarity, in Figure OA.5 we normalize each of the two time series to zero in 2010:Q1.

Before the shock, the (unconditional) credit supply of banks with higher holdings of sovereigns - if anything - was growing faster than that of banks with lower holdings. Immediately after the shock, we observe a sharp reversal of the lending trend for the group with high sovereign

holdings, while banks with lower holdings kept a similar dynamic for the first three quarters of the post-shock period. This evidence excludes that our results could be driven by a failure of parallel trend, where more exposed banks were cutting credit more than less exposed banks also before the actual shock to sovereign markets.

However, in the main result section of the paper - Figure 3 - we provide a more refined version of this analysis. In particular, always consistent with our main analyses, we restrict our attention to the variation in bank credit (on the y-axis in Figure OA.5) which is not explained by banks' balance sheet characteristics. To do so, we run a loan-level regression with outcome $\ln(\text{Loans}_{bj,t})$ on a set of bank-level characteristics and relationship-specific characteristics:

$$\ln(\text{Loans}_{bj,t}) = \psi_0 + \Omega \cdot \bar{X}_{b,t} + \Lambda \cdot \bar{Z}_{bj,t} + \varepsilon_{bj,t}$$

where $\ln(\text{Loans}_{bj,t})$ is the natural logarithm of the value of outstanding loans issued bank b in favor of firm j in quarter t, and $\bar{X}_{b,t}$ and $\bar{Z}_{b,t}$ are four-quarters moving average of our bank-specific and relationship-specific controls. We extract the residuals ($\hat{\varepsilon}_{jb,t}$) of this regression. Sorting banks into "High" and "Low Sovereign" as described above, we aggregate $\hat{\varepsilon}_{jb,t}$ into two time series. As above, we normalize each time series such that they take value zero in 2010:Q1, and plot them over time in Figure 3. As discussed in the paper, in this case we find that the two groups present very similar patterns in lending before the bailout but more exposed banks start experience a larger decline in lending in the quarters after the Greek bailout. More discussion on the interpretation of these results and on other tests is available in the Section (3) of the paper.

OA.2.2 Aggregate implications of the security channel

In the paper, we use our micro estimates to quantify the aggregate impact of the sovereign shock on lending. In particular, we want to assess what percentage of the drop in aggregate credit is implied by our micro-estimates. In this Section, we discuss a simple back-of-the-envelope approach to aggregate the estimates. To be clear, this analysis does not aim to estimate the aggregate impact of the shock, but instead it simply wants to capture the extent to which our micro-level estimates can be aggregated up to a meaningful economic quantity.

Using the estimates of the linear model (2), for every firm j we compute the percentage change in bank credit which can be imputed to its lenders' exposure to sovereigns ($\hat{s}_j = \hat{\alpha}_1 \text{Sovereigns}^{AVE}_{j,2010Q1}$). This percentage change is then converted into an amount expressed in euro by multiplying this number by the overall lending of firm j in the pre-period. Lastly, we can then aggregate the overall drop and compare it to the overall level of lending in the pre-

Figure OA.5: **The bank lending channel**

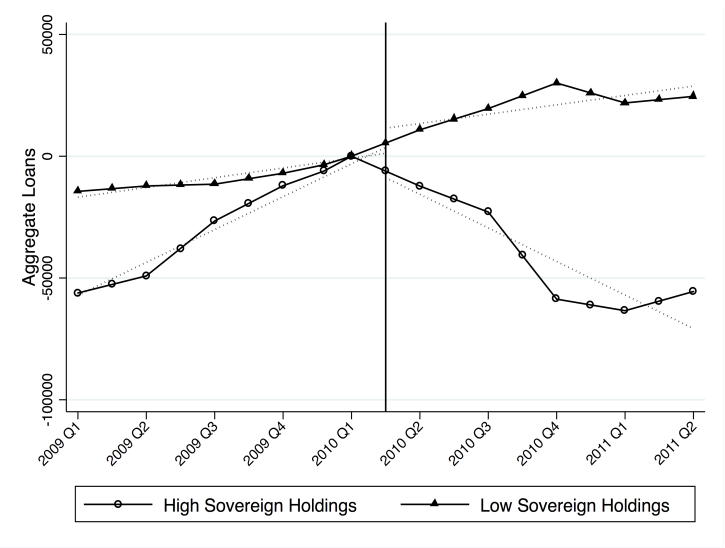


Figure OA.5 illustrates the bank lending channel semi-parametrically by comparing lending to firms from banks with high holdings of Italian sovereign bonds, the most exposed to the sovereign shock, and banks with lower holdings. See Appendix OA.2.1 for a detailed description of the procedure use to conduct the this figure.

period.[73] This simple analysis provides us with a proxy of the overall decline in lending explained by the shock to sovereign markets. For credit, our estimates suggest that the transmission of the sovereign crisis through the balance sheet accounts for about 2% of the decline in aggregate lending to non-financial corporations, as discussed in the paper.

