Whatever It Takes: The Real Effects of Unconventional Monetary Policy[*]

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Abstract

Launched in Summer 2012, the European Central Bank (ECB)'s Outright Monetary Transactions (OMT) program indirectly recapitalized European banks through its positive impact on periphery sovereign bonds. However, the stability reestablished in the banking sector did not fully translate into economic growth. We document zombie lending by banks that remained weakly-capitalized even post-OMT. In turn, firms receiving loans used these funds not to undertake real economic activity such as employment and investment but to build up cash reserves. Creditworthy firms in industries with a high zombie firm prevalence suffered significantly from this credit misallocation, which further slowed down the economic recovery.

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At the peak of the European debt crisis in 2012, the anxiety about excessive sovereign debt led to a spike in government bond yields for countries in the European periphery that was considered unsustainable, and endangered the Eurozone as a whole. In response, the president of the European Central Bank (ECB), Mario Draghi, introduced the Outright Monetary Transactions (OMT) program by stating on July 26, 2012, during a conference in London 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. Even though the OMT program has not been activated yet, the sole announcement of its introduction has lowered spreads of sovereign bonds issued by the distressed European countries. The resulting appreciation in bond prices led to a "stealth recapitalization" (a term coined by Brunnermeier and Sannikov, 2016) as banks with significant holdings of these bonds experienced large windfall gains, which helped to restore the stability of the European banking system.[1]

Yet, 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 is still no conclusive evidence why the regained financial stability of the European banking sector did not result in a more robust economic recovery. However, there are several signs that Europe's weak economic recovery may be a repeat of Japan's "zombie lending" experience in the 1990s.[2] 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] In these same countries, about 12%, 8%, and 18% of total bank loans in 2014, respectively, were non-performing according to data from the World Bank.

To the best of our knowledge, our paper is the first to provide systematic evidence that, indeed,

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[1]Brunnermeier and Sannikov (2016) present a model where the central bank can recapitalize banks through open market operations and capital gains.

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

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

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Europe's slow economic recovery can be at least partially explained by zombie lending of banks that regained some lending capacity after the OMT announcement but which still remained weakly-capitalized post-OMT. Similar to the behavior of weakly-capitalized Japanese banks during Japan's banking crisis (e.g., see Giannetti and Simonov, 2013), these banks extended new (subsidized) loans at advantageous conditions to provide their impaired borrowers with the liquidity necessary to meet payments on other outstanding loans. Thereby, these banks avoided (or at least deferred) realizing immediate loan losses in the hope that the respective borrowers would eventually regain solvency.

Our results show that roughly 8% of the loans extended to the firms in our sample in the post-OMT period were such zombie loans. This shift in loan supply away from creditworthy productive firms towards distressed and less productive borrowers led to an inefficient credit allocation, which distorted market competition and caused detrimental effects on employment, investment, and growth. We find that the zombie lending problem was most pronounced in Italy, Spain, and Portugal, where affected industries experienced an investment loss corresponding to on average 1.5 years of investment capital and an on average 7pp lower employment growth.

Hence, while the policy debate centers around the concern that the liquidity injections into the banking system are not resulting in positive real effects due to the banks' unwillingness to lend, we document another reason for the ineffectiveness of these measures: Credit is not allocated to the productive part of the economy. Therefore, while the OMT program probably averted an even fiercer economic downturn (or even a break-up of the Eurozone), combining it with a targeted recapitalization measure and/or forced bank closures could have led to a more stable recovery.

For our analysis, we obtain bank-firm relationships from Thomson Reuters DealScan, firm-specific information from the Amadeus database, and bank-specific information from various sources, including banks' CDS spreads, balance sheet information, and detailed data about banks' sovereign debt holdings from the European Banking Authority (EBA). The sample includes all EU firms from 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 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 OMT announcement. Second, we track the resulting change in their lending behavior. Third, we evaluate whether the change in loan supply led to financial and real effects for European firms and analyze the subsequent consequences

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for the banks' loan portfolio performance.

Our results show that banks with significant holdings of bonds issued by stressed European countries (the GIIPS countries, i.e., Greece, Ireland, Italy, Portugal, and Spain) realized the highest windfall gains post-OMT, which improved their capitalization. In particular, the equity of banks incorporated in GIIPS countries (GIIPS banks) increased on average by 8%, while it increased by roughly 1% for non-GIIPS banks. This improvement in the banks' financial health led to an increased loan supply post-OMT. By employing an approach similar to Khwaja and Mian (2008) to control for credit demand, we find that banks with higher windfall gains on their sovereign debt holdings increased their loan supply relatively more than banks with lower windfall gains. While this macro-evidence on bank lending may suggest a healthy restoration of bank credit supply post-OMT, the micro-evidence about *which* firms received the credit paints a different picture.

To analyze which type of borrowers benefited most from an increased lending volume post-OMT, we divide our sample into low- and high-quality borrowers based on their ability to service existing debt, i.e., their EBIT interest coverage ratio (IC). We find that the additional loan supply was mainly targeted towards pre-existing low-quality borrowers (i.e., an increase in lending at the intensive margin), but not towards new borrowers (i.e., no increase at the extensive margin).

This finding is consistent with both, the firm balance sheet channel and zombie lending. The firm balance sheet channel involves a positive shock on the credit quality of the borrower pool (e.g., Bernanke and Gertler, 1995), which makes lending to low-quality borrowers at appropriately-priced loan rates again a profitable investment due to the borrowers' greater net worth, higher collateral value, and better future prospects. In contrast, zombie lending is subsidized lending at advantageous interest rates to economically failed existing borrowers to avoid (or at least defer) loan defaults (e.g., Caballero, Hoshi, and Kashyap, 2008).

We use these distinguishing features to determine which channel triggered the banks' credit supply increase to low-quality borrowers post-OMT. First, we show that these loans were given at subsidized interest rates, which is a strong indication for zombie lending. Second, we track the borrowers' financial and real outcomes pre- and post-OMT and document that firm performance of low-quality firms remained poor after they regained access to bank financing. This finding suggests that their weak performance pre-OMT was due to fundamental economic problems and not due to temporary financial constraints, which provides further evidence in favor of zombie lending.

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To detect subsidized zombie lending, we follow Caballero et al. (2008) and Giannetti and Simonov (2013) and check whether distressed firms obtained loans at below-market interest rates, i.e., at rates *below* the rates paid by the most creditworthy firms in the economy (i.e., AAA rated public firms from non-GIIPS European countries). Our results show that banks that regained some lending capacity post-OMT but still remained weakly-capitalized indeed primarily extended subsidized loans to low-quality borrowers with whom they had a pre-existing lending relationship. For well-capitalized banks we find the exact opposite behavior. These banks significantly increased the loan supply to healthy borrowers post-OMT, and reduced their zombie lending activity relative to their non-zombie lending.

There are three potential explanations for the documented subsidized zombie lending: (i) Risk-shifting by weakly-capitalized banks due to the fear of increasing regulatory scrutiny, (ii) pressure to engage in zombie lending by the domestic government (moral suasion) that fears an increase in firm defaults, unemployment rates, and voter dissatisfaction, and (iii) a post-OMT clearance of a credit backlog to low-quality GIIPS firms by weakly-capitalized GIIPS banks. To separate these three explanations, we document that (i) zombie lending was not prevalent for banks with a significant government ownership stake, (ii) did not occur more towards government-owned firms, and (iii) also occurred to non-domestic firms and by non-GIIPS banks. These findings suggest that banks' risk-shifting incentives seem to have been the driver of the documented zombie lending.

To further distinguish between subsidized zombie lending and the firm balance sheet channel as explanation for the loan supply increase towards low-quality borrowers, we track the firms' financial and real outcomes pre- and post-OMT. For this analysis, we closely follow Acharya, Eisert, Eufinger, and Hirsch (2018). Our results show that non-zombie firms connected to banks that benefited from the OMT announcement increased their leverage and cash holdings by roughly the same amount. This finding suggests that these firms used the majority of the new loans to build up cash reserves. Consistent with this evidence, we do not find any changes in real economic activity for non-zombie firms: neither investment, employment, nor return on assets are significantly affected by a firm's indirect OMT windfall gains (i.e., the benefits accrued via its banks).

For zombie firms, we find a more pronounced increase in leverage than in cash holdings as these firms had to use the liquidity from new loans, at least partially, to repay other outstanding debt. Accordingly, we also do not find any real effects for zombie firms. This evidence suggests

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that these firms had fundamental economic problems and did not only suffer from temporary financial constraints, which confirms that the banks' lending behavior was driven by zombie lending incentives and not by improved economic prospects of their borrower pool.

To explore the long-run effects of zombie lending for borrowing firms, we compare the default propensity of zombie versus non-zombie firms. We find that, while zombie and non-zombie firms had similar default rates in the two years after the OMT announcement (i.e., 2013 and 2014), zombie firms experienced a sharp increase in default rates from 2015 onwards. By 2016, around 15% of zombie firms in our sample had defaulted compared to only 7.5% of non-zombie firms. Hence, while zombie lending was initially successful in that it kept these borrowers alive, in the long-run many zombie firms failed anyway due to their significant lower firm quality.

Regarding the long-run effects for banks that we identify as zombie lending banks based on our syndicated loan data, we find that these banks not only incurred higher losses on their syndicated loans, but across all loan categories (loans to SMEs, etc.). In particular, the ratio of non-performing loans (NPLs) relative to total loans increased significantly more for zombie lending banks compared to banks for which we do not find evidence for zombie lending over our sample period.

In a final step, we analyze whether the "rise of the zombies" post-OMT had negative spillover effects on non-zombie firms, which could occur via two mechanisms: (i) zombie lending banks shift their loan supply to distressed borrowers, thereby crowding-out credit to productive firms, and (ii) zombie firms are kept artificially alive, which distorts market competition (e.g., depressed product prices and higher wages) and thus negatively affects healthy firms competing in the same industries.

Building on the approach of Caballero et al. (2008), we document that non-zombie firms indeed suffered from an increased zombie presence in their industry: both their investment and employment growth were significantly lower compared to non-zombie firms active in industries without a high zombie prevalence. For example, non-zombie firms in industries with an average increase (i.e., 7 percentage points (pp) increase), in the fraction of zombies invested 12.5% of capital less and had 5.5pp lower employment growth compared to a scenario where the zombie prevalence would have stayed at its pre-OMT level.

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1 Related Literature

Our paper contributes to the small but growing literature that studies the effects of a "stealth recapitalization" (i.e., an indirect recapitalization through a price appreciation of bank security holdings; see Brunnermeier and Sannikov, 2016) on bank lending. The OMT announcement is an interesting testing ground for this research question as the crude recapitalization effect of the OMT announcement led to a large heterogeneity in terms of the banks' equity gains and their post-recapitalization equity ratio.[4]

So far, most studies on the effect of a stealth recapitalization on bank lending focus on the recent U.S. quantitative easing (QE) programs, which recapitalized banks due to the implemented large-scale asset purchases (LSAPs) and their resulting positive price effect on banks' security holdings. Kandrac and Schlusche (2016) show that bank reserves created by the U.S. QE programs led to higher loan growth and increased bank risk-taking. Di Maggio, Kermani, and Palmer (2016) find that banks originated more mortgages of the type eligible for purchase by the Federal Reserve in response to the LSAPs launch. Rodnyansky and Darmouni (2017) show that banks with a large exposure to the LSAPs, measured by their mortgage-backed securities (MBS) holdings, increased their loan supply more. Chakraborty, Goldstein, and MacKinlay (2016) present evidence that, while banks that benefited from MBS purchases increased lending more than other banks, they decreased their supply of loan types that were not directly targeted by the MBS purchases, which led to a crowding-out of commercial lending.

While, as we show, the OMT program also positively affected overall loan growth (see also Ferrando, Popov, and Udell, 2017, who provide survey-based evidence for an easing of SME credit standards), it did not lead to a crowding-out of non-eligible loan types as its recapitalization effect was not due to actual asset purchases but merely its announcement effect. However, our paper highlights that a stealth recapitalization measure can lead to another severe distortion: credit misallocation due to zombie lending. In particular, we show that if such a measure fails to adequately recapitalize (some) banks, this creates incentives to shift loan supply from high- to low-quality borrowers, with detrimental aggregate effects on employment, investment, and economic

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[4]See Altavilla, Giannone, and Lenza (2014), Szczerbowicz (2015), and Krishnamurthy, Nagel, and Vissing-Jorgensen (2018) for evidence on the impact of the OMT announcement on government bond spreads and prices.

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growth. Hence, while a stealth recapitalization creates less moral hazard ex-ante compared to an explicit bailout regime (its crude recapitalization effect is not conditional on being a weak bank, as argued by Brunnermeier and Sannikov, 2016), our paper shows that such a non-tailored measure creates a strong moral-hazard problem ex-post as affected banks gain lending capacity but some might remain undercapitalized.

Our paper is also related to the literature that analyzes the impact of explicit bailouts on bank lending, whose findings are mixed and often conflicting. Regarding the effect of the U.S. Troubled Asset Relief Program (TARP) on lending, Li (2013) and Berger, Makaew, and Roman (2016b) find that TARP banks expanded their credit supply, Lin, Liu, and Srinivasan (2014) find a decline in lending, while Duchin and Sosyura (2014) and Bassett, Demiralp, and Lloyd (2017) do not find a change in loan supply. Black and Hazelwood (2013) find mixed results depending on bank size, i.e., a loan volume decrease for large TARP banks and no significant change for small TARP banks.[5]

Using German data from 1999 to 2009, Berger, Bouwman, Kick, and Schaeck (2016a) find that bailouts lead to a reduction in lending and risk-taking. For an international sample, Brei, Gambacorta, and Von Peter (2013) find that rescue measures lead to a loan supply increase, but only if a rescued bank's capitalization exceeds a certain threshold. This evidence is also in line with the experience from the Japanese banking crisis in the 1990s (e.g., Peek and Rosengreen, 2005).[6] Consistent with our findings, Giannetti and Simonov (2013) show that Japanese banks that remained weakly-capitalized even after being bailed out started to engage in zombie lending. Ultimately, this led to a credit misallocation and a long stagnation (see Caballero et al., 2008).

While the evidence on the effect of bailouts on loan supply is mixed, studies that analyze the impact of capital regulation on lending mostly show that higher capital requirements decrease the loan supply (Aiyar, Calomiris, Hooley, Korniyenko, and Wieladek, 2014a; Aiyar, Calomiris, and Wieladek, 2014b; Aiyar, Calomiris, and Wieladek, 2016; Jiménez, Ongena, Peydró, and Saurina, 2017; Gropp, Mosk, Ongena, and Wix, 2018). Blattner, Farinha, and Rebelo (2017) refine these findings by showing that in response to tighter capital requirements affected banks cut back credit for all but a subset of impaired firms for which banks had been underreporting incurred loan losses.

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[5]Regarding the effect of TARP on credit risk, Duchin and Sosyura (2014) and Berger et al. (2016b) find that TARP banks granted riskier loans post-bailout, while Li (2013) finds no change in loan quality. Black and Hazelwood (2013) find an increase (decrease) in credit risk for large (small) TARP banks.

[6]See Kane (1989) for zombie lending evidence in the context of the U.S. savings and loans debacle.

Our paper also contributes to studies that analyze the ECB's liquidity injections. Acharya, Imbierowicz, Steffen, and Teichmann (2015a) investigate the impact of the ECB's competitive liquidity tender at the beginning of the 2007–08 financial crisis and find a differential liquidity transmission of low- versus high-risk banks, and an impaired transmission to borrowers of high-risk banks. Using Italian data, Carpinelli and Crosignani (2017) show that while the ECB's Long Term Refinancing Operations (LTRO) helped to limit the bank lending contraction, the loan supply nevertheless decreased post-LTRO as banks used most of the liquidity to buy government bonds (see also Crosignani, Faria-e Castro, and Fonseca, 2015). Using country level data on LTRO uptakes, Daetz, Subrahmanyam, Tang, and Wang (2016) find that debt holdings of public firms in countries with a larger share of LTRO uptakes as a fraction of GDP increased in the aftermath of LTRO.

More broadly, our paper also relates to the literature examining the impact of traditional monetary policy on the economy through the bank lending channel.[7] The recent part of this literature analyzes the link between negative interest rates and bank risk-taking (Heider, Saidi, and Schepens, 2016), the effect of lower interest rates on bank behavior (e.g., Maddaloni and Peydró, 2011; Jiménez, Ongena, Peydró, and Saurina, 2014; Dell'Ariccia, Laeven, and Marquez, 2014), and the pass-through to consumer credit (Agarwal, Chomsisengphet, Mahoney, and Stroebel, 2017).

2 Data

Our dataset contains bank-firm relationships in Europe, along with 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 European firms as only very few bonds are issued in Europe (Standard & Poor's, 2010). Our sample period spans the fiscal years 2009-2014.[8] Consistent with the literature (e.g., Sufi, 2007), all loans are aggregated to a bank's parent.

We obtain information on bank and sovereign CDS spreads from Markit, sovereign bond information (i.e., prices, yields, durations, and maturities) from Datastream, bank balance sheet data from SNL, and data on the banks' complete breakdown of sovereign debt holdings from the EBA at the closest date available before July 26, 2012 (the first OMT announcement date), which is the

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[7]See Rodnyansky and Darmouni (2017) for a comprehensive overview of this literature.

[8]All our results continue to hold if we drop 2014 from the sample. Results are available upon request.

EBA's capital exercise from June 2012.

For banks to be included in the sample, they must act as loan syndicate lead arranger during our sample period. We identify the lead arranger according to definitions in Standard & Poor's Guide to the European loan market (2010). That is, we classify a bank as a lead arranger if its role is either "mandated lead arranger", "mandated arranger", or "bookrunner". Moreover, the banks need to be included in the capital exercise conducted by the EBA in June 2012. According to the EBA, the sample of banks included in the stress tests cover about 65% of bank assets in Europe.

Finally, we augment our dataset with firm-level accounting data taken from Bureau van Dijk's Amadeus database. Acharya et al. (2018) verify that firms in the intersection of DealScan and Amadeus are comparable to other large firms in Amadeus.

3 Bank Capitalization and Lending

3.1 Bank Capitalization

The OMT announcement significantly lowered spreads of sovereign bonds issued by distressed European countries, thereby increasing these bonds' prices (see Altavilla et al., 2014, Szczerbowicz, 2015, and Krishnamurthy et al., 2018). As a result, banks with significant holdings of these bonds experienced substantial windfall gains. First, bonds in the banks' trading book, which are marked-to-market, directly increased in value. Second, even though the sovereign bonds in the banks' banking book are not marked-to-market, investors included a value increase of these bonds in their bank valuation. For example, Italian-based UBI Banca states in its 2012 annual report: "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 855mn Euro".[9] Given UBI Banca's total equity of 9.8bn Euro in December 2011, this amounts to a gain of 8.6%.

To formally estimate the impact of the OMT announcement on the banks' capitalization, we use data on their sovereign debt holdings provided by the EBA and the changes in sovereign bond prices to construct a variable called *OMT windfall gain* that measures how much a bank's equity increased due to the OMT announcement.[10] First, we calculate the change in bond prices for all

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[9]Consistent with this statement, Acharya, Pierret, and Steffen (2015b) and Krishnamurthy et al. (2018) document significantly positive effects on banks' equity prices after the OMT announcement.

[10]As Krishnamurthy et al. (2018), we are not able to use Greek and Irish sovereign yields as they are partially or

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maturities around the three OMT announcement dates (July 26, August 2, and September 6 of 2012) and sum these changes across the three dates.[11] Next, we multiply the respective sovereign debt holdings outstanding before July 26 and the cumulated change in sovereign bond prices for each maturity and country. Finally, the total *OMT windfall gain* of a bank follows from summing the individual value gains over all EU sovereign bond holdings in the bank's portfolio.

We report this gain on sovereign debt holdings as a fraction of a bank's total equity (measured at the end of fiscal year 2011), i.e., we define the windfall gains of bank b as:

$$OMT \ windfall \ gain_b = \frac{\Delta Value \ EU \ Sov. \ Debt_b}{Total \ Equity_b}. \tag{1}$$

Column (1) of Panel A in Table 2 shows that both GIIPS and non-GIIPS banks experienced *OMT windfall gains*, that is, these banks' equity increased post-OMT by 8% and 1%, respectively.[12] GIIPS banks had significantly higher gains than non-GIIPS banks due to their larger GIIPS sovereign bond holdings (11.8% versus 1% of total assets, respectively, as shown in Column 2).[13] Moreover, following Veronesi and Zingales (2010), we show in the Online Appendix that, in addition to the OMT announcement's recapitalization effect, it also freed up liquidity.

