Whatever it takes: The Real Effects of Unconventional Monetary Policy*

Viral V. Acharya†, Tim Eisert‡, Christian Eufinger§, and Christian Hirsch¶

Abstract

On July 26, 2012 the ECB's president Mario Draghi announced to do "whatever it takes" to preserve the Euro and subsequently launched the Outright Monetary Transactions (OMT) Program, which led to a significant increase in the value of sovereign bonds issued by European periphery countries. As a result, the OMT announcement indirectly recapitalized periphery country banks due to their significant holdings of these bonds. However, the regained stability of the European banking sector has not fully transferred into economic growth. We show that this development can at least partially be explained by zombie lending motives of banks that still remained undercapitalized after the OMT announcement. While banks that benefited from the announcement increased their overall loan supply, this supply was mostly targeted towards low-quality firms with pre-existing lending relationships with these banks. As a result, there was no positive impact on real economic activity like employment or investment. Instead, these firms mainly used the newly acquired funds to build up cash reserves. Finally, we document that creditworthy firms in industries with a prevalence of zombie firms suffered significantly from the credit misallocation, which slowed down the economic recovery.

*The authors appreciate helpful comments from Taylor Begley, Luc Laeven, Steven Ongena, Saverio Simonelli, Marti Subrahmanyam, and Annette Vissing-Jorgensen. Furthermore, we thank conference participants at the Third Conference on Sovereign Bond Markets, the Sixteenth Jacques Polak Annual Research Conference, and the CEPR/RELTIF Meeting in Milan as well as seminar participants at Utah, Rutgers, the European Central Bank, Rotterdam, Leuven, the Austrian Central Bank, Amsterdam, and Frankfurt. We are grateful to the Assonime/ CEPR Research Programme on Restarting European Long-Term Investment Finance (RELTIF) for financial support of the research in this paper. Hirsch gratefully acknowledges support from the Research Center SAFE, funded by the State of Hessen initiative for research Loewe. Eufinger gratefully acknowledges the financial support of the Public-Private Sector Research Center of the IESE Business School, as well as, the Europlace Institute of Finance (EIF) and the Labex Louis Bachelier. Corresponding author: Viral V. Acharya, Phone: +1-212-998-0354, Fax: +1-212-995-4256, Email: vacharya@stern.nyu.edu, Leonard N. Stern School of Business, 44 West 4th Street, Suite 9-84, New York, NY 10012.

†New York University, CEPR, and NBER

‡Erasmus University Rotterdam

§IESE Business School

¶Goethe University Frankfurt and SAFE

1 Introduction

At the peak of the European debt crisis in 2010, the European Central Bank (ECB) began to introduce unconventional monetary policy measures to stabilize the Eurozone and restore trust in the periphery of Europe. Ultimately, these unconventional monetary policy measures were aimed at breaking the vicious circle between poor bank health and sovereign indebtedness, which had led to a sharp decline in economic activity in the countries in the periphery of the Eurozone (Acharya, Eisert, Eufinger, and Hirsch, 2015). Especially important in restoring trust in the viability of the Eurozone was the ECB's Outright Monetary Transactions (OMT) program, which the ECB's president Mario Draghi announced in his famous speech in July of 2012, saying that "[...] the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough."

Once activated towards a specific country, the OMT program allows the ECB to buy a theoretically unlimited amount of the country's government bonds in secondary markets. There is clear empirical evidence that the announcement of the OMT program has been successful in terms of lowering spreads of sovereign bonds issued by distressed European countries (e.g., Krishnamurthy, Nagel, and Vissing-Jorgensen, 2014). Moreover, we show that the resulting value increase of these bonds resulted in a backdoor (indirect) bank recapitalization as banks with significant holdings of these bonds experienced substantial windfall gains, which helped to restore the stability of the European banking system (see also Acharya, Pierret, and Steffen, 2015).[1]

However, when Mario Draghi reflected on the impact of the OMT program on the real economy during a speech in November 2014, he noted that "[...] these positive developments in the financial sphere have not transferred fully into the economic sphere. The economic situation in the euro area remains difficult. The euro area exited recession in the second quarter of 2013, but underlying growth momentum remains weak. Unemployment is only falling very slowly. And confidence in our overall economic prospects is fragile and easily disrupted, feeding into low investment."

There are a lot of unvital signs that Europe's weak economic recovery is a repeat of Japan's "zombie lending" experience in the 1990s, when banks in distress failed to foreclose on unprofitable and highly indebted firms.[2] For example, in 2013, in Portugal, Spain and Italy, 50%, 40% and 30% of debt, respectively, was owed by firms which were not able to cover their interest expenses out of their pre-tax earnings.[3] To the best of our knowledge, our paper is the first to provide systematic evidence that, indeed, the slow

[1]The OMT program has in particular recapitalized the banks that caused the loan supply disruptions during the European debt crisis. Confirming the positive effect of the indirect recapitalization, we find that the CDS spreads of these banks decreased significantly on the dates surrounding the OMT announcement.

[2]See, for example, "Blight of the living dead", *The Economist*, July 13, 2013 and "Companies: The rise of the zombie" by Michael Stothard, *Financial Times*, January 8, 2013.

[3]"Europe's other debt crisis", *The Economist*, October 26, 2013.

economic growth in Europe can at least partially be explained by zombie lending motives of banks that still remained undercapitalized after the OMT announcement.

While an indirect recapitalization measure like the OMT program allows central banks to target the recapitalization to banks holding troublesome assets, it does not allow them to tailor the amount of the recapitalization to a bank's specific capital needs. Therefore, even though European banks regained some lending capacity due to the recapitalization effect of the OMT announcement, some of these banks still remained weakly-capitalized after the announcement, creating zombie lending incentives for these banks. By continuing to lend to their impaired borrowers, distressed banks can avoid realizing losses on outstanding loans, which would further deter the banks' situation due to increasing regulatory scrutiny and intensified pressure from market forces. Instead, by "evergreening" loans to their impaired borrowers, banks in distress can gamble for resurrection in the hope that their borrowers regain solvency, or, at least, they can delay taking a balance sheet hit. This behavior leads to an inefficient allocation of bank loans, since loan supply is shifted away from creditworthy productive firms towards distressed less productive borrowers, which distorts market competition and causes detrimental effects on employment, investment, and growth in general.[4]

Our sample is based on loan information data obtained from Thomson Reuters LPC's DealScan, which provides extensive coverage of bank-firm relationships throughout Europe. We augment this dataset with firm-specific information from Bureau van Dijk's Amadeus database and bank-specific information from various sources, including the banks' CDS spreads, balance sheet information, and sovereign debt holdings. The sample includes all private firms from all EU countries for which Dealscan provides loan information and covers the years 2009 until 2014. This dataset allows us to trace the impact of the OMT program announcement through the banking sector to the real economy. Accordingly, we organize our empirical analysis into three parts. First, we determine the extent to which individual banks were affected by the announcement of the OMT program. Second, we track the resulting change in their lending behavior and, finally, we evaluate whether the change in loan supply led to real effects for European firms.

Our results show that banks from stressed European countries (the GIIPS countries, i.e., Greece, Ireland, Italy, Portugal, and Spain) realized the highest windfall gains after the OMT announcement due to their substantial amount of sovereign debt holdings from these countries. Moreover, we document that this increase in bank health led to an increase in available loans to firms. Building on the methodology of Khwaja and Mian (2008), we find that, in the quarters following the OMT announcement, banks with higher windfall gains on their sovereign debt holdings increased loan supply to the corporate sector relatively more than banks with lower windfall gains, but only to existing borrowers

[4]See Kane (1989), Peek and Rosengren (2005), Caballero, Hoshi, and Kashyap (2008), and Giannetti and Simonov (2013).

(intensive margin). Conversely, we do not find any significant relation between a bank's windfall gains and its propensity to issue new loans to borrowers it did not have a prior relation with (extensive margin).

To analyze which type of borrowers benefited most from an increased lending volume in the period after the announcement of the OMT program, we divide our sample into low- and high-quality borrower based on the ability of firms to service existing debt. In particular, a low-quality (high-quality) borrower is defined as having a below (above) country median interest coverage ratio. The results of our lending regressions show that in particular low-quality borrowers benefited from the increased loan volume in the period following the OMT program announcement. In contrast, high-quality borrower did not benefit significantly from the OMT announcement as the loan volume extended to this subset of firms did not increase. The fact that the banks' loan supply increase in the period following the OMT announcement was primarily targeted towards existing low-quality borrowers is a first indication that zombie lending behavior might have prevailed in the European lending market.

Given this evidence, we then specifically test whether these results can indeed be traced back to zombie lending behavior by banks that regained some lending capacity due to the OMT announcement but still remained weakly-capitalized. Following Caballero, Hoshi, and Kashyap (2008) and Giannetti and Simonov (2013), we show that these banks extended loans to existing low-quality borrowers at interest rates that are below the rates paid by the most creditworthy European borrowers (high-quality public borrowers in non-GIIPS European countries). Lending at these very advantageous interest rates is a very strong indication that the banks' lending behavior can at least partially be explained by zombie lending motives.

In a next step, we determine how the change in the banks' lending behavior, induced by the OMT announcement, has impacted corporate policies of firms. For this analysis, we closely follow the approach used in Acharya, Eisert, Eufinger, and Hirsch (2015). In particular, we use a difference-in-differences framework to evaluate the performance and policies of borrowing firms in the post-OMT period. To measure the impact of the OMT program announcement, we construct a variable for each firm that captures its indirect benefits from the post-OMT value increase of the sovereign debt holdings of the banks it is associated with. We provide evidence that borrowers with higher indirect OMT windfall gains (that is, benefits were accrued via their banks) increased both their cash holdings and leverage by roughly the same amount, suggesting that they used the majority of cash inflow to build up cash reserves. Firms that received subsidized loans (zombie firms), on the other hand, are not able to increase cash and leverage by the same margin since these firms have to use the funds acquired through new loans, at least partially, to repay some other debts. Moreover, we do not find any changes in real economic activity: neither investment, employment, nor return on assets are significantly

affected by a firms' indirect OMT windfall gains.

To consistently estimate the real effects for borrowing firms, we include industry-country-year fixed effects to capture any time-varying shocks to an industry in a given country that may have affected the firms' credit demand, their access to credit, and/or their real outcomes. Moreover, if a firm borrows from a bank incorporated in a GIIPS country (GIIPS bank), we include foreign bank GIIPS country-year fixed effects, that is, a fixed effect for the GIIPS bank's country of incorporation. These fixed effects absorb any unobserved, time-varying heterogeneity that may arise because a firm's dependency on banks from a certain country might be influenced by whether this firm has business in the respective country. Consider as an example a German firm borrowing from a Spanish and a German bank. For this firm, we also include a Spain-year fixed effect to capture the firm's potential exposure to the economic downturn in Spain during the sovereign crisis. Furthermore, we control for unobserved, time-constant firm heterogeneity and observable time-varying firm characteristics that affect the firms' corporate policies, loan demand, and/or loan supply.

In a final step, we analyze whether the rise in zombie firms after the OMT announcement had an impact on non-zombie firms operating in the same industries. There are two potential channels through which non-zombie firms could be negatively affected. First, banks with zombie lending incentives might shift their loan supply to existing distressed borrowers, thereby crowding-out credit to productive creditworthy firms operating in the same industries. Second, zombie lending keeps distressed borrowers artificially alive, which congests the respective markets. The resulting distorting effects on healthy firms competing in the same industries include, for example, depressed product market prices and higher market wages. Building on the analysis of Caballero, Hoshi, and Kashyap (2008), we document that high-quality non-zombie firms indeed suffered from the presence of zombie firms in their industry: both their investment and employment growth rates were significantly lower if the fraction of zombie firms in their industry increased compared to high-quality non-zombie firms active in industries without a high prevalence of zombie firms. This finding highlights that the distorted market competition, induced by the misallocation of loan supply due to zombie lending, hampered real economic growth and thus significantly weakened the potentially positive impact of the OMT program's indirect bank recapitalization effect.

Therefore, our analysis provides evidence that central banks can indirectly recapitalize an undercapitalized banking sector by affecting the prices of assets that banks are holding on their balance sheets. However, it also highlights that central banks need to pay close attention to the magnitude of the gains that banks can realize from their intervention, and hence the amount of additional equity capital these banks are being provided. If the backdoor (indirect) bank recapitalization fails to adequately recapitalize (some) banks, zombie lending incentives may arise, which can have detrimental effects on employment,

investment, and growth in general.

Overall, the announcement of the OMT program probably averted an even fiercer economic downturn or even a break-up of the Eurozone. Our results suggest, however, that combining the OMT program with a targeted bank recapitalization program would presumably have led to superior outcomes in terms of economic growth. Given a well-capitalized European banking system, the increased loan supply would have been targeted mainly at the most productive firms and, without the market distortions due to zombie lending, the regained stability of the European banking system probably would have been fully transferred into economic growth.

2 Outright Monetary Transactions

In mid-2012 the anxiety about excessive national debt led to interest rates on Italian and Spanish government bonds that were considered unsustainable. From mid-2011 to mid-2012, the spreads of Italian and Spanish 10-year government bonds had increased by 200 and 250 basis points, respectively relative to German government bonds. As a result, yields on 10-year Italian and Spanish government bonds were more than 4 percentage points higher than yields on German government bonds in July 2012.

This significant increase in bond spreads of countries in the periphery of the Eurozone became a matter of great concern for the ECB as it endangered the monetary union as a whole. In response to the mounting crisis, ECB President Mario Draghi stated on July 26, 2012, during a conference in London: "Within our mandate, the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough." On August 2, 2012, the ECB announced it would undertake outright monetary transactions in secondary, sovereign bond markets. The technical details of these operations were unveiled on September 6, 2012.

To activate the OMT program towards a specific country, that is, buy a theoretically unlimited amount of government bonds with one to three years maturity in secondary markets, four conditions have to be met. First, the country must have received financial support from the European Stability Mechanism (ESM). Second, the government must comply with the reform efforts required by the respective ESM program. Third, the OMT program can only start if the country has regained complete access to private lending markets. Fourth, the country's government bond yields are higher than what can be justified by the fundamental economic data. In case the OMT program would be activated the ECB would reabsorb the liquidity pumped into the system by auctioning off an equal amount of one-week deposits at the ECB. By Summer 2015, the OMT program has still not been actually activated.

There is clear empirical evidence that the OMT announcement significantly lowered

sovereign bond spreads. For example, Szczerbowicz et al. (2012) find that the OMT measure lowered covered bond spreads and periphery sovereign yields. Altavilla, Giannone, and Lenza (2014), Krishnamurthy, Nagel, and Vissing-Jorgensen (2014), and Ferrando, Popov, and Udell (2015) reach a similar conclusion by showing that the OMT announcements led to a relative strong decrease for Italian and Spanish government bond yields (roughly 2 pp), while bond yields of the same maturity in Germany and France seem unaffected. Furthermore, Krishnamurthy, Nagel, and Vissing-Jorgensen (2014) investigate which channels led to the reduction in bond yields. The authors find that for Italy and Spain, a decrease in default and segmentation risks was the main factor in case of OMT, while there might have been a reduction in redenomination risk in the case of Spain and Portugal, but not for Italy. Finally, their paper shows that the announcement of the OMT measure led to large increases in stock prices in both distressed and core countries. Saka, Fuertes, and Kalotychou (2015) finds that the perceived commonality in default risk among peripheral and core Eurozone sovereigns increased after Draghi's "whatever-it-takes" announcement.

The higher demand for GIIPS bonds and, in turn, higher bond prices implied that banks were able to sell government bonds with a profit and bonds in the banks' trading book, which are marked to market, increased in value. Both improved the banks' equity position. For example, Italian-based UBI Banca states in its annual report of 2012:"The effects of the narrowing of the BTP/Bund spread entailed an improvement in the market value of debt instruments with a relative positive net impact on the fair value reserve of Euro 855 million [...]." Given UBI Banca's total equity of 8,608 million, this amounts to a gain of 9.9% of total equity. Consistent with this statement, Krishnamurthy, Nagel, and Vissing-Jorgensen (2014) and Acharya, Pierret, and Steffen (2015) document significantly positive effects on banks' equity prices after the OMT announcement.

Moreover, due to the lower sovereign bond spreads and the resulting positive effect on the banks' financial stability, investors regained faith in the banking sectors of the stressed countries. This improved the ability of banks from GIIPS countries to acquire funding from financial markets. For example, Spain-based BBVA noted in its annual report of 2012: "[...] as a result of new measures adopted by the ECB with the outright monetary transactions (OMT), the long-term funding markets have performed better, enabling top-level financial institutions like BBVA to resort to them on a recurring basis for the issue of both senior debt and covered bonds." Furthermore, since banks regularly use sovereign bonds as collateral, their access to private repo markets and ECB financing improved as well due to higher bond ratings and the resulting lower haircuts.

Hence, by substantially reducing sovereign yields, the OMT program improved the asset side, capitalization, and ability to access financing for banks with large GIIPS sovereign debt holdings, and thereby the financial stability of these banks. However, there is still no conclusive evidence about the impact of the regained financial stability of the

European banking sector, induced by the ECB's OMT program, on bank lending and the resulting effects for the real economy. To our knowledge, our paper and a concurrent paper by Ferrando, Popov, and Udell (2015) are the only papers that investigate the effects of OMT on extension of credit to European borrowers. Using survey data, Ferrando, Popov, and Udell (2015) find that after the announcement of OMT, less firms report that they are credit rationed and discouraged from applying for loans. While we also study the impact of the OMT announcement on bank lending, we additionally provide evidence for zombie lending behavior and analyze the consequence of the OMT announcement on the real economy.