One concern with the aggregation is that it may over-state the impact of the policy as the effect of the shock was larger for smaller companies. This is particularly a concern for real effects analysis (investment and employment). As discussed in the paper, in these analyses we find essentially that the whole effect is driven by smaller companies. In general, the fact that we find that investment only contracts for small businesses may imply that the aggregate impact of the security channel might be small, as smaller companies by definition contribute less to aggregate economic activity. However, this effect would be counterbalanced by a composition effect: small businesses are numerically the large majority of our sample. As a result, this "extensive" margin effect may partially compensate the smaller "intensive" margin effect. In order to explore the combined effect of two margins, we replicated the same aggregation exercise that we already performed for credit on investment. To deal with the composition effect, we now allow for heterogeneity in the effects by assigning different parameters to large and small firms. In particular, we assume that the shock had no impact for large firms and it had an impact equal to the estimated parameter in the interaction for the smaller firms. This approach allows us to jointly consider both margins discussed above: (a) smaller firms do less investment on

[73] Overall, this is $\frac{\sum_j \hat{s_j} \cdot Tot\ Loans_{j,PRE}}{\sum_j Tot\ Loans_{j,PRE}}$.

average and therefore will count less in aggregate; (b) smaller firms are numerically more than large firms. Apart from this difference, the aggregation follows the same approach as previously described for credit.

Using this approach, we estimate that the aggregate contraction in investment that is attributable to the security channel is about 2.3%. At the same time, we find a similar result (-2.02%) for employment wage. To be consistent, we can also replicate the estimate for credit using this approach, and we find that the impact is around -2.42%, which is very similar to the average effect discussed above. Overall, this discussion confirms that the aggregation of our micro effect is indeed economically meaningful. However, it is important to be clear that this analysis does not aim to provide a full characterization of the aggregate impact of the sovereign shock on either the credit market or the real economy as a whole.

OA.2.3 Bank Lending Channel: Additional Robustness

Here we present a few robustness tests that we discussed in the first part of the paper (Section 3). The objective is to bolster the claim that the sovereign shock had a causal impact on credit.

In Table OA.3, we examine how our results change if we use the full sample of firms with both firms with multiple and single relationships. Column 3 is already presented in the main result (Table 3). Here we present the different iterations with the various set of controls and different ways to cluster the standard errors. Overall, we find that sovereign exposure is always negative and significant at the conventional levels. Furthermore, these results are also very similar in magnitude to our main results.

Similarly, in Table OA.4, we examine our choice of clustering standard errors (at bank level in the paper) by repeating our main specification using firm level clustering. While we argue in the paper that bank clustering is conceptually more correct, here we want to show that this choice is also more conservative. Indeed, we find that standard errors clustered at firm-level are smaller in magnitude, and this difference is generally large. This result confirms our choice of clustering errors at bank level.

In Table OA.6, we examine whether our results may be driven by heterogeneity in governance across banks. The idea is that certain banks may be characterized by a different governance structure, which may be correlated to how lending was affected by the Greek bailout as well as to sovereign exposure. We consider two main classes of banks that may divert from the standard private bank governance model: Credit Cooperative and Foreign banks. In general, we find reassuring results. In particular, we detect no significant difference in the extent to which these banks react to the sovereign shock. This excludes that these banks may have driven our main results.

Interestingly, this result is different than Bofondi et al. (2017). Our paper, which looks at the onset of the crisis, identifies a direct channel connecting the actual amount of sovereign in banks'

portfolio and lending. As we discuss, this channel could be activated by any shock to any bank security. Instead, Bofondi et al. (2017) looks at the later part of the crisis and document that, at that stage, the sovereign risk overgrew the actual share of sovereign holdings and become "country" risk. In their context, this country risk affects banks beyond their actual sovereign holding. In this regard, the two papers - which also differ on other important dimensions (different empirical model, examination of the real effects, and others aspects mentioned in the draft) - focus on two different mechanism through which a sovereign shock can propagate. Therefore, the results are not really in contrast, but they simply shows two possible mechanisms through which sovereign assets and lending can be negatively related.

Lastly, we show that our main results are generally robust to the set of controls used in the analysis. In particular, one concern is that our results may be mechanically created by controlling for several balance sheet items that are related to each other from the balance sheet identities. Given this concern, it is useful to know to what extent our results are stable to the inclusion or exclusion of some regressors. We tackle this concern in two ways. In the robustness part of Section (3) we have already shown that adding other controls does not significantly affect this result. This is also the case when the control added is another item of the balance sheet (e.g. bond funding). Therefore, our results appear to be particularly robust to the inclusion of new controls. On top of this, we can also show that our results are also robust to the exclusion of any regressor. In particular, in Figure OA.6, we test if the coefficient of sovereign holdings varies as we remove bank-level controls from our regression model one at a time. Across all the iterations, the exclusion of individual controls does not alter the economic magnitude of our estimates and we cannot reject the null hypothesis that coefficients are statistically the same for all controls. Importantly, our identification relies on the ability to control for bank characteristics that may be correlated with sovereign holdings and may also influence lending policies. As a result, we do not think there is much to learn from the relative magnitude of these coefficients. However, we find it reassuring that our main result remains significant in all these cases.