Finally, Column (3) reports results for time-series regressions of CDS spreads of each bank on a set of dummy variables for the three OMT announcement dates. We report the mean of the sum of the coefficients over the three dates separately for GIIPS and non-GIIPS banks. In line with the previous findings, the results show that the OMT announcement had a significant positive effect on the perceived stability of GIIPS banks as their CDS spread decreased on average by 96bp, while it decreased on average by 23bp for non-GIIPS banks.[14]

Taken together, this evidence shows that the OMT announcement led to a stealth recapitalization of European banks (especially GIIPS banks) and thereby reduced the banks' credit risk. In the following, we will refer to banks that strongly benefited from the OMT announcement (above

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completely missing. Hence, we are not able to calculate the *OMT windfall gain* for Greek and Irish banks since the majority of these banks' sovereign debt holdings is domestic.

[11]For the OMT announcement dates, we follow Krishnamurthy et al. (2018) and analyze the events on 07/26/2012 ("whatever-it-takes" speech); 08/02/2012 (OMT announcement); and 09/06/2012 (release of technical details).

[12]Crosignani et al. (2015) finds similar magnitudes (+7.2% of total equity due to gains from LTRO and OMT).

[13]The difference in pre-OMT GIIPS sovereign holdings between GIIPS and non-GIIPS banks can be explained by the banks' home bias (e.g., Acharya and Steffen, 2015).

[14]Consistent with this finding, Figure A1, Panel A shows a clear negative relation between a bank's GIIPS 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 Panel B. See Table A1 for corresponding regression results.

mean *OMT windfall gain*, which consists mainly of GIIPS banks) as *high-gain banks* and banks that benefited less (below mean *OMT windfall gain*) as *low-gain banks*.[15]

Next, we investigate whether banks became uniformly well-capitalized as a result of the stealth recapitalization. Table 2, Panel B presents the evolution of the banks' book leverage ratio separately for high- and low-gain banks and, as a benchmark, also for U.S. banks. Moreover, we present the evolution of the leverage of high-gain banks separately for banks that are within 2% and above 2% of EBA's regulatory capital requirement post-OMT (9% Tier-1 capital to risk-weighted assets ratio). In the following, we call banks below and above this threshold *weakly-capitalized* and *well-capitalized*, respectively.[16] Results are robust to using other cutoff points (e.g., 1.5% or 2.5%).

Before the start of the financial and sovereign debt crisis (Column *pre-crisis*), both well- and weakly-capitalized high-gain banks had a lower leverage than low-gain banks (which consist predominantly of non-GIIPS banks). However, while the leverage ratio decreased significantly over time for low-gain banks, it increased dramatically for high-gain banks classified as weakly-capitalized (peaking in the year prior to the OMT announcement at 24.29) and increased slightly for well-capitalized high-gain banks over the sovereign debt crisis period (see Column *Crisis/pre-OMT*).

Importantly, while the leverage ratio of weakly-capitalized high-gain banks improved post-OMT, these banks still remained highly leveraged. Well-capitalized high-gain banks, on the other hand, were below their pre-crisis leverage post-OMT (see Column *post-OMT*). Even more striking is the change of the banks' quasi-leverage ratio, defined as market value of equity plus book value of debt divided by market value of equity (see Panel C of Table 2). Due to the significant decrease of European banks' market-to-book ratio during the crisis (especially for weakly-capitalized banks), their quasi-leverage ratio was seven times higher than that of U.S. banks post-OMT. Hence, although the OMT announcement increased the banks' capitalization (and raised most banks above the regulatory minimum of 9%), some banks still remained weakly-capitalized post-OMT as they still had a very high "risk unweighted" leverage ratio.[17]

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[15]The median *OMT windfall gain* in our sample is 0.9%, while the mean is 2.9%. Hence, splitting banks at the mean ensures that high-gain banks experienced a significant gain on their sovereign debt holdings.

[16]From the banks that experienced high (low) *OMT windfall gains*, 10 (8) are classified weakly-capitalized and 9 (22) are classified well-capitalized when using the 2% buffer split.

[17]This can be explained by the fact that banks met the minimum capital requirement mainly by reducing their risk-weighted assets, instead of increasing their equity capital (see Gropp et al., 2018).

3.2 Bank Lending

To investigate whether and how the OMT announcement affected bank lending, we employ the same methodology as Acharya et al. (2018), that is, a modified Khwaja and Mian (2008) bank lending regression. More precisely, we track the loan volume of different banks (which benefited to a different degree from the OMT announcement) to a certain firm "cluster", thereby controlling for loan demand and any observed and unobserved borrower characteristics shared by firms in the same cluster that might influence loan outcomes.

This approach generates slightly more time-series bank lending heterogeneity than employing firm fixed effects, which allows us to analyze lending on a quarterly basis and thus better identify the effect of the OMT announcement.[18] This firm clustering approach has also been used by Degryse, De Jonghe, Jakovljevic, Wang, and Schepens (2017), who show that it leads to very similar results as the firm fixed effects approach, and, importantly, does not create any bias in the estimation.

We form firm clusters based on three criteria, which capture important drivers of loan demand and firm quality: (i) the country of incorporation; (ii) the industry; and (iii) the firm rating.[19] The first two criteria are motivated by the fact that firms in a particular industry and country share many characteristics and were thus affected similarly by macroeconomic developments. Forming clusters based on ratings follows from studies that shows that credit quality affects a firm's loan demand (e.g., Diamond, 1991). This clustering generates relatively small and homogenous clusters with on average only 2.8 firms per cluster (the median firm cluster size is 2).

3.2.1   Loan Volume.   Figure 1 plots the log of the total quantity of loans provided by high- and low-gain banks in a given quarter, respectively. While banks that strongly benefited from the OMT announcement significantly increased their loan supply after 2012Q3, the loan supply provided by low-gain banks remained at roughly the same level.

Next, we formally investigate whether banks with higher *OMT windfall gains* increased their loan supply to existing borrowers (intensive margin) and/or to firms with which no relation existed pre-OMT (extensive margin) more than banks with a relatively low *OMT windfall gain*. Our

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[18]The year-to-year change in bank-firm lending relationships tends to be relatively low in DealScan as syndicated loans typically have long maturities and DealScan contains information only at the time of the loan origination.

[19]Since only a small fraction of all firms in our sample have a rating from one of the rating agencies, we assign ratings estimated from three-year median IC ratio by rating category provided by Standard & Poor's.

preferred specification to estimate the quarterly loan volume change $\Delta Volume_{bmt+1}$ by bank b to existing borrowers in firm cluster m in quarter t is:

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\begin{aligned}
y_{bmt+1} =\ & \beta_1 \cdot OMT\ windfall\ gain_b \cdot PostOMT_t + \gamma \cdot X_{bt} \\
+\ & Firm\ Cluster_m \cdot Quarter\text{-}Year_{t+1} + Firm\ Cluster_m \cdot Bank_b + u_{bmt+1}, \qquad (2)
\end{aligned}
$$

where the firm clusters only consist of firms that had a pre-OMT relation with a bank. $\Delta Volume$ is the difference in the log loan volume and is calculated based on asset-weighted shares provided by the lead arrangers.[20] Our main variable of interest is $OMT\ windfall\ gain$ interacted with a dummy variable $PostOMT$, which is equal to one when the quarter is in the post-OMT period.

For the extensive margin, our dependent variable is the indicator $NewLoan_{bmt+1}$, which is equal to one if the bank issued a new loan to a firm cluster to which no relation existed pre-OMT. Our preferred specification for the extensive margin is the same as in Eq. (2) where now the firm clusters consist of firms with no prior relation (pre-OMT) with the respective lender.

We present the results of this empirical analysis in Table 3, where, for brevity, we only report the results for our main variable of interest, the $OMT\ windfall\ gain$. The results in Panel A show that banks with higher windfall gains from the OMT announcement significantly increased their loan supply to existing borrowers (intensive margin) post-OMT. This result holds across all specifications (Columns 1-3), which control for different sets of fixed effects.

In our least restrictive specification, we control for firm-cluster, time, bank fixed effects, and time varying bank control variables (see Column 1). Column (2) shows the regression results for the case in which we also include firm-cluster-time fixed effects, which allow us to control for any observed and unobserved time-varying characteristics that are shared by firms in the same cluster. In Column (3), we additionally interact firm-cluster and bank fixed effects, which exploits the variation within the same firm-cluster-bank relationship over time. This controls for any unobserved characteristics common to firms in the same cluster, bank heterogeneity, and for relationships between firms in a given cluster and the respective bank. The coefficient in Column (3) suggests that a one standard deviation higher $OMT\ windfall\ gain$ led to a 1.5pp loan volume increase at the intensive margin.

To further test the robustness of these results, we follow Peek and Rosengreen (2005) and

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[20]Our results are also robust to employing equal weights.

Giannetti and Simonov (2013) and employ the probability of a loan increase instead of the loan amount change as dependent variable. Column (5) of Table 3, Panel A confirms that our results are robust to using this alternative lending supply measure. Finally, in Column (6) of Table 3 we restrict our sample to GIIPS banks. Recall that especially GIIPS banks benefited from the OMT announcement due to their large GIIPS sovereign debt exposures. The results show that also within the subsample of GIIPS banks, those banks with higher windfall gains increased lending to existing borrowers more. Finally, in Table A3 we replace the *OMT windfall gain* with the CDS announcement return for the OMT program for each bank, which measures the extent to which banks benefited from the OMT announcement based on market price reactions. In addition to the OMT's recapitalization effect, the banks' CDS return also captures the OMT's broad positive impact on the GIIPS economies. All results continue to hold with this alternative measure.

Finally, to mitigate concerns that other factors or shocks could have affected the banks' lending behavior, Figure A3 presents placebo tests that show the absence of treatment effects for placebo program dates and for randomly reassigned levels of treatment intensity. In particular, Panel A plots the coefficient for the effect of the *OMT windfall gains* on the loan volume change for each quarter and shows that *OMT windfall gains* do not have a significantly positive effect on the banks' loan supply pre-OMT. Post-OMT, however, there is a persistent, significant positive effect. For the second placebo test we reassign the *OMT windfall gains* randomly to banks. Panel B shows that in none of the quarters there is a significant relation between the randomly assigned *OMT windfall gains* and the change in bank lending.

For lending at the extensive margin, Panel B of Table 3 shows that across all specifications there is no significant relation between a bank's *OMT windfall gain* and its propensity to issue a new loan to firms with which it did not have a prior relation. These results suggest that only existing borrowers benefited from the OMT-induced loan supply increase.

3.2.2 Borrower Quality.

To determine whether banks that benefited from the OMT announcement targeted their loan supply increase towards a particular type of borrower, we analyze whether they lent more to low- or high-quality borrowers. We identify low-quality (high-quality) borrowers as firms with a below (above) country median 3-year IC ratio in the crisis years 2009 to 2011 and refer to them in the following as *low-IC* ratio (*high-IC* ratio) firms.

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The general picture that emerges from Table 3, Panel C is that the loan volume increase (at the intensive margin) post-OMT was primarily driven by lending to low-IC ratio borrowers since only the triple interaction term of *OMT windfall gain*, post-OMT, and low-IC is significantly positive. This result holds even after controlling for bank-time fixed effects, which absorb any time varying bank characteristics that could drive our results (see Column 4). In particular, including bank-time fixed effects addresses the concern that sovereign bond holdings could be endogenous to bank characteristics in a way that could bias the estimated treatment effect. Table 3, Panel D shows that even if we split the firms according to their IC ratio there are no significant loan supply effects at the extensive margin.

3.2.3 Contemporaneous Shocks.

A concern is that bank lending could have been affected by contemporaneous bank-level shocks that were correlated with our *OMT windfall gain* variable.

The first measure that potentially could have led to interfering effects is the ECB's LTRO, which was allotted in December 2011 (LTRO1) and February 2012 (LTRO2) to provide more liquidity to the European banking system. Its distinctive feature compared to pre-existing liquidity facilities was its longer (three-year) maturity, while interest rate and haircut did not differ.

However, while the LTRO program improved the banks' liquidity, we do not see a credit expansion between the LTRO launch and the OMT announcement (see Figure 1). In line with this evidence, Carpinelli and Crosignani (2017) find that, even though the LTRO program helped to limit the lending contraction, the loan supply nevertheless decreased post-LTRO. A likely explanation is that banks had to use the LTRO-induced liquidity to safeguard against massive deposit withdrawals as, in early 2012, the European financial markets were characterized by high uncertainty and even small negative events could have had potentially large consequences.[21] Following Veronesi and Zingales (2010), we show in the Online Appendix that, indeed, the bank run risk was sizable pre-OMT especially for GIIPS banks, but significantly decreased post-OMT for banks with higher *OMT windfall gains*. This evidence suggests that the OMT announcement helped the affected banks to free up the liquidity acquired under the LTRO program to grant new loans.

A second contemporaneous shock that potentially affected banks' loan supply is EBA's 2011

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[21]Between 20% to 50% of bank deposits are held overnight and can thus be withdrawn at short notice. For example, British customers withdrew 200mn pounds the day after the rating downgrade of Banco Santander in May 2012 and some analysts estimated that banks would have lost up to 10% of their deposit base if Greece had left the Eurozone in 2012. See, "Europe Banks Fear a Flight", *The Wall Street Journal*, May 21, 2012.

capital exercise, which required a subset of European banks to increase their Tier-1/risk-weighted assets ratio to 9% by the end of June 2012 (i.e., one month pre-OMT). One distinct feature of this capital exercise was that it included a surcharge for the banks' sovereign bond holdings, which implies that its effect is likely correlated with our *OMT windfall gain* variable. However, Gropp et al. (2018) document that the affected banks increased their risk-weighted capital ratio mainly by reducing their risk-weighted asset (as opposed to an equity increase), which led to a credit supply reduction. Our bank lending results are thus conservative as the effect of the capital exercise, if any, acted in the opposite direction of the OMT announcement and thus biases our results downwards.

Finally, our results could have been influenced by two EU policy responses to the Eurozone crisis, the European Stability Mechanism (ESM) and the European Financial Stability Facility (EFSF).[22] In particular, in December 2012, the ESM approved a support package for the recapitalization of Spanish banks (the main recipients were Banco de Valencia, Bankia, Catalunya Banc, and NCG Banco). However, none of the recipient banks was part of the EBA's capital exercise from June 2012 and thus included in our sample, which rules out that this measure affects our results. Moreover, in May 2011, a financial assistance package for Portugal was approved under the umbrella of the EFSF. Using 3.8bn Euro from this bailout package, Millennium bcp was rescued in June 2012. While this bank was part of EBA's capital exercise and thus is part of our sample, all our results hold when we exclude Millennium bcp from our analysis.

4   Zombie Lending

Weak firms with pre-existing lending relationships benefiting from the increased loan supply is consistent with both, the firm balance-sheet channel (Bernanke and Gertler, 1995) and zombie lending (Caballero et al., 2008). According to the firm balance-sheet channel, the OMT-induced positive macro shock increased the credit quality of the banks' borrower pool by improving the outlook of their investment opportunities, net worth, and collateral. In turn, extending new loans to these borrowers at appropriately-priced loan rates was again a positive NPV investment.

In contrast, according to the zombie lending channel, banks that remained weakly-capitalized post-OMT had an incentive to extend subsidized (negative NPV) loans at advantageous interest

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[22]Recall that we are not able to calculate the *OMT windfall gain* for Greek and Irish banks as their sovereign debt is mostly domestic and Greek and Irish sovereign yields are mostly missing (see also Krishnamurthy et al., 2018).

rates to existing distressed borrowers to avoid (or at least defer) having to declare outstanding loans non-performing. This reclassification would have lowered the banks' net operating income, required them to raise provisioning levels, and also would have tied up even more equity capital due to higher risk weights on impaired assets (see Aiyar et al., 2015 and Jassaud and Kang, 2015). In turn, regulatory scrutiny and pressure from market forces would have been more intense, which would have further deteriorated the banks' situation.

In the following, we use these distinguishing features to determine which channel triggered the banks' lending increase to low-quality borrowers. First, we check whether these loans had subsidized interest rates post-OMT, which would be a strong indication for zombie lending. Second, we track the borrowers' financial and real outcomes pre- and post-OMT. If the firms' weak performance pre-OMT was due to fundamental economic problems, their performance should have remained poor even after banks increased their loan supply (evidence for zombie lending). If, however, the poor performance was caused by financial constraints, these firms should have recovered after they regained access to bank financing post-OMT (evidence for the firm balance sheet channel).

Accordingly, we first investigate whether and how banks adjusted their interest rates post-OMT. Table A4 shows that weakly-capitalized banks with high *OMT windfall gains* significantly reduced the interest rates for low-quality firms, while leaving the rates for high-quality firms unchanged. In contrast, well-capitalized banks slightly reduced the interest rate charged to high-quality firms and did not significantly change their lending rates to low-quality firms. This lending pattern is a first indication for zombie lending by weakly-capitalized banks.

To detect subsidized zombie lending, we follow Caballero et al. (2008) and Giannetti and Simonov (2013) and check whether distressed firms obtained loans at below-market interest rates. More precisely, a firm is considered to have received subsidized credit (i.e., loans at advantageous interest rates) if in a given year the firm's interest expense is below the expense paid by the most creditworthy firms in the economy. As benchmark firms, we use AAA-rated (inferred from ICs) public firms incorporated in non-GIIPS countries.[23] These firms were least affected by the sovereign debt crisis, since they were less exposed to the downturn in the European periphery and were able to substitute a potential lack of bank financing with other funding sources (Acharya et al., 2018).

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[23]As there are significant differences in the pricing of syndicated loans between U.S. and European loans (U.S. firms pay significantly higher spreads; see Berg, Saunders, Steffen, and Streitz, 2016), we have to rely on creditworthy European firms and cannot use U.S. firms to calculate the benchmark interest rate.

For our main zombie definition, we calculate the interest rate benchmark based on information from Amadeus (index A).[24] In what follows we use r for interest rates and R for interest expenses. Amadeus reports the total interest payments of firm i in country j and industry h in year t, R_{ijht}, as well as its total outstanding debt, $Debt_{ijht}$. The average interest rate paid by firm i can thus be calculated by dividing R_{ijht} by $Debt_{ijht}$. While we are not able to distinguish between the interest paid on different maturities in the Amadeus data, it provides information about the firms' reliance on short- and long-term debt which we use to divide firms into two groups. The benchmark rates for firms that rely mostly on short- and long-term debt, respectively, are derived from AAA-rated public firms with a similar debt maturity structure. That is, the interest rate benchmark for a given firm, r_{gt}^A (with $g \in \{s, l\}$ where s is short-term and l is long-term), is calculated using the median interest rate paid by all public AAA-rated firms incorporated in non-GIIPS countries in a given year, split according to their reliance on short versus long-term debt.

Given this benchmark, we calculate the threshold R_{ijht}^{A*} below which the interest payment of firm i in country j and industry h in year t is considered subsidized as

$$R_{ijht}^{A*} = r_{gt}^A \cdot Debt_{ijht}. \tag{3}$$

Figure 2, Panel A plots the evolution of the benchmark interest rates over time, as well as, the median interest payment of zombie firms.

We then compare the actual interest payments of the borrowers in our sample with the hypothetical interest payments to calculate the interest expense gap:

$$x_{ijht}^{A*} = R_{ijht} - R_{ijht}^{A*}. \tag{4}$$

Finally, a firm i is classified as zombie if it meets the following three criteria: (i) its x_{ijht}^{A*} is negative, (ii) its rating (derived from three year median ICs) is BB or lower, and (iii) the syndicate composition has either remained constant, or banks that left the syndicate were not replaced by new participants, i.e., the same syndicate has already provided a loan to the firm.[25] By imposing

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[24]Alternatively, we use loan information from DealScan to calculate the benchmark rate (denoted with index D), which yields very similar results. See the Online Appendix for a detailed explanation.

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

the second criterion on zombies, we reduce the risk of misclassifying high-quality borrowers 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 involved banks have zombie lending incentives, that is, all banks have a stake in the company from a prior loan.

To ensure the robustness of our results with respect to the zombie classification, we employ various alternative zombie definitions in the Online Appendix. First, instead of a crisp zombie definition, we employ fuzzy zombie measures where a firm can be a zombie "to a certain degree". Second, we do not require a firm to be of low-quality to be classified as zombie. Third, we replace the unique interest rate benchmark across all industries with an industry-specific benchmark interest rate. All results remain similar when using these alternative zombie classifications.