3 Data

We use a novel hand-matched dataset that contains bank-firm relationships in Europe, along with detailed firm and bank-specific information. Information about bank-firm relationships are taken from Thomson Reuters LPC's DealScan, which provides a comprehensive coverage of the European syndicated loan market. In contrast to the U.S., bank financing is the key funding source for firms in our sample since only very few bonds are issued in Europe (Standard&Poor's, 2010). The sample includes all private firms from all EU countries for which Dealscan provides loan information and our sample period spans the fiscal years 2009-2014. Consistent with the literature (e.g., Sufi, 2007), all loans are aggregated to a bank's parent company.

We augment the data on bank-firm relationships with firm-level accounting data taken from Bureau van Dijk's Amadeus database. This database contains information about 19 million public and private companies from 34 countries, including all EU countries.[5] Since especially non-listed firms were affected by the lending contraction in the periphery due to their lack of alternative funding sources, we restrict our sample to private firms in Europe (see Acharya, Eisert, Eufinger, and Hirsch (2015)). This allow us to evaluate whether firms that were under severe stress during the peak of the sovereign debt crisis benefited from the OMT announcement.

Finally, we obtain information on bank as well as sovereign CDS spreads from Markit, bank equity and sovereign bond information from Datastream, bank level balance sheet data from SNL, and data on the sovereign debt holdings of banks from the EBA stress tests, transparency, and capital exercises. For banks to be included in the sample, they must act as lead arranger in the syndicated loan market during our sample period. We identify the lead arranger according to definitions provided by Standard & Poor's, which for the European loan market are stated in Standard & Poor's Guide to the European loan market (2010). Therefore, we classify a bank as a lead arranger if its role is either

[5]For a description of the process to match DealScan and Amadeus see Acharya, Eisert, Eufinger, and Hirsch (2015).

"mandated lead arranger", "mandated arranger", or "bookrunner". Moreover, the bank needs to be included in EBA stress tests and must have data about the sovereign bond holdings available prior to the OMT announcement (June 2012).

4 Results

4.1 Bank Health

We begin our empirical analysis by investigating the effect of the OMT announcement on the financial health of large European banks. We conduct an event study using CDS spreads that we compile from Markit. For the OMT announcement dates, we follow Krishnamurthy, Nagel, and Vissing-Jorgensen (2014) and analyze the events on July 26, 2012 ("whatever-it-takes" speech); August 2, 2012 (announcement of the OMT program; and September 6, 2012 (announcement of technical details).

In 2012, financial markets throughout Europe were characterized by tensions and high uncertainty. We account for these market conditions in our analysis by, first, using a 1-day event window in our event study.[6] By employing a narrow window around the OMT announcement dates, we are able to separate the effect of the OMT announcement from other events that may potentially influence financial bank health. Second, we follow the time-series event study approach of Krishnamurthy and Vissing-Jorgensen (2011), which compares the event announcement period (OMT in our case) to other periods of the same length without an event. The advantage of this approach is that it does account for the possibility that other events may arrive during the OMT announcement periods. In doing so the estimated standard errors are more conservative than standard errors from a more traditional cross sectional event study.

Results are presented in Panel A of Table 1. Column (1) reports results for time-series regressions of CDS spreads on a set of dummy variables for the three OMT announcement dates. We run separate regressions for the subset of GIIPS and non-GIIPS banks and report the mean of the sum over the three event dates. The CDS spread of the mean GIIPS bank decreased by -96bp over the three OMT announcement dates, while it decreased by -23bp for the average non-GIIPS bank.

To gauge the statistical significance, we conduct F-tests of the joint significance of the dummy variables in our time-series regressions. The F-test is reported in parenthesis below the mean and indicates that the CDS spreads on days with OMT announcements are jointly significantly different from zero for both subsets of banks. To gauge the difference in the magnitude of the announcement effects for the two subsets, we use a t-test for the difference in means. The test shows that the default risk of GIIPS banks

[6]Results from a 2- or 3-day event window are qualitatively and quantitatively similar.

decreased by a larger margin than the default risk of non-GIIPS banks.

We draw two main conclusions from this result. First, the OMT announcement led to an improvement of bank financial health for all European banks, that is, for GIIPS and non-GIIPS banks, as evidenced by a substantial decrease in CDS spreads. Second, the effect of the OMT announcement for GIIPS banks is about four times larger than the effect for non-GIIPS banks.

To analyze the large difference in the magnitude of the CDS return between non-GIIPS and GIIPS banks, we exploit information on EU sovereign debt holdings of banks directly. In particular, we use changes in sovereign bond prices, as well as information on sovereign debt holdings, to estimate the impact of the OMT program announcement on the value of the banks' sovereign debt holdings. Since a large fraction of these holdings are held in the banks' trading books, and are hence marked to market, an increase in their value translates into an equity capital gain for the banks. We call this variable the *OMT windfall gain*. Note that, while mainly GIIPS sovereign yields were affected by the OMT announcement, the sovereign yields of other countries were also affected (although to a lesser extent). To capture all sovereign debt holdings, our measure of *OMT windfall gain* is based on all EU sovereign debt holdings of a bank.

To compute the *OMT windfall gain*, we first compile data on the sovereign debt holdings of all sample banks at the closest date before July 26 (the first OMT announcement date) from the EBA webpage.[7] From Datastream, we obtain information on EU sovereign bonds prices, yields, and duration for various maturities. Second, we calculate the change in bond prices for all maturities around the three OMT announcement dates (July 26, August 2, and September 6) and sum these changes across the three announcement dates.[8] Third, we multiply the respective sovereign debt holdings outstanding before July 26 and the sum of the change in sovereign bond prices for each maturity and country with valid bond price information in Datastream. Finally, the total *OMT windfall gain* follows from summing the individual gains over all EU sovereign bonds in the banks portfolio. We report this gain on sovereign debt holdings as a fraction of a bank's total equity throughout, that is, we define the windfall gains of bank b in country j as:

$$OMT\ windfall\ gain_{bj} = \frac{\Delta\, Value\ EU\ Sov.\ Debt_{bj}}{Total\ Equity_{bj}}. \tag{1}$$

Note that, similar to Krishnamurthy, Nagel, and Vissing-Jorgensen (2014), we are only able to use sovereign yields from three out of the five GIIPS countries (Spain, Italy, and Portugal), since for Greece and Ireland information on yields is partially or completely missing. Since the majority of sovereign debt holdings of GIIPS banks is domestic, we

[7] Sovereign debt holdings are from June 2012.

[8] As a robustness check, we compute the change in bond prices by using the duration of a bond and the change in yield, where the change in yield is either computed from Datastream yields or taken from Krishnamurthy, Nagel, and Vissing-Jorgensen (2014). Results do not change.

are not able to calculate the *OMT windfall gain* for Greek and Irish banks in our sample, since we cannot derive the gain in value of their sovereign debt holdings.

Column (2) of Panel A in Table 1 reports the results for the *OMT windfall gain*, split by GIIPS and non-GIIPS banks. Both subsets of banks experienced significant windfall gains from the appreciation of value of their sovereign debt portfolio through the announcement of the OMT program. However, when testing the difference between the two subgroups, perhaps not surprisingly, GIIPS banks experienced significantly larger windfall gains compared to non-GIIPS banks as is evidenced by a t-value of 5.69. This significant difference is due to the fact that banks' sovereign banks holdings are biased towards their own domestic sovereign (e.g., Acharya and Steffen, 2014) and that GIIPS sovereign yields were most affected by the OMT announcement.

Column (3) of Panel A in Table 1 shows that the value of GIIPS sovereign bond holdings reported to the EBA right before the announcement of the OMT program as a fraction of total assets is roughly 10 times larger for GIIPS banks than for non-GIIPS banks (11.8% compared to 1%). Therefore, as mainly GIIPS sovereign debt appreciated in value in response to the OMT measure, GIIPS banks benefited much more from the OMT program than non-GIIPS banks. Consistent with this explanation, Figure 1, Panel A shows a clear negative relation between a bank's sovereign debt holdings and its CDS return around the OMT announcement. This relation is also present within the subsample of GIIPS banks, as shown by Figure 1, Panel B.

Panel B of Table 1 presents the evolution of the banks' book leverage ratio separately for GIIPS banks and non-GIIPS banks as well as for U.S. banks. We split GIIPS banks further into banks have an above median leverage ratio after the OMT announcement (still undercapitalized) and those with a below median leverage ratio (well-capitalized). Before the start of the financial and sovereign debt crisis, both well-capitalized and still undercapitalized GIIPS banks had lower leverage ratios than non-GIIPS banks. But while the leverage ratio decreased significantly over time for non-GIIPS banks, it increased dramatically (peaking in the year prior to the OMT announcement at 24.74) for GIIPS banks classified as still undercapitalized and slightly for well-capitalized GIIPS banks over the sovereign debt crisis period. While the the leverage ratio of weakly-capitalized GIIPS banks improved significantly (by around 15% in total) after the OMT announcement, they still remain highly levered after the announcement. Well-capitalized GIIPS banks, on the other hand, are back to their pre-crisis leverage ratio after the OMT announcement. A similar picture emerges when considering the quasi leverage of banks, defined as market value of equity plus the book value of debt divided by the market value of equity (see Panel C of Table 1).

Next, we provide detailed evidence on how much of the change in CDS spreads around the OMT announcements can be explained by banks' sovereign debt holdings and their resulting windfall gains. In particular, we regress the value of the GIIPS sovereign debt

holdings of banks and the *OMT windfall gain* on a bank's CDS return. We compute the change in CDS spread for each bank by summing CDS spread changes over the three OMT announcement dates.

Results are presented in Table 2. Panel A reports results for the value of the GIIPS sovereign debt holdings of banks. In all specifications, this variable has a significantly negative effect on a bank's CDS return, suggesting that banks indeed benefited through the increase in the value of their sovereign debt holdings (which is in line with the finding of Acharya, Pierret, and Steffen, 2015). Panel B of Table 2 documents a similar pattern for the *OMT windfall gain* variable.

To summarize, we find evidence which is consistent with the OMT announcement increasing the financial health of large banks in Europe. The effect is larger for GIIPS banks, which are the banks that had reduced their lending volume to the real sector during the sovereign debt crisis. We show that an important channel of the mechanism works through GIIPS sovereign debt holdings of banks.

4.2 Bank Lending

We now turn to the question of whether the increased health of periphery country banks with high GIIPS sovereign debt holdings led to an increase in loan supply in the quarters following the OMT announcement and if so which borrowers benefited the most. We employ the same methodology as Acharya, Eisert, Eufinger, and Hirsch (2015) to control for loan demand and other observed and unobserved changes in borrowing firm characteristics. In particular, we track the evolution of the lending volume from a specific bank to a certain firm cluster, which allows us to control for any observed and unobserved characteristics that are shared by firms in the same cluster and that might influence loan outcomes.

To this end, we form firm clusters based on the following three criteria, which capture important drivers of loan demand, as well as the quality of firms in our sample: (1) the country of incorporation; (2) the industry; and (3) the firm rating. The main reason for aggregating firms based on the first two criteria is that firms in a particular industry in a particular country probably share a lot of firm characteristics and were thus likely affected in a similar way by macroeconomic developments during our sample period. Our motivation behind forming clusters based on credit quality follows from theoretical research in which credit quality is an important source of variation driving a firm's loan demand (e.g., Diamond (1991)).

Since we focus on private borrowers, firms in our sample generally do not have a credit rating. To aggregate firms into clusters, we assign ratings estimated from interest coverage ratio medians for firms by rating category provided by Standard & Poor's. This approach exploits the fact that our measure of credit quality which is based on accounting

information is monotone across credit categories. We follow Standard & Poor's and assign ratings on the basis of the three-year median interest coverage ratio of each firm.

We start our empirical investigation by analyzing the supply of bank loans to private borrowers around the OMT announcement graphically. Figure 2 plots the log of the sum loans provided by banks that strongly benefited (above median *OMT windfall gain*) and banks that benefited less (below median *OMT windfall gain*) from the OMT announcement in a given quarter. Note that we measure the change in loan volume relative to the quarter of the OMT announcement, that is, the y-axis is normalized to zero at the time of the announcement in Q3 2012. Figure 2 documents a significant increase in loan supply by banks that strongly benefited from the OMT announcement to private borrowers after Q3 2012. In contrast, we do not see a similar increase in loan supply by banks that did not significantly benefit from the measure. Furthermore, the figure shows that, pre-OMT announcement, the bank loan supply by banks with a low *OMT windfall gain* is higher than that by banks with a high *OMT windfall gain* (which are mostly GIIPS banks), a result confirmed by previous studies (e.g., Acharya, Eisert, Eufinger, and Hirsch, 2015).

In the following we investigate both, whether high *OMT windfall gain* banks increase loan supply to existing borrowers (intensive margin) and whether they have a higher propensity to grant new loans to borrowers with which no relation existed in the period before the OMT announcement (extensive margin). Our preferred specification to estimate the quarterly change in loan volume provided by bank b in country j to firm cluster m in quarter t (intensive margin) is given by:

$$\begin{aligned} \Delta Volume_{bmjt+1} &= \beta_1 \cdot OMT\ windfall\ gain_{bj} * PostOMT \\ &+ \gamma \cdot X_{bjt} + Firm\ Cluster_m \cdot Quarter\text{-}Year_{t+1} \\ &+ Firm\ Cluster_m \cdot Bank_{bj} + u_{bmjt+1}, \end{aligned} \tag{2}$$

where *OMT windfall gain* is as defined in Eq. (1). Note that the firm clusters in this case only consist of firms that had a prior relation (before the OMT announcement) with a bank.

For the extensive margin our dependent variable is an indicator equal to one if the bank issued a new loan to a firm cluster to which no relation existed in the period prior to the OMT announcement. Our specification is given by:

$$\begin{aligned} NewLoan_{bmjt+1} &= \beta_1 \cdot OMT\ windfall\ gain_{bj} * PostOMT \\ &+ \gamma \cdot X_{bjt} + Firm\ Cluster_m \cdot Quarter\text{-}Year_{t+1} \\ &+ Firm\ Cluster_m \cdot Bank_{bj} + u_{bmjt+1}. \end{aligned} \tag{3}$$

Here firm clusters consist of firms with no prior relation (before the OMT announcement) with a bank. We present the results of our empirical analysis in Table 3. As before, we

use a bank's windfall gain on its sovereign debt portfolio from the OMT announcement to proxy how much the bank benefited from the OMT program. Therefore, our main variable of interest is *OMT windfall gain* interacted with a dummy variable *PostOMT*, which is equal to one when the quarter falls into the period after the OMT announcement. The results in Panel A show that banks with higher windfall gains from the OMT announcement significantly increased their supply of bank loans to existing private borrowers (intensive margin) after the OMT announcement across all specifications, which control for different sets of fixed effects. When we include bank and quarter-year fixed effects in our regression, the coefficient on the interaction between *OMT windfall gain* and *PostOMT* is positive and significant, as shown in Column (1).

This result continues to hold if we interact firm-cluster and bank fixed effects. By doing this, we exploit the variation within the same firm-cluster-bank relationship over time. This controls for any unobserved characteristics that are shared by firms in the same cluster, bank heterogeneity, and for relationships between firms in a given cluster and the respective bank. The results of this specification are presented in Column (2). The interaction between *OMT windfall gain* and *PostOMT* remains positive and significant. Finally, in the results reported in Columns (3) and (4), we add firm-cluster-time fixed effects, which allow us to additionally control for any time observed and unobserved time-varying characteristics that are shared by firms in the same cluster.

To further test the robustness of these results, we follow Peek and Rosengreen (2005) and Giannetti and Simonov (2013) and employ the probability of a loan increase instead of the change in the loan amount as the dependent variable in our regression analysis. Results in Column (5) of Table 3 confirm that our result is invariant to using this alternative measure of lending supply expansion. Finally, Column (6) of Table 3 estimates the regression when we restrict our sample to GIIPS banks. Recall that, in particular, GIIPS banks hold large GIIPS sovereign debt holdings, which implies that especially these banks benefited from the OMT program announcement. The significant coefficient in Column (6) shows that also within the subsample of GIIPS banks, those banks with higher windfall gains increased lending to private borrowers more than GIIPS banks with lower windfall gains.

Conversely, Panel C of Table 3 shows that there is no significant relation between a bank's OMT windfall gains and its propensity to issue a new loan to a group of borrowers it had no prior relationship with. These results suggest that only existing borrowers benefited from the loan supply increase induced by the OMT Program. As a robustness check, we replace *OMT windfall gain* in the above regression with a bank's *CDS return* on the OMT announcement dates. This allows us to determine the extent to which banks benefited from the OMT announcement with market price reactions and thus the perceived change in bank credit risk in the market. Results are presented in Table A1 in the online appendix. Panel A and B show that all results continue to hold qualitatively

and quantitatively using this alternative measure.

We now turn to analyzing which type of borrowers benefited most from an increased lending volume in the period after the announcement of the OMT program. We identify a low-quality (high-quality) borrower as a borrower with a below (above) country median 3-year average interest coverage ratio in the crisis years 2009 to 2011. The general picture that emerges from Panel B in Table 3 is that the increase in loan volume (at the intensive margin) in the period after the OMT announcement is entirely driven by low-quality borrowers since only the triple interaction term of OMT windfall gains, post-OMT, and low-quality is significantly positive.

An explanation for this result is that in many cases borrowers with a below country median average interest coverage ratio based on the 2009 to 2011 period are precisely those borrowers that had close borrowing relationships with GIIPS banks in the past. Acharya, Eisert, Eufinger, and Hirsch (2015) show that, while not being less healthy before the outbreak of the European sovereign debt crisis (i.e., there was no systematic relation between firm quality and whether a firm borrowed from GIIPS banks prior to the sovereign debt crisis), firms that were very dependent on GIIPS banks became financially constrained during the sovereign debt crisis. This is due to the fact that GIIPS banks were weakly-capitalized and decreased lending to the private sector. Since bank-borrower relationships are sticky (Chodorow-Reich (2014)), and private firms are less able to utilize alternative funding sources, these borrowers were stuck with weakly-capitalized banks. This implies that they got under stress themselves and as a result their interest coverage ratios decreased, as shown by Figure 6, Panel A. Panel D of Table 3 again confirms that there are no significant loan supply effects at the extensive margin, even if we split the firms according to their quality. Panels C and D of Table A1 show that these results continue to hold if we use the *CDS return* on the OMT announcement dates instead of the *OMT windfall gains*.