OA.2.4 Additional Explanations for the Relationship Between Sovereign Holdings and Credit Supply

In this Section, we provide a more detailed discussion of our analysis on alternative interpretations of our results, which is contained in a shorter version in Section 3.

Previous literature has highlighted the importance of portfolio rebalancing to understand lending behavior by banks, in particular during periods characterized by tensions in financial markets (Abbassi et al., 2014; Peydró et al., 2017). In our context, this translates to the concern that the pre-crisis amount of sovereigns in banks' portfolios may proxy their ability and incentives to trade sovereign assets. If this were the case, then the negative effect that we attribute to

sovereigns' contraction may be driven by the changes in trading strategies by banks.[74] Using our micro-data, Table OA.5 presents different tests that help rule out the portfolio adjustment explanation. First, we show that our point estimates do not significantly change when we control for the scaled amount of sovereigns purchased by banks in the immediate aftermath of the bailout (2010Q2). One limitation of this approach is that this variable measures behavior of banks ex-post, which is therefore endogenous with respect to changes in lending opportunities. To overcome this limitation, we add controls for two variables proxying banks' ex-ante ability to trade sovereign securities, which are the amount of trading revenue scaled by assets (Column 2) and a dummy equal to one if the bank was in the top quartile in terms of trading revenue (Column 3). Also in this case, we find no evidence that ability in trading can explain our results.

Second, we can rule out that our results are driven by differences in the governance structure across banks more and less exposed to sovereign securities, which may be correlated both with sovereign exposure and lending patterns around the Greek bailout. In order to study this dimension, we consider two extreme cases: cooperative banks and foreign banks. First, our baseline specification controls for whether a bank is a cooperative bank, as these intermediaries face strict regulatory constraints in the composition of their assets and, as a result of this, tend invest more on sovereign securities. Moreover, also controlling for a dummy that flags foreign banks does not significantly affect our result (Column 4 of Table OA.5). Together, these results suggest that governance does not explain our result.[75]

Third, our results are also not explained by the contraction in bond markets, which characterized the European economy during this time. This shock may have been particularly important for banks, since financial intermediaries were among the main issuers of corporate bonds in Italy.[76] In particular, to the extent that the ability to raise funding in the bond markets and the decision to invest in sovereign assets are correlated, this change in funding markets may explain our main result. To verify this relationship, we augment our regression model with a measure of banks' dependence on bond financing in the pre-shock period (Table OA.5, Column 5). We find that adding this extra control does not significantly affect neither the significance nor the magnitude of our main coefficient. We return to the importance of bond financing in the analysis of the channels of transmission of the sovereign shock (Section 3.3).

[74] A first suggestive evidence against the portfolio adjustment channel comes from the time-series dynamics of the Italian banking system's sovereign holdings. Figure OA.3 in the Appendix shows in the early part of the sovereign crisis the aggregate sovereign holdings of the Italian banking system remained stable.

[75] As shown in Table OA.6 in the Appendix, it is also the case that these different types of institutions do not appear to respond differently to the shock. The small difference in response between domestic and foreign banks appears in contrast with the findings in Bofondi et al. (2017), which instead shows that country-specific risk is the key determinant of the reduction in credit in the second part of the sovereign crisis. As we discuss in Appendix OA.2.3, these results suggest that the exact mechanism through which the sovereign shock can affect lending may change during different phases of the crisis.

[76] Between 2000-2016, almost 75 percent of corporate bond issuances by Italian firms were done by Depository Institutions (Source: Thomson Reuters SDC Platinum). We thank one of the anonymous referees for this information.