4.1 Evolution and Characteristics of Zombie Firms

Table 4, Panel A 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 18% to 20% of zombie firms, while Germany, France, and the UK only have between 7% and 12% zombie firms.[26]

Figure 2, Panel B plots the fraction of zombie firms in our sample over time. The figure shows that the asset-weighted fraction of zombie firms increased significantly in the post-OMT period. This "rise of the zombies" can be explained by several mutually reinforcing factors. The number of impaired borrowers strongly increased during the crisis, which increased the pool of borrowers needing subsidized credit to stay afloat. While weakly-capitalized banks likely already had zombie lending incentives pre-LTRO/OMT, they were not able to act on these incentives on a large scale due to bank run risk and lack of liquidity and capital (see Section A1 in the Online Appendix). Post-LTRO, weakly-capitalized banks had sufficient liquidity but no capital to lend. Post-OMT, banks then had both, sufficient liquidity and capital, to significantly increase lending (see Figure 1). However, a significant fraction of banks had still zombie lending incentives post-OMT as they remained weakly-capitalized (Table 2, Panels B and C), but now they had the lending capacity to fully act on these incentives.

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[26]The zombie prevalence by country in our sample 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". See "Companies: The rise of the zombie", Financial Times, January 8, 2013.

A potential concern is that this growth in the number of zombies was driven by the economic downturn in GIIPS countries and a subsequent deterioration in firm quality as opposed to an increase in zombie lending at subsidized interest rates. More precisely, our results could be driven by the possibility that many firms already received subsidized credit pre-OMT, thereby satisfying zombie criterion (i), but are classified as zombies only after their IC deteriorated enough during the economic downturn to also satisfy the low-quality zombie criterion (ii). In this case the increase in the number of zombies would not have been caused by an active decision of the banks.

To mitigate this concern, we again plot the evolution of the asset-weighted fraction of zombies in Figure B1, but without requiring firms to be of low-quality to be classified as zombie (i.e., we drop criterion ii). We denote this zombie definition *Zombie3*.[27] The figure shows that the zombie prevalence follows the same trend when using this alternative zombie definition as compared to using our main definition. This evidence indicates that the increase in the zombie prevalence was indeed driven by more firms getting subsidized credit and not a deterioration in firm quality.

Figure 2, Panel C shows that firms that only became zombies post-OMT (i.e., firms that contributed to the zombie increase) paid pre-OMT interest rates which have been between 1-5pp above the rates paid by the benchmark firms. Hence, these firms only satisfied the subsidized lending zombie criterion post-OMT. This evidence shows, first, that these firms did not always receive subsidized loans, mitigating concerns that some time-invariant firm fundamentals allow them to pay low interest rates on their debt in general. Second, it indicates that the drop in interest rates played an important role for the zombie prevalence increase.

Table 4, Panel B, which compares the characteristics of zombie to non-zombie firms, shows that, on average, zombie firms have a significantly higher leverage, and lower net worth and profitability (EBITDA/Assets) ratios.[28] Most importantly, zombie firms only have an IC ratio of 0.23 as opposed to 1.79 for other low-IC ratio firms. Hence, these firms were unable to meet their current interest payments from the earnings generated. To avoid default events, banks thus had to either provide them with additional cheap liquidity through new subsidized loans and/or lower the interest rates of their pre-existing loans to below market-rate levels (which led to a spike in loan amendments post-OMT, as shown in the Online Appendix).

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[27]Table B1 provides an overview over all alternative zombie definitions.

[28]These results show that even *within* the group of low-IC ratio firms, zombie firms are significantly worse than non-zombie firms on observable solvency and liquidity ratios.

Finally, a potential concern could be that other loan characteristics of zombie firms, besides the cost of borrowing, are significantly different. Even though we derive the benchmark interest rates separately for short- and long-term loans, it could still be that within these two maturity brackets, loans to zombie firms are, e.g., of significantly shorter maturity. This could justify a reduction in their borrowing costs. However, when comparing the loan characteristics of zombie and other non-zombie firms with low-IC ratios we do not find any significant differences (see Table 4, Panel B). More precisely, these loans are of similar size and have a similar maturity. Moreover, there is also no significant difference in the loan type (term loan versus revolver) extended to these firms that could lead to loan pricing differences.[29] Hence, the lower borrowing costs for zombie firms do not seem to be due to differences in loan characteristics.

4.2 Lending to Zombie Firms

Figure 3, Panel A shows that banks that regained some lending capacity due to their windfall gains from the OMT announcement (high-gain banks), but which still remained weakly-capitalized, show a strong increase in their zombie loan volume relative to their total assets post-OMT. Panel B shows that this significant increase is mainly driven by weakly-capitalized banks located in GIIPS countries. Conversely, well-capitalized high-gain banks significantly reduced their zombie lending as fraction of total asset post-OMT.

To formally test for the difference in post-OMT zombie lending behavior as a function of bank capitalization, we estimate the quarterly change in loan volume provided by bank b to firm cluster m in quarter t by employing the following panel regression:

$$
\begin{aligned}
\Delta Volume_{bmt+1} \;=\; & \beta_1 \cdot OMT\ windfall\ gain_b \cdot PostOMT_t \\
& + \; \beta_2 \cdot OMT\ windfall\ gain_b \cdot PostOMT_t \cdot Weakly\text{-}capitalized_b \\
& + \; \beta_3 \cdot OMT\ windfall\ gain_b \cdot PostOMT_t \cdot Zombie_{mt} \\
& + \; \beta_4 \cdot OMT\ windfall\ gain_b \cdot PostOMT_t \cdot Zombie_{mt} \cdot Weakly\text{-}capitalized_b \\
& + \; \gamma \cdot X_{bt} + Firm\ Cluster_m \cdot Quarter\text{-}Year_{t+1} \\
& + \; Firm\ Cluster_m \cdot Bank_b + u_{bmt+1}.
\end{aligned}
\tag{5}
$$

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[29]We cannot observe covenants for our loan contracts as this information is missing for most loans in DealScan.

Note that we also control for all other pairwise and triple interaction terms if they are not absorbed by the fixed effects, but omit them in Eq. (5) for brevity. Moreover, in addition to the criteria used to form firm clusters in Section 3.2, we add the criterion whether firms are classified as zombie for this analysis. This extra criterion leads to a larger number of firm clusters than in our loan volume analysis. That is, the firm clusters consisting of zombies have on average only 1.3 firms per cluster with a median of 1. Finally, note that, for our regression analysis, we lag the *Zombie* indicator by one period as in Giannetti and Simonov (2013), since the non-lagged zombie dummy itself would constitute an outcome of a bank's willingness to extend credit.

Importantly, there are two factors that generate sufficient cross-sectional heterogeneity in the banks' *OMT windfall gains* and their post-OMT capitalization that allow us to gauge the effects of these two bank characteristics. First, there is no significant relation between banks' pre-crisis capitalization and GIIPS sovereign debt holdings (Spearman's rank correlation coefficient is only 0.21 and insignificant). Second, the rank correlation between the banks' pre-crisis GIIPS sovereign debt holdings and their equity change between pre-crisis and post-OMT is -0.49, which implies that their equity change is also driven by other factors (differences in credit exposure, etc.).

The results are presented in Table 5.[30] Several findings are noteworthy. First, even before the OMT announcement, weakly-capitalized banks already engaged in significantly more zombie lending than well-capitalized banks (see *Weakly-capitalized*Zombie*).

Second, conditional on a bank's *OMT windfall gains*, there is a significant difference in the lending behavior of well- versus weakly-capitalized banks post-OMT. Banks that remained weakly-capitalized show no significant increase in their loan supply to non-zombie firms (see $\beta_1 + \beta_2$) and lent significantly less to non-zombie firms compared to well-capitalized banks (see β_2). However, compared to well-capitalized banks, these banks lent significantly more to zombie firms (see β_4). Based on the coefficients reported in Table 5, Column (3), a one standard deviation higher *OMT windfall gain* for weakly-capitalized banks implies a 1.2pp loan volume increase to zombies.

Banks with high *OMT windfall gain* that were well-capitalized post-OMT, on the other hand, increased the loan supply to non-zombie borrowers post-OMT (see β_1). In particular, based on the specification in Column (3), a one standard deviation higher *OMT windfall gain* implies a loan

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[30]In Table 5 we cluster standard errors at the bank-level. Tables A5 and A6 show that our results are robust to clustering standard errors at the firm-cluster level and to double clustering them at the bank and firm-cluster level, respectively.

supply increase to non-zombie firms by 2.6pp. Moreover, in contrast to weakly-capitalized banks, well-capitalized banks reduced their zombie lending activity as a fraction of total lending.

To analyze the zombie lending activity of well-capitalized banks in more detail, we plot the coefficient of $\beta_1 + \beta_3$ (i.e., their lending to zombies post-OMT) for each quarter in Panel A of Figure A4. This figure shows that, while well-capitalized banks did not cut back on zombie firms immediately, their loan volume reduction to zombies becomes statistically significant after 2013Q2. This pattern can be explained by the fact that banks cannot terminate their outstanding (zombie) loans immediately. Instead, to reduce their zombie exposure, they have to stop rolling over the respective loans once they mature, which results in a delay in their zombie exposure decrease. In line with this explanation, Panel B of Figure A4 shows that a significant share of the zombie loans that were issued pre-OMT matured in 2013Q2, which coincides with the time when the sum of the two coefficients (i.e., $\beta_1 + \beta_3$) becomes negatively significant.

Third, conditional on the banks' post-OMT capitalization, they behaved differently depending on the magnitude of their *OMT windfall gains*. Weakly-capitalized banks with high *OMT windfall gains* extended significantly more credit to zombie firms (see $\widehat{\beta_1} + \widehat{\beta_2} + \widehat{\beta_3} + \widehat{\beta_4}$ in Table 5). In contrast, weakly-capitalized banks with only low *OMT windfall gains* did not significantly change their lending to non-zombie and zombie firms after the OMT announcement (see *Weakly-capitalized*PostOMT* and *Weakly-capitalized*PostOMT*Zombie*). This evidence supports the notion that the *OMT windfall gains* facilitated zombie lending by enhancing the weakly-capitalized banks' lending capacity.

While the firm-cluster-time fixed effects absorb unobserved shocks to credit demand, our zombie lending results could still be biased by endogeneity of the banks' treatment levels as the exposure to the OMT shock is likely correlated with bank characteristics, such as country of incorporation, capitalization, and appetite for risk. We address this concern by employing two additional tests.

First, we introduce additional interaction terms in Table A7 between *PostOMT*, *Weakly-Capitalized*, *Zombie*, and other bank characteristics that could be correlated with the banks' *OMT windfall gains*.[31] In particular, we add (i) a dummy for whether a bank has government ownership (*High Gov Own*; Columns 7-8); (ii) a dummy for whether the bank has an above median size (*Large*

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[31]In Table A7 we cluster standard errors at the bank level. Tables A8 and A9 show that our results are robust to clustering standard errors at the firm-cluster level and to double clustering them at the bank and firm-cluster level, respectively.

Bank; Columns 9-10); (iii) a proxy for the banks' business model, i.e., commercial bank versus investment bank focused (*Loans/Assets*; Columns 11-12); and (iv) the fraction of cash from central banks over total assets (*Cash/Assets*; Columns 13-14), which is a proxy for the banks' funding model and the extent to which they borrowed from central banks over the crisis period. We then run horse races between the interactions with our main variable of interest (*OMT windfall gain*) and the interactions with these various bank characteristics. Across all horse races the quadruple interaction term on *OMT windfall gain*PostOMT*Weakly-Capitalized*Zombie* remains significant.

Second, we add a more restrictive fixed effects setting with bank-time fixed effects to absorb any time varying bank characteristics that could drive our results (see Table 5, Column 4). Our key result that well-capitalized banks significantly reduced their zombie credit exposure as a fraction of their total lending post-OMT, whereas still weakly-capitalized banks significantly increased their loan volume to zombie firms, continues to hold. 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 (Table 5, Column 5) or when we restrict the analysis to GIIPS banks (Table 5, Column 6).[32]

Moreover, our results shows that the treatment effects are similar across banks in different countries. This evidence supports the interpretation that the zombie incentive distortion is independent of local regulation and/or industry structure and is thus not driven by endogenously higher treatment exposure of GIIPS banks, which operate in an environment where baseline exposure to zombie firms and incentives for evergreening are endogenously higher.

Finally, similar to the placebo test presented for the results in Section 3.2.1, we again conduct tests with placebo program dates and randomly reassigned levels of treatment intensity. Figure A3, Panel C plots the coefficient for the zombie lending of weakly-capitalized banks interacted with *OMT windfall gains* over time and shows that there is only a significantly positive effect on bank lending post-OMT. Panel D shows that there is no significant effect on bank lending when we randomly assign the *OMT windfall gains*.

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[32]Table A10, Panel C shows the robustness of these results for the case where we use the CDS announcement return for the OMT program for each bank instead of *OMT windfall gain*.

4.3 Alternative Explanations for Subsidized Lending

The observed subsidized lending of weakly-capitalized banks could also be driven by (i) government moral suasion and, (ii), a credit expansion to GIIPS borrowers by GIIPS banks.

At the peak of the crisis, GIIPS governments might have pressured domestic banks to redirect credit to weak firms at advantageous interest rates to avoid firm defaults and higher unemployment rates. Moreover, if the governments' ability to exert pressure was greater for weakly-capitalized banks, then moral suasion could potentially drive our results as only these banks engaged in zombie lending, whereas well-capitalized banks significantly reduced their zombie exposure.[33]

Furthermore, our results could be driven by the possibility that weakly-capitalized GIIPS banks cleared a credit backlog post-OMT and lent more to low-quality GIIPS firms at very low interest rates to rapidly expand their credit supply.

We employ four different tests to address these concerns. First, if GIIPS governments indeed exerted pressure, subsidized lending should have been more prevalent for government-owned banks. To investigate this hypothesis, we collect data on the government ownership of all banks in our sample from Bureau van Dijk's Orbis database and conduct a horse race between weakly-capitalized and government-owned banks. Columns 1-2 of Table A7 provide the results. Across both specifications, we find that only banks that remained weakly-capitalized post-OMT engaged in zombie lending, whereas government-owned banks do not seem to have engaged in zombie lending.

Second, if government moral suasion was widespread, especially government-owned firms should have received subsidized loans. To investigate this possibility, we use ownership information from Amadeus and rerun our lending regressions excluding firms with positive government ownership.[34] Table A11, Panel A shows that the results remain qualitatively unchanged.

Finally, if weakly-capitalized GIIPS banks strongly increased their loan supply to low-quality GIIPS borrowers at advantageous interest rates due to either government moral suasion or a clearance of a credit supply backlog, we would expect a credit increase especially of *domestic* banks to *domestic* low-IC ratio firms. To test these hypotheses, we first rerun our main regression but limit

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[33]A potential link between the banks' capitalization and their proneness to moral suasion is that weak banks will more likely need a bailout than well-capitalized banks and are hence more dependent on the government's goodwill.

[34]We thank Vadym Volosovych for providing us with the ownership data. See Kalemli-Ozcan, Sorensen, Villegas-Sanchez, Volosovych, and Yesiltas (2015) for details on the construction of these data.

the analysis to the (small) subsample of non-GIIPS firms that received funding from GIIPS banks.[35] Table A7, Columns 3-4 show that we obtain similar results when focusing on this subsample. In a second test, we limit the analysis to non-GIIPS banks. Again, while the economic significance decreases, the results remain qualitatively unchanged, as shown by Columns 5-6.

Taken together, our findings suggest that the loan supply increase to low-IC ratio borrowers was indeed caused by zombie lending incentives of weakly-capitalized banks.

In the Online Appendix, we confirm that banks that remained weakly-capitalized post-OMT indeed had incentives to "evergreen" loans to zombie borrowers by calculating for each bank what its regulatory capital ratio would have been if it had pulled the plug on these borrowers. Moreover, we test the robustness of our results with regard to two alternative measures of bank capitalization: (i) a continuous measure and (ii) a measure that incorporates a capital adjustments required by the EBA for risky sovereign debt holdings. All results continue to hold.

5   Real and Financial Outcomes

To analyze whether there are differences between the behavior and performance of zombie and non-zombie firms pre- and post-OMT, we closely follow the approach in Acharya et al. (2018) and divide the financial information reported in Amadeus into the pre-OMT period (fiscal years 2009 to 2011) and the post-OMT period (fiscal years 2012 to 2014). The indicator variable *PostOMT* is now equal to one if the financial information reported in Amadeus falls in the post-OMT period.

To proxy the extent to which firms benefited from the OMT announcement through their bank relationships, we construct the variable *Indirect OMT windfall gain*. First, we use the *OMT windfall gain* of each bank, as defined in Eq. (1), and compute the average *OMT windfall gain* of all banks that act as lead arranger in a given syndicate. We denote this variable *Average OMT windfall gain*. Second, we calculate a firm's indirect gains from its lending relationships by weighting the *Average OMT windfall gain* of each of its loan syndicates by the fraction of its total outstanding syndicated loan amounts. This yields the following measure for firm i in country j in industry h at time t:

$$Indirect\ OMT\ windfall\ gain_{ijht} = \frac{\sum_{l \in L_{ijht}} Average\ OMT\ windfall\ gain_{lijh} \cdot Loan\ Amount_{lijht}}{Total\ Loan\ Amount_{ijht}}, \qquad (6)$$

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[35]Acharya et al. (2018) document that these bank relationships emerged primarily through pre-crisis bank M&A transactions, e.g., a German bank is taken over by an Italian bank and the German firm borrowing from the German bank before the M&A transaction is now borrowing from the Italian bank.

where L_{ijht} are all of the firm's loans outstanding at time t.[36] We use five different measures for the firms' policies. In particular, we analyze changes in cash holdings $((cash_{t+1} - cash_t)/total\ assets_t)$ and debt $((total\ liabilities_{t+1} - total\ liabilities_t)/total\ assets_t)$ to investigate changes in the firms' financial policies. To analyze non-financial firm policies, we consider employment growth ($\Delta \log Employment$), investment ($CAPX/Tangible\ Assets$), and the return on assets (ROA).

We begin by exploring the effect of the OMT announcement on firm outcomes graphically. Figure 4 plots the time series of the cash holdings, leverage, employment growth, investment, and ROA, respectively, for high *Indirect OMT windfall gain* firms (i.e., firms with an above median *Indirect OMT windfall gain*), further split into high-IC ratio, low-IC ratio non-zombie, and zombie firms. The figure shows that low-IC ratio non-zombie firms significantly increased leverage and cash holdings post-OMT (Panels A and B). Zombies , however, were not able to raise their cash holdings, despite the strong increase in leverage resulting from the inflow of new bank credit. Panels C-E show that none of the three firm groups show a significant increase in employment, investment, or ROA post-OMT. Moreover, the performance of zombie firms appears to be the worst of all firms.

To formally investigate whether borrowing firms with tight lending 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:

$$
\begin{aligned}
y_{ijht+1} \quad = \quad & \beta_1 \cdot Indirect\ OMT\ windfall\ gain_{ijh} \cdot PostOMT_t \\
+ \quad & \gamma \cdot X_{ijht} + Firm_{ijh} + Industry_h \cdot Country_j \cdot Year_{t+1} + u_{ijht+1}.
\end{aligned} \quad (7)
$$

Our baseline regression includes firm fixed effects, as well as firm-level control variables - firm size, leverage, net worth, the fraction of tangible assets, the IC ratio, and the EBITDA/total assets ratio - to capture other determinants of firms' corporate policies.[37] Additionally, we include interactions between industry, year, and country fixed effects to capture 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. Importantly, these fixed effects also absorb all shocks at the national

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[36]We measure the dependence on banks that benefited from the OMT announcement as the average dependence on these banks over the 2009-2011 period. Results are qualitatively similar when using the 2006-2008 average.

[37]All results are qualitatively and quantitatively similar if we rerun these regressions using weighted least squares with firms' total assets as weights.

level (changes in tax rates, regulations, etc.) that could affect investment and employment creation.

Results for the full sample are presented in Table 6, Panel A. The unit of observation is a firm-year. For ease of exposition, we only report the results for our key variable of interest, the interaction of *Indirect OMT windfall gain* with the *PostOMT* dummy. For the financial variables, we find a significant increase post-OMT in both cash and debt for the full sample of firms (Columns 1 and 2). The difference of the coefficients for the change in cash and the change in debt regressions is small and statistically insignificant (see Column 3). This result suggests that debt and cash holdings increased by a similar amount, implying that firms used the liquidity inflow from bank credit primarily to increase their cash reserves. This finding is consistent with the fact that we do not find any significant effects for the real variables. Neither employment nor investment or ROA (Columns 4 - 6) change significantly for firms with a high *Indirect OMT windfall gain* in the post-OMT period. Hence, the primary objective of firms on average seems to be regaining financial stability by increasing their cash reserves to pre-crisis levels.