Given this evidence that only low quality borrower benefited at the intensive margin, we next explore whether banks' lending behavior can be explained by loan evergreening (zombie lending). In particular, weakly-capitalized banks have an incentive to roll over existing loans to distressed borrowers or even increase the lending volume to these borrowers to avoid having to write down outstanding loans, which would mean that banks have to realize large losses and thus dramatically worsen their situation. Indeed, anecdotal evidence suggests that concerns over their balance sheet prevented banks from restructuring their loan portfolio. An economist from a major bank said in this context: "In Spain, Ireland, Portugal and Greece, banks have been reluctant to pull the plug on companies as it would have forced them to crystallise heavy losses".[9]

To detect zombie firms, we follow the approach in Caballero, Hoshi, and Kashyap

[9] "Companies: The rise of the zombie" by Michael Stothard, Financial Times, January 8, 2013.

(2008) and Giannetti and Simonov (2013), which is based on whether firms obtain subsidized credit from their banks. A firm is considered to receive subsidized credit (i.e., a loan at a very advantageous interest rate) if in a given year the actual interest expenses paid by the firm is below the interest expense paid by the most creditworthy firms in the economy. To this end, we use the interest rate paid by public firms incorporated in non-GIIPS countries with a AAA rating (inferred from EBIT interest coverage ratios) as benchmark interest rate to derive the interest rate expense benchmark. In what follows we use r for interest rates and R for interest expenses.

We argue that this is a reasonable choice for an advantageous interest expense benchmark because these firms are the most creditworthy firms in our sample. Public, non-GIIPS firms were among the least affected firms by the sovereign debt crisis, since they were less strongly affected by the macroeconomic downturn in the periphery and were also able to substitute a potential lack of bank financing with other sources of funding. By calculating benchmark interest rates from public firms we further reduce the risk of misclassifying private firms as zombies because Saunders and Steffen (2011) document that public firms pay lower spreads than otherwise similar private firms, suggesting that there is a cost of being a private firm.

We use information from two different sources to calculate interest rate benchmarks. The first approach is directly based on loan information from Dealscan (in what follows denoted with the index D). To calculate interest rate benchmarks, we first compute the median interest rate on newly issued loans in a given year paid by public firms incorporated in non-GIIPS countries with a AAA rating (inferred from EBIT interest coverage ratios). This approach has the advantage that we know the maturity of the loans and can thus calculate the benchmark interest rate based on two different maturity buckets m. To be even more conservative, we use the minimum of this measure over the last 5 years, that is, we assume that the firm receives new credit when interest rates are most favorable to the firm. This yields two benchmark interest rates (short and long term) r^D_{tm}. Given this interest rate benchmark, we calculate the minimum required interest payment of private firm i in country j and industry h in year t, $R^{D^*}_{ijht}$, as $\sum_m r^D_{tm} \cdot Debt_{ijhtm}$, (where we split a firm's total debt $Debt_{ijht}$ into short and long term maturity).

The second approach to calculate the benchmark interest rate is based on information obtained from Amadeus (in what follows denoted with the index A). More precisely, Amadeus reports the total interest payments of firm i in country j and industry h in year t, R_{ijht}, as well as total outstanding debt, $Debt_{ijht}$. Therefore, the average interest rate paid by firm i can be calculated by dividing R_{ijht} by $Debt_{ijht}$. However, with the data from Amadeus, we are not able to distinguish between the interest paid on different maturities. Hence, we divide firms into two groups, based on their reliance on short and long term debt. The benchmark rate for private firms that rely mostly on short (long)

term debt is then derived from AAA rated public firms with a similar short (long) term debt structure. In particular, the interest rate benchmark, r^A_{tm}, is calculated using the median interest rate paid by public firms incorporated in non-GIIPS countries with a AAA rating (inferred from EBIT interest coverage ratios) in a given year, split according to their reliance on short versus long-term debt. Given this interest rate benchmark, we calculate the minimum required interest payment of private firm i in country j and industry h in year t, $R^{A^*}_{ijht}$, as $r^A_{tm} \cdot Debt_{ijht}$, where we also split the private firms into two groups based on their reliance on short versus long-term debt. Figure 3 plots the evolution of the benchmark interest rates calculated from Dealscan and Amadeus over time and across maturities, as well as the median interest payment of zombie firms.

We then compare the actual interest payments of our low-quality private firms with the two hypothetical interest payments to calculate the interest expense gap:

$$x^{n^*}_{ijht} = R_{ijht} - R^{n^*}_{ijht} \tag{4}$$

where $n \in \{D, A\}$. Ideally, we would like to compare the firms' interest expense in Dealscan to the benchmark derived from Dealscan. However, Dealscan contains information only at the time of the origination of the loan, which does not allow us to observe changes over time for a particular loan. Moreover, the spread information is missing for more than 50% of our Dealscan sample of low-quality private firms. Therefore, we compare both benchmark interest expenses (from Dealscan and Amadeus) to the interest expense information of low-quality private firms from Amadeus.

Given $x^{n^*}_{ijht}$, a private firm is classified as zombie if it meets the following three criteria: (i) x^{n*}_{ijht} is negative, (ii) its rating (derived from three year median EBIT interest coverage ratios) is BB or lower, and (iii) the syndicate composition has either remained constant, or banks leaving the syndicate without being replaced by new participants, that is, the same syndicate has already provided a loan to the firm.[10] By imposing the second criterion on zombie firms, we reduce the risk of misclassifying high-quality private borrower as zombies because these firms may pay low interest rates on their debt for reasons unrelated to zombie lending. By requiring zombies to fulfill the last criterion, we ensure that all banks involved have zombie lending incentives, that is, all banks should have a stake in the company from a prior loan and be negatively affected in case the firm defaults on the loan.

However, one potential concern is that only weak banks leave the syndicate. If this is true, then we would potentially misclassify zombie firms because a negative $x^{n^*}_{ijht}$ could also be explained by relationship lending of strong banks. In this argument, banks provide subsidized credit (criterion (i)) to weak firms (criterion (ii)) because they have better information about the future health of the borrower due to a long standing relationship.

[10]Given that (i) and (ii) are satisfied, (iii) holds in 95% of the cases.

To test whether the remaining banks have zombie lending or relationship lending incentives, we compare the quality of banks remaining in the syndicate to banks that leave the syndicate. If the banks leaving the syndicate are of lower (higher) quality compared to the banks remaining in the syndicate, we would interpret this as evidence consistent with zombie (relationship) lending.

The results of the comparison are provided in Panel A (for the zombie definition based on interest rate benchmarks derived from Amadeus) and Panel B (for the zombie definition based on interest rate benchmarks derived from Dealscan) of Table 5. The results indeed show for both alternative zombie classifications that the banks leaving the syndicate have a higher equity ratio and are therefore of higher quality which is consistent with healthier banks not wanting to participate in zombie lending activities.

Figure 4 plots the asset-weighted fraction of zombie firms in our sample over time for the zombie definition based on the Amadeus or the Dealscan benchmark interest rates, respectively. The figure clearly shows that in the post-OMT period, the fraction of firms that received loans with an interest rate below the lower bound increased significantly. Table 5 presents a breakdown of the number of zombie firms by country. The table documents that the zombie problem is particularly severe in the periphery of Europe, with Spain and Italy having around 16.3% - 20.3% of zombie firms. Germany, France and the UK on the other hand only have between 3.4% and 10% of zombie firms. Importantly, the zombie breakdown by country, and thus the firms that we classify as zombies is very stable across the two zombie definitions which are based on alternative benchmark interest rates. The country breakdown is also in line with anecdotal evidence from the financial press which stated that "the zombie problem is chiefly focused in the peripheries of Europe rather than the core".[11]

Table 6, Column 4 presents the results for the comparison of zombie firms to other below median quality firms. Zombie firms have significantly lower net worth and EBITDA/Assets ratio as well as higher leverage. More importantly, zombie firms only have an interest coverage ratio of 0.39 or 0.40 (depending on the benchmark) as opposed to 1.18 for other low-quality firms, suggesting that they are unable to cover their current interest payments from the earnings generated. Taken together, these results show that within in the group of low-quality firms, zombie firms are significantly worse than non-zombie firms.

To formally test whether some high windfall gain banks engaged in zombie lending, even after the backdoor recapitalization induced by OMT, we follow the literature on bank recapitalization to identify banks that might have particularly strong zombie lending incentives. Diamond and Rajan (2000) argue that a key pitfall of bank recapitalization is the failure to recapitalize banks adequately, that is banks might still be undercapitalized after a recapitalization. If the amount of the recapitalization is inadequate to fully re-

[11] "Companies: The rise of the zombie" by Michael Stothard, Financial Times, January 8, 2013.

store banks health it can incentivize banks to extent new loans to insolvent firms that would need to be restructured. Giannetti and Simonov (2013) confirm this mechanism empirically for Japan. Indeed, there is some evidence that at least some banks are not adequately capitalized after the OMT announcement because equity capital is too low to absorb losses that would entail from a sustained period of stress (Haldane (2012); Acharya and Steffen (2013)). In the following we want to shed light on whether this mechanism was also present in the period after the OMT announcement.

To identify still undercapitalized banks we split banks into two groups (above and below median) based on their leverage ratio after the OMT announcement. We call a bank *Still Undercapitalized* if its leverage ratio exceeds the sample median after the OMT announcement.

We start by investigating graphically whether GIIPS banks that still remain undercapitalized after the OMT announcement increase the fraction of zombie loans compared to GIIPS banks that are well-capitalized. As can be seen from Figure 5, Panel A, ex post undercapitalized GIIPS banks show a very strong increase in their zombie loan volume, relative to the total loan volume. Conversely, well-capitalized GIIPS banks significantly decrease the zombie loan volume in their loan book after the OMT announcement. In a next step we split GIIPS banks into two subgroups: Italian vs Spanish/Portuguese banks.[12] Figure 5, Panel B and C show that while both Italian as well as Spanish/Portuguese banks that still remain undercapitalized show an increase in the fraction of zombie loan volume, the increase is much more pronounced in Italy than in Spain and Portugal.

We thus estimate the following regression:

$$\begin{aligned}
\Delta Volume_{bmjt+1} &= \beta_1 \cdot OMT\ windfall\ gain_{bj} * PostOMT \\
&+ \beta_2 \cdot OMT\ windfall\ gain_{bj} * PostOMT * Still\ Undercap_{bj} \\
&+ \beta_3 \cdot OMT\ windfall\ gain_{bj} * PostOMT * Zombie_{mt} \\
&+ \beta_4 \cdot OMT\ windfall\ gain_{bj} * PostOMT * Zombie_{mt} \\
&* Still\ Undercap_{bj} \\
&+ \gamma \cdot X_{bjt} + Firm\ Cluster_m \cdot Quarter\text{-}Year_{t+1} \\
&+ Firm\ Cluster_m \cdot Bank_{bj} + u_{bmjt+1}. \qquad (5)
\end{aligned}$$

Note that we control for all other pairwise and triple interaction terms. The results for the zombie lending test are presented in Table 7.[13] In addition to the criteria used to form firm clusters in Section 4.2, in this part of the analysis we add the criterion whether

[12]Note that due the fact that only two Spanish banks still remain undercapitalized after the OMT announcement, we cannot investigate their lending behavior separately and thus have to combine them for this analysis with Portuguese banks to achieve enough cross-sectional variation.

[13]For the zombie lending analysis we only report results at the intensive margin, since one of the criteria for classifying a firm as zombie is that it had a prior relation to all banks involved in the loan.

firms are classified as zombie or not: Thus, in this section we form firm clusters based on the following four criteria: (1) the country of incorporation; (2) the industry; (3) the firm rating; and (4) whether the firm is a zombie. Note, that this implies that we end up having more firm clusters than in the previous analysis.

Several results are noteworthy. First, high OMT windfall gain banks that are well-capitalized increase the loan supply to corporate borrowers in the post-OMT announcement period, but significantly decrease their zombie lending activity. Based on the specification in Column (4) of Panel A a one standard deviation higher OMT windfall gains, implies an increase in loan supply by 2.5%. Banks that still remain undercapitalized, however, show no significant increase in their loan supply to private borrowers in Europe. These banks only increase the loan supply to zombie firms. Based on the coefficients reported in Table 7, Column (4), a one standard deviation higher OMT windfall gain implies a 1.1% increase in loan supply to zombie firms. We find similar results when we replace the change in loan volume with a dummy for whether the loan amount to a cluster actually increased or restricting the analysis is restricted to GIIPS banks (Column (6)).[14]

Finally, we investigate whether we find the same pattern (i.e., well-capitalized banks increase loan volume to non-zombie firms and cut lending to zombie firms; still undercapitalized banks increase lending to zombie firms, but do not increase lending to non-zombie firms) in both subsamples of GIIPS banks (i.e., Spanish/Portuguese and Italian banks). Results for Spain and Portugal are presented in Column (7), whereas results for Italy are presented in Column (8). In line with the suggestive evidence of Figure 5, we find the increase in the zombie lending volume to be more significant (both statistically and economically) in Italy than in Spain and Portugal.

In sum, while the OMT program has led to a significant recapitalization of the European banking sector, our results are consistent with the notion that the equity capital gains for some banks were indeed too small to allow them to write off loans from very poorly performing firms. To prevent incurring the losses from non-performing loans, these banks continued to lend to zombie firms.

4.3 Real and Financial outcomes

Given the evidence from the previous section that banks with higher windfall gains from the OMT announcement significantly increased their lending volume to the real sector, we now investigate how firms use this cash inflow from new loans. To analyze the real and financial outcomes of borrowing firms, we closely follow the approach in Acharya, Eisert, Eufinger, and Hirsch (2015) and divide the financial information reported in Amadeus into the period before the OMT program announcement (i.e., fiscal years 2009

[14]Table A2 shows the robustness of these results when using *CDS Returns* instead of *OMT windfall gains*.

to 2011) and the period after the OMT program announcement (i.e., fiscal years 2012, 2013, and 2014). We construct a new indicator variable, *PostOMT*, which is now equal to one if the financial information reported in Amadeus falls in the post-OMT period.

To determine how much firms benefited from the OMT announcement through their banking relationships, we construct a variable that measures how much firms gained indirectly from the OMT announcement through the sovereign debt holdings of their banks. We denote this variable as *Indirect OMT windfall gain*. To construct the variable, in a first step, we use the *OMT windfall gain* of each individual bank, as defined in Eq. (1), to compute the *Average OMT windfall gain* for all the banks that act as lead arranger in a given syndicate. Second, we calculate the indirect gains of a firm from the OMT program due to the windfall gains of the banks it has lending relationships with by using the fraction of syndicated loans a bank gets from a particular syndicate as weights. This yields the following measure for firm i in country j in industry h at time t:

$$\textit{Indirect OMT windfall gains}_{ijht} = \frac{\sum_{l \in L_{ijht}} \textit{Average OMT windfall gain}_{lijh} \cdot \textit{Loan Amount}_{lijht}}{\textit{Total Loan Amount}_{ijht}}, \quad (6)$$

where L_{ijht} are all of the firm's loans outstanding at time t. We measure the dependence on banks that benefited from the OMT announcement as the average dependence on these banks over the 2009-2011 period.[15]

Table 4 presents descriptive statistics for our sample firms in the pre-OMT period of 2009-2011, split into firms with high and low indirect gains on sovereign debt through their banks. Consistent with (Acharya, Eisert, Eufinger, and Hirsch (2015)), firms with a higher dependence on banks that benefited from the OMT announcement are larger and have a higher fraction of tangible assets. However, note that, while in the pre-crisis period of 2006-2008 firms in the two groups were comparable along all other observable dimensions, in the pre-OMT period of 2009-2011 firms with a higher dependence on banks that benefited from OMT (i.e., banks that were cutting lending significantly more during the peak of the crisis), have a lower interest coverage ratio, net worth and EBITDA/Assets ratio. This indicates that the quality of these firms deteriorated over the crisis period due to the fact that these firms could not access bank financing in this period.

We use five different proxies for the financial and corporate policies of firms. In particular, we use changes in cash holdings $((cash_{t+1} - cash_t)/total\ assets_t)$ or leverage $((total\ liabilities_{t+1} - total\ liabilities_t)/total\ assets_t)$ to proxy for the change in financial policies of firms. To analyze non-financial firm policies, we consider employment growth (Δlog *Employment*), investment ($CAPX/Tangible\ Assets$), and the return on asset (ROA).

We begin by exploring the effect of the sovereign debt crisis on several firm outcomes

[15]Results are qualitatively similar when using the 2006-2008 average.

graphically.[16] In Figures 6 and 7, we plot the time series of the cash holdings, leverage, employment growth rates, investment levels, and ROA, respectively, for firms with a high and low *Indirect OMT windfall gains*. The figures show that, while the trend before the start of the European debt crisis was similar across all firms, firms with a high dependence on banks that benefited from the OMT announcement (which are mostly GIIPS banks) incurred larger negative real effects during the crisis. Moreover, the figures shows that after the OMT announcement firms with high *Indirect OMT windfall gains* show a significant increase in leverage and cash holdings, whereas firms with low *Indirect OMT windfall gains* did not change their cash and leverage policies significantly. It is interesting to note that for firms with high *Indirect OMT windfall gains* cash and leverage increased by roughly the same amount, suggesting that these firms used the cash inflow from new loans primarily to build up cash reserves roughly to the same levels they had before the start of the European debt crisis. Finally, none of the two firm groups shows a significant change in their investment level, employment growth rate, or return on assets after the OMT announcement. This first evidence indicates that the additional loan supply acquired by firms with lending relationships to banks that strongly benefited from the OMT announcement was not used for productive purposes and instead translated into liquidity reserves.