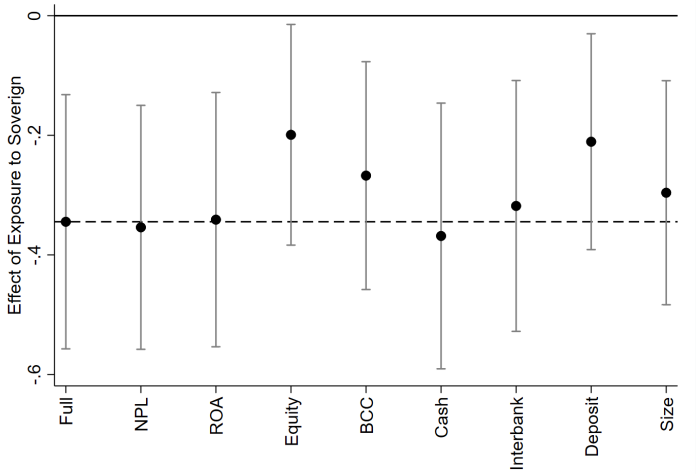
Finally, a strand of the literature has explored the role played by government pressure in sovereign markets. Previous evidence suggests that domestic banks — which are more likely to be connected with their own government — are systematically more likely to hold or purchase sovereign assets during periods of fiscal stress (Becker and Ivashina, 2014b; Ongena et al., 2018). In our context, one concern is that the sovereign exposure may in part capture this moral suasion mechanism. We can provide three pieces of evidence against this potential confounding factor. First, as noted before, our results are not explained by differences between national and foreign banks or by the heterogeneity in trading activity across banks, as moral suasion would predict. Second, we find that variation in the extent to which a bank can potentially be influenced by politicians does not explain our results. This test exploits the important role of banking foundations in the ownership structure of Italian banks (Jassaud, 2014). Banking foundations are private entities created in the early 1990s during the privatization process of the Italian financial sector. Despite their private nature, these entities are generally controlled by the local government and they still retain an important ownership stake in the banking sector.[77] Consistent with the previous literature (e.g. De Marco and Macchiavelli, 2016), we use variation in the ownership share of foundations to identify those banks that are more likely influenced by political parties (Appendix A.3). In particular, we define two dummy variables equal one if foundations held more than 10% or 5% of a bank's equity . We find that the inclusion of these proxies of direct government connection does not significantly change either the magnitude or significance of the security channel (Columns 6 and 7, Table OA.5). Third, we find consistent results when we use an alternative measure of moral suasion, which instead identifies as banks more likely to be influenced by the government those institutions that act as primary dealers in the Italian sovereign market. This test builds on Williams (2018), who finds that market makers are more likely to be affected by financial repression.[78] Also in this case, we find that controlling for this variable also does not affect our key result (Column 8, Table OA.5). Overall, this battery of test confirm that moral suasion is not an important confounding factor in our analysis.

In the last column, we also show that our results are consistent when we include all the control for alternative explanations together. For those channels for which we have more than one proxy variables we only include one proxy. For instance, for political connection, we only include the 10% threshold, but results are similar if we add the 5% version of the variable. By the same token, for the trading channel, we do not include the variable of net purchases because

[77] In 2009-2010, foundations retained significant control power in the board of a number of financial institutions in Italy. For each banking foundation, we manually collected from it annual report information on its shareholder's composition and data on its stake on financial instutions as of December 2019. Section A.3 in the Appendix contains an extensive discussion on the data collection as well as backround information on banking foundations in Italy.

[78] We identify primary dealers using the official list of primary dealers as of February 2010 that is available in the Italian Government website (http://www.dt.tesoro.it/en/debito_pubblico/specialisti_titoli_stato/).

Figure OA.6: **Leave-out test**



This figure reports the coefficient and confidence intervals of the main coefficient of sovereign exposure on credit where we drop one at the time the variable that is reported in the x-axis. For facilitating the interpretation of the figure, the horizontal line reports the main estimate, which is the one reported in the main table as "Full".

- as discussed above - this is endogenous to the unfolding of the crisis. However, its inclusion does not affect the result.

OA.2.5 Credit Supply across different types of firms

In the paper, we have shown that banks reduced credit because of the sovereign shock and this credit supply shock led to an overall reduction in firm credit. Furthermore, we have documented that this inability to smooth the credit shock was more prevalent among small firms. There may be two explanations for this result. First, smaller firms may be less able to respond to a reduction in credit within the banking sector. Second, banks may have cut credit more extensively to smaller firms. As we discuss in the paper, we believe that the first explanation is prevalent in our setting. To show this in the data, we repeat our within-firm analysis estimating the effect of the sovereign shock across small and large firms. In this way, we can isolate the heterogeneous effect of the shock across size while keeping credit demand constant. Results are presented in Table OA.7: as anticipated, we find no difference in the shock effect across small and large firms. The coefficient for small firms is indeed negative, but it is very small in size and non-significant.

Lastly, we present the same type of test looking at the heterogeneity across different lending relationships. On top of being interesting per se, this test could have useful implications for our identification. In particular, one issue that could still affect our result despite the presence of firm fixed-effects is the presence of a bank-specific demand shock. The idea is that firms may have a demand shock that is specific to a subset of banks. To the extent that this is the case and

if the banks that are targeted by the demand shock are on average more exposed to sovereign, our results may be capturing this effect. In practice, this concern could materialize if firms cut demand of credit for banks characterized by specific relationship strength. For instance, it could be that firms during this period were more prone to cut demand to banks they had shorter or weaker relationship and these banks were on average more exposed to sovereign. Table OA.8 presents result regarding this potential issue. In general, we find no evidence that the cut in lending was specific of a subset of firm-bank relationships. Our interaction coefficient is generally both small and non-significant. This provides evidence that the concern of relationship-driven bank specific demand shock is not supported by the data in our case.

As a side note, it is also important to point out that the presence of a significant interaction would not have necessarily invalidated our analysis. As we discuss above with size, the interaction of this analysis can also capture supply-side forces. However, the fact we find a null result in this dimension still provides evidence that helps us exclude this concern from our empirical setting.