In Panel B of Table 6, we provide evidence on the relation between financial and real effects and the *Indirect OMT windfall gain* of firms classified based on their median IC ratio during the sovereign debt crisis (2009 to 2011). Recall that Table 3, Panel C shows that primarily low-IC firms benefited from the loan volume expansion induced by the post-OMT value appreciation of the banks' sovereign debt holdings. Consistent with this evidence, the general picture that emerges from Table 6, Panel B is that the financial effects (i.e., increase in cash holdings and leverage) are driven by low-IC firms, whereas neither high- nor low-IC firms show a significant relation between *Indirect OMT windfall gain* and real economic activity like employment and investment.

Moreover, Table 6, Panel C documents that zombies did not use their newly acquired credit to build up cash reserves. For these firms, debt increased significantly more than cash holdings (Columns 1 and 2). A potential explanation is that these firms needed the liquidity to service interest payments on other existing loans. Consistent with this explanation, zombies only have an IC ratio of 0.23, implying that they are unable to service interest payments from earnings alone.

Finally, there are no significant effects of the increased loan supply on employment, investment, or ROA (Columns 4-6) for zombie firms, suggesting no improvement in economic activity.[38] The

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[38] As noted by the Financial Times, this raises the concern "[...] 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

fact that the performance of zombie firms remained poor even after banks increased their loan supply is further evidence for zombie lending and against the firm balance sheet channel.

6 Long-Run Effects and Market Distortions

Next, we analyze the long-run effects of zombie lending and whether it led to market distortions. First, we track the amount of NPLs of banks that engaged in zombie lending behavior and the long-run default propensity of zombie compared to non-zombie firms. Second, we determine the spillover effects of the increased zombie prevalence for non-zombie firms.

6.1 Long-Run Effects

6.1.1 Banks. Figure 5, Panel A shows that for zombie lending banks, that is, banks that we identify as having extended an above-median share of zombie loans based on our syndicated loan data, the total NPLs/loans ratio (i.e., NPLs across all loan categories, not just syndicated loans) increased significantly in our sample period. In contrast, the NPLs/loans ratio for banks for which we do not find much evidence for zombie lending, shows only a slight increase. This suggests that zombie lending banks extended zombie loans also in other loan categories (e.g., loans to SMEs).

This graphical evidence is confirmed by the regression results presented in Panel A of Table 7, where we formally compare the change in the banks' NPLs/total loans ratios from pre- to post-2014.[39] The results shows that for banks with zombie lending incentives (i.e., weakly-capitalized banks with high *OMT windfall gains*), the NPLs/loans ratio increased significantly, while it did not change for well-capitalized banks.

6.1.2 Firms. Next, we track whether the rise in NPLs is followed by a subsequent default propensity increase for zombies. For this analysis, we collect data on firm defaults from Amadeus and augment this information with an extensive news search on default events for our sample firms (see the Online Appendix for more details). We classify a firm as defaulted if it either entered bankruptcy or if insolvency proceedings have been opened. Figure 5, Panel B presents asset-weighted cumulative default rates separately for zombie and non-zombie firms, while Panel

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areas". See "Companies: The rise of the zombie", Financial Times, January 8, 2013.

[39]We take the average of this ratio in 2012-13 and 2014-15, respectively.

C shows equally-weighted rates. The first two years post-OMT (i.e., in 2013 and 2014), zombies had a similar or even smaller default propensity than non-zombie firms. This result is remarkable as zombie firms are on average of much lower quality than non-zombie firms (see Table 4, Panel B). However, the liquidity provided through zombie loans allowed many zombies to stay afloat (the intended purpose of these loans in the first place). Yet, starting in 2015, we see a sharp default rate increase for zombies, which is consistent with the rise in NPLs starting a year earlier.

To formally test whether the sharp default rate increase for zombies is also statistically significant, we run panel regressions for the post-OMT period until 2016. The dependent variable in these regressions is an indicator variable for whether a firm defaulted in year t. The results in Table 7, Panel B show that low-IC ratio firms in general have a higher default probability than high-IC ratio firms. Moreover, consistent with the evidence from Panels B and C of Figure 5, zombie firms have a lower default propensity than other low-IC ratio firms immediately post-OMT (2012-2014) but a significantly higher default probability during 2015-2016.

6.2 Zombie Distortions

There are two potential channels through which non-zombie firms could have been negatively affected by the prevalence of zombies. First, banks with zombie lending incentives shift their lending towards existing borrowers that struggle to service their debt. This credit misallocation leads to a loan supply reduction and higher interest rates for productive, creditworthy firms operating in the same industry. Hence, these firms are potentially more financially constrained than firms in industries without such loan supply distortions.

Second, the zombie prevalence 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 reduce employment and lose market share. But, zombie loans keep distressed borrowers artificially alive, which congests the respective markets. The resulting distorting effects on healthy firms in the same industries include, e.g., depressed product market prices and increased market wages by hanging on to the workers whose productivity in the zombie firms declined. Due to these two channels, we expect that a high prevalence of congesting zombies in a particular industry resulted in larger distortions for healthy firms and thus a less vigorous recovery in these industries compared to industries with a low zombie prevalence (see also Caballero et al., 2008).

We start by providing suggestive country-industry-level evidence of the distortions caused by the increased zombie prevalence. Similar in spirit to Caballero et al. (2008), we compare the average industry productivity for industries with a large and small increase in the zombie fraction. We follow Caballero et al. (2008) and measure productivity as *Log(Sales)-2/3*Log(Employment)-1/3*Log(Fixed Assets)*. Figure A6 shows that the productivity decreased in industries that faced a larger zombie increase post-OMT, whereas industries with a lower zombie increase experienced a productivity increase. This result is confirmed by the cross-sectional regressions at the country-industry level in Table A13. The table shows that industries with a larger zombie increase post-OMT had a significantly lower productivity growth, measured as average growth in the industry productivity from the pre-OMT period (2009-2011) to the post-OMT period (2012-2015).

To test whether a high zombie presence had negative spillover effects on non-zombie firms operating in the same industry, we estimate the following panel regression:

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

where *Industry Frac Zombie*$_{jht}$ measures the zombie fraction in industry h (SIC2) in country j at time t and the dependent variables are the interest rate, employment growth, investment, and productivity.[40] Our coefficients of interest is β_2, that is, whether non-zombie firms pay higher interest rates, invest less, have lower employment growth, or a higher average productivity due to a high zombie prevalence in their industry. We again include firm and industry-country-year fixed effects. The latter alleviate concerns that the zombie prevalence in an industry in a given country and year is correlated with its overall performance. Moreover, if industry-specific policies by the government were time-varying, this specification would control for the changes.[41]

Results for this regression analysis are presented in Table 8, Panel A. The results show that non-zombie firms pay higher interest rates ($\beta_2 > 0$), invest less ($\beta_2 < 0$), have lower employment growth rates ($\beta_2 < 0$), and higher average productivity ($\beta_2 > 0$) if they operate in industries with many

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[40]We use the universe of very large Amadeus firms to calculate the industry fraction of zombies since the competitive general equilibrium effects work in the aggregate through the *full* sample of firms receiving zombie credit.

[41]Hence, the only shocks that would bias our results are shocks that are correlated with *Industry Frac Zombie* and that affect zombie and non-zombie firms differently within the same industry.

zombie firms compared to firms in industries with a low zombie prevalence. Regarding the average productivity result, as argued by Caballero et al. (2008), if non-zombie firms have to cut back their business due to competitive distortions, they primarily cut projects with a low productivity, which increases their average productivity.

The estimates in Table 8, Column (2) imply that non-zombie firms with an average increase in their industry's zombie fraction (which was 7pp) invested around 12.6% of capital less post-OMT compared to a scenario where the zombie fraction would have stayed at its pre-OMT level. An industry at the 95th percentile experienced a zombie increase of 18pp, implying that non-zombie firms invested around 32% of capital less due to the zombie increase. When looking at employment growth (Column 3), we find that firms that experienced an average zombie fraction increase in their industry had around 5.6pp lower employment growth rates. Considering again the 95th percentile, we find that non-zombie firms in this industry had 14.4pp lower employment growth rates.

Table 9 provides an overview of the evolution of the fraction of zombie firms by sector for GIIPS countries. The average zombie fraction increase was largest in the construction sector with an increase of 13.59pp. As Panel A shows, given an average investment to capital rate of 9.48% in this sector, the rise in the zombie fraction implies an investment loss of 24.4% or the equivalent of 2.6 years of investment. Similarly striking numbers can be found in the trade industry where 1.6 investment years were lost. Panel B shows that the zombie increase translated into an employment loss of 10.8pp in the construction industry and a loss of 7.8pp in the trade industry.

Finally, we investigate whether these distortionary effects are disproportionately larger in industries with certain baseline characteristics. In particular, we analyze whether these negative externalities were more intense in competitive versus non-competitive industries and in external finance dependent versus non-dependent industries.

To measure an industry's competitiveness, we use the Herfindahl-Hirschman Index (HHI) and split our sample at the median in competitive and non-competitive industries. The results in Table 8, Panels B and C show that, due to a loan supply shift to zombie firms, non-zombie firms had to pay higher interest rates if the zombie prevalence in their industry was particularly high, irrespective of the industry's competitiveness. Yet, only non-zombie firms in competitive industries suffered real effects from a high zombie prevalence (i.e., lower investments and employment growth).

To determine an industry's dependence on external finance, we follow Rajan and Zingales

(1998) and Acharya and Xu (2017) and consider an industry to be external finance dependent if its firms' median fraction of capital expenditures not financed through internal cash flows is above the median of all industries. Table 8, Panels D and E show that, while again all non-zombie firms suffered higher interest rates when facing a large zombie presence, only non-zombie firms in external finance dependent industries experienced negative real effects from a high zombie prevalence.

Finally, we employ two placebo tests to address concerns that other shocks on the real economic activity at the national level (changes in the corporate tax rate, regulations, etc.) might affect our results. First, Table A12, Panel A shows that there is no significant relation between randomly (across industry-country pairs) assigned *Industry Frac Zombie* and the firms' real economic activity. Second, Panels B and C shows that, while *Industry Frac Zombie* does not have a significant effect on the firms' real outcomes pre-OMT, there is a significant effect post-OMT.

Another potential concern with our zombie distortions analysis is that the Stable-Unit-Treatment-Value-Assumption (SUTVA, see Rubin, 1978) could be violated due to spillover effects between industries, which would bias our estimates.[42] In particular, as banks only have a finite amount of credit to allocate among industries, industries that are not directly affected by zombie lending could still suffer a lower credit supply as lending is shifted towards zombie industries. If the SUTVA is violated due to this spillover, our estimated effect of a zombie prevalence increase for non-zombie firms would be biased downwards as the average treatment on the treated effect would be higher than the estimated difference between treatment and control group.

7   Conclusion

In this paper, we show that the OMT announcement improved the health of banks in the periphery of the Eurozone. By increasing the prices of periphery sovereign bonds, banks holding these assets realized significant windfall gains, and this improved their capitalization. On the aggregate level, this bank health improvement translated into an increased loan supply to the corporate sector. However, these loans were mainly extended to low-quality borrowers with whom the respective banks already had a pre-existing lending relationship. We show that this lending pattern was mainly caused by zombie lending motives of banks that regained some lending capacity post-OMT

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[42]The SUTVA implies that treatments received by one unit do not affect outcomes for another unit.

but remained weakly-capitalized. These undercapitalized banks had an incentive to evergreen loans to their struggling borrowers to avoid having to declare outstanding loans non-performing.

We find that non-zombie firms that regained access to bank financing post-OMT used the cash inflow from new loans primarily to build up cash reserves. In contrast, zombie firms that received new loans only used a fraction of the cash inflow to build up cash reserves, likely spending the rest on interest payments on outstanding loans. Finally, neither zombie nor non-zombie firms showed a significant increase in real activity, that is, an increase in employment or investment. Over time, zombie firms experienced greater default rates and weakly-capitalized banks that we identify as banks that engaged in zombie lending suffered a stronger increase in non-performing loans.

Finally, we find that, due to credit misallocation and the resulting market distortions, creditworthy firms were negatively affected if they operated in industries with a high zombie prevalence. Both their employment growth and investments were lower than that of non-zombie firms in industries without a zombie problem.

More broadly, our paper shows that central banks can indirectly recapitalize their banking sector by influencing the prices of assets that banks hold in their portfolios. By increasing the value of these assets banks can realize significant windfall gains and this improves their equity positions. However, authorities need to pay close attention to the magnitude of these gains. If the gains are too low to adequately recapitalize (some) banks, zombie lending incentives might arise as banks that remain weakly-capitalized have an incentive to evergreen loans to troubled firms. This can lead to significant market distortions in industries with a high zombie firm prevalence.

Our analysis thus highlights the importance of a well-capitalized banking sector for an effective transmission of unconventional monetary policy measures (such as the OMT) to the real economy. While the OMT program helped to avert a collapse of the Eurozone by stabilizing sovereign bond yields and (partially) restoring financial stability, combining the program with a targeted recapitalization program and/or forced bank closures would most likely have induced a stronger economic recovery. Instead, low bank capitalization and uncertainty about the health of the banks' balance sheets remain significant issues as evidenced by the malaise in the Italian banking sector three years post-OMT, where 19% of loans are classified as non-performing. As noted by the Financial Times, "the growing fear is that the continent could be following the path of Japan, where low interest rates, looser government policy and the failure of the big banks to foreclose on unprofitable and

highly indebted companies is thought to have contributed to two decades of weak growth".[43]

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[43] "Companies: The rise of the zombie", Financial Times, January 8, 2013.

Appendix

Figure 1. Evolution of Loan Volume
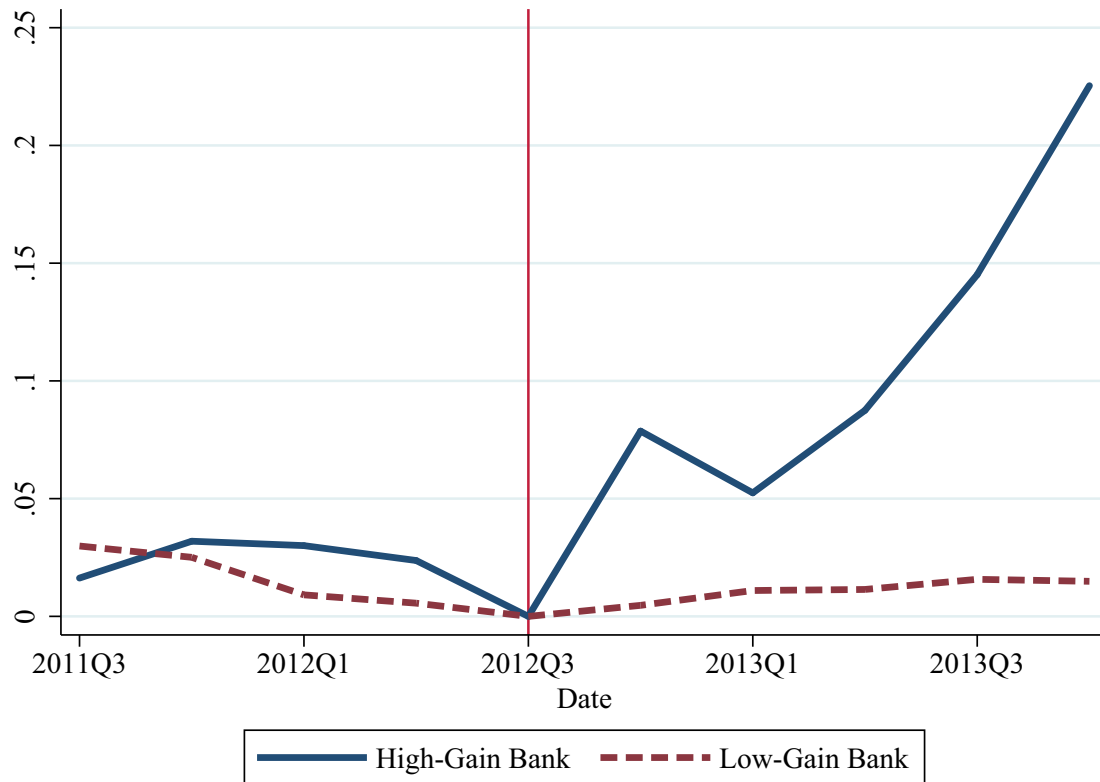
The figure shows the log-ratio of total loans in a given quarter relative to the quarter of the OMT announcement, i.e., the y-axis is normalized to 0 at the time of the OMT announcement, controlling for firm-cluster fixed effects. For each quarter, we aggregate all loans to firms borrowing from banks that are covered by the EBA's June 2012 capital exercise. A bank is classified as high-gain (low-gain) bank if its equity capital increase due to the OMT announcement is above (below) the sample mean. The vertical line marks the OMT announcement period in 2012Q3.

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Figure 2. Benchmark Interest Rates and Fraction of Zombie Firms
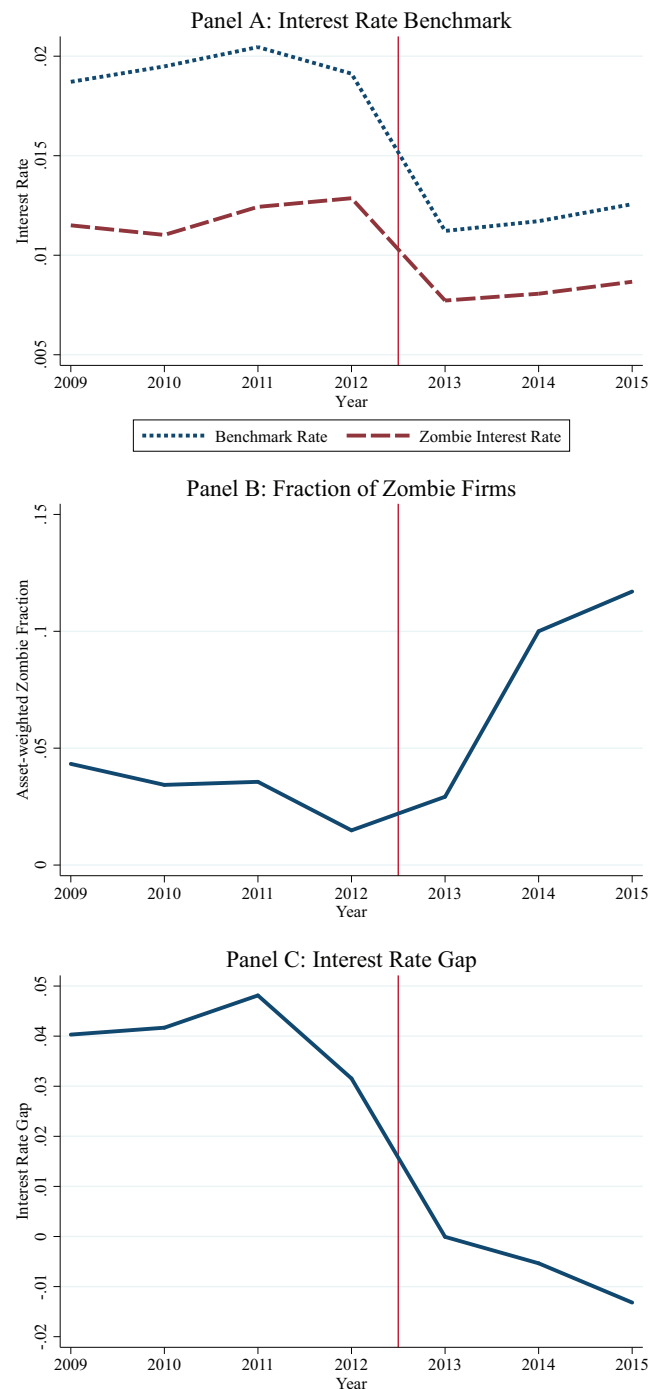
Panel A shows the average benchmark interest rate (blue dotted line) and the median interest rate paid by firms that are classified as zombie (red dashed line). Panel B shows the asset-weighted fraction of zombie firms in our sample. Panel C shows the average interest rate gap for firms that only became a zombie post-OMT. We classify a firm as zombie if it meets the following three criteria: (i) the firm received subsidized credit, (ii) its rating (derived from three year median ICs) is BB or lower, and (iii) the syndicate composition has either remained constant, or banks that left the syndicate were not replaced by new participants, that is, the same syndicate has already provided a loan to the firm. The vertical line marks the OMT announcement period in 2012Q3.