To formally investigate whether borrowing firms with significant business relationships to banks that benefited from the OMT announcement altered their corporate policies, we employ the following specification for firm i in country j, and industry h in year t:

$$\begin{aligned} y_{ijht+1} &= \beta_1 \cdot \textit{Indirect OMT windfall gains}_{ijh} \cdot \textit{PostOMT}_t \\ &+ \gamma \cdot X_{ijht} + \textit{Firm}_{ijh} + \textit{Industry}_h \cdot \textit{Country}_j \cdot \textit{Year}_{t+1} + u_{ijht+1} \\ &+ \textit{ForeignGIIPSBankCountry}_{k \neq j} \cdot \textit{Year}_{t+1}. \end{aligned} \tag{7}$$

Our baseline regression includes firm and year fixed effects, as well as firm-level control variables to capture other determinants of firms' corporate policies. These include firm size, leverage, net worth, the fraction of tangible assets, the interest coverage ratio, and the ratio of EBITDA to total assets. Additionally, we include interactions between industry, year, and country fixed effects to capture any unobserved time-varying shocks to an industry in a given country in a given year that may impact credit demand of borrowing firms as well as their real outcomes.

We observe a number of cross boarder firm-bank relationships in our sample. For example, a German firm borrowing from a Spanish bank. To capture possible effects that the German firm's exposure to the potentially changing macroeconomic environment in Spain after the OMT announcement that might be correlated with its dependence on

[16]Note that we control for observable firm characteristics such as industry, country, and size in the figures.

a Spanish bank (e.g., because the German firm has a subsidiary in Spain), we include foreign GIIPS bank country times year fixed effects. For the example of the German firm with a Spanish subsidiary, besides the industry-country-year fixed effect, we additionally include a Spain-year fixed for this firm.

Results are presented in Table 8. The unit of observation is a firm-year. For ease of exposure, we only report the results for our key variable of interest, the interaction of *Indirect OMT windfall gains* with the *PostOMT* dummy. The results in Table 8 show distinct patterns for the behavior of financial and real variables after the OMT program announcement. For the financial variables, we find a significant increase in both cash and leverage. Note that the difference of the coefficients for the change in cash and change in leverage regressions is small and statistically insignificant (see Column (3)). This result suggests that both leverage and cash holdings increased by a similar amount, implying that firms used the liquidity inflow primarily to increase their cash reserves. More precisely, a one standard deviation increase in *Indirect OMT windfall gains* implies an increase in cash and leverage of around 1.9pp.

This result is further confirmed by the fact that we do not find any significant effects for the real variables. Neither employment nor investment or ROA change significantly for firms with high *Indirect OMT windfall gains* in the period after the OMT announcement. Hence, the primary objective of these firms seems to be to regain financial stability, i.e., to increase their cash reserves and reach the pre-crisis cash level again.

Recall, that Panel B of Table 3 reports that primarily low-quality firms benefited from the expansion in loan volume induced by the increase in value of the sovereign debt holdings in the period following the OMT program announcement. We now provide evidence on the relation between real effects and the *Indirect OMT windfall gains* of these firms. Panel B of Table 8 presents the results for our baseline regressions for the five different corporate policies of firms (i.e., change in cash, change in debt, employment growth, investment, and return on assets), split based on the firms' quality. Again, we classify firms based on their average interest coverage ratio during the sovereign debt crisis (2009 to 2011).

The general picture that emerges from the table is that the financial effects reported in Panel B of Table 8 for our entire sample of firms is driven mostly by the low interest coverage subgroup of firms, while neither high- nor low-quality firms show a significant relation between *Indirect OMT windfall gains* of their banks and real economic activity like employment and investment.

In contrast, Panels C and D of Table 8 documents that zombie firms do not use the entire funds from their new bank loans to build up cash reserves. For these firms, leverage increases significantly more than cash holdings. A potential explanation could be that firms need the proceeds from newly received loans to service interest rate payments on their existing loans. Note, that this is consistent with the observation, that zombie firms

only have an interest coverage ratio of 0.39-0.40, implying that they are unable to service interest payments from earnings. The Financial Times wrote on this topic that "The concern is that these companies - which spend so much of their cash servicing interest payments that they are unable to invest in new equipment or future growth areas - could be at least partly to blame for the weak recovery in Europe, hogging resources that could go to more productive areas".[17]. This is also consistent with the fact that for these firms there are no significant effects on either employment or investment.[18] These firms thus show the typical behavior of zombie firms (Giannetti and Simonov (2013)). Moreover the quote suggests that the presence of zombie firms might have contagious spillover effects on healthy firms, which are cut off from lending as loans go to zombie firms instead. Thus, the next section will investigate whether the presence of zombie firms leads to distortions for healthy firms operating in the same industry as the zombie firms.

4.4 Zombie Distortions

In a final step, we investigate whether the rising fraction of zombie firms had negative effects on healthy (non-zombie) firms competing in the same industries. There are two potential channels through which non-zombie firms that operate in the same industries as zombie firms could be negatively affected by the prevalence of zombies. First, banks with incentives to evergreen outstanding loans might shift their loan supply to existing borrowers that struggle to service their debt. This might lead to a reduction in loan supply for productive creditworthy firms operating in the same industries, which makes these firms potentially more financially constrained than firms in industries without such loan supply distortions. Second, the prevalence of zombie firms might lead to distorted market competition, which also negatively affects non-zombie firms competing in the same industries. The normal competitive outcome would be that impaired firms shed workers and lose market share. However, subsidized loans extended by still undercapitalized banks kept distressed borrowers artificially alive, which congests the respective markets. The resulting distorting effects on healthy firms competing in the same industries include, for example, depressing product market prices and raising market wages by hanging on to the workers whose productivity at the current firms declined. Due to these two channels, we expect that a high prevalence of congesting zombie firms in a particular industry resulted in larger distortions for healthy firms and thus a less vigorous recovery in this industry compared to industries with a low fraction of zombie firms (see also Caballero, Hoshi, and Kashyap (2008)).

[17]Financial Times: Companies: The Rise of the Zombie, January 8th, 2013

[18]All results are depicted graphically in Figures 8 and 9, where we plot the time series of the asset-weighted cash holdings, leverage, employment growth rates, investment levels, and ROA respectively, for high quality firms, low quality non-zombie firms, as well as zombie firms, respectively. Note, that we only consider firms with a high dependence on banks that benefited from the OMT announcement.

The basic regression we will run in this section follows Caballero, Hoshi, and Kashyap (2008) and is given by:

$$\begin{aligned} y_{ijht+1} &= \beta_1 \cdot \textit{Non-Zombie}_{ijht} + \beta_2 \cdot \textit{Non-Zombie}_{ijht} \cdot \textit{Fraction Zombies}_{jht} \\ &+ \beta_3 \cdot \textit{Non-Zombie}_{ijht} \cdot \textit{Fraction Zombies}_{jht} \cdot \textit{High IC Firm}_{ijht} \\ &+ \gamma \cdot X_{ijht} + \textit{Firm}_{ijh} + \textit{Industry}_h \cdot \textit{Country}_j \cdot \textit{Year}_{t+1} + u_{ijht+1}, \end{aligned} \tag{8}$$

where $\textit{Fraction Zombies}_{jht}$ measures the fraction of zombies in industry h in country j at time t.[19]

We will focus our analysis on real outcomes at the firm level, that is, the dependent variables are the interest rate paid, employment growth, investment, and productivity. In particular, if the prevalence of zombies firms in a particular industry is very high, it is very likely that many banks that act as capital supplier to this industry shifted their attention to zombie firms. Hence, we expect that non-zombie firms active in this industry have to pay higher interest rates to still be able to access bank financing. Moreover, due to the resulting financial constraints and the distorted market competition, firms competing in industries with a high prevalence of zombie firms should have a lower employment growth and lower investments compared to firms in industries with only a few zombie firms. Finally, high-quality non-zombie firms operating in high fraction zombie industries should have had a higher average productivity. As argued by Caballero, Hoshi, and Kashyap (2008), due to the competition distortions, these firms had to cut back their business more strongly in terms of projects and investments. Since firms primarily reduce investments in projects with a low productivity, the average productivity of their projects should have increased.

Therefore, our coefficients of interest are β_2 and β_3, that is, whether non-zombie firms, and especially high-quality non-zombie firms, pay higher interest rates, invest less, have lower employment growth, or a higher average productivity due to the presence of zombie firms in their industry. In our preferred specification, we include again firm, and industry-country-year fixed effects. The latter alleviate concerns that the fraction of zombie firms in the industry in a given a country and year is a proxy for the overall (un)attractiveness of operating in the industry (for that year). Note, however, that even without industry-country-year fixed effects, non-zombie firms would have to be more affected by a industry-specific macroeconomic downturn than zombie firms in order to get a significant effect of being a non-zombie on interest rates, investment, employment, or productivity.

Results for this specification are presented in Table 9. The results of the regression

[19]We use the universe of very large Amadeus firms to calculate the industry fraction of zombie firms. This implies that we have to drop the criterion regarding the syndicate composition for our zombie definition.

analysis in the table show that low-quality non-zombie firms that operate in industries with a high zombie fraction do not pay higher interest rates, invest less, or have lower employment growth rates (β_2 is insignificant throughout all specifications). High-quality non-zombie firms, however, pay higher interest rates, invest significantly less, and also have significantly lower employment growth rates if they operate in industries with many zombie firms (β_3 is significant throughout all specifications) compared to firms in industries with a low prevalence of zombie firms. This is consistent with our predictions and with our previous results, which show that mostly low-quality borrowers benefited from the loan supply increase. While also non-zombie low-quality firms received additional loans, these firms mostly used the proceeds to build up cash reserves. If regaining financial stability was indeed their primary objective, it seems plausible that these firms would not have used the loan proceeds to invest or hire people if there were less zombies in their industry. High-quality firms, however, which did not benefit from the loan supply increase (instead they even had to pay higher interest rates), suffer from the presence of zombie firms in their industry. For these firms, investment levels are significantly depressed if they operate in industries with a significant fraction of zombie firms. On average, the fraction of zombie firms increased by 8.9% after OMT. Considering the estimates in Columns (2) and (4), this implies that high-quality non-zombie firms invest between 11.6% and 13.3% of capital less compared to a scenario where the fraction of zombies had stayed at its pre-OMT level. An industry at the 95th percentile saw an increase of zombie firms of 30%, implying that high-quality non-zombie firms invested between 39% and 44% of capital less due to the increase in the fraction of zombie firms. When looking at employment growth, we find that firms that saw an increase of 8.9% in the fraction of zombie firms in their industry had 3.6% to 4.4% lower employment growth rates. Considering again the 90th percentile, we find that high-quality non-zombie firms in this industry had 12% to 15% lower employment growth rates.

Finally, to ensure that the negative effects on healthy firms that are active in industries with a high zombie firm prevalence was indeed caused by distorted market competition, we analyze whether these negative effects were more intense for healthy firms in competitive industries. In particular, the prevalence of zombie firms should not strongly affect non-zombie firms in a non-competitive industry, because these firms are generally not very affected by the behavior of firms in the same industry. Hence, whether impaired firms downsized their business or whether zombie lending kept these firms afloat and thereby prevented an adjustment process should not have significantly affected the behavior and performance of healthy firms when these firms were active in a non-competitive industry.

Table 10 presents the results for this test. First, the results show that, due to a loan supply shift to zombie firms, all high-quality non-zombie firms had to pay higher interest rates if the prevalence of zombie firms in their industry was particularly high, irrespective of whether the industry is competitive or not. However, only high-quality

non-zombie firms that operate in competitive industries with many zombie firms were significantly negatively affected (i.e, lower investments and employment growth), while high-quality non-zombie firms in non-competitive industries did not suffer real effects due to the presence of zombie firms in their industries. Again low-quality non-zombie firms are not negatively affected by the presence of zombie firms in their industries, irrespective of whether the industry is competitive or not. These results suggest that indeed high-quality firms suffer real effects caused by distortions of competitive forces that are due to zombie lending to their industries.

5 Conclusion

In this paper, we show that the announcement of the OMT program has significantly improved the health of banks in the periphery of Europe. By substantially reducing the yields on periphery sovereign debt, GIIPS banks could realize significant windfall gains on their large sovereign debt holdings. These gains significantly reduced bank risk and allowed banks to access market based financing again. The increase in bank health translated into an increased loan supply to the corporate sector, especially to low-quality borrowers. We show that this increase in loan supply to low-quality borrowers is at least partly driven by zombie lending motives of high gain banks that remain weakly-capitalized after the OMT announcement. The analysis thus highlights the importance of recapitalizing banks adequately to prevent them from engaging in zombie lending. Non-zombie firms that regain access to bank based financing use the cash inflow from new bank loans to build up cash reserves. Zombie firms, on the other hand, are not able to use the inflow from new bank loans to build up cash reserves one for one. Neither group of firms show a significant increase in real activity, that is, an increase in employment or investment.

Moreover, we find that high-quality non-zombie firms, i.e., firms that did not benefit from the increase in bank loan supply are negatively affected if they operate in industries with a higher fraction of zombie firms. Both their employment growth and investment are depressed by the increased fraction of zombie firms in their industry.

More broadly, our paper shows that central banks can conduct backdoor recapitalizations of the banking sector, if they are able to influence the prices of assets that banks hold in relatively large quantities. By increasing the value of these assets banks can realize significant gains which improves their equity positions. However, central banks need to pay close attention to the magnitude of the gain realized by undercapitalized banks. If the gains are too low to adequately recapitalize (some) banks, zombie lending incentives might arise. This can lead to significant distortions in the respective industries, as high-quality firms operating in industries with a high fraction of zombies suffer from significantly depressed employment growth rates and investment.

References

Acharya, V. V., T. Eisert, C. Eufinger, and C. W. Hirsch (2015): "Real effects of the sovereign debt crisis in Europe: Evidence from syndicated loans," CEPR Discussion Paper No. DP10108.

Acharya, V. V., B. Imbierowicz, S. Steffen, and D. Teichmann (2015): "Does the Lack of Financial Stability Impair the Transmission of Monetary Policy?," Working Paper.

Acharya, V. V., D. Pierret, and S. Steffen (2015): "Lender of Last Resort versus Buyer of Last Resort - Evidence from the European Sovereign Debt Crisis," Working Paper.

Acharya, V. V., and S. Steffen (2013): "Falling Short of Expectations? Stress-Testing the European Banking System," Working Paper.

——— (2014): "The Greatest Carry Trade Ever? Understanding Eurozone Bank Risks," Journal of Financial Economics, 115(2), 215–236.

Agarwal, S., S. Chomsisengphet, N. Mahoney, and J. Stroebel (2015): "Do Banks Pass Through Credit Expansions to Consumers Who Want To Borrow?," Working Paper.

Altavilla, C., D. Giannone, and M. Lenza (2014): "The Financial and Macroeconomic effects of OMT Announcements," ECB Working Paper.

Caballero, R. J., T. Hoshi, and A. K. Kashyap (2008): "Zombie Lending and Depressed Restructuring in Japan," The American Economic Review, pp. 1943–1977.

Chodorow-Reich, G. (2014): "The Employment Effects of Credit Market Disruptions: Firm-level Evidence from the 2008-09 Financial Crisis," Quarterly Journal of Economics, 129, 1–59.

Diamond, D., and R. Rajan (2000): "A Theory of Bank Capital," Journal of Finance, 55(6), 2431–2465.

Diamond, D. W. (1991): "Monitoring and reputation: The choice between bank loans and directly placed debt," Journal of Political Economy, 99(4), 689–721.

Ferrando, A., A. A. Popov, and G. F. Udell (2015): "Sovereign Stress, Unconventional Monetary Policy, and SME Access to Fina nce," Working Paper.

Giannetti, M., and A. Simonov (2013): "On the Real Effects of Bank Bailouts: Micro Evidence from Japan," American Economic Journal: Macroeconomics, 5(1), 135–67.

Haldane, A. (2012): "The Dog and the Frisbee," Bank of England Speech.

Kane, E. J. (1989): The S & L insurance mess: how did it happen? The Urban Insitute.

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.

Krishnamurthy, A., S. Nagel, and A. Vissing-Jorgensen (2014): "ECB policies involving government bond purchases: Impact and channels," Working Paper.

Krishnamurthy, A., and A. Vissing-Jorgensen (2011): "The Effects of Quantitative Easing on Interest Rates: Channels and Implications for Policy," Brookings Papers on Economics Activity.

Peek, J., and E. S. Rosengreen (2005): "Unnatural Selection: Perverse Incentives and the Allocation of Credit in Japan," American Economic Review, 95(4), 1144–1166.

Peek, J., and E. S. Rosengren (2005): "Unnatural Selection: Perverse Incentives and the Misallocation of Credit in Japan," American Economic Review, 95(4), 1144–1166.

Saka, O., A.-M. Fuertes, and E. Kalotychou (2015): "ECB policy and Eurozone fragility: Was De Grauwe right?," Journal of International Money and Finance, 54, 168–185.

Saunders, A., and S. Steffen (2011): "The costs of being private: Evidence from the loan market," Review of Financial Studies, 24(12), 4091–4122.