OA.2.6 Firm Fixed effect and Credit Demand

As discussed in the paper, other studies employing a similar within-firm identification strategy have treated the estimated fixed effects as nuisance parameters (Gan 2007b; Khwaja and Mian 2008; Jiménez and Ongena 2012; Jiménez et al. 2014; Cingano et al. 2016). However, to the extent that they proxy real demand-side shocks, the estimated fixed effects may convey useful information on the transmission of the sovereign shock to the real economy. Based on this argument, we use the estimated firm fixed effect - $\hat{\rho}_j$- as a control in our between-firm estimator.

To validate this approach, we examine to what extent $\hat{\rho}_j$ actually captures variation in credit demand across firms. In particular, we expect to observe a significant correlation between the firm's fixed-effect estimates and proxies of riskiness and demand for credit, which have been used by the previous literature in finance. In Table OA.9, we find a strong, positive correlation between the fixed effects and a firm's growth in revenues and assets between 2009 and 2010. Similarly, the $\hat{\rho}_j$ are positively correlated with the credit score of the borrower after the onset of the crisis. While the estimates $\hat{\rho}_j$ are likely noisy, these findings corroborate the hypothesis that the firm fixed-effect estimated by model (1) capture and control for relevant information about changes in firms' credit demand and creditworthiness.[79]

OA.2.7 Firm-level analysis: other results

In addition to firm size, the literature has provided other proxies of firms' sensitivity to the availability of external financing. To further explore the heterogeneous effects of a credit-supply

[79]We also find a significant and sizable correlation with asset and revenues growth measured over a two-year window (2009-2011), rather than one year.

shock, we examine another measure – the level of dependence on external financing – to capture variation in the extent to which firm policies are responsive to credit tightening. To explore this aspect, we rely on underlying technological differences among industries and construct a measure of dependence on external finance following the classification proposed by Rajan and Zingales (1998).[80] We expect firms that are more heavily dependent on external financing to run their operations to be more affected by a credit shock all else equal. Dependence on external finance is measured using the RZ index, as developed in the seminal work of Rajan and Zingales (1998). It is computed at the two-digit SIC level, as described in the data section of the Appendix A.1. The results reported in Table OA.10 are in line with this hypothesis. We find that firms that are more dependent on external financing cut employment relatively more than other firms in response to the sovereign shock. The same does not hold for investment, for which we cannot find any statistically significant effect. These findings are in line with those in Duygan-Bump et al. (2015), which shows that dependence on external financing had a particularly strong role in explaining the firms' employment cuts during the recent financial crisis in the US. Importantly, we find that credit does not decline relatively more (or less) for more externally dependent firms. This is reassuring, since we did not expect a different degree of dependence on external financing to play an unambiguous role in determining firms' ability to smooth the credit shock across lenders once firm characteristics are controlled for.

[80]More specifically, we use the Rajan-Zingales (RZ) index constructed using US Compustat firms, and we impute it to firms in our data set according to their industry. The intuition behind the RZ index is the following. For technological reasons some industries rely on external financing more than others. For example, some industries operate on a larger scale than others, have projects with longer gestation or require continuous investments to keep operating; thus, these industries should be more negatively affected than others by an unexpected tightening of credit supply. We refer to Rajan and Zingales (1998) for further details.

Table OA.3: **The Bank Lending Channel: Alternative Sample**

	(1)	(2)	(3)	(4)
	g(Loans)			
Sovereigns	-0.243***	-0.243***	-0.364***	-0.364***
	(0.093)	(0.020)	(0.133)	(0.020)
ROA	7.035	7.035***	6.390	6.390***
	(9.092)	(1.660)	(10.446)	(1.601)
Size	0.005	0.005***	0.009	0.009***
	(0.006)	(0.001)	(0.008)	(0.001)
Tier1	0.712***	0.712***	0.920***	0.920***
	(0.249)	(0.048)	(0.280)	(0.045)
Deposits	0.167***	0.167***	0.173**	0.173***
	(0.060)	(0.010)	(0.072)	(0.010)
Liquidity	5.081	5.081***	5.247	5.247***
	(3.723)	(0.574)	(4.583)	(0.557)
Net Interbank Debt	0.189*	0.189***	0.087	0.087***
	(0.101)	(0.019)	(0.180)	(0.018)
Non Performing Loans	-0.708***	-0.708***	-0.262	-0.262***
	(0.200)	(0.054)	(0.364)	(0.053)
BCC	0.043	0.043***	0.084**	0.084***
	(0.028)	(0.005)	(0.034)	(0.005)
Firm Fixed Effect	N	N	N	N
Bank Controls	Y	Y	Y	Y
Relationship Controls	N	N	Y	Y
Firm Controls	Y	Y	Y	Y
Industry and Province Fixed Effects	Y	Y	Y	Y
Cluster SE	Bank	Firm	Bank	Firm
Observations	506482	506482	506482	506482
R-squared	0.023	0.023	0.058	0.058

This table examines the transmission of the sovereign shock to credit supply via the bank lending channel. The outcome variable is the normalized growth rate in loans ($g(Loans)$) granted by bank b to firm j between (2010:Q2-2011:Q1) and (2009:Q2-2010:Q1). The main independent variable is the stock of Italian sovereigns held by the lender at the end of 2010:Q1 scaled by RWA (Sovereigns). All regressions are estimated on the full sample that includes both single- and multiple-relationship firms. All regressions include a set industry and province fixed effects and a set of bank-specific, relationship-specific, and firm-specific controls measured at the end of 2010:Q1. Standard Errors are clustered at bank level. *** denotes significance at the 1% level, ** at the 5%, and * at the 10%.