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Figure 3. Fraction of Zombie Loans - High-Gain and GIIPS Banks

Panel A: Zombie Loans - High-Gain Banks

Panel B: Zombie Loans - GIIPS Banks

Weakly-Capitalized Banks ——— Well-Capitalized Banks
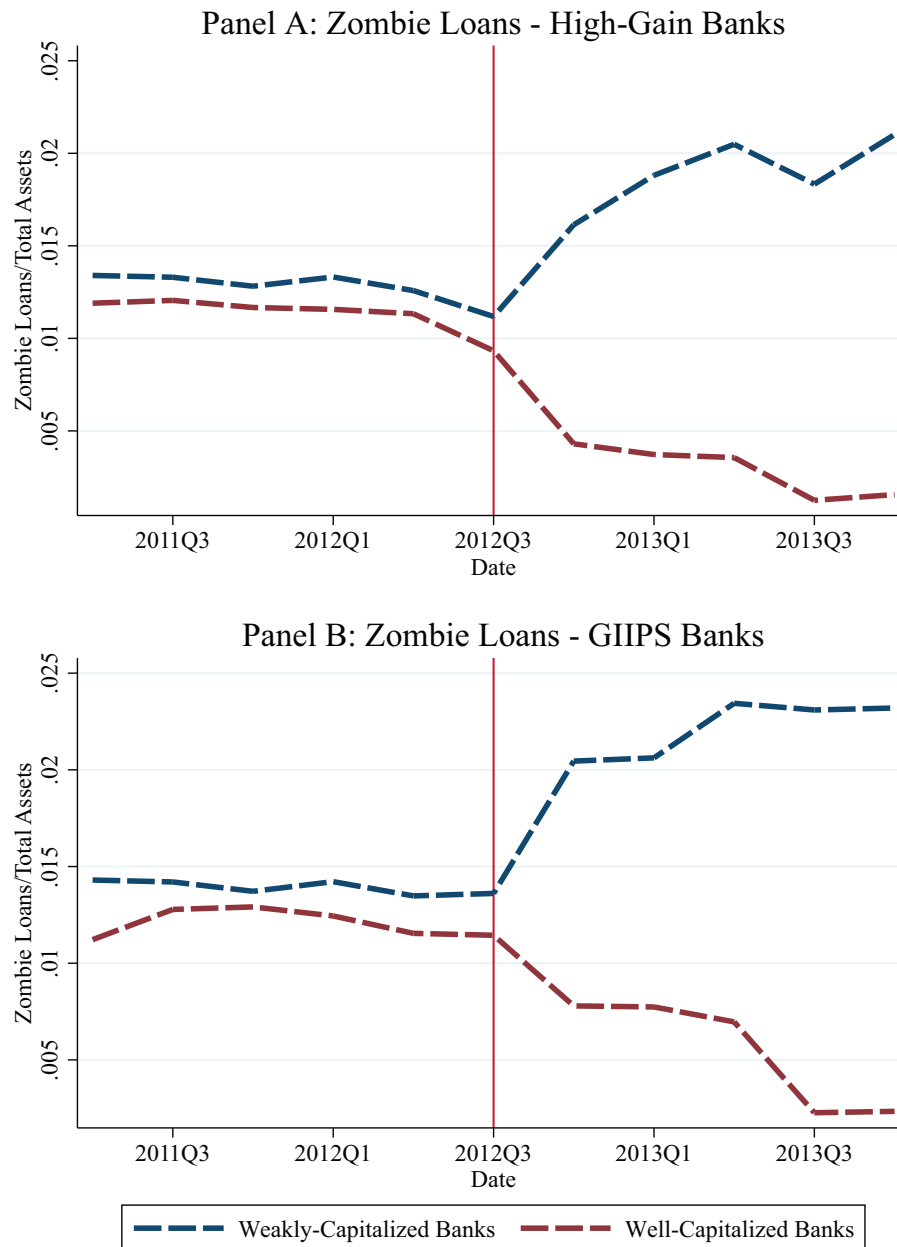
The figure presents the ratio of zombie loans to total assets separately for the subsample of high-gain banks (Panel A) and GIIPS banks (Panel B). A bank is classified as high-gain (low-gain) bank if its equity capital increase due to the OMT announcement is above (below) the sample mean. A bank is classified as weakly-capitalized (well-capitalized) if its leverage ratio is less (more) than 2% above the regulatory threshold post-OMT. For the definition of a zombie firm see the caption of Figure 2. The vertical line marks the OMT announcement period in 2012Q3.

Figure 4. Financial and Real Effects

Panel A: Cash

Panel B: Leverage

Panel C: Employment Growth

Panel D: Investment

Panel E: Return on Assets

High-IC — — Low-IC Non-Zombie ⋯⋯ Zombie
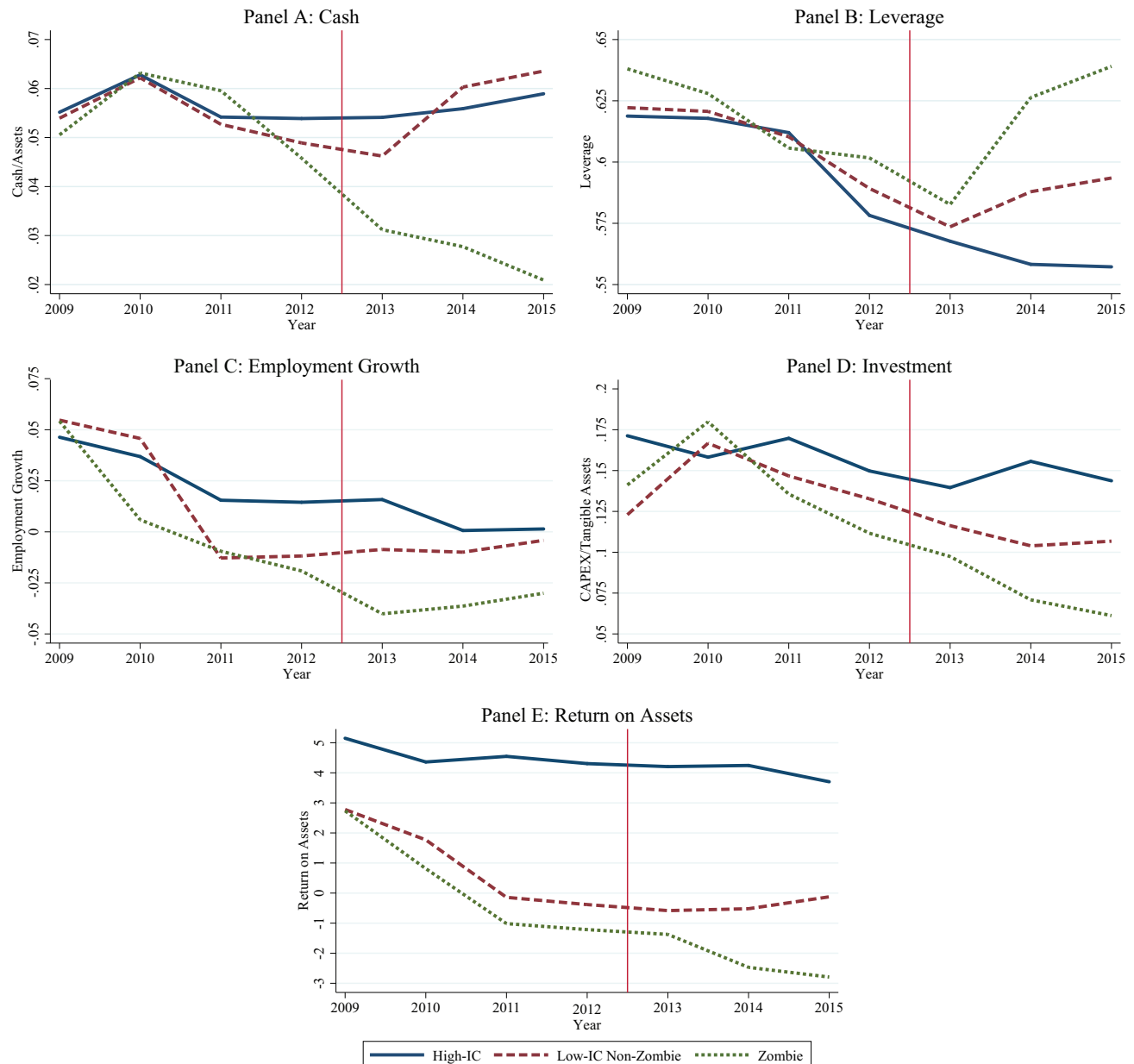
Panel A shows the evolution of the asset-weighted cash holdings as a fraction of total assets and Panel B the evolution of the asset-weighted leverage as a fraction of total assets. Panel C shows the evolution of the asset-weighted employment growth rates, Panel D the evolution of the asset-weighted capital expenditures as a fraction of tangible assets, and Panel E the evolution of the asset-weighted return on assets. All panels show high *Indirect OMT windfall gain* firms (i.e., firms with an above median *Indirect OMT windfall gain*), where we split these borrowers into three groups: High-IC ratio firms (blue solid line), low-IC ratio non-zombie firms (red dashed line), and zombie firms (green dotted line). A firm is classified as high-IC (low-IC) ratio firm if its 2009-2011 median IC ratio is above (below) the country-specific 2009-2011 median IC ratio. For the definition of a zombie firm see the caption of Figure 2. The vertical line marks the OMT announcement period in 2012Q3.

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Figure 5. Evolution of Non-Performing Loans and Firm Default Rates

Panel A: Evolution of Non-Performing Loans

Panel B: Cumulative Asset Weighted Default Rates

Panel C: Cumulative Default Rates
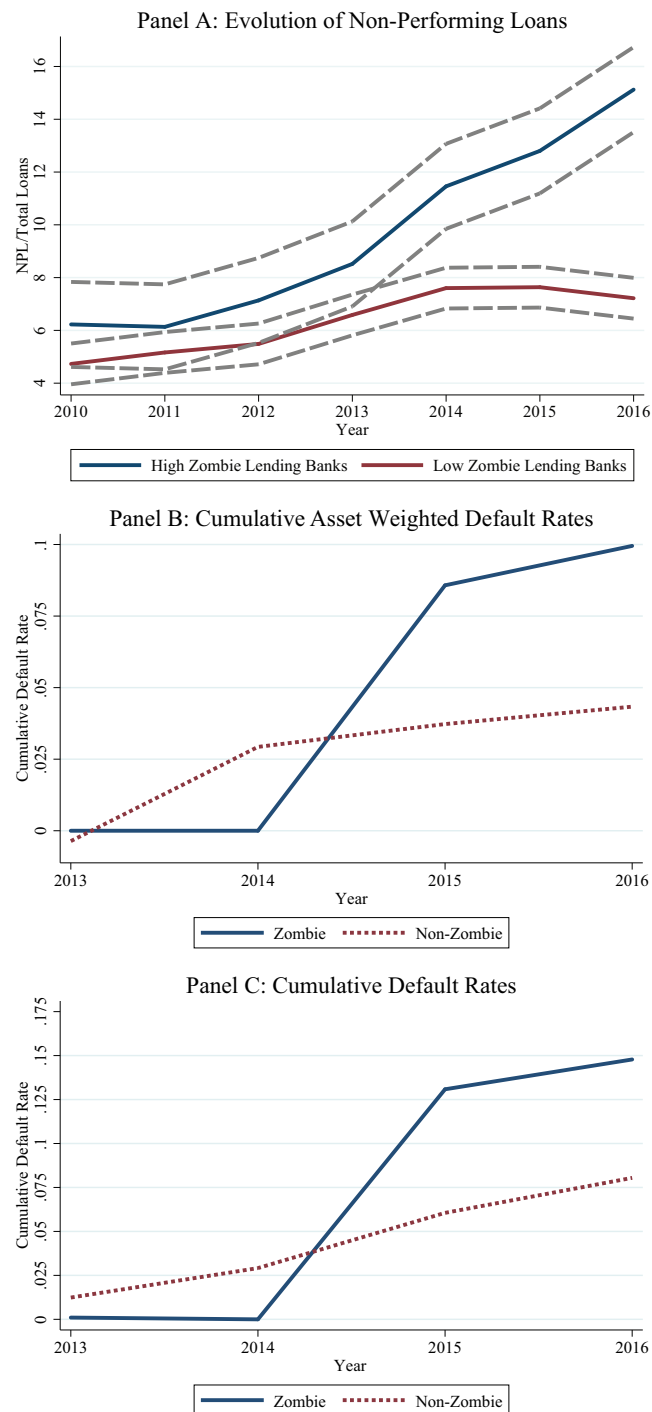
Panel A shows the asset-weighted fraction of NPLs to total loans (in %) for high and low zombie lending banks by the end of year t. The gray dashed lines show 95% confidence intervals. A bank is classified as high (low) zombie lending bank if it has an above (below) median fraction of zombie loans/total assets. Panel B presents asset-weighted cumulative firm default rates and Panel C equally weighted cumulative firm default rates for zombie (blue solid line) and non-zombie (red dashed line) firms by the end of year t. For the definition of a zombie firm see the caption of Figure 2.

Table 1. Variable Definitions

Variable	Definition
Bank level: Key explanatory variables	
OMT windfall gain	Δ*Value EU Sovereign Debt*/*Total Equity*
Weakly-Capitalized	Dummy equal to one if a bank is within 2% of EBA's regulatory capital requirement
High-Gain	Dummy equal to one if a bank has an above mean *OMT windfall gain*
PostOMT	Dummy equal to one if observation falls into the post-OMT period, which starts end of fiscal year 2012
Zombie	Dummy equal to one if firm (i) received subsidized credit, (ii) its rating is BB or lower, and (iii) syndicate has already provided a loan
Bank level: Dependent variables	
Δ*Volume*	$ln(Volume_{t+1}) - ln(Volume_t)$
New Loan	Dummy equal to one if the bank issued a new loan to a firm cluster to which no relation existed pre-OMT
Firm level: Key explanatory variables	
Average OMT windfall gain	Average *OMT windfall gain* of all lead arrangers in a given syndicate
Indirect OMT windfall gain	Proxy for the extent to which a firm benefited from the OMT announcement through their banking relationships
Industry Frac Zombie	Asset-weighted fraction of zombie firms in a given industry and country in a given year
Firm level: Dependent variables	
Δ*Debt*	$(Total\ Liabilities_{t+1} - Total\ Liabilities_t)/Total\ Assets_t$
Δ*Cash*	$(Cash_{t+1} - Cash_t)/Total\ Assets_t$
Employment Growth (Emp. Growth)	$ln(Employment_{t+1}) - ln(Employment_t)$
CAPX	$(Fixed\ Assets_{t+1} - Fixed\ Assets_t + Depreciation)/Fixed\ Assets_t$, set to 0 if negative
Return on Assets (ROA)	*Net Income*/*Total Assets*
Productivity	$Log(Sales)-2/3*Log(Employment)-1/3*Log(Fixed\ Assets)$
Interest Payment (Int. Payment)	*Interest Expenses*
Firm level: Control variables	
$ln(Assets)$	Natural logarithm of total assets
Leverage	$(Total\ Assets - Total\ Equity)/Total\ Assets$
Net Worth	$(Total\ shareholder\ funds\&Liabilities - Current\&Non\text{-}Current\ Liabilities - Cash)/Total\ Assets$
Tangibility	*Fixed Assets*/*Total Assets*
Interest Coverage Ratio (IC)	*EBIT*/*Interest Expense*
EBITDA/Assets	*EBITDA*/*Total Assets*

Table 2. Descriptive Statistics of Banks around OMT

Panel A: Bank Reaction

	(1)	(2)	(3)
	OMT windfall gain	GIIPS/Assets	CDS Return
Non-GIIPS Banks	0.011	0.010	-0.23
			(-9.2)
GIIPS Banks	0.08	0.118	-0.96
			(-3.4)
t-test for difference	5.69	12.7	7.8

Panel B: Total Assets/Total Equity Ratio

	Pre-Crisis	Crisis/pre-OMT	Post-OMT
Weakly-capitalized high-gain	15.30	24.29	19.63
Well-capitalized high-gain	15.03	16.08	13.92
Low-gain	20.75	17.11	16.68
U.S. Banks	12.65	9.25	8.70

Panel C: Quasi-Leverage Ratio

	Pre-Crisis	Crisis/pre-OMT	Post-OMT
Weakly-capitalized high-gain	22.31	71.05	40.37
Well-capitalized high-gain	19.20	26.15	17.85
Low-gain	14.39	31.81	28.61
U.S. Banks	8.5	10.1	9.9

Panel A presents descriptive statistics about the banks' *OMT windfall gain*, their GIIPS sovereign debt holdings, and the banks' CDS spread reaction to the OMT announcements. Banks included in the analysis are part of the EBA capital exercise 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. *OMT windfall gain* is the value gain on banks' sovereign debt holdings as a fraction of total equity. GIIPS/Assets is the banks' GIIPS sovereign debt holdings as a fraction of total assets. Panel B presents the book leverage ratio for different groups of banks, while Panel C presents the quasi-leverage, which is defined as market value of equity plus the book value of debt divided by the market value of equity. Pre-crisis is defined as the average assets/equity ratios for the years 2004-2006. Crisis/pre-OMT is defined as the assets/equity ratio in the year before the OMT announcement, whereas post-OMT is defined as the assets/equity ratio in the year after the OMT announcement. A bank is classified as high-gain (low-gain) bank if its equity capital increase due to the OMT announcement is above (below) the sample mean. A bank is classified as weakly-capitalized (well-capitalized) if its leverage ratio is less (more) than 2% above the regulatory threshold post-OMT. *t*-statistics are reported in parentheses.