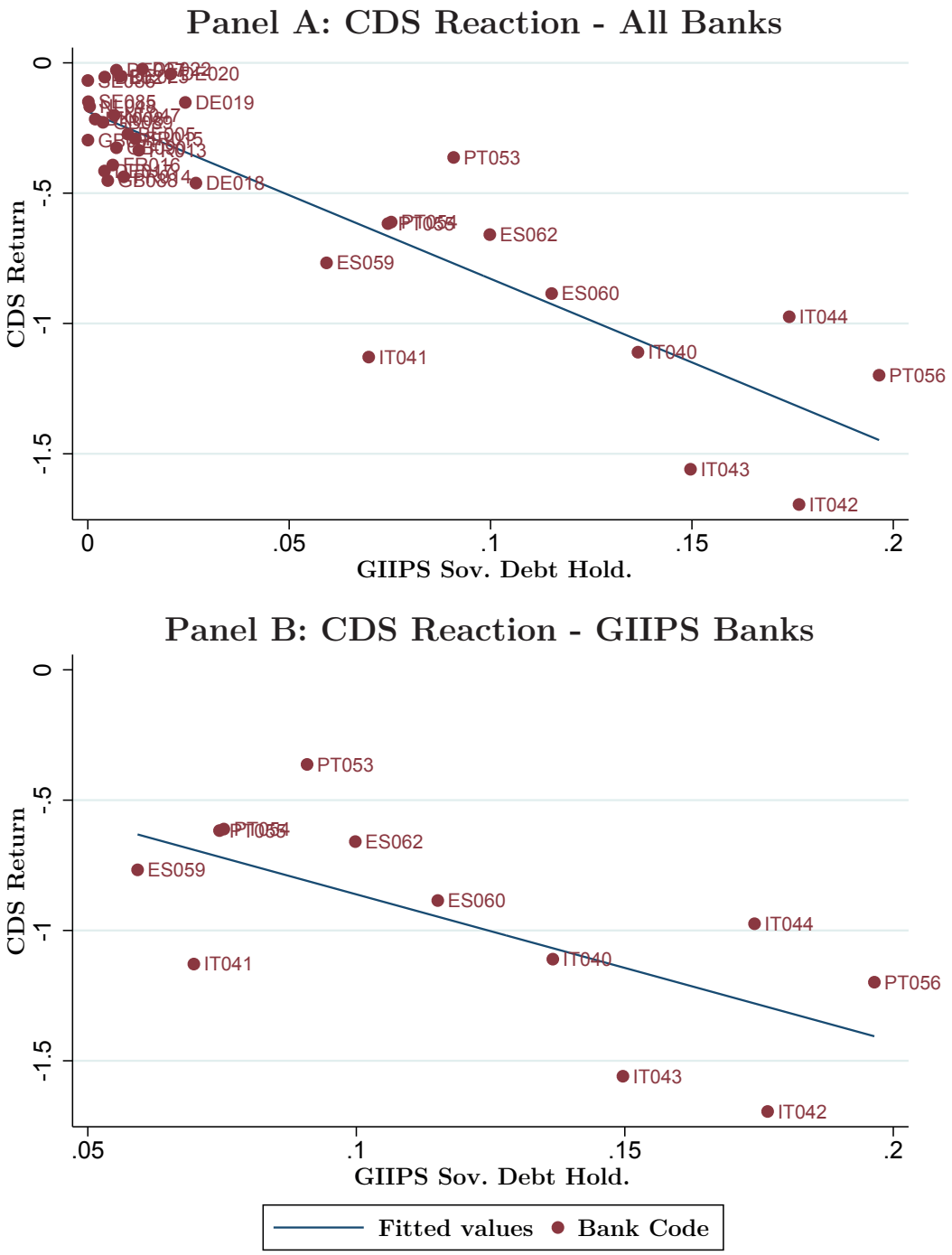
Standard&Poor's (2010): A Guide To The European Loan Market. New York, NY: The McGraw-Hill Companies, Inc.

Sufi, A. (2007): "Information asymmetry and financing arrangements: Evidence from syndicated loans," Journal of Finance, 62(2), 629–668.

Szczerbowicz, U., et al. (2012): "The ECB unconventional monetary policies: have they lowered market borrowing costs for banks and governments?," Working Paper.

Appendix

Figure 1



Panel A (Panel B) plots the relation between banks' CDS return on the OMT announcement dates and their GIIPS sovereign debt holdings for GIIPS and non-GIIPS banks (only for GIIPS banks). Banks included in the analysis must have information about their sovereign debt portfolio prior to the OMT announcement (June 2012) and must be active in the syndicated loan market during the sample period. GIIPS Banks include banks incorporated in Italy, Portugal, and Spain. Non-GIIPS banks consist of banks in all other European countries that are included in the European Banking Authority's stress tests and capital exercises.

Figure 2

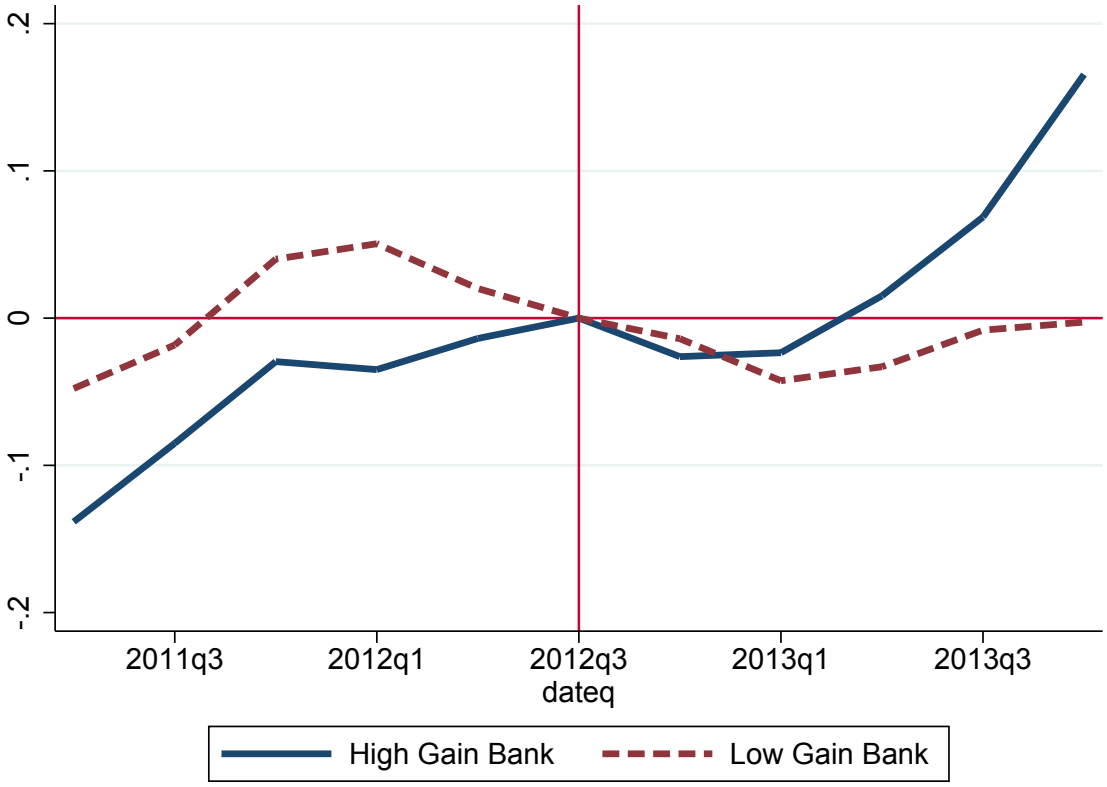


Figure 2 shows the log-ratio of total loans in a given quarter relative to the quarter of the OMT announcement, i.e., the y-axis is normalized to 0 at the time of the OMT announcement. For each quarter we aggregate all loans to private firms borrowing from GIIPS and non-GIIPS banks where GIIPS banks are banks headquartered in Italy, Portugal, or Spain. Non-GIIPS banks consist of banks in all other European countries that are covered by the European Banking Authority's stress tests and capital exercises. We consider all loans in Dealscan and restrict the sample to private firms with financial information available in Amadeus.

Figure 3

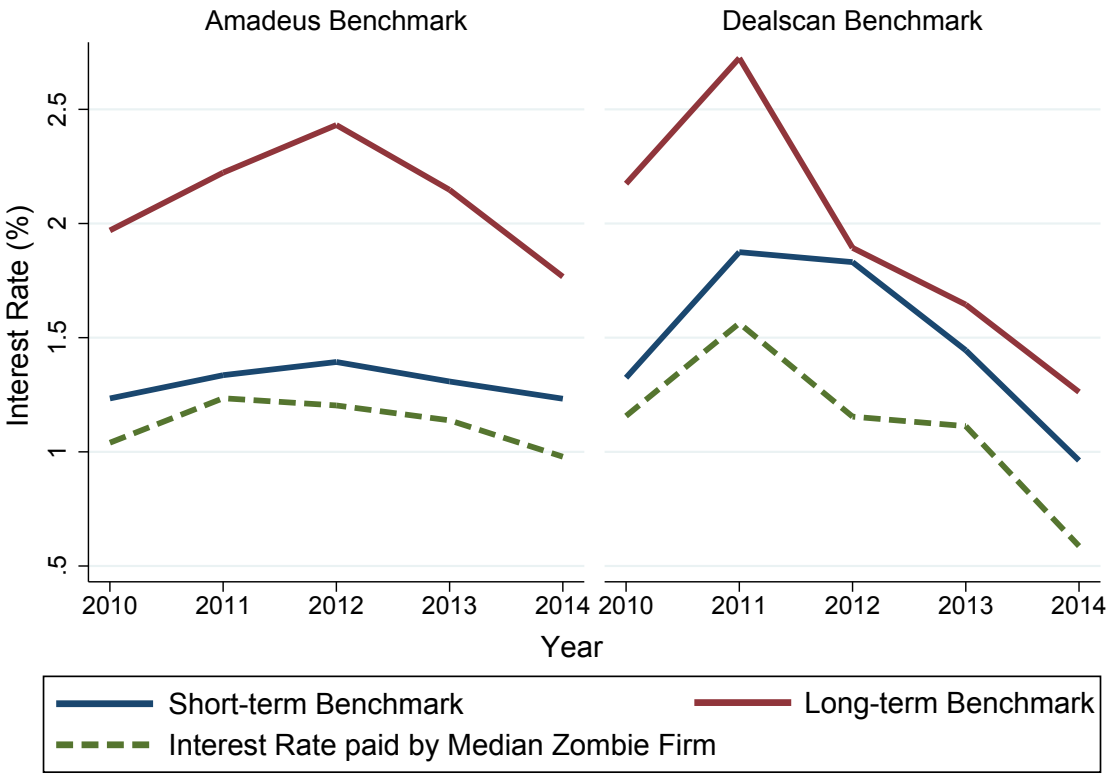


Figure 3 shows the evolution of benchmark interest rates for the two alternative zombie classifications which use information in either Amadeus or Dealscan to calculate benchmark interest rates. We classify a firm as zombie if it meets the following three criteria: (i) the firm receives subsidized credit, (ii) its rating (derived from three year median EBIT interest coverage ratios) is BB or lower, and (iii) the syndicate composition has either remained constant, or banks leaving the syndicate without being replaced by new participants, that is, the same syndicate has already provided a loan to the firm. We consider all loans in DealScan to firms located in: Greece, Italy, Ireland, Portugal, Spain (GIIPS countries) and all other EU countries with an active syndicated loan market (non-GIIPS countries). We restrict the sample to private firms with financial information in Amadeus.

Figure 4

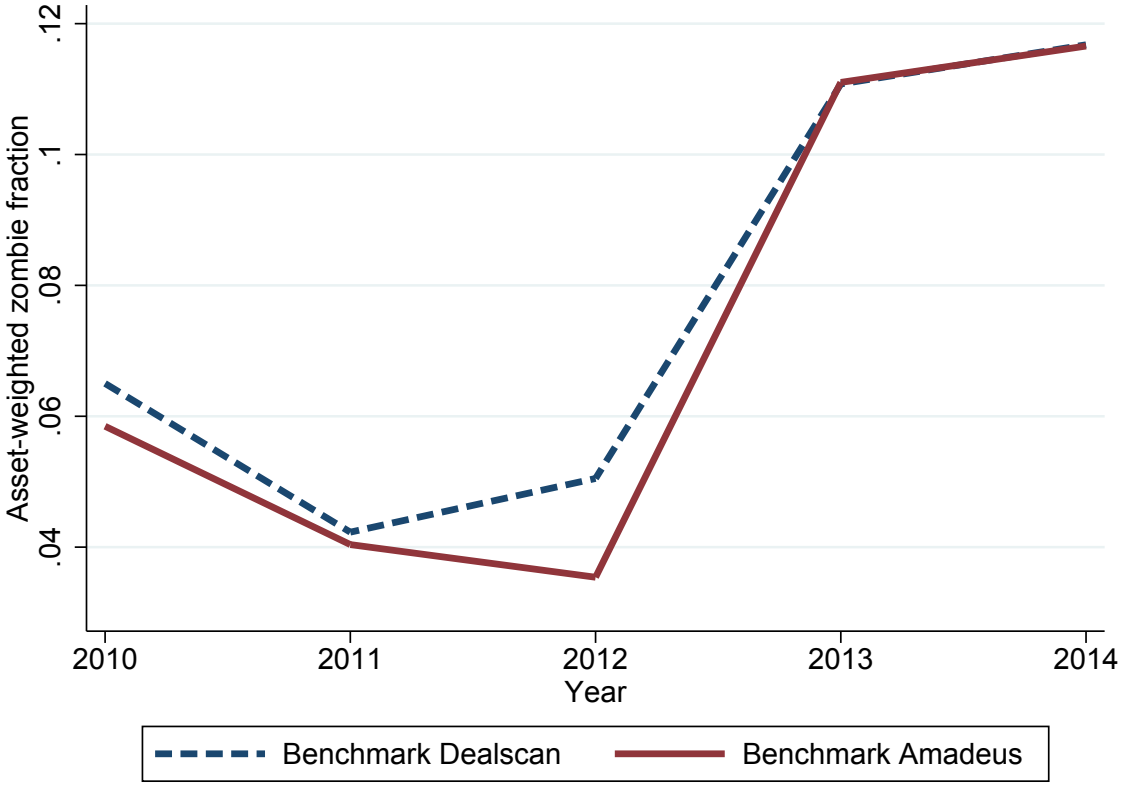
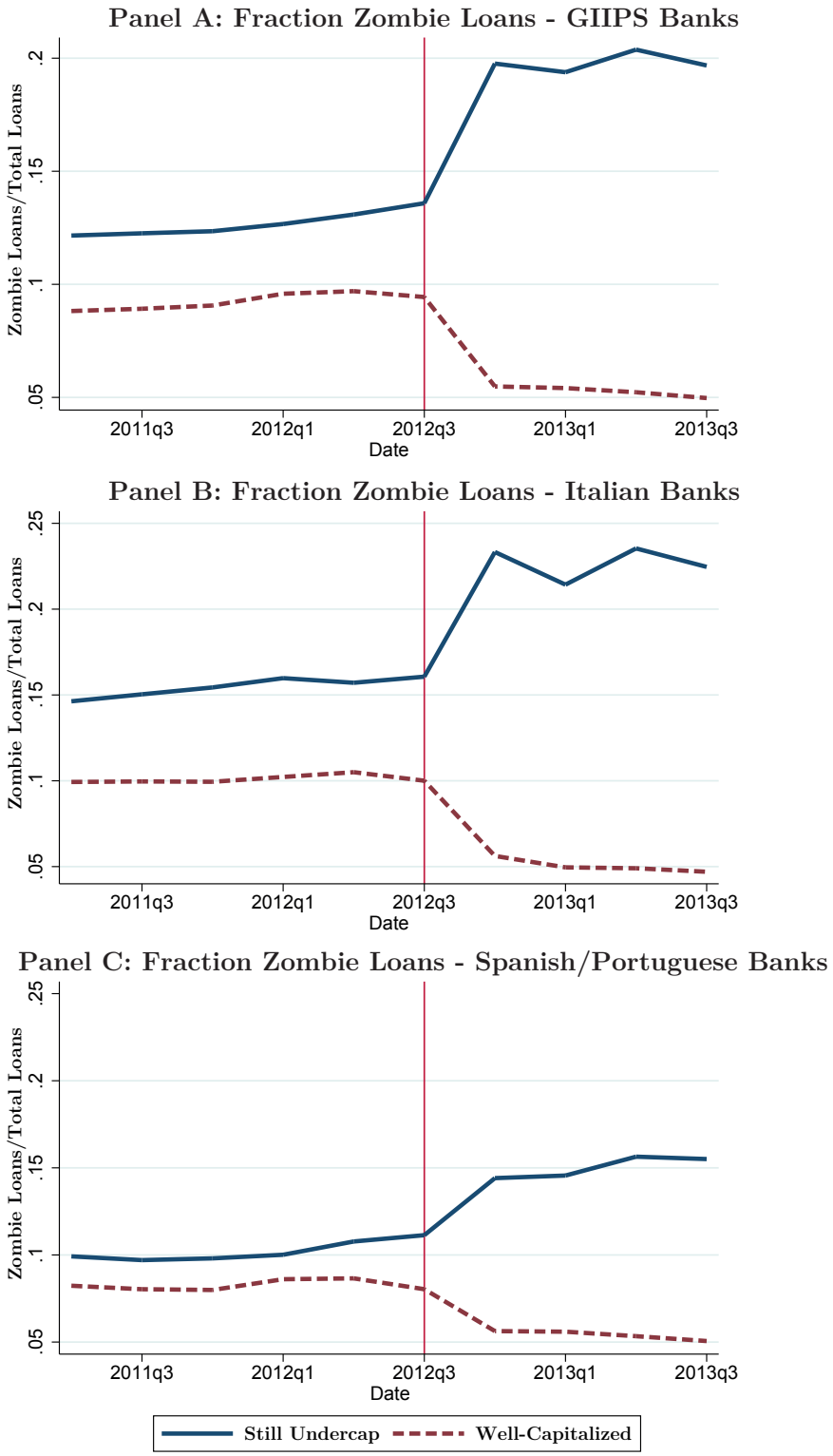