Table OA.4: **The Bank Lending Channel: Alternative Clustering**

	(1)	(2)	(3)
	g(Loans)		
Sovereigns	-0.260***	-0.259***	-0.345***
	(0.021)	(0.022)	(0.023)
ROA	6.559***	8.913***	7.324***
	(1.768)	(2.030)	(1.976)
Size	0.005***	0.004***	0.006***
	(0.001)	(0.001)	(0.001)
Tier1	0.759***	0.748***	0.905***
	(0.051)	(0.059)	(0.057)
Deposits	0.180***	0.171***	0.168***
	(0.011)	(0.012)	(0.012)
Liquidity	5.319***	5.382***	5.574***
	(0.608)	(0.687)	(0.673)
Net Interbank Debt	0.195***	0.197***	0.126***
	(0.020)	(0.021)	(0.021)
Non Performing Loans	-0.738***	-0.706***	-0.339***
	(0.057)	(0.063)	(0.063)
BCC	0.043***	0.043***	0.068***
	(0.006)	(0.006)	(0.006)
Length Relationship			0.003***
			(0.000)
Share Relationship			-0.020***
			(0.000)
Firm Fixed Effect	N	Y	Y
Firm Controls	Y	N	N
Industry and Province Fixed Effects	Y	N	N
Cluster SE	Firm	Firm	Firm
Observations	478235	478235	478235
R-squared	0.023	0.372	0.387

This table examines the transmission of the sovereign shock to credit supply via the bank lending channel. The outcome variable is the normalized growth rate in loans ($g(Loans)$) granted by bank b to firm j between (2010:Q2-2011:Q1) and (2009:Q2-2010:Q1). The main independent variable is the stock of Italian sovereigns held by the lender at the end of 2010:Q1 scaled by RWA (Sovereigns). All regressions include a set of bank-specific controls measured at the end of 2010:Q1. Column 1 includes industry and province fixed effects. Columns 2 and 3 are within-firm estimates and include firm fixed effects. The models in Columns 1-3 are estimated on the sample of firms with multiple lending relationships. Standard Errors are clustered at firm level or bank level, as reported in the third-last row. *** denotes significance at the 1% level, ** at the 5%, and * at the 10%.

Table OA.5: **The Bank Lending Channel: Other Mechanisms**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
					g(Loans)				
Sovereigns	-0.370***	-0.311**	-0.357***	-0.342**	-0.330**	-0.379***	-0.282**	-0.388***	-0.295**
	(0.130)	(0.130)	(0.132)	(0.135)	(0.135)	(0.131)	(0.127)	(0.131)	(0.137)
Net Sovereign Purchases	-0.413								
	(0.574)								
Revenues Trading		0.001							0.059
		(0.031)							(0.036)
Any Trading			0.052***						0.056***
			(0.017)						(0.021)
Foreign				-0.004					-0.020
				(0.035)					(0.037)
Bond financing					-0.038				-0.081
					(0.069)				(0.066)
Politically Connected Bank 10%						0.026			0.028
						(0.023)			(0.023)
Politically Connected Bank 5%							-0.027		
							(0.028)		
Primary Dealer								0.040	-0.010
								(0.038)	(0.035)
Firm Fixed Effect	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bank Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Relationship Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	478235	474916	478235	478235	478235	478235	478235	478235	474916
R-squared	0.387	0.388	0.388	0.387	0.387	0.387	0.387	0.387	0.389

This table tests the alternative explanations that might explain the relationship between sovereign holdings and credit supply tightening transmission of the sovereign shock to credit supply via the bank lending channel. The outcome variable is the normalized growth rate in loans ($g(Loans)$) granted by bank b to firm j between (2010:Q2-2011:Q1) and (2009:Q2-2010:Q1). The main independent variable is the stock of Italian sovereigns held by the lender at the end of 2010:Q1 scaled by RWA (*Sovereigns*). In Column 1 we control for net purchases of sovereign securities (*Net Sovereign Purchases*). In Columns 2 and 3 we control for revenues from trading activity (*Revenues Trading*) or for a dummy flagging banks that engage in any securities trading activity (*Any Trading*). In Column 4 we control for a dummy variable that flags banks that are a subsidiary of a foreign bank (*Foreign Bank*). In Column 5 we control for importance of bond financing (*Bond Financing*). In Columns 6 and 7 we control for a dummy variable that flags banks partially controlled by banking foundations (share holdings of foundations above 10% or 5% - *Politically Connected Bank* 10% and *Politically Connected Bank* 5%). In Column 8 we flag banks that operate as primary dealers in sovereign auctions of Italian bonds (*Primary Dealer*). Column 9 runs an horse-race regression. All regressions include a set of bank-specific and relationship-specific controls measured at the end of 2010:Q1. Every specification contains firm fixed effects and it is estimated on the sample of firms with multiple credit relationships. Standard Errors are clustered at bank level. *** denotes significance at the 1% level, ** at the 5%, and * at the 10%.