Table 3. Loan Volume Regressions

Panel A: Intensive Margin - All Firms

	(1) All Banks ΔLoans	(2) All Banks ΔLoans	(3) All Banks ΔLoans	(4) All Banks ΔLoans	(5) All Banks Loan Inc.	(6) GIIPS Banks ΔLoans
OMT windfall gain*PostOMT	0.287***	0.241***	0.253**		0.227**	0.276**
	(4.03)	(2.76)	(2.57)		(2.17)	(2.16)
R^2	0.098	0.736	0.774		0.702	0.763
N	15,930	15,930	15,930		15,930	6,518

Panel B: Extensive Margin - All Firms

	New Loan	New Loan	New Loan			New Loan
OMT windfall gain*PostOMT	0.086	0.020	0.022			-0.009
	(1.12)	(0.65)	(0.74)			(-0.19)
R^2	0.048	0.594	0.627			0.669
N	18,291	18,291	18,291			8,655
Bank Level Controls	YES	YES	YES		YES	YES
FirmCluster Fixed Effects	YES	NO	NO		NO	NO
Time Fixed Effects	YES	NO	NO		NO	NO
Bank Fixed Effects	YES	YES	NO		NO	NO
FirmCluster-Bank Fixed Effects	NO	NO	YES		YES	YES
FirmCluster-Time Fixed Effects	NO	YES	YES		YES	YES

Panel C: Intensive Margin - Quality Split

	All Banks ΔLoans	All Banks ΔLoans	All Banks ΔLoans	All Banks ΔLoans	All Banks Loan Inc.	GIIPS Banks ΔLoans
OMT windfall gain*PostOMT	0.039	-0.064	-0.045			
	(0.56)	(-1.01)	(-1.04)			
OMT windfall gain*PostOMT*Low-IC	0.348**	0.286**	0.251**	0.309**	0.319**	0.399***
	(2.50)	(2.07)	(2.12)	(2.30)	(2.25)	(3.16)
R^2	0.098	0.737	0.778	0.772	0.706	0.778
N	15,930	15,930	15,930	15,930	15,930	6,518

Panel D: Extensive Margin - Quality Split

	New Loan	New Loan	New Loan	New Loan		New Loan
OMT windfall gain*PostOMT	0.068	0.059	0.053			
	(0.77)	(0.80)	(0.68)			
OMT windfall gain*PostOMT*Low-IC	0.040	-0.058	-0.053	-0.034		-0.023
	(0.53)	(-0.56)	(-0.48)	(-0.30)		(-1.08)
R^2	0.048	0.595	0.627	0.633		0.676
N	18,291	18,291	18,291	18,291		8,655
Bank Level Controls	YES	YES	YES	NO	NO	NO
FirmCluster Fixed Effects	YES	NO	NO	NO	NO	NO
Time Fixed Effects	YES	NO	NO	NO	NO	NO
Bank Fixed Effects	YES	YES	NO	NO	NO	NO
FirmCluster-Bank Fixed Effects	NO	NO	YES	YES	YES	NO
FirmCluster-Time Fixed Effects	NO	YES	YES	YES	YES	YES
Bank-Time Fixed Effects	NO	NO	NO	YES	YES	YES
Mean Dependent Variable (Panels A&C)	0.023	0.023	0.023	0.023	0.135	0.029
SD Dependent Variable (Panels A&C)	0.108	0.108	0.108	0.108	0.329	0.131
Mean Dependent Variable (Panels B&D)	0.038	0.038	0.038	0.038		0.036
SD Dependent Variable (Panels B&D)	0.151	0.151	0.151	0.151		0.157
Mean OMT windfall gain	0.029	0.029	0.029	0.029	0.029	0.080
SD OMT windfall gain	0.060	0.060	0.060	0.060	0.060	0.054

The table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm cluster-bank-quarteryear. In Panel A and C, the dependent variable is the change in loan volume of a firm cluster-bank relation in a given quarter. In Panels B and D, the dependent variable is a dummy equal to one if a new loan is issued to a firm cluster with which no prior relation existed. Firm clusters are formed based on a firm's country of incorporation, industry, and rating. *OMT windfall gain* is the value gain on banks' sovereign debt holdings as a fraction of total equity. *PostOMT* is an indicator variable equal to one starting in quarter four of 2012, and zero before. A firm is classified as high-IC (low-IC) ratio firm if its 2009-2011 median IC ratio is above (below) the country-specific 2009-2011 median IC ratio. 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

Panel A: Breakdown of Zombie Firms by Country		
Country	Zombie Firms/ Total Borrowers	# of Firms in Sample
Germany	11 (7%)	167
Spain	37 (18%)	201
France	20 (10%)	203
UK	33 (12%)	286
Italy	40 (20%)	198

Panel B: Difference in Group of Firms				
	High-IC Ratio	Low-IC Ratio No Zombie	Zombie	Difference (2)-(3)
Total Assets (mn)	3130	2820	2110	710**
				(2.05)
Tangibility	0.556	0.598	0.491	0.107***
				(6.68)
Int. Cov.	6.645	1.790	0.230	1.56***
				(8.28)
Net Worth	0.309	0.223	0.186	0.037***
				(2.91)
EBITDA/Assets	0.134	0.077	0.030	0.047***
				(11.92)
Leverage	0.602	0.709	0.742	-0.033***
				(-2.84)
Loan Amount/Total Assets (%)	21.25	18.80	21.92	-3.12
				(-1.48)
Maturity (Months)	60.03	63.35	61.39	1.96
				(0.58)
Term Loan (%)	53.31	51.76	54.38	-2.62
				(-0.58)

Panel A presents a breakdown of the number of zombie firms by country where the fraction of all sample firms in a given country is shown in parenthesis. Panel B presents a test for the difference in means between low-IC non-zombie firms and zombie firms. A firm is classified as high-IC (low-IC) ratio firm if its 2009-2011 median IC ratio is above (below) the country-specific 2009-2011 median IC ratio. For the definition of a zombie firm see the caption of Figure 2. Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$).

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Table 5. Loan Volume Regressions - Zombie Lending

	(1) All Banks ΔLoans	(2) All Banks ΔLoans	(3) All Banks ΔLoans	(4) All Banks ΔLoans	(5) All Banks Loan Inc.	(6) GIIPS Banks ΔLoans
OMT windfall gain*PostOMT ($\widehat{\beta}_1$)	0.484*** (3.17)	0.420** (2.30)	0.437** (2.01)			
Zombie*PostOMT	0.003 (1.28)	0.033 (0.07)				
OMT windfall gain*Zombie	-0.061 (-1.09)	-0.025 (-0.25)				
Weakly-capitalized*PostOMT ($\widehat{\beta}_5$)	0.007 (0.45)	0.008 (0.35)	0.001 (0.48)			
Weakly-capitalized*Zombie	0.010** (2.14)	0.009** (1.98)				
Weakly-capitalized*PostOMT*Zombie ($\widehat{\beta}_6$)	-0.006 (-0.16)	-0.009 (-1.13)	-0.003 (-0.13)	0.008 (0.36)	-0.023 (-1.15)	-0.007 (-0.97)
OMT windfall gain*PostOMT*Zombie ($\widehat{\beta}_3$)	-0.562* (-1.93)	-0.511*** (-3.17)	-0.501*** (-3.72)	-0.546*** (-3.96)	-0.553** (-2.32)	-0.684** (-2.59)
OMT windfall gain*PostOMT*Weakly-capitalized ($\widehat{\beta}_2$)	-0.494** (-2.48)	-0.445** (-2.10)	-0.438** (-2.04)			
OMT windfall gain*Weakly-capitalized*Zombie	-0.042 (-0.56)	-0.062 (-1.37)				
OMT windfall gain*PostOMT*Weakly-capitalized*Zombie ($\widehat{\beta}_4$)	0.792** (2.32)	0.733*** (3.55)	0.699** (2.38)	0.661** (2.43)	0.804*** (2.92)	0.980** (2.38)
R^2	0.077	0.706	0.740	0.747	0.711	0.777
N	18,098	18,098	18,098	18,098	18,098	7,815
$\widehat{\beta}_1 + \widehat{\beta}_3$	-0.078 (-0.98)	-0.091 (-1.14)	-0.064 (-0.85)			
$\widehat{\beta}_1 + \widehat{\beta}_2$	-0.010 (-0.16)	-0.025 (-0.25)	-0.001 (-0.01)			
$\widehat{\beta}_2 + \widehat{\beta}_4$	0.298** (1.97)	0.288** (2.08)	0.261* (1.76)			
$\widehat{\beta}_1 + \widehat{\beta}_2 + \widehat{\beta}_3 + \widehat{\beta}_4$	0.220** (2.17)	0.197** (2.29)	0.197* (1.79)			
$\widehat{\beta}_5 + \widehat{\beta}_6$	0.001 (0.02)	-0.001 (-0.06)	-0.002 (-0.09)			
Mean Dependent Variable	0.026	0.026	0.026	0.026	0.146	0.031
SD Dependent Variable	0.121	0.121	0.121	0.121	0.343	0.152
Mean OMT windfall gain	0.029	0.029	0.029	0.029	0.029	0.080
SD OMT windfall gain	0.060	0.060	0.060	0.060	0.060	0.054
Bank Level Controls	YES	YES	YES	NO	NO	NO
Time Fixed Effect	YES	YES	NO	NO	NO	NO
FirmCluster Fixed Effect	YES	YES	NO	NO	NO	NO
Bank Fixed Effect	YES	YES	NO	NO	NO	NO
Bank-Time Fixed Effect	NO	NO	YES	YES	YES	YES
FirmCluster-Bank Fixed Effect	NO	NO	YES	YES	YES	NO
FirmCluster-Time Fixed Effect	NO	NO	YES	YES	YES	YES

This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression as in Table 3. 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 zombie or non-zombie firms. *OMT windfall gain* is the value gain on banks' sovereign debt holdings as a fraction of total equity. *Weakly-Capitalized* is a dummy variable that equals one if a bank is less than 2% above the regulatory capital requirement post-OMT. *PostOMT* is an indicator variable equal to one starting in quarter four of 2012, and zero before. For the definition of a zombie firm see the caption of Figure 2. 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: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$).

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Table 6. Financial and Real Effects

Panel A: All Firms						
	(1)	(2)	(3)	(4)	(5)	(6)
	ΔCash	ΔDebt	ΔCash-ΔDebt	Emp. Growth	CAPX	ROA
Indirect OMT windfall gain*PostOMT	0.315**	0.316**	-0.001	0.061	-0.335	0.014
	(2.54)	(2.36)	(-0.01)	(0.62)	(-1.07)	(0.04)
R^2	0.522	0.605		0.804	0.644	0.587
N	5,324	6,599		6,486	6,492	5,544
Panel B: Quality Classification 2009-2011						
Indirect OMT windfall gain*PostOMT	0.136	0.108		-0.023	-0.092	0.185
	(0.92)	(0.53)		(-0.17)	(-0.27)	(0.53)
Indirect OMT windfall gain*PostOMT*Low-IC	0.574***	0.579**	-0.005	0.087	-0.381	-0.498
	(2.85)	(2.09)	(-0.00)	(0.56)	(-0.83)	(-1.22)
R^2	0.550	0.636		0.806	0.644	0.596
N	5,324	6,599		6,486	6,492	5,544
Panel C: Zombie Firms						
Indirect OMT windfall gain*PostOMT*Low-IC	0.543**	0.541**	0.002	0.030	-0.194	-0.339
	(2.41)	(2.50)	(0.01)	(0.32)	(-0.71)	(-1.45)
Indirect OMT windfall gain*PostOMT*Low-IC*Zombie	-0.548**	0.648***	-1.196***	0.065	0.007	-0.255
	(-2.02)	(2.86)	(-3.38)	(0.57)	(0.01)	(-0.84)
R^2	0.574	0.625		0.772	0.592	0.516
N	5,324	6,599		6,486	6,492	5,544
Mean Dependent Variable	0.010	-0.005		0.014	0.141	0.035
SD Dependent Variable	0.064	0.065		0.07	0.175	0.091
Mean Indirect OMT windfall gain	0.022	0.022		0.022	0.022	0.022
SD Indirect OMT windfall gain	0.032	0.032		0.032	0.032	0.032
Firm Level Controls	YES	YES		YES	YES	YES
Firm Fixed Effects	YES	YES		YES	YES	YES
Industry-Country-Year Fixed Effects	YES	YES		YES	YES	YES

Table 6 presents firm-level regression results. The dependent variables are the change in cash holdings, change in leverage, employment growth, investments, and ROA, respectively. In Panel B, a firm is classified as high-IC (low-IC) ratio firm if its 2009-2011 median IC ratio is above (below) the country-specific 2009-2011 median IC ratio. *Indirect OMT windfall gain* measures 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. For the definition of a zombie firm see the caption of Figure 2. Firm control variables include the logarithm of total assets, leverage, tangibility, IC 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 7. Long-Run Effects

Panel A: Non-Performing Loans				
	(1) ΔNPL	(2) ΔNPL	(3) ΔNPL	(4) ΔNPL
OMT windfall gain	0.149	0.128	0.227	0.045
	(0.76)	(0.61)	(1.26)	(0.29)
Weakly-capitalized	0.017**	0.016*	0.012	-0.002
	(2.20)	(2.05)	(1.32)	(-0.22)
OMT windfall gain*Weakly-capitalized	0.980**	1.014**	0.792**	0.714**
	(2.85)	(2.75)	(2.48)	(2.76)
Log(Assets)		-0.001	0.000	0.002
		(-0.90)	(0.12)	(0.28)
RWA/TA			0.068*	0.153**
			(1.91)	(2.91)
R^2	0.594	0.595	0.632	0.771
N	49	49	49	49
Country Fixed Effects	NO	NO	NO	YES

Panel B: Firm Defaults				
	Default	Default	Default	
Low-IC	0.026***	0.024***	0.029***	
	(4.03)	(3.60)	(3.58)	
Zombie	-0.036***	-0.034***	-0.054*	
	(-3.11)	(-2.77)	(-1.88)	
Zombie*Post	0.059**	0.059**	0.070**	
	(2.11)	(1.98)	(2.00)	
Low-IC*Post	0.002	0.004	0.000	
	(0.43)	(0.97)	(0.02)	
R^2	0.067	0.085	0.195	
N	4,993	4,993	4,993	
Industry Fixed Effects	YES	NO	NO	
Country Fixed Effects	YES	NO	NO	
Time Fixed Effects	YES	NO	NO	
Industry-Time Fixed Effects	NO	YES	NO	
Country-Time Fixed Effects	NO	YES	NO	
Industry-Country-Time Fixed Effects	NO	NO	YES	

Panel A presents cross-sectional bank regressions. The dependent variable is the change of a bank's NPLs to total loans ratio (average post- minus average pre-2014). *OMT windfall gain* is the value gain on banks' sovereign debt holdings as a fraction of total equity. *Weakly-Capitalized* is a dummy variable that equals one if a bank is less than 2% above the regulatory capital requirement post-OMT. Panel B presents firm panel regressions for the years 2012-2016. *Post* is an indicator variable equal to one starting at the end of fiscal year 2015, and zero before. We classify a firm as defaulted if it is either no longer active or if insolvency proceedings have been opened. A firm is classified as high-IC (low-IC) ratio firm if its 2009-2011 median IC ratio is above (below) the country-specific 2009-2011 median IC ratio. For the definition of a zombie firm see the caption of Figure 2. Standard errors are clustered at the country of bank level in Panel A and at the firm-level in Panel B. *t*-statistics are reported in parentheses. Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$).

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Table 8. Externalities

Panel A: Entire Sample				
	(1)	(2)	(3)	(4)
	Int. Payment	CAPX	Emp. Growth	Productivity
Industry Frac Zombie*Non-Zombie	0.024***	-0.018**	-0.008***	0.008**
	(2.97)	(-2.03)	(-2.99)	(2.32)
R^2	0.825	0.572	0.504	0.935
N	5,574	5,070	4,280	4,932
Panel B: Competitive Industries				
Industry Frac Zombie*Non-Zombie	0.032***	-0.021**	-0.009***	0.010**
	(3.43)	(-2.47)	(-2.92)	(2.56)
R^2	0.836	0.589	0.572	0.957
N	2,800	2,511	2,057	2,421
Panel C: Non-Competitive Industries				
Industry Frac Zombie*Non-Zombie	0.025*	-0.008	-0.001	0.002
	(1.95)	(-1.15)	(-0.46)	(1.07)
R^2	0.852	0.617	0.656	0.926
N	2,774	2,559	2,133	2,511
Panel D: External Finance Dependent Industries				
Industry Frac Zombie*Non-Zombie	0.029***	-0.020***	-0.009**	0.008**
	(3.20)	(-2.84)	(-2.11)	(2.35)
R^2	0.821	0.583	0.521	0.920
N	3,032	2,857	2,343	2,618
Panel E: Non-External Finance Dependent Industries				
Industry Frac Zombie*Non-Zombie	0.018*	-0.003	-0.001	0.002
	(1.84)	(-1.30)	(-1.45)	(1.25)
R^2	0.832	0.553	0.544	0.950
N	2,542	2,213	1,937	2,314
Firm Level Controls	YES	YES	YES	YES
Firm Fixed Effects	YES	YES	YES	YES
Industry-Country-Year Fixed Effects	YES	YES	YES	YES

This table presents firm-level regressions. The dependent variables are interest payments, investments, employment growth, and productivity, respectively. *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. For the definition of a zombie firm see the caption of Figure 2. To measure the competitiveness of an industry, we use the Herfindahl-Hirschman Index (HHI) and split our sample at the median in competitive and non-competitive industries (Panels B and C). To determine an industry's dependence on external finance, we follow Rajan and Zingales (1998) and Acharya and Xu (2017) and consider an industry to be external finance dependent if the median fraction of capital expenditures not financed through internal cash flows of the firms in this industry is above the median of all industries (Panels D and E). Firm control variables include the logarithm of total assets, leverage, tangibility, IC 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 9. Effects on Non-Zombie Firms

Panel A: Investment Loss

Industry	Avg. Investment (% of Capital)	ΔFraction Zombie	Investment Loss (% of Capital)	Investment Years lost
Construction	9.48%	13.59pp	24.4%	2.6
Manufacturing	11.4%	5.50pp	9.9%	0.9
Trade	10.8%	9.79pp	17.6%	1.6
Service	11.1%	9.28pp	16.8%	1.5
Other	10.6%	3.99pp	7.1%	0.7

Panel B: Employment Loss

Industry	Avg. Emp. Growth	ΔFraction Zombie	Employment Loss
Construction	-2.1%	13.59pp	10.8pp
Manufacturing	0.55%	5.50pp	4.4pp
Trade	0.24%	9.79pp	7.8pp
Service	-1.0%	9.28pp	7.4pp
Other	0.5%	3.99pp	3.1pp

Panels A and B present estimates of the investment and employment losses, respectively, that result from the increased presence of zombie firms in an industry. For the definition of a zombie firm see the caption of Figure 2. The estimates are derived from a partial equilibrium analysis that compares the outcomes from the de facto fraction of zombie firms to an outcome if the fraction of zombie firms had stayed at its pre-OMT level.

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Online Appendix for

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

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Online Appendix - List of Contents

This appendix contains additional estimates and figures that are mentioned and described in our paper but were not reported there to preserve space. Specifically, the appendix includes:

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    - **Zombie Lending Incentives**
    - **Alternative Measures of Bank Capitalization**
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        * Figure A2 shows the evolution of the run index for high- and low-gain banks calculated following Veronesi and Zingales (2010).
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        * Table A6 presents the results of a modified Khwaja and Mian (2008) bank lending

channel regression as in Table 5 where standard errors are double-clustered at the bank- and firm-cluster level.

* Table A7 presents various robustness checks for the bank lending results in Table 5 where standard errors are clustered at the bank-level.

* Table A8 presents the results of a modified Khwaja and Mian (2008) bank lending channel regression as in Table A7 where standard errors are clustered at the firm-cluster level.

* Table A9 presents the results of a modified Khwaja and Mian (2008) bank lending channel regression as in Table A7 where standard errors are double-clustered at the bank- and firm-cluster level.

* Table A10 presents the results of a modified Khwaja and Mian (2008) bank lending channel regression as in Table 5. Panel A presents results for a continuous measure of capitalization. Panel B defines a bank as *weakly-capitalized* if it is less than 2% above the regulatory capital requirement post-OMT after adjusting for sovereign risk in the regulatory capital ratio. Panel C replaces a bank's *OMT windfall gain* with its *CDS OMT Return.*

* Table A11 presents the results of a modified Khwaja and Mian (2008) bank lending channel regression as in Table 5. Panel A excludes firm with positive government ownership. Panel B excludes firms in which banks that provide a loan also have an equity ownership stake.

* Table A12 presents placebo tests for the firm-level regressions from Table 8.

* Table A13 presents results of cross-sectional regressions at the country-industry level of the change in the average productivity from the pre-OMT period (2009-2011) to the post-OMT period (2012-2015).

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    * Figure B4 presents cumulative default rates for the crisp zombie definitions *Zombie2* and *Zombie3.*

– **Tables**
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  * Table B2 presents a breakdown of the number of zombie firms by country for the three crisp zombie classifications (*Zombie*, *Zombie2*, and *Zombie3*).
  * Table B3, Panels A and B present a test for the difference in means between low-IC ratio non-zombie firms and zombie firms for Zombie definitions *Zombie2* and *Zombie3*, respectively. Panel C presents a test for the difference in means between firms that are classified as zombies only under the industry-specific benchmark (*Zombie2*) but not under the main definition *Zombie*.
  * Table B4 presents the results of a modified Khwaja and Mian (2008) bank lending channel regression as in Table 5 where we employ zombie definitions *Zombie2* and *Zombie3*.
  * Table B5 presents firm-level regression results as in Table 6 where we employ zombie definitions *Zombie2* and *Zombie3*.

Online Appendix A: *Robustness and Further Results*

A1 Further Results on Liquidity

In addition to the positive impact on the banks' equity capitalization, the OMT announcement also positively affected the banks' liquidity. First, the OMT announcement restored the ability of banks with significant holdings of GIIPS sovereign bonds 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". Second, the OMT announcement helped banks to free up liquidity that they had acquired previously, e.g., under the LTRO programs (see also Section 3.2.3), but which they had not been able to invest due to their insufficient solvency.

To provide evidence on the extent to which banks were subject to a bank run (and thus liquidity constrained) around the OMT announcement, we adopt the method used in Veronesi and Zingales (2010), which utilizes the term structure of CDS rates to estimate the probability of a bank run.[44] The idea is to compare the probability of bankruptcy in year 1 ($P1$) and the conditional probability of bankruptcy in year 2 given no default in year 1 ($P2$). The run index is then calculated as $R = P1 - P2$. A positive R value is an indication that a bank is subject to a run as this suggests that the probability of default is higher in the short-term (i.e., within one year) than in the long-term (i.e., in year 2 conditional on surviving year 1).

Figure A2 plots the evolution of the run index over the period January 2012 to December 2013 for high- and low-gain banks. For high-gain banks the run index is positive at the beginning of 2012 but gradually decreases after the second LTRO allotment date (February 2012). However, the decline in the probability of a bank run is not permanent for these banks as the run index increases again until the date of the OMT announcements (the three vertical lines). After the OMT announcement, the run index is permanently lower than 0 for high-gain banks (even lower than for low-gain banks), which indicates that the imminent threat of a bank run is no longer present for these banks.