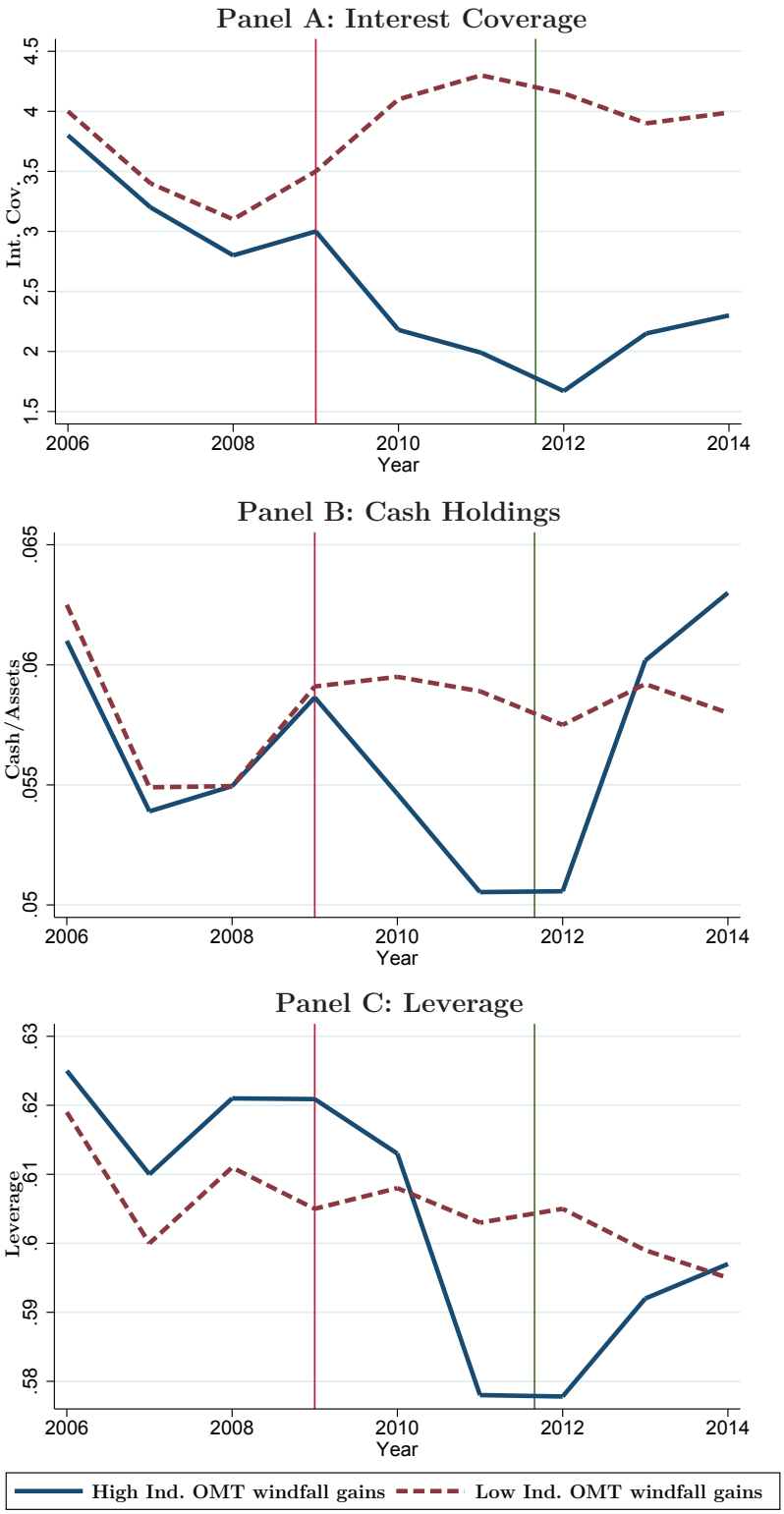
Figure 4 shows the evolution of the asset-weighted fraction of zombies in our sample for the two alternative zombie classifications which use information in either Amadeus or Dealscan to calculate benchmark interest rates. We classify a firm as zombie if it meets the following three criteria: (i) the firm receives subsidized credit, (ii) its rating (derived from three year median EBIT interest coverage ratios) is BB or lower, and (iii) the syndicate composition has either remained constant, or banks leaving the syndicate without being replaced by new participants, that is, the same syndicate has already provided a loan to the firm. We consider all loans in DealScan to firms located in: Greece, Italy, Ireland, Portugal, Spain (GIIPS countries) and all other EU countries with an active syndicated loan market (non-GIIPS countries). We restrict the sample to private firms with financial information in Amadeus.

Figure 5



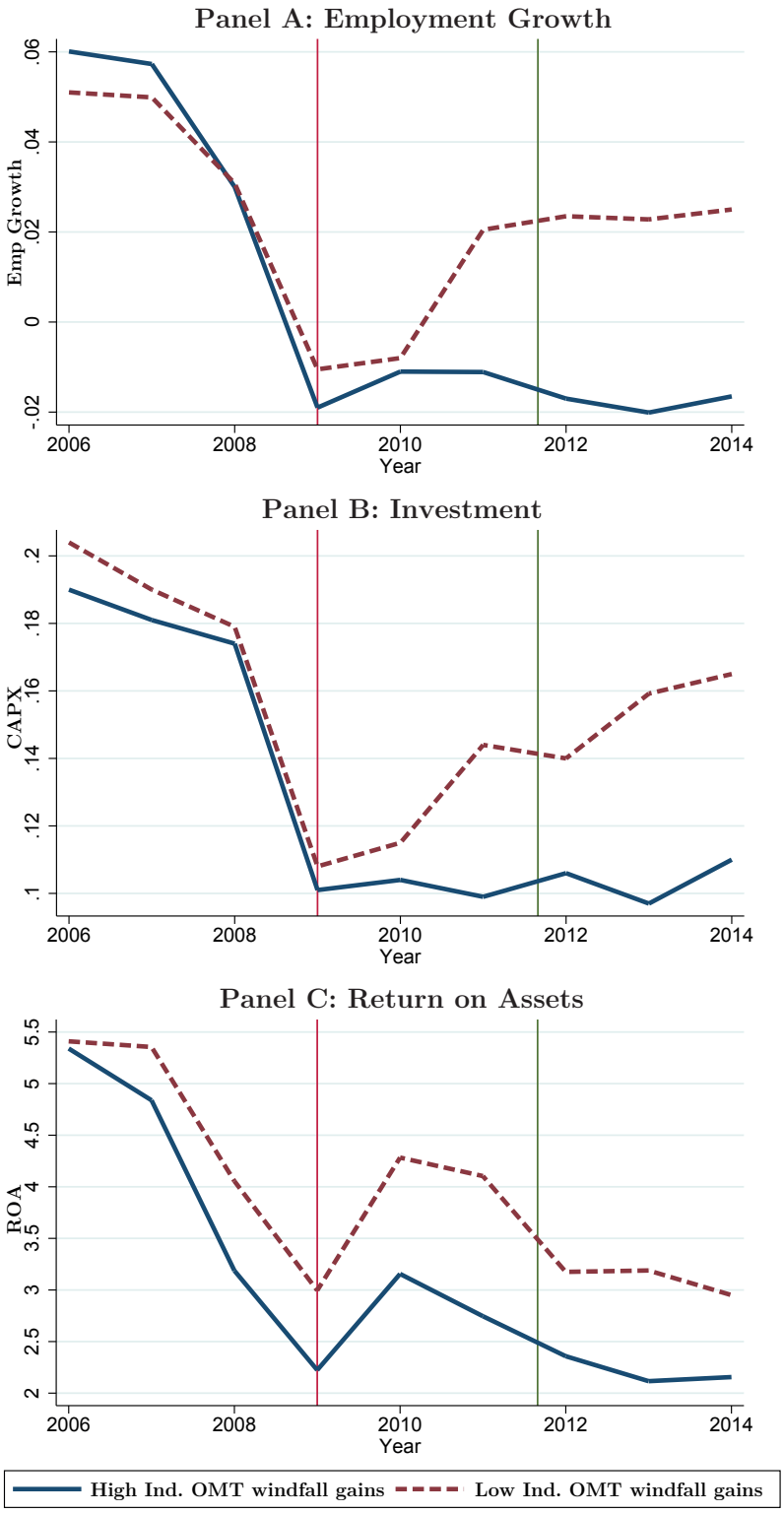
Panel A shows the fraction of the loan volume issued to zombies divided by the total loan volume for banks from Italy, Portugal, or Spain. Panel B shows the same for banks from Italy only and Panel C for banks from Spain and Portugal only. The blue solid line shows the evolution for GIIPS banks that are still undercapitalized after the OMT announcement, whereas the red dashed line shows the evolution for GIIPS banks that are well-capitalized after the OMT announcement. We consider all loans in Dealscan with information about the pricing of the loans and restrict the sample to private firms with financial information available in Amadeus.

Figure 6



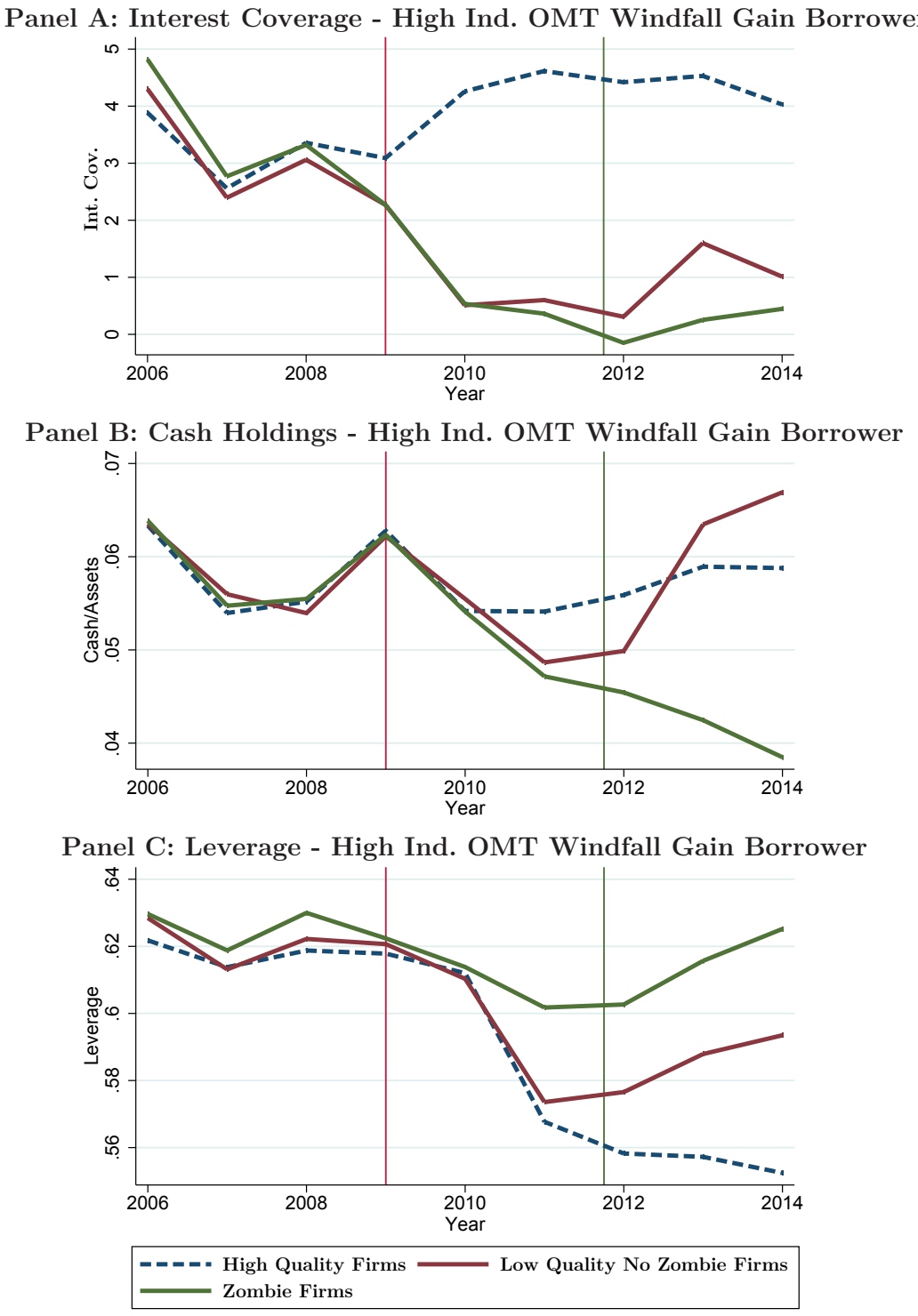
Panel A shows the evolution of interest coverage ratio, Panel B the evolution of cash holdings as a fraction of total assets, and Panel C the evolution of leverage as a fraction of total assets for firms with high (blue solid line) and low (red dashed line) dependence on banks that benefited from the OMT announcement in the pre-OMT and post-OMT period. We consider all loans in DealScan to firms located in: Greece, Italy, Ireland, Portugal, Spain (GIIPS countries) and all other EU countries with an active syndicated loan market (non-GIIPS countries). We restrict the sample to private firms with financial information in Amadeus.

Figure 7



Panel A shows the evolution of employment growth rates, Panel B the evolution of capital expenditures as a fraction of tangible assets, and Panel C the evolution of the return on assets for firms with high (blue solid line) and low (red dashed line) dependence on banks that benefited from the OMT announcement in the pre-OMT and post-OMT period. We consider all loans in DealScan to firms located in: Greece, Italy, Ireland, Portugal, Spain (GIIPS countries) and all other EU countries with an active syndicated loan market (non-GIIPS countries). We restrict the sample to private firms with financial information in Amadeus.

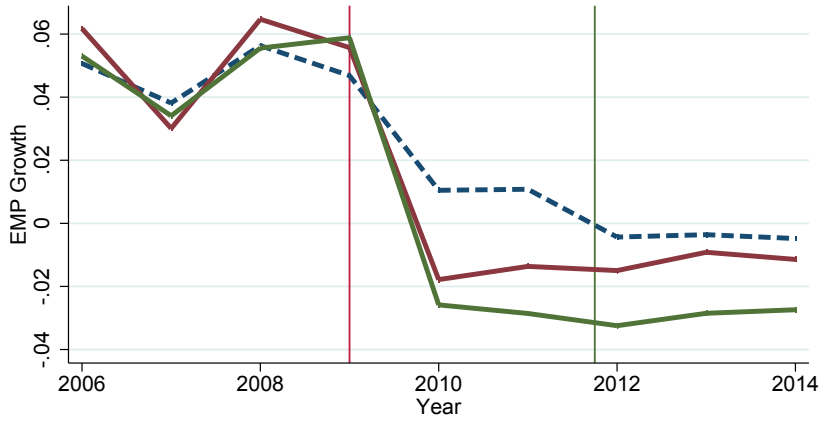
Figure 8



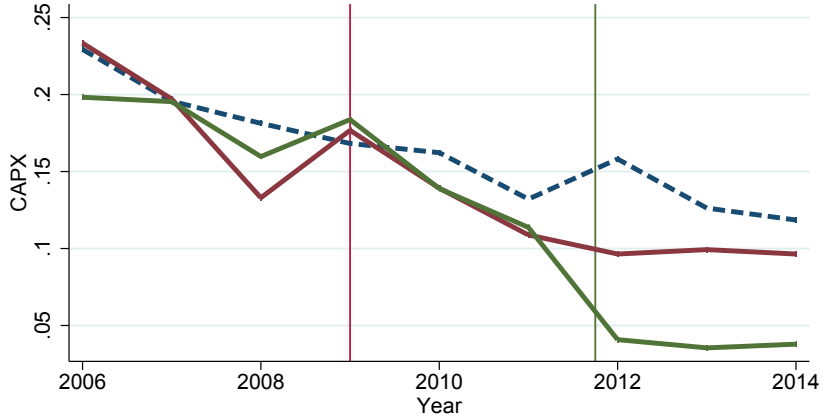
Panel A shows the evolution of the asset-weighted interest coverage ratio, Panel B the evolution of the asset-weighted cash holdings as a fraction of total assets, and Panel C the evolution of the asset-weighted leverage as a fraction of total assets. All three panels are for firms with a high dependence on banks that benefited from the OMT announcement, where we split these borrowers into three groups: high quality firms (blue dashed line), low quality non-zombie firms (red solid line) and low quality zombie firms (green solid line), where firms are defined as low-quality based on their 2009-2011 average EBIT interest coverage ratio. We consider all loans in DealScan to firms located in: Greece, Italy, Ireland, Portugal, Spain (GIIPS countries) and all other EU countries with an active syndicated loan market (non-GIIPS countries). We restrict the sample to private firms with financial information in Amadeus.