Table OA.6: **The Bank Lending Channel: Foreign and Cooperative Banks**

	(1)	(2)
	g(Loans)	
Sovereigns	-0.351**	-0.409**
	(0.139)	(0.173)
Sovereigns · Foreign	0.222	
	(0.401)	
Sovereigns · BCC		0.154
		(0.156)
Foreign	-0.023	
	(0.058)	
BCC	0.068*	0.049
	(0.037)	(0.042)
Firm Fixed Effect	Y	Y
Bank Controls	Y	Y
Relationship Controls	Y	Y
Observations	478235	478235
R-squared	0.387	0.387

This table investigates the channels of transmission of the sovereign shock through banks' balance sheet. We investigate the heterogeneity across banks with different governance and ownership structure. The interaction variables include: $Foreign\,Bank$ (a dummy equal one if the bank is a subsidiary of a foreign bank), BCC (a dummy equal one if the bank is a Cooperative bank). All interaction variables are also included as a control in the regression. The outcome variable is the normalized growth rates in term loans ($g(Loans)$). The independent variables of interest are the exposure of the lender to Italian sovereigns ($Sovereigns$), and its interactions with different proxies of the transmission channels. All regressions include a set of bank-specific and relationship-specific controls measured at the end of 2010:Q1. Every specification contains firm fixed effects and it is estimated on the sample of firms with multiple credit relationships. Standard Errors are clustered at bank level. *** denotes significance at the 1% level, ** at the 5%, and * at the 10%.

Table OA.7: **The Bank Lending Channel: Heterogeneity by Firm Size**

	(1)	(2)	(3)	(4)
	g(Loans)			
Sovereigns	-0.556***	-0.322**	-0.525***	-0.305**
	(0.179)	(0.141)	(0.143)	(0.140)
Sovereigns · ln(Revenues)	0.028		0.026	
	(0.023)		(0.018)	
Sovereigns · Small Firm		-0.044		-0.038
		(0.056)		(0.050)
ROA	7.148	7.253	5.270	5.162
	(11.514)	(11.520)	(9.977)	(9.963)
Size	0.006	0.006	0.008	0.008
	(0.008)	(0.008)	(0.007)	(0.007)
Tier1	0.911***	0.907***	0.839***	0.822***
	(0.282)	(0.282)	(0.274)	(0.277)
Deposits	0.167**	0.168**	0.145**	0.143**
	(0.074)	(0.074)	(0.073)	(0.073)
Liquidity	5.637	5.607	4.948	4.882
	(5.310)	(5.312)	(4.275)	(4.234)
Net Interbank Debt	0.126	0.126	0.070	0.081
	(0.175)	(0.174)	(0.173)	(0.174)
Non Performing Loans	-0.339	-0.338	-0.167	-0.180
	(0.352)	(0.350)	(0.369)	(0.366)
BCC	0.069*	0.069*	0.083***	0.081**
	(0.036)	(0.036)	(0.032)	(0.032)
Length Relationship	0.003***	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)
Share Relationship	-0.020***	-0.020***	-0.025***	-0.025***
	(0.004)	(0.004)	(0.003)	(0.003)
Firm Fixed Effect	Y	Y	N	N
Bank Controls	Y	Y	Y	Y
Relationship Controls	Y	Y	Y	Y
Observations	478235	478235	533904	533904
R-squared	0.387	0.387	0.050	0.049

This table examines the heterogeneity of the bank lending channel across firms of different size. The outcome variable is the normalized growth rate in loans ($g(Loans)$) granted by bank b to firm j between (2010:Q2-2011:Q1) and (2009:Q2-2010:Q1). The main independent variable is the stock of Italian sovereigns held by the lender at the end of 2010:Q1 scaled by RWA ($Sovereigns$). The interaction variable is a dummy equal to one if firm j's revenues in 2009 are below 2 Million Euros in 2009 ($Small\,Firm$). All regressions include a set of bank-specific controls measured at the end of2010:Q1. Columns 1 and 4 include a constant. Columns 2 and 3 are within-firm estimates and include firm fixed effects. The models in Columns 1-3 are estimated on the sample of firms with multiple lending relationships. The sample in Column (4) includes single- and multiple-relationship firms. Columns 3 and 4 include relationship-specific controls measured at the end of 2010:Q1. Standard Errors are clustered at bank level. *** denotes significance at the 1% level, ** at the 5%, and * at the 10%.