Table A2 confirms this result using cross-sectional (across banks) regressions of the change in the run index on *OMT windfall gain*. The results show that banks with a higher *OMT windfall gain* have a significantly stronger decrease in their run index (calculated as the average six months pre-OMT relative to the average six months post-OMT).

Taken together, through its positive effect on European banks' capitalization, the OMT announcement also increased their liquidity. The improved financial stability thus allowed banks to use existing and newly (from financial markets) acquired liquidity to grant new loans.

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[44]Veronesi, P., and L. Zingales. 2010. Paulson's Gift. Journal of Financial Economics 97:339–368.

A2   Zombie Lending Incentives

To confirm that high-gain banks that remained weakly-capitalized post-OMT had an incentive to engage in zombie lending, we calculate for each bank what its regulatory capital ratio would have been if it had pulled the plug on its zombie borrowers, implying (in the worst case) a full write-off of the outstanding loans to these borrowers. Our estimates show that, indeed, these banks would have faced significant capital shortfalls in this case. That is, their capital ratios would have been on average only 4.8% instead of the 9% required by the EBA. Moreover, their risk-unadjusted leverage ratio (i.e., total assets/total equity), which was on average 19.63 (see Table 2) post-OMT, would have increase to around 30. This suggests that high-gain banks that remained weakly-capitalized post-OMT indeed had strong zombie lending incentives.

This conclusion is supported by the fact that, even within its existing borrower pool, the likelihood that a weakly-capitalized bank extended a subsidized loan to a specific borrower seem to have increased in its pre-OMT credit exposure to this borrower. While the average pre-existing loan size of a borrower that received subsidized credit post-OMT amounted to on average 3.2% of the respective lender's total equity, the average loan size of other low-quality borrowers who did *not* receive subsidized lending amounted to on average only 2.2% of the lender's total equity. This difference is also statistically significant, which provides further evidence that banks' acted on zombie lending incentives.[45]

A3   Alternative Measures of Bank Capitalization

As a further robustness check, we employ two alternative measures of bank capitalization. First, instead of classifying banks into two categories (well- and weakly-capitalized), we employ a continuous measure of the banks' capital buffer above the regulatory minimum. To maintain the same sign of coefficients as in Table 5, we invert the capital buffer measure, such that a higher value corresponds to a *smaller* distance to the regulatory minimum. Panel A of Table A10 show that our results are qualitatively and quantitatively similar for all zombie definitions when we use this continuous capitalization measure. More precisely, a bank at the 90th percentile of the capital buffer distribution (i.e., a bank with a capital ratio close to the regulatory minimum) increased its zombie lending volume by 1.6pp.

Second, the EBA required banks to have a higher Tier-1 capital ratio as a buffer for risky sovereign debt holdings. After incorporating this requirement in the calculation of risk-weighted assets (under the Basel regulation sovereign debt holdings carry zero risk weights, i.e., they are not included in the risk-weighted assets calculation), banks still had to satisfy the 9% regulatory capital ratio. Hence, as a further robustness check, we classify a bank as weakly-capitalized if it was within 2% of this adjusted regulatory requirement in the end of 2012. Results continue to hold

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[45]To further ensure that the zombie lending incentive is actually resulting from loan exposures, we rerun our main analysis excluding lending relationships where banks also have positive equity ownership in the borrower. Results remain unchanged (see Table A11, Panel B).

as shown by Table A10, Panel B.

A4 Loan Renegotiations

To gauge the importance of loan renegotiations in the post-OMT period, we collect data on loan amendments from Bloomberg and Dealscan for our sample period and match the amendment information to our sample firms. While we cannot observe what terms exactly have been altered in a loan contract in most cases, we see (i) which firms received an amendment to their loan contract, and (ii) when the amendment took place. This information allows us to determine for each loan amendment whether the zombie status of our sample firm changed between the beginning of the year in which the amendment was introduced and the end of that year. If a firm that received an amendment in year t is a non-zombie firm in year $t-1$ but is classified as zombie at the end of year t, we label this as a *"Zombie Amendment"*.

Figure A5, Panels A and B plot for all sample countries and only GIIPS countries, respectively, the share of firms that received a loan amendment in year t relative to the total number of firms. Several observations are noteworthy. Looking at the evolution of the prevalence of loan amendments in all countries over time in Panel A shows that the fraction of borrowers receiving an amendment and the fraction of borrowers turning into zombie firms post-renegotiation was highest in 2012. This spike in (zombie-generating) loan amendments in 2012 is mainly driven by borrowers located in GIIPS countries, as shown by Panel B.

This evidence suggests that the increase in the loan volume to zombie firms post-OMT was initially also driven by the renegotiation of the interest rates on pre-existing loans (which turned the respective firms into zombies).

A5 Identifying Firm Defaults

To identify default events for our sample firms, we proceed in two steps. First, we flag firms that according to the legal status variable reported in Amadeus are in distress, insolvent, or bankrupt. In a second step, we then conduct an extensive news search to confirm that these firms in fact entered bankruptcy or filed for insolvency within the period covered by our analysis (2012-2016).

Accordingly, we first identify firms that have one of the following legal status in Amadeus: "Active (default of payments)", "Active (dormant)", "Active (insolvency proceedings)", "Active (reorganization)", "Active (rescue plan)", "Bankruptcy", "Dissolved", "Dissolved (bankruptcy)", "Dissolved (demerger)", "Dissolved (liquidation)", "Dissolved (merger or take-over)", "In liquidation","Inactive (no precision)".

In a second step, we check whether these firms are actually in default and determine the specific event date for each firm by performing a series of media keyword searches similar to Faccio, Masulis and McConnell (2006).[46] In particular, using Factiva, an online database of various news media

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[46]Faccio, M., R. W. Masulis, and J. J. McConnell. 2006. Political Connections and Corporate Bailouts. The

Electronic copy available at: https://ssrn.com/abstract=2740338

sources, we conduct keyword searches for the period January 1, 2012 through December 31, 2016 using (i) the name of the company, and (ii) the keywords "bankrupt*", "insolven*", "default*", "liquidat*" or "restructure*".[47]

Finally, to be included in the list of defaulted firms, the news article must unambiguously describe that the firm entered bankruptcy or filed for insolvency within the period covered by the analysis (2012-2016).

Journal of Finance 61:2597–2635.

[47]Note that the asterisks work as placeholder text and thus such a search identifies news articles that contain words that match versions of these phrases that are identical or contain a set of additional characters in place of the asterisk (e.g., searching for "bankrupt*" identifies articles containing the phrases "bankruptcy", or "bankrupt".

A6 Figures

Figure A1. CDS Reaction

Panel A: All Banks
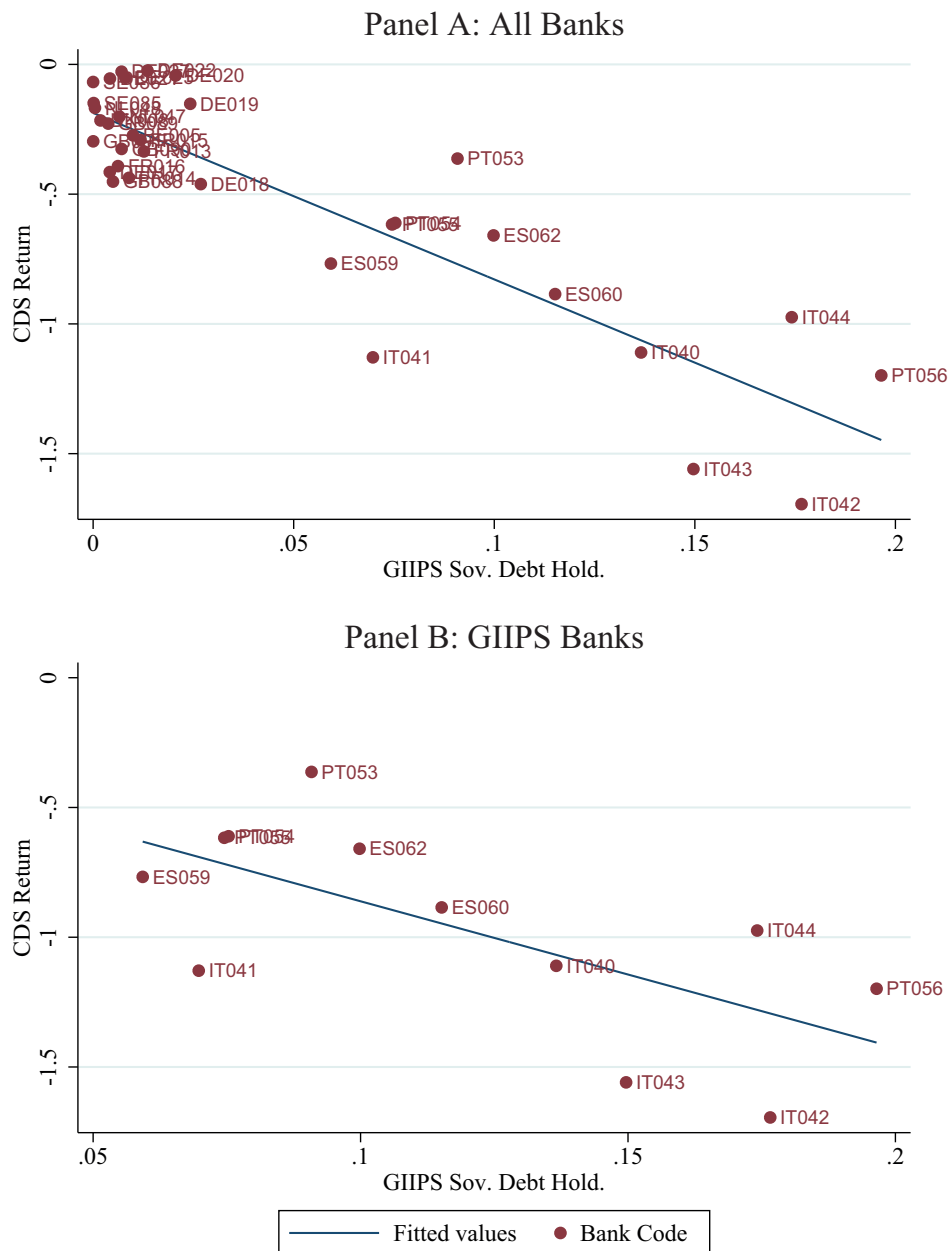
Panel B: GIIPS Banks

Panel A plots the relation between banks' CDS return on the OMT announcement dates and their GIIPS sovereign debt holdings for GIIPS and non-GIIPS banks, while Panel B plots it for GIIPS banks only. GIIPS banks include banks incorporated in Italy, Portugal, and Spain. Non-GIIPS banks consist of banks in all other European countries. All banks are included in the analysis for which information about their sovereign debt portfolio prior to the OMT announcement (June 2012) is available and which are active in the syndicated loan market during the sample period.

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Figure A2. Evolution of the Run Index
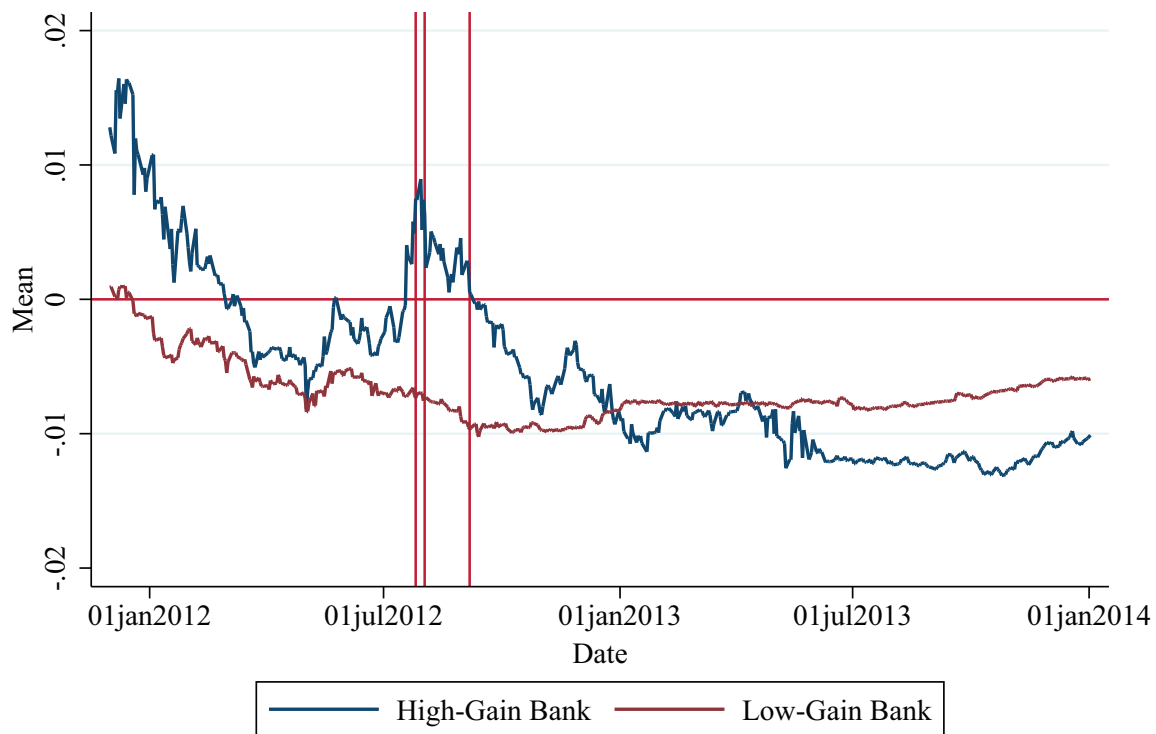
The figure shows the evolution of the run index for high- and low-gain banks calculated following Veronesi and Zingales (2010).[48] The run index is a proxy for the likelihood that a bank faces a bank run. A bank is classified as high-gain (low-gain) bank if its equity capital increase due to the OMT announcement is above (below) the sample mean. The vertical lines indicate the OMT announcement dates (July 26, August 2, September 6, 2012).

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[48]Veronesi, P., and L. Zingales. 2010. Paulson's Gift. Journal of Financial Economics 97:339–368.

Figure A3. Placebo Tests
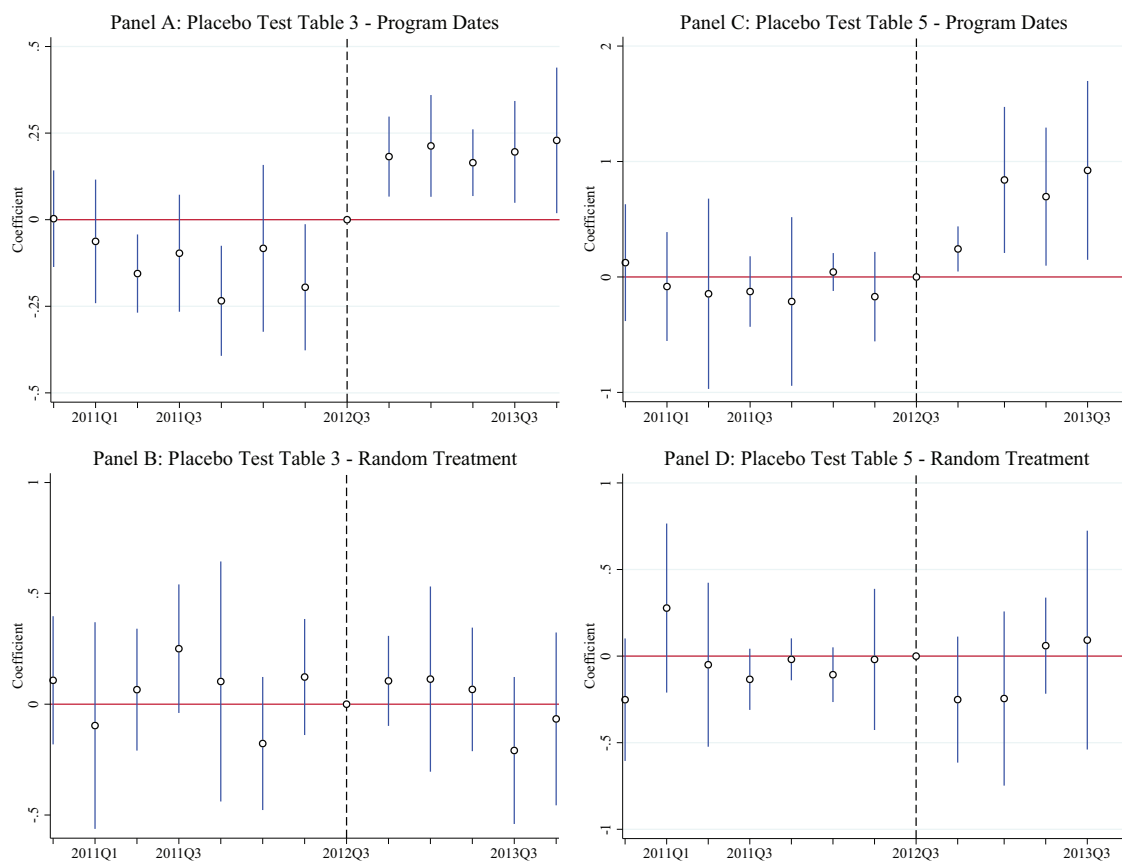
Panel A plots the estimated coefficients from the following regression:

$$\Delta Volume_{bmt+1} = \sum_{\tau} \beta_{\tau} \cdot OMT\ windfall\ gain_b \cdot \mathbb{1}_{t,\tau} + \gamma \cdot X_{bt} + Firm\ Cluster_m \cdot Quarter\text{-}Year_{t+1}$$
$$+ Firm\ Cluster_m \cdot Bank_b + u_{bmt+1}.$$

The indicator $\mathbb{1}_{t,\tau}$ is a dummy variable equal to one if $t = \tau$, and zero otherwise. The vertical dashed line marks the OMT announcement period in 2012Q3. The vertical non-dashed lines represent 95% confidence intervals, adjusted for bank level clustering. We exclude 2012Q3, thus estimating the effect relative to the OMT announcement quarter.

Panel B repeats the same exercise with randomly reassigned *OMT windfall gains*. Similarly, Panel C plots estimated coefficients corresponding to β_4 in Eq. 5, while Panel D again plots these coefficients with randomly reassigned *OMT windfall gains*.