Figure 9

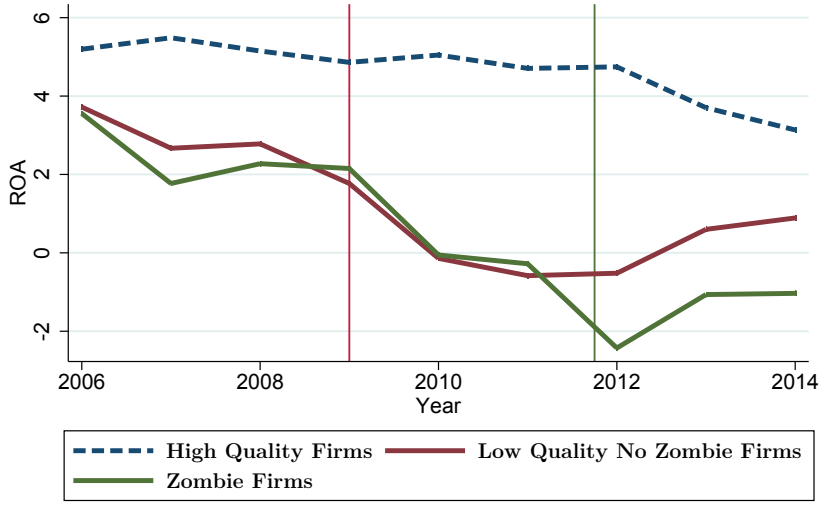
Panel A: Employment Growth - High Ind. OMT Windfall Gain Borrower



Panel B: Investment - High Ind. OMT Windfall Gain Borrower



Panel C: Return on Assets - High Ind. OMT Windfall Gain Borrower



Panel A shows the evolution of the asset-weighted employment growth rates, Panel B the evolution of the asset-weighted capital expenditures as a fraction of tangible assets, and Panel C the evolution of the asset-weighted return on assets. All three panels for firms with a high dependence on banks that benefited from the OMT announcement, where we split these borrowers into three groups: high quality firms (blue dashed line), low quality non-zombie firms (red solid line) and low quality zombie firms (green solid line), where firms are defined as low-quality based on their 2009-2011 average EBIT interest coverage ratio. We consider all loans in DealScan to firms located in: Greece, Italy, Ireland, Portugal, Spain (GIIPS countries) and all other EU countries with an active syndicated loan market (non-GIIPS countries). We restrict the sample to private firms with financial information in Amadeus.

Table 1: Bank Reaction to OMT

Panel A: Bank Reaction			
	(1)	(2)	(3)
	CDS return OMT	OMT windfall gain	GIIPS/Assets
Non-GIIPS Banks	-0.23	0.011	0.010
	(-9.2)		
GIIPS Banks	-0.96	0.08	0.118
	(-3.4)		
t-test for difference	7.8	5.69	12.7
Panel B: Total Assets/Total Equity Ratio			
	pre-crisis	crisis/pre-OMT	post-OMT
Still undercapitalized GIIPS	16.29	24.74	21.21
well-capitalized GIIPS	12.37	13.57	12.39
non-GIIPS European	21.88	16.53	15.87
U.S. Banks	12.65	9.25	8.70
Panel C: Quasi-Leverage Ratio			
	pre-crisis	crisis/pre-OMT	post-OMT
Still undercapitalized GIIPS	10.49	63.91	45.86
well-capitalized GIIPS	8.74	42.17	36.76
non-GIIPS European	14.69	37.34	34.46
U.S. Banks	8.5	10.1	9.9

Panel A of Table 1 presents descriptive statistics about banks' CDS spread reaction to the OMT announcements, the *OMT windfall gain*, and the amount of sovereign debt holdings. Banks included in the analysis must have information about their sovereign debt portfolio prior to the OMT announcement (June 2012) and must be active in the syndicated loan market during the sample period. GIIPS Banks include banks incorporated in Italy, Portugal, and Spain. Non-GIIPS banks consist of banks in all other European countries that are covered by the European Banking Authority's stress tests and capital exercises. CDS return OMT represents the CDS return on the three OMT announcement dates (July 26, August 2, and September 6, 2012). *OMT windfall gain* represents the value gain on bank's sovereign debt holdings as a fraction of total equity. GIIPS/Assets represents banks' GIIPS sovereign debt holdings as a fraction of total assets. Panel B presents the book leverage ratio for different groups of banks. Pre-crisis is defined as the average equity/assets ratios for the years 2004-2006. Post-crisis/pre-OMT is defined as the equity/assets ratio in December 2011, whereas post-OMT is defined as the equity/assets ratio in December 2012. A bank is classified as still undercapitalized if its leverage ratio is above the sample median in December 2012 (post-OMT). Panel C reports quasi-leverage defined as market value of equity plus the book value of debt divided by the market value of equity. F-values are reported in parentheses. Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$).

Table 2: Bank CDS Reaction to OMT Announcement

Panel A: GIIPS sovereign bond holdings scaled by total assets				
	(1)	(2)	(3)	(4)
	CDS Return OMT	CDS Return OMT	CDS Return OMT	CDS Return OMT
GIIPS/Assets	-6.414***	-7.635***	-7.567***	-7.715***
	(-10.38)	(-13.05)	(-11.28)	(-10.62)
Log Assets		-0.134***	-0.133***	-0.126***
		(-4.12)	(-4.00)	(-3.51)
Tier1 Capital			0.396	1.110
			(0.22)	(0.50)
RWA/Assets				0.084
				(0.57)
R^2	0.771	0.852	0.852	0.854
N	34	34	34	34
Panel B: OMT windfall gain				
OMT windfall gain	-6.501***	-6.741***	-6.321***	-7.016***
	(-7.06)	(-8.25)	(-7.23)	(-7.94)
Log Assets		-0.076*	-0.074*	-0.119**
		(-1.88)	(-1.85)	(-2.26)
Tier1 Capital			0.028	0.010
			(1.27)	(0.37)
RWA/Assets				0.597
				(0.79)
R^2	0.609	0.621	0.777	0.782
N	34	34	34	34

Table 2 presents estimates from a linear regression analysis of the determinants banks' CDS returns on the OMT announcement dates. Independent variables are each banks' GIIPS sovereign bond holdings scaled by total assets (GIIPS/Assets) measured before the OMT announcement or the OMT windfall gain which is defined as the gain on the sovereign debt holdings as a fraction of total equity. Control variables include the log of total assets, the ratio of tier 1 capital to risk weighted assets, and the ratio of risk weighted assets to total assets, all measured in the period prior to the OMT announcement. t-statistics are reported in parentheses. Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$).

Table 3: Loan Volume Regressions

Panel A: Intensive Margin - All Firms						
	(1)	(2)	(3)	(4)	(5)	(6)
	ΔLoans	ΔLoans	ΔLoans	ΔLoans	Loan Inc.	ΔLoans
OMT windfall gain*PostOMT	0.234***	0.211***	0.216**	0.254**	0.301*	0.284**
	(3.19)	(2.92)	(2.60)	(2.41)	(1.71)	(2.00)
R^2	0.013	0.097	0.598	0.643	0.617	0.775
N	10879	10879	10879	10879	10879	4090
Panel B: Intensive Margin - Quality Split						
OMT windfall gain*PostOMT	0.042	0.062	-0.004	-0.014	-0.030	0.038
	(0.68)	(0.80)	(-0.06)	(-0.18)	(-0.21)	(0.41)
OMT windfall gain*PostOMT*LowIC	0.280***	0.295***	0.212***	0.253***	0.364**	0.296**
	(5.66)	(5.02)	(3.25)	(3.02)	(2.03)	(2.89)
R^2	0.014	0.098	0.598	0.643	0.617	0.775
N	10879	10879	10879	10879	10879	4090
Panel C: Extensive Margin - All Firms						
	New Loan	New Loan	New Loan	New Loan		New Loan
OMT windfall gain*PostOMT	0.018	0.018	-0.044	-0.046		-0.136
	(0.22)	(0.21)	(-0.63)	(-0.63)		(-1.32)
R^2	0.006	0.077	0.667	0.692		0.815
N	25874	25874	25874	25874		7255
Panel D: Extensive Margin - Quality Split						
OMT windfall gain*PostOMT	-0.013	-0.020	-0.015	-0.023		-0.188
	(-0.14)	(-0.20)	(-0.12)	(-0.17)		(-1.40)
OMT windfall gain*PostOMT*LowIC	0.060	0.074	-0.056	-0.045		0.109
	(0.71)	(0.81)	(-0.47)	(-0.36)		(0.99)
R^2	0.006	0.077	0.667	0.692		0.815
N	25874	25874	25874	25874		7255
Bank Level Controls	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	NO	YES	NO	NO	NO
Time Fixed Effects	YES	YES	NO	NO	NO	NO
FirmCluster-Bank Fixed Effects	NO	YES	NO	YES	YES	YES
FirmCluster-Time Fixed Effects	NO	NO	YES	YES	YES	YES

Table 3 presents the results of a modified version of the Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm cluster-bank-quarteryear. The dependent variable is the change in log loan volume of a firm cluster-bank relation in a given quarter (Panel A and B) or a dummy variable equal to one if a new loan is issued to a firm cluster with which no prior relation existed (Panel C and D). Columns (1)-(5) consider all banks, whereas Column (6) focuses on banks from Italy, Portugal, and Spain. Firm clusters are formed based on a firm's country of incorporation, industry, and rating. The rating of each firm is estimated from EBIT interest coverage ratio medians (2009-2011) for firms by rating category provided by Standard & Poor's. Firms are split based on the country-specific 3-year median interest coverage ratio. In Panel A and B data are restricted to: (i) the set of firm-bank relations that existed prior to the OMT announcement (i.e., all firms in a cluster must have a relation to a particular bank), and (ii) firm cluster-quarters where firms in a cluster borrow from at least one bank that benefited one bank that did not benefit from the OMT announcement. In Panels C and D only firms without existing relation at the time of the OMT announcement are included. *PostOMT* is an indicator variable equal to one starting in quarter four of 2012, and zero before. Bank Level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. Standard errors are clustered at the bank level. t-statistics are reported in parentheses. Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$).

Table 4: Descriptive Statistics (pre-OMT Program Announcement) - All Firms

		Total Assets (mn)	Tangibility	Int. Cov.	Net Worth	EBITDA/Assets
	Mean	2850	0.614	2.70	0.210	0.076
High Indirect OMT windfall gains	Median	486	0.658	1.25	0.190	0.069
	Std. Dev.	7520	0.260	9.25	0.196	0.062
	Mean	1810	0.536	4.98	0.230	0.090
Low Indirect OMT windfall gains	Median	330	0.553	1.41	0.220	0.075
	Std. Dev.	5590	0.290	2.540	0.216	0.077
Diff. (t-Stat)		1040 (3.65)	0.078 (6.30)	-2.28 (-5.83)	-0.02 (-1.77)	-0.014 (-2.87)
Normalized Diff.		0.289	0.149	-0.148	-0.074	-0.120

Table 4 presents descriptive statistics of firm-level control variables split into firms with a high and low dependence on banks that benefited from the OMT announcement in the pre-OMT period.

Table 5

Panel A: Difference in equity ratio of syndicate banks (Amadeus Benchmark)		
	Remaining Banks	Leaving Banks
Mean	5.13	6.02
SD	1.04	2.23
Difference (t-statistic)	-.0.89 (-2.25)	

Panel B: Difference in equity ratio of syndicate banks (Dealscan Benchmark)		
	Remaining Banks	Leaving Banks
Mean	4.92	5.45
SD	.99	1.78
Difference (t-statistic)	-.53 (-2.06)	

Panel C: Breakdown of zombie firms by country (Amadeus Benchmark)		
Country	Number of Zombies	Number of private firms in sample
Germany	4	119 (3.4%)
Spain	29	177 (16.3%)
France	10	137 (7.2%)
UK	23	235 (9.8%)
Italy	35	172 (20.3%)

Panel D: Breakdown of zombie firms by country (Dealscan Benchmark)		
Country	Number of Zombies	Number of private firms in sample
Germany	6	119 (5%)
Spain	31	177 (17.5%)
France	13	137 (9.5%)
UK	25	235 (10.6%)
Italy	34	172 (19.8%)

Table 5, Panel A and B present the difference in the mean capital ratio (total equity/total assets) of banks leaving zombie syndicates and banks remaining in zombie syndicates while Panel C and D present a breakdown of the number of zombie firms by country (fraction of all sample firms in a given country). We present these results for the two alternative zombie classifications which use information in either Amadeus or Dealscan to calculate benchmark interest rates. We classify a firm as zombie if it meets the following three criteria: (i) the firm receives subsidized credit, (ii) its rating (derived from three year median EBIT interest coverage ratios) is BB or lower, and (iii) the syndicate composition has either remained constant, or banks leaving the syndicate without being replaced by new participants, that is, the same syndicate has already provided a loan to the firm.

Table 6: Difference in means between non-zombie low-quality firms and zombie firms

Panel A: Amadeus Benchmark				
	(1)	(2)	(3)	(4)
	High Quality	Low Quality Non-Zombie	Zombie	Difference (2)-(3)
Total Assets (mn)	1390	1730	900	830
				(1.19)
Tangibility	0.544	0.614	0.665	-0.051
				(-1.33)
Int. Cov.	4.602	1.187	0.394	0.793*
				(1.80)
Net Worth	0.248	0.174	0.113	0.061**
				(2.12)
EBITDA/Assets	0.108	0.064	0.035	0.029***
				(3.78)
Leverage	0.566	0.583	0.625	-0.042*
				(-1.84)
Panel B: Dealscan Benchmark				
	(1)	(2)	(3)	(4)
	High Quality	Low Quality Non-Zombie	Zombie	Difference (2)-(3)
Total Assets (mn)	1390	1500	1050	450
				(0.77)
Tangibility	0.542	0.609	0.638	-0.029
				(-0.81)
Int. Cov.	4.630	1.184	0.403	0.781*
				(1.90)
Net Worth	0.246	0.174	0.117	0.057**
				(2.06)
EBITDA/Assets	0.105	0.052	0.037	0.015**
				(1.98)
Leverage	0.564	0.585	0.629	-0.044**
				(-2.06)

Table 6 presents a test for the difference in means between low-quality non-zombie firms and zombie firms, where firms are defined as low-quality based on their 2009-2011 average EBIT interest coverage ratio. We present these results for the two alternative zombie classifications which use information in either Amadeus or Dealscan to calculate benchmark interest rates. We classify a firm as zombie if it meets the following three criteria: (i) the firm receives subsidized credit, (ii) its rating (derived from three year median EBIT interest coverage ratios) is BB or lower, and (iii) the syndicate composition has either remained constant, or banks leaving the syndicate without being replaced by new participants, that is, the same syndicate has already provided a loan to the firm.

Table 7: Loan Volume Regressions - Zombie Lending

Panel A: Zombie Amadeus Benchmark								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ΔLoans	ΔLoans	ΔLoans	ΔLoans	Loan Inc.	ΔLoans	ΔLoans	ΔLoans
	All banks	All banks	All banks	All banks	All banks	GIIPS banks	Spanish and Portuguese banks	Italian banks
OMT windfall gain*PostOMT	0.444***	0.450***	0.393***	0.414***	0.569***	0.587**	0.320*	0.552***
	(5.03)	(4.79)	(3.05)	(3.01)	(2.82)	(1.99)	(1.92)	(3.52)
OMT windfall gain*PostOMT*Zombie	-0.526***	-0.573***	-0.468***	-0.543***	-0.585**	-0.697**	-0.513***	-0.635***
	(-3.16)	(-2.74)	(-4.53)	(-2.75)	(-2.04)	(-2.55)	(-3.32)	(-3.76)
OMT windfall gain*PostOMT*Still Undercap	-0.405**	-0.460**	-0.431***	-0.433***	-0.560***	-0.663**	-0.430**	-0.551***
	(-2.13)	(-2.33)	(-2.75)	(-2.83)	(-2.78)	(-2.83)	(-2.10)	(-3.12)
OMT windfall gain*PostOMT*Still Undercap*Zombie	0.722***	0.701***	0.768***	0.756***	0.865**	0.998***	0.746*	1.01***
	(3.17)	(4.50)	(4.12)	(3.58)	(2.42)	(3.66)	(1.79)	(4.05)
R^2	0.011	0.111	0.726	0.759	0.695	0.834	0.832	0.906
N	13600	13600	13600	13600	13600	4280	2878	1402
Panel B: Zombie Dealscan Benchmark								
OMT windfall gain*PostOMT	0.437***	0.448***	0.397***	0.412***	0.689***	0.648**	0.306**	0.511***
	(4.67)	(4.37)	(3.39)	(3.34)	(4.11)	(2.15)	(2.41)	(2.97)
OMT windfall gain*PostOMT*Zombie	-0.493***	-0.522***	-0.480***	-0.544***	-0.784***	-0.733***	-0.491***	-0.685***
	(-2.74)	(-2.73)	(-5.54)	(-3.91)	(-3.40)	(-2.97)	(-4.58)	(-4.24)
OMT windfall gain*PostOMT*Still Undercap	-0.461**	-0.517**	-0.440***	-0.409***	-0.682***	-0.664***	-0.468***	-0.521**
	(-2.38)	(-2.48)	(-3.54)	(-3.59)	(-4.26)	(-3.42)	(-2.79)	(-2.51)
OMT windfall gain*PostOMT*Still Undercap*Zombie	0.758***	0.732***	0.684***	0.707***	1.093***	1.012**	0.750**	1.10***
	(3.47)	(3.57)	(5.70)	(4.43)	(3.95)	(2.64)	(2.47)	(4.04)
R^2	0.010	0.114	0.723	0.756	0.693	0.848	0.843	0.928
N	13600	13600	13600	13600	13600	4280	2878	1402
Bank Level Controls	YES	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	NO	YES	NO	NO	NO	YES	YES
Time Fixed Effects	YES	YES	NO	NO	NO	NO	NO	NO
FirmCluster-Bank Fixed Effects	NO	YES	NO	YES	YES	YES	NO	NO
FirmCluster-Time Fixed Effects	NO	NO	YES	YES	YES	YES	YES	YES

Table 7 presents the results of a modified version of the Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm cluster-bank-quarteryear. The dependent variable is the change in log loan volume of a firm cluster-bank relation in a given quarter where firm clusters are formed based on a firm's country of incorporation, industry, rating, and whether the firm is a zombie. Hence clusters consist entirely of zombies or non-zombies. We present these results for the two alternative zombie classifications which use information in either Amadeus or Dealscan to calculate benchmark interest rates. Panel A considers the interest benchmark based on Amadeus whereas Panel B presents results for the benchmark based on Dealscan. *Still Undercap* is a dummy variable that equals one if banks have an above sample median leverage ratio after the OMT announcement. Data are restricted to: (i) the set of firm cluster-bank relations that existed prior to OMT announcement, (ii) firm cluster-quarters where firms in a cluster borrow from at least one bank that benefited one bank that did not benefit from the OMT announcement. Columns (1)-(5) consider all banks, Column (6) focusses on banks in Italy, Spain and Portugal, whereas Columns (7) and (8) consider only banks from Spain/Portugal and Italy, respectively. *PostOMT* is an indicator variable equal to one starting in quarter four of 2012, and zero before. Standard errors are clustered at the bank level. t-statistics are reported in parentheses. Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$).