Table OA.8: **The Bank Lending Channel: Heterogeneity by Relationship variables**

	(1)	(2)	(3)	(4)
	g(Loans)			
Sovereigns	-0.408**	-0.308*	-0.556***	-0.492**
	(0.180)	(0.169)	(0.179)	(0.242)
Sovereigns · Length Relationship	0.007			0.007
	(0.11)			(0.11)
Sovereigns · Share Relationship		-0.001		-0.001
		(0.002)		(0.002)
Sovereigns · ln(Revenues)			0.028	0.016
			(0.023)	(0.024)
Firm Fixed Effect	Y	Y	Y	Y
Bank Controls	Y	Y	Y	Y
Relationship Controls	Y	Y	Y	Y
Observations	478235	478235	478235	478235
R-squared	0.387	0.387	0.387	0.387

This table examines the heterogeneity of bank lending channel across firms of with different lending relationships and size. The outcome variable is the normalized growth rate in loans ($g(Loans)$) granted by bank b to firm j between (2010:Q2-2011:Q1) and (2009:Q2-2010:Q1). The main independent variable is the stock of Italian sovereigns held by the lender at the end of 2010:Q1 scaled by RWA ($Sovereigns$). The interaction variable in Column 1 is the length of lending relationships between a firm and a bank ($Length\,Relationship$) The interaction variable in Column 2 is the share total bank of credit provided the lender ($Share\,Relationship$). The interaction variables in Column 3 is a dummy equal to one if firm j's revenues in 2009 are below 2 Million Euros in 2009 ($Small\,Firm_{2009}$). In Column 4 we include the three interaction effects. All regressions include firm fixed effects, a set of bank-specific controls, and relationship-specific controls measured at the end of 2010:Q1. The sample includes multiple-relationship firms. Standard Errors are clustered at bank level. *** denotes significance at the 1% level, ** at the 5%, and * at the 10%.

Table OA.9: **Fixed Effects and Demand-Side Shocks**

	(1)	(2)	(3)	(4)	(5)
			$\hat{\rho}$		
gr(Revenues)	0.092***			0.081***	0.082***
	(0.002)			(0.002)	(0.002)
gr(Inv)		0.089***		0.076***	0.075***
		(0.002)		(0.002)	(0.002)
Credit Rating 2011			0.004***	0.007***	0.008***
			(0.000)	(0.000)	(0.000)
$\ln(\text{Revenues}_{2009})$					0.005***
					(0.001)
Observations	141374	141374	141374	141374	141374
R-squared	0.017	0.018	0.001	0.032	0.032

This table investigates the correlation between the fixed effects estimated by model (1) on the sample of firms with multiple lending relationships appearing in the CADS database with proxies of firms demand, investment opportunities, and creditworthiness. The right-hand side variables include revenue growth between the fiscal years 2009 and 2011 ($gr(Revenues)$), growth in fixed assets ($gr(Inv)$), credit rating at the end of fiscal year 2011 ($Credit\,Rating$), and the logarithm of revenues in 2009 ($ln(Revenues)$)). *** denotes significance at the 1% level, ** at the 5%, and * at the 10%.

Table OA.10: **Real Effects: Dependence on External Finance**

	(1)	(2)	(3)	(4)	(5)	(6)
	g(Tot Loans)		gr(Empl)		gr(Inv)	
Sovereigns^{AVE}	-0.208***	-0.159***	-0.078*	-0.069	-0.028	-0.016
	(0.057)	(0.027)	(0.043)	(0.043)	(0.041)	(0.041)
Sovereigns^{AVE} · RZ	-0.010	-0.004	-0.016**	-0.014**	0.007	0.009
	(0.006)	(0.003)	(0.006)	(0.006)	(0.006)	(0.006)
$\hat{\rho}$		0.834***		0.154***		0.209***
		(0.004)		(0.006)		(0.005)
Industry and Province Fixed Effects	Y	Y	Y	Y	Y	Y
Bank Controls	Y	Y	Y	Y	Y	Y
Firm Controls	Y	Y	Y	Y	Y	Y
Observations	139013	139013	139013	139013	139013	139013
R-squared	0.111	0.689	0.027	0.042	0.012	0.028

This table examines the effects of the sovereign crisis on corporate investments and employment transmitted via the lending channel across firms with heterogeneous dependence on external finance. The dependent variables are two proxies of firm investment and employment. The main independent variable is the weighted average of the exposure to Italian sovereigns of firm j's lenders ($Sovereigns^{AVE}$). We interact the firm level shock with a proxy of a firm dependence on external finance (RZ Index). All regressions include a set of weighted averaged bank-specific and relationship-specific controls measured at the end 2010:Q1. All regressions include province fixed effects and industry fixed effects measured at the end of 2010:Q1. Columns 2, 4 and 6 control for unobserved demand-side shocks using the firm fixed effect $\hat{\rho}_j$ estimated in the baseline regression of the bank lending channel (equation (1)). Standard Errors are clustered at lead bank level. *** denotes significance at the 1% level, ** at the 5%, and * at the 10%.