Table 8: Financial and Real Effects - All Firms

Panel A: All Firms						
	(1)	(2)	(3)	(4)	(5)	(6)
	ΔCash	ΔDebt	ΔDebt-ΔCash	Emp. Growth	CAPX	ROA
Indirect OMT windfall gains*PostOMT	0.376***	0.368***	-0.008	0.070	-0.248	0.051
	(2.82)	(2.87)	(-0.04)	(0.15)	(-0.59)	(0.43)
R^2	0.485	0.576		0.458	0.496	0.460
N	3198	3982		3163	3948	3919
Panel B: Quality Classification 2009-2011						
Indirect OMT windfall gains*PostOMT	0.171	0.267	0.096	0.065	0.023	-0.101
	(1.01)	(1.32)	(0.36)	(0.15)	(0.05)	(-0.67)
Indirect OMT windfall gains*PostOMT*Low IC	0.517**	0.567**	0.05	-0.240	-0.728	0.252
	(2.42)	(2.08)	0.14	(-0.49)	(-1.30)	(1.40)
R^2	0.493	0.612		0.441	0.486	0.459
N	3198	3982		3163	3948	3919
Panel C: Zombie Lending - Amadeus Benchmark						
Indirect OMT windfall gains*PostOMT*Low IC	0.519**	0.557**	0.038	-0.418	-0.618	0.185
	(2.30)	(2.05)	(0.1)	(-0.98)	(-0.93)	(0.82)
Indirect OMT windfall gains*PostOMT*Low IC*Zombie	-0.384**	-0.028	0.356**	0.346	0.044	0.125
	(-2.00)	(-0.19)	(2.15)	(1.36)	(0.11)	(1.12)
R^2	0.514	0.619		0.471	0.500	0.482
N	2856	3431		2773	3361	3405
Panel D: Zombie Lending - Dealscan Benchmark						
Indirect OMT windfall gains*PostOMT*Low IC	0.568**	0.582**	0.014	-0.398	-0.931	0.176
	(2.45)	(2.17)	(0.2)	(-0.57)	(-1.37)	(0.77)
Indirect OMT windfall gains*PostOMT*Low IC*Zombie	-0.385**	-0.107	0.278**	0.534	0.371	0.072
	(-2.27)	(-0.98)	(2.12)	(1.09)	(1.16)	(0.63)
R^2	0.513	0.617		0.466	0.501	0.481
N	2856	3431		2773	3361	3405
Firm Level Controls	YES	YES		YES	YES	
Firm Fixed Effects	YES	YES		YES	YES	YES
Industry-Country-Year Fixed Effects	YES	YES		YES	YES	YES
Foreign Bank Country-Year Fixed Effects	YES	YES		YES	YES	YES

Table 8 presents firm-level regression results. The dependent variables are the change in cash holdings, change in leverage, employment growth, investments, and ROA, respectively. Panel A includes all firms in the sample. In Panel B, firms are split based on the country-specific 3-year median interest coverage ratio in the sovereign debt crisis years 2009 to 2011 in high and low-quality firms. Panel C considers all firms for which it is possible to classify them as zombies or non-zombies based the interest rate benchmark from Amadeus, while Panel D considers the interest rate benchmark from Dealscan. The sample consists of all private firms in the intersection of DealScan and Amadeus that are located in the following countries: Greece, Italy, Ireland, Portugal, Spain (GIIPS countries) or other EU countries with active syndicated loan markets (non-GIIPS countries). *Indirect OMT windfall gains* measure the firms' indirect gains on sovereign debt holdings through their lenders, that is, for each firm, we measure the exposure it has to the value increase in the sovereign debt holdings of the banks from which it received loans. *PostOMT* is an indicator variable equal to one starting at the end of fiscal year 2012, and zero before. Firm control variables include the logarithm of total assets, tangibility, interest coverage ratio, EBITDA as a fraction of total assets, and net worth. All firm-level control variables are lagged by one period. Standard errors are adjusted for heteroscedasticity and clustered at the firm-level. t-statistics are reported in parentheses. Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$).

Table 9: Effects on Non-zombie Firms

Panel A: Amadeus Benchmark				
	(1)	(2)	(3)	(4)
	Interest	Emp. Growth	CAPX	Productivity
Industry Frac Zombie*Non-Zombie	-0.001	0.000	0.002	-0.001
	(-1.44)	(1.57)	(1.36)	(-0.39)
Industry Frac Zombie*Non-Zombie*High IC	0.021**	-0.005**	-0.015**	0.011***
	(2.03)	(-2.05)	(-2.43)	(2.87)
R^2	0.523	0.453	0.468	0.441
N	3327	2773	3361	2860
Panel B: Dealscan Benchmark				
Industry Frac Zombie*Non-Zombie	-0.001	0.000	0.002	0.001
	(-0.88)	(1.53)	(1.54)	(1.30)
Industry Frac Zombie*Non-Zombie*High IC	0.019**	-0.004**	-0.013**	0.011**
	(2.13)	(-2.55)	(-2.08)	(2.38)
R^2	0.520	0.456	0.470	0.471
N	3327	2773	3361	2860
Firm Level Controls	YES	YES	YES	YES
Firm Fixed Effects	YES	YES	YES	YES
Industry-Country-Year Fixed Effects	YES	YES	YES	YES

Table 9 presents firm-level regression results. The dependent variables are interest payments, employment growth, investments, and productivity, respectively. Panel A considers the interest rate benchmark derived from Amadeus whereas Panel B considers the benchmark derived from Dealscan. The sample consists of all private firms in the intersection of DealScan and Amadeus that are located in the following countries: Greece, Italy, Ireland, Portugal, Spain (GIIPS countries) or other EU countries with active syndicated loan markets (non-GIIPS countries). *Industry Frac Zombie* measures the asset-weighted fraction of zombie firms in a given industry and country in a given year (measured using the universe of very large Amadeus firms). *Non-zombie* is an indicator variable equal to one for firms that are not classified as zombie firms. High IC is an indicator variable if the firm has an above country median interest coverage ratio. Firm control variables include the logarithm of total assets, tangibility, interest coverage ratio, EBITDA as a fraction of total assets, and net worth. Standard errors are adjusted for heteroscedasticity and clustered at the firm-level. t-statistics are reported in parentheses. Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$).

Table 10: Effects on Non-Zombie Firms

Panel A: Amadeus Benchmark - Competitive Industries				
	(1)	(2)	(3)	(4)
	Interest	Emp. Growth	CAPX	Productivity
Industry Frac Zombie*Non-Zombie	-0.001	0.000	0.001	-0.000
	(-1.62)	(1.32)	(1.48)	(-0.02)
Industry Frac Zombie*Non-Zombie*High IC	0.021**	-0.004**	-0.014**	0.012***
	(2.34)	(-2.15)	(-2.27)	(2.93)
R^2	0.564	0.467	0.418	0.573
N	1685	1345	1702	1398
Panel B: Amadeus Benchmark - Non-Competitive Industries				
Industry Frac Zombie*Non-Zombie	-0.001	-0.000	-0.000	0.000
	(-1.37)	(-0.25)	(-0.74)	(0.31)
Industry Frac Zombie*Non-Zombie*High IC	0.020**	-0.001	-0.001	0.016
	(2.57)	(-0.85)	(-0.78)	(1.45)
R^2	0.664	0.646	0.681	0.579
N	1642	1428	1659	1462
Panel C: Dealscan Benchmark - Competitive Industries				
Industry Frac Zombie*Non-Zombie	-0.000	0.000	0.001	0.001
	(-0.60)	(1.28)	(0.58)	(1.36)
Industry Frac Zombie*Non-Zombie*High IC	0.020**	-0.004**	-0.015**	0.013**
	(2.04)	(-2.32)	(-2.21)	(2.30)
R^2	0.565	0.477	0.427	0.587
N	1685	1345	1702	1398
Panel D: Dealscan Benchmark - Non-Competitive Industries				
Industry Frac Zombie*Non-Zombie	-0.001	0.000	-0.000	-0.000
	(-1.43)	(0.52)	(-0.20)	(-0.37)
Industry Frac Zombie*Non-Zombie*High IC	0.018**	-0.000	0.001	0.003
	(2.18)	(-0.48)	(0.67)	(1.04)
R^2	0.646	0.644	0.682	0.570
N	1642	1428	1659	1462
Firm Level Controls	YES	YES	YES	YES
Firm Fixed Effects	YES	YES	YES	YES
Industry-Country-Year Fixed Effects	YES	YES	YES	YES

Table 10 presents firm-level regression results. The dependent variables are interest payments, employment growth, investments, and productivity, respectively. Panel A and B consider the interest rate benchmark derived from Amadeus whereas Panel C and D consider the benchmark derived from Dealscan. The sample is further split into competitive (Panel A and C) and non-competitive industries (Panel B and D) based on the the HHI index of an industry. The sample consists of all private firms in the intersection of DealScan and Amadeus that are located in the following countries: Greece, Italy, Ireland, Portugal, Spain (GIIPS countries) or other EU countries with active syndicated loan markets (non-GIIPS countries). *Industry Frac Zombie* measures the asset-weighted fraction of zombie firms in a given industry and country in a given year (measured using the universe of very large Amadeus firms). *Non-zombie* is an indicator variable equal to one for firms that are not classified as zombie firms. High IC is an indicator variable if the firm has an above country median interest coverage ratio. Firm control variables include the logarithm of total assets, tangibility, interest coverage ratio, EBITDA as a fraction of total assets, and net worth. Standard errors are adjusted for heteroscedasticity and clustered at the firm-level. t-statistics are reported in parentheses. Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$).

For Online Publication

Online Appendix for

"Whatever it takes: The Real Effects of Unconventional Monetary Policy"

Viral V. Acharya
Tim Eisert
Christian Eufinger
Christian Hirsch

May 2016

Table A1: Loan Volume Regressions

Panel A: Intensive Margin - All Firms						
	(1)	(2)	(3)	(4)	(5)	(6)
	ΔLoans	ΔLoans	ΔLoans	ΔLoans	Loan Inc.	ΔLoans
CDS Return*PostOMT	0.046***	0.057***	0.040**	0.041**	0.039**	0.057**
	(4.89)	(4.51)	(2.47)	(2.07)	(2.71)	(2.86)
R^2	0.012	0.100	0.637	0.678	0.632	0.858
N	10023	10023	10023	10023	10023	3700
Panel B: Intensive Margin - Quality Split						
CDS Return*PostOMT	0.008	0.018	-0.011	-0.015	-0.013	0.038
	(0.79)	(1.39)	(-1.06)	(-1.27)	(-0.40)	(0.96)
CDS Return*PostOMT*LowIC	0.063***	0.064***	0.064***	0.070***	0.094**	0.073**
	(5.03)	(3.97)	(3.00)	(3.57)	(2.02)	(1.97)
R^2	0.013	0.102	0.639	0.680	0.632	0.887
N	10023	10023	10023	10023	10023	3700
Panel C: Extensive Margin - All Firms						
	New Loan	New Loan	New Loan	New Loan		New Loan
CDS Return*PostOMT	-0.002	-0.002	-0.042	-0.042		-0.099
	(-0.02)	(-0.02)	(-0.58)	(-0.56)		(-0.87)
R^2	0.006	0.079	0.674	0.700		0.818
N	23174	23174	23174	23174		6725
Panel D: Extensive Margin - Quality Split						
CDS Return*PostOMT	0.053	-0.022	0.000	-0.044		-0.188
	(0.63)	(-0.23)	(0.00)	(-0.33)		(-1.40)
CDS Return*PostOMT*LowIC	-0.103	0.038	-0.080	0.003		0.109
	(-1.32)	(0.39)	(-1.17)	(0.02)		(0.99)
R^2	0.006	0.079	0.674	0.700		0.815
N	23174	23174	23174	23174		6725
Bank Level Controls	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	NO	YES	NO	NO	NO
Time Fixed Effects	YES	YES	NO	NO	NO	NO
FirmCluster-Bank Fixed Effects	NO	YES	NO	YES	YES	YES
FirmCluster-Time Fixed Effects	NO	NO	YES	YES	YES	YES

Table A1 presents the results of a modified version of the Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm cluster-bank-quarteryear. The dependent variable is the change in log loan volume of a firm cluster-bank relation in a given quarter (Panel A and B) or a dummy variable equal to one if a new loan is issued to a firm cluster with which no prior relation existed (Panel C and D). Columns (1)-(5) consider all banks, whereas Column (6) focuses on banks from Italy, Portugal, and Spain. Firm clusters are formed based on a firm's country of incorporation, industry, and rating. The rating of each firm is estimated from EBIT interest coverage ratio medians (2009-2011) for firms by rating category provided by Standard & Poor's. Firms are split based on the country-specific 3-year median interest coverage ratio. In Panel A and B data are restricted to: (i) the set of firm firm-bank relations that existed prior to the OMT announcement (i.e., all firms in a cluster must have a relation to a particular bank), and (ii) firm cluster-quarters where firms in a cluster borrow from at least one bank that benefited one bank that did not benefit from the OMT announcement. In Panels C and D only firms without existing relation at the time of the OMT announcement are included. *PostOMT* is an indicator variable equal to one starting in quarter four of 2012, and zero before. Bank Level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. Standard errors are clustered at the bank level. t-statistics are reported in parentheses. Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$).

Table A2: Loan Volume Regressions - Zombie Lending

Panel A: Zombie Amadeus Benchmark						
	(1)	(2)	(3)	(4)	(5)	(6)
	ΔLoans	ΔLoans	ΔLoans	ΔLoans	Loan Inc.	ΔLoans
CDS Return*PostOMT	0.065***	0.066***	0.056**	0.059**	0.083**	0.077*
	(4.57)	(4.07)	(2.45)	(2.31)	(2.53)	(2.18)
CDS Return*PostOMT*Zombie	-0.085***	-0.073**	-0.071***	-0.091*	-0.088***	-0.091**
	(-2.94)	(-2.32)	(-3.13)	(-1.83)	(-2.94)	(-2.51)
CDS Return*PostOMT*Still Undercap	-0.069***	-0.074***	-0.067***	-0.072***	-0.089***	-0.080**
	(-4.91)	(-4.95)	(-3.36)	(-3.22)	(-3.14)	(-2.77)
CDS Return*PostOMT*Still Undercap*Zombie	0.123**	0.122***	0.135***	0.139**	0.140**	0.152**
	(2.34)	(4.87)	(3.78)	(2.19)	(2.65)	(2.69)
R^2	0.012	0.111	0.728	0.761	0.696	0.849
N	12367	12367	12367	12367	12367	3986
Panel B: Zombie Dealscan Benchmark						
CDS Return*PostOMT	0.062***	0.065***	0.056**	0.059**	0.105***	0.085*
	(3.19)	(2.88)	(2.45)	(2.37)	(3.60)	(2.05)
CDS Return*PostOMT*Zombie	-0.075**	-0.074**	-0.100**	-0.070**	-0.122**	-0.089*
	(-2.23)	(-2.11)	(-2.55)	(-2.29)	(-2.30)	(-1.81)
CDS Return*PostOMT*Still Undercap	-0.069***	-0.077***	-0.061***	-0.070***	-0.095***	-0.099***
	(-3.88)	(-4.05)	(-3.17)	(-3.25)	(-3.69)	(-3.28)
CDS Return*PostOMT*Still Undercap*Zombie	0.138***	0.146***	0.134***	0.132***	0.184**	0.169**
	(2.81)	(3.73)	(3.50)	(3.06)	(2.10)	(2.29)
R^2	0.011	0.114	0.723	0.756	0.633	0.860
N	12367	12367	12367	12367	12367	3986
Bank Level Controls	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	NO	YES	NO	NO	NO
Time Fixed Effects	YES	YES	NO	NO	NO	NO
FirmCluster-Bank Fixed Effects	NO	YES	NO	YES	YES	YES
FirmCluster-Time Fixed Effects	NO	NO	YES	YES	YES	YES

Table A2 presents the results of a modified version of the Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm cluster-bank-quarteryear. The dependent variable is the change in log loan volume of a firm cluster-bank relation in a given quarter where firm clusters are formed based on a firm's country of incorporation, industry, rating, and whether the firm is a zombie. Hence clusters consist entirely of zombies or non-zombies. We present these results for the two alternative zombie classifications which use information in either Amadeus or Dealscan to calculate benchmark interest rates. Panel A considers the interest benchmark based on Amadeus whereas Panel B presents results for the benchmark based on Dealscan. Data are restricted to: (i) the set of firm cluster-bank relations that existed prior to OMT announcement, (ii) firm cluster-quarters where firms in a cluster borrow from at least one bank that benefited one bank that did not benefit from the OMT announcement. Columns (1)-(5) consider all banks, Column (6) focusses on banks in Italy, Spain and Portugal. *PostOMT* is an indicator variable equal to one starting in quarter four of 2012, and zero before. Standard errors are clustered at the bank level. t-statistics are reported in parentheses. Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$).