Figure A4. Well-Capitalized Banks - Zombie Lending

Panel A: Zombie Lending of Well-Capitalized Banks

Panel B: Maturity of pre-existing Zombie Loans
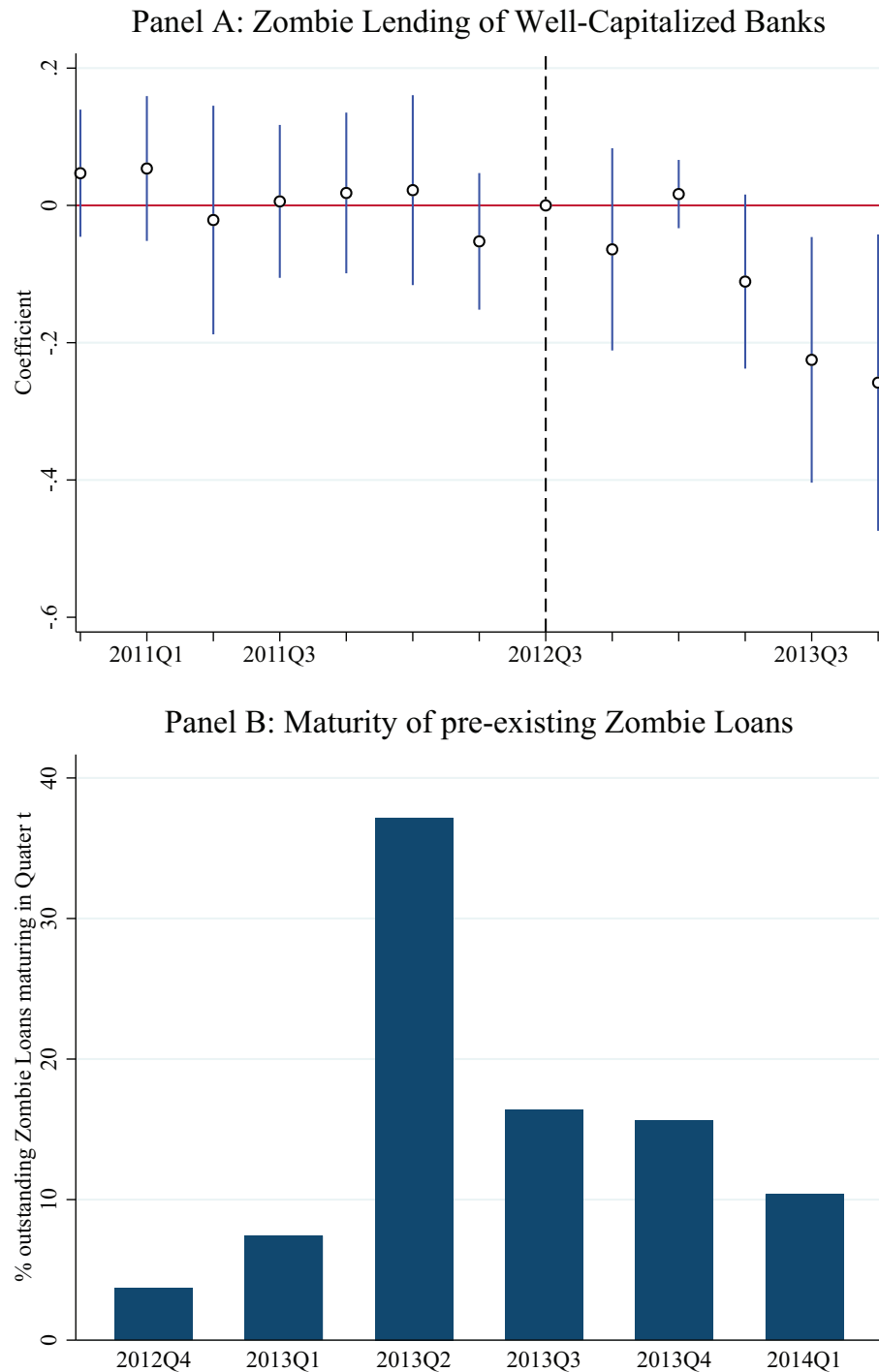
Panel A presents the coefficients of the sum of *OMT windfall gain*PostOMT + OMT windfall gain*PostOMT*Zombie* over time, following the methodology outlined in Figure A3. Panel B plots for well-capitalized banks the fraction of pre-existing zombie loans (i.e., zombie loans that were outstanding before the OMT announcement) that matured in a given quarter.

Figure A5. Loan Amendments
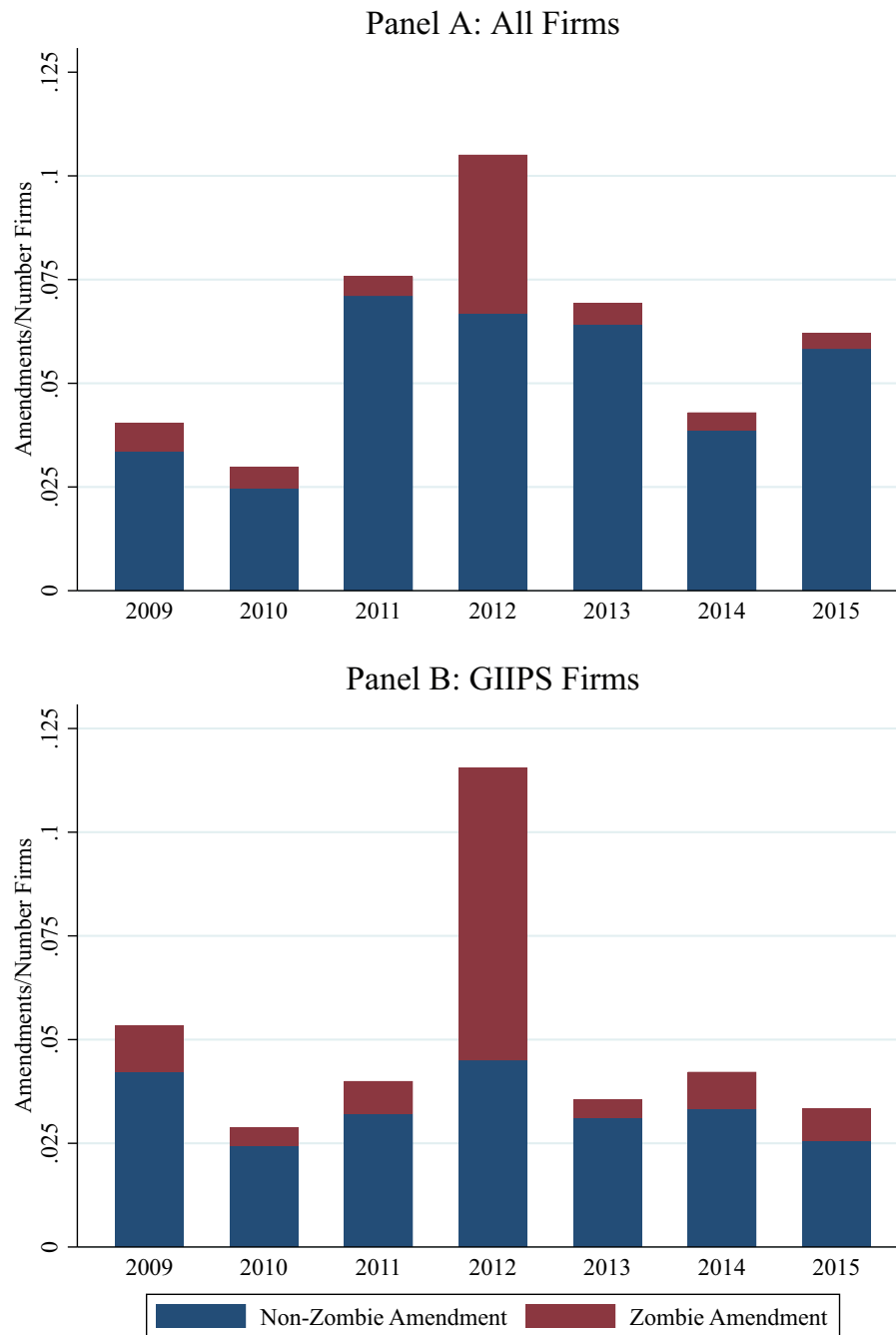
Panel A: All Firms

Panel B: GIIPS Firms

Panels A and B plot for all sample countries and only GIIPS countries, respectively, the share of firms that received a loan amendment in year t relative to the total number of firms.

Figure A6. Industry Productivity
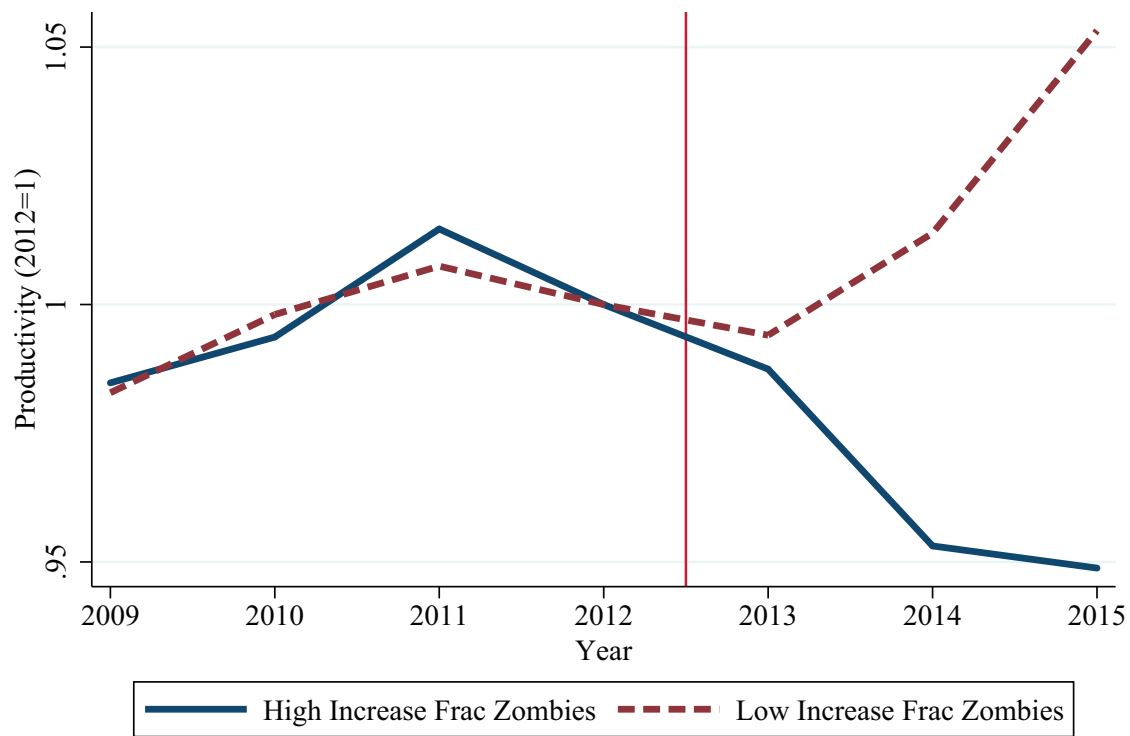
This figure shows the average country-industry-level productivity (measured relative to 2012 where productivity is set equal to one) for industries with a high (blue solid line) and low (red dashed line) increase in the fraction of zombie firms in the post-OMT period. For the definition of a zombie firm see the caption of Figure 2. The vertical line marks the OMT announcement period in 2012Q3.

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A7 Tables

Table A1. Bank CDS Reaction to OMT Announcement

Panel A: GIIPS Sovereign Bond Holdings scaled by Total Assets				
	(1)	(2)	(3)	(4)
	CDS Return	CDS Return	CDS Return	CDS Return
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)
Tier-1 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	30	30	30	30
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)
Tier-1 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	30	30	30	30

This table presents estimates from a linear regression analysis of the determinants of banks' CDS returns on the OMT announcement dates. Independent variables are each bank's GIIPS sovereign bond holdings scaled by total assets (GIIPS/Assets) measured before the OMT announcement (Panel A) and its *OMT windfall gain* which is defined as the gain on the sovereign debt holdings as a fraction of total equity (Panel B). Control variables are 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 A2. Run Index

	(1)	(2)	(3)	(4)
	ΔRun Index	ΔRun Index	ΔRun Index	ΔRun Index
OMT windfall gain	-0.150***	-0.139***	-0.175***	-0.162***
	(-6.58)	(-3.85)	(-3.89)	(-2.51)
GIIPS Bank			0.002	0.002
			(0.65)	(0.44)
Ln(Total Assets)		0.001		0.000
		(0.59)		(0.39)
Tier-1 Ratio		0.000		0.000
		(0.09)		(0.02)
R^2	0.607	0.610	0.613	0.613
N	30	30	30	30

This table presents bank cross sectional regressions. The dependent variable is the change in the run index (average 6 months prior to average 6 months post-OMT) calculated following Veronesi and Zingales (2010). The run index is a proxy for the likelihood that a bank faces a bank run. *OMT windfall gain* is the value gain on banks' sovereign debt holdings as a fraction of total equity. *t*-statistics are reported in parentheses. Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$).

Table A3. Loan Volume Regressions - CDS Return

Panel A: Intensive Margin

	(1)	(2)	(3)	(4)	(5)	(6)
	All Banks	All Banks	All Banks	All Banks	All Banks	GIIPS Banks
	ΔLoans	ΔLoans	ΔLoans	ΔLoans	Loan Inc.	ΔLoans
CDS OMT Return*PostOMT	0.067***	0.051***	0.056***		0.085**	0.061**
	(3.25)	(3.41)	(3.26)		(2.12)	(2.58)
R^2	0.100	0.738	0.776		0.705	0.774
N	13,301	13,301	13,301		13,301	5,073
Bank Level Controls	YES	YES	YES		YES	YES
FirmCluster Fixed Effects	YES	NO	NO		NO	NO
Time Fixed Effects	YES	NO	NO		NO	NO
Bank Fixed Effects	YES	YES	NO		NO	NO
FirmCluster-Bank Fixed Effects	NO	NO	YES		YES	YES
FirmCluster-Time Fixed Effects	NO	YES	YES		YES	YES

Panel B: Intensive Margin - Quality Split

	(1)	(2)	(3)	(4)	(5)	(6)
CDS OMT Return*PostOMT	0.003	-0.003	-0.007			
	(1.10)	(-0.18)	(-0.31)			
OMT windfall gain*PostOMT*Low-IC	0.051*	0.057**	0.055**	0.066***	0.124***	0.084**
	(1.86)	(2.19)	(2.29)	(2.79)	(2.94)	(2.13)
R^2	0.100	0.750	0.789	0.795	0.720	0.798
N	13,301	13,301	13,301	13,301	13,301	5,073
Bank Level Controls	YES	YES	YES	NO	YES	YES
FirmCluster Fixed Effects	YES	NO	NO	NO	NO	NO
Time Fixed Effects	YES	NO	NO	NO	NO	NO
Bank Fixed Effects	YES	YES	NO	NO	NO	NO
FirmCluster-Bank Fixed Effects	NO	NO	YES	YES	YES	NO
FirmCluster-Time Fixed Effects	NO	YES	YES	YES	YES	YES
Bank-Time Fixed Effects	NO	NO	NO	YES	YES	YES

This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression as in Table 3. A firm is classified as high-IC (low-IC) ratio firm if its 2009-2011 median IC ratio is above (below) the country-specific 2009-2011 median IC ratio. *CDS OMT Return* is the CDS return of a bank on the three OMT announcement dates (July 26, August 2, and September 6, 2012). *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 A4. Interest Rate Regressions

	(1)	(2)	(3)	(4)
	All Banks	All Banks	All Banks	GIIPS Banks
	Spread	Spread	Spread	Spread
OMT windfall gain*PostOMT	-105.12*	-111.84*		-138.96**
	(-1.86)	(-1.93)		(-1.98)
OMT windfall gain*PostOMT*Low-IC	72.48	82.68	16.44	55.92
	(1.36)	(1.25)	(1.15)	(1.39)
OMT windfall gain*PostOMT*Weakly-capitalized	96.2	93.4		112.6
	(1.18)	(1.12)		(1.27)
OMT windfall gain*PostOMT*Weakly-capitalized*Low-IC	-550.24**	-554.08**	-516.48**	-822.40**
	(-2.22)	(-2.14)	(-2.28)	(-2.11)
R^2	0.694	0.725	0.737	0.738
N	8,309	8,309	8,309	3,822
FirmCluster-Time Fixed Effect	YES	YES	YES	YES
Bank Fixed Effect	YES	NO	NO	NO
FirmCluster-Bank Fixed Effect	NO	YES	YES	YES
Bank-Time Fixed Effect	NO	NO	YES	NO

This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression where the dependent variable is the all-in-drawn spread. Firm clusters are formed based on a firm's country of incorporation, industry, and rating. A firm is classified as high-IC (low-IC) ratio firm if its 2009-2011 median IC ratio is above (below) the country-specific 2009-2011 median IC ratio. *OMT windfall gain* is the value gain on banks' sovereign debt holdings as a fraction of total equity. *Weakly-Capitalized* is a dummy variable that equals one if a bank is less than 2% above the regulatory capital requirement post-OMT. *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 A5. Loan Volume Regressions - Zombie Lending (Firm-Cluster Level Clustering)

	(1) All Banks ΔLoans	(2) All Banks ΔLoans	(3) All Banks ΔLoans	(4) All Banks ΔLoans	(5) All Banks Loan Inc.	(6) GIIPS Banks ΔLoans
OMT windfall gain*PostOMT	0.484** (2.30)	0.420** (2.18)	0.437** (1.96)			
Zombie*PostOMT	0.003 (1.19)					
OMT windfall gain*Zombie	-0.061 (-0.63)	0.033 (0.08)				
Weakly-capitalized*PostOMT	0.007 (1.23)	0.008 (1.12)	0.001 (0.89)			
Weakly-capitalized*Zombie	0.010** (2.29)	0.009** (2.06)				
Weakly-capitalized*PostOMT*Zombie	-0.006 (-0.15)	-0.009 (-0.78)	-0.003 (-0.26)	0.008 (0.49)	-0.023 (-1.18)	-0.007 (-1.26)
OMT windfall gain*PostOMT*Zombie	-0.562** (-1.99)	-0.511** (-2.39)	-0.501** (-2.41)	-0.546** (-2.44)	-0.553** (-2.07)	-0.684** (-2.21)
OMT windfall gain*PostOMT*Weakly-capitalized	-0.494** (-2.12)	-0.445** (-2.33)	-0.438** (-2.05)			
OMT windfall gain*Weakly-capitalized*Zombie	-0.042 (-0.54)	-0.062 (-1.20)				
OMT windfall gain*PostOMT*Weakly-capitalized*Zombie	0.792** (1.99)	0.733** (2.31)	0.699** (2.11)	0.661** (2.30)	0.804** (2.30)	0.980** (2.18)
R^2	0.077	0.706	0.740	0.747	0.711	0.777
N	18,098	18,098	18,098	18,098	18,098	7,815
Bank Level Controls	YES	YES	YES	NO	NO	NO
Time Fixed Effect	YES	YES	NO	NO	NO	NO
FirmCluster Fixed Effect	YES	NO	NO	NO	NO	NO
Bank Fixed Effect	YES	YES	NO	NO	NO	NO
Bank-Time Fixed Effect	NO	NO	YES	YES	YES	YES
FirmCluster-Bank Fixed Effect	NO	NO	YES	YES	YES	NO
FirmCluster-Time Fixed Effect	NO	YES	YES	YES	YES	YES

This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression as in Table 5. 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 zombie or non-zombie firms. *OMT windfall gain* is the value gain on banks' sovereign debt holdings as a fraction of total equity. *Weakly-Capitalized* is a dummy variable that equals one if a bank is less than 2% above the regulatory capital requirement post-OMT. *PostOMT* is an indicator variable equal to one starting in quarter four of 2012, and zero before. For the definition of a zombie firm see the caption of Figure 2. Bank level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. Standard errors are clustered at the firm-cluster level. *t*-statistics are reported in parentheses. Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$).

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Table A6. Loan Volume Regressions - Zombie Lending (Double-Clustering)

	(1) All Banks ΔLoans	(2) All Banks ΔLoans	(3) All Banks ΔLoans	(4) All Banks ΔLoans	(5) All Banks Loan Inc.	(6) GIIPS Banks ΔLoans
OMT windfall gain*PostOMT	0.484*** (2.70)	0.420** (2.19)	0.437** (1.99)			
Zombie*PostOMT	0.003 (1.16)					
OMT windfall gain*Zombie	-0.061 (-0.68)	0.033 (0.09)				
Weakly-capitalized*PostOMT	0.007 (0.86)	0.008 (0.96)	0.001 (0.67)			
Weakly-capitalized*Zombie	0.010** (1.98)	0.009* (1.94)				
Weakly-capitalized*PostOMT*Zombie	-0.006 (-0.22)	-0.009 (-0.74)	-0.003 (-0.17)	0.008 (0.54)	-0.023 (-1.06)	-0.007 (-1.22)
OMT windfall gain*PostOMT*Zombie	-0.562* (-1.82)	-0.511** (-2.52)	-0.501** (-2.54)	-0.546*** (-2.72)	-0.553** (-2.08)	-0.684** (-2.29)
OMT windfall gain*PostOMT*Weakly-capitalized	-0.494** (-2.30)	-0.445** (-2.07)	-0.438* (-1.95)			
OMT windfall gain*Weakly-capitalized*Zombie	-0.042 (-0.54)	-0.062 (-1.49)				
OMT windfall gain*PostOMT*Weakly-capitalized*Zombie	0.792** (2.19)	0.733** (2.56)	0.699** (2.12)	0.661** (2.27)	0.804** (2.42)	0.980** (2.14)
R^2	0.077	0.706	0.740	0.747	0.711	0.777
N	18,098	18,098	18,098	18,098	18,098	7,815
Bank Level Controls	YES	YES	YES	NO	NO	NO
Time Fixed Effect	YES	YES	NO	NO	NO	NO
FirmCluster Fixed Effect	YES	NO	NO	NO	NO	NO
Bank Fixed Effect	YES	YES	NO	NO	NO	NO
Bank-Time Fixed Effect	NO	NO	NO	YES	YES	YES
FirmCluster-Bank Fixed Effect	NO	NO	YES	YES	YES	NO
FirmCluster-Time Fixed Effect	NO	YES	YES	YES	YES	YES

This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression as in Table 5. 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 zombie or non-zombie firms. *OMT windfall gain* is the value gain on banks' sovereign debt holdings as a fraction of total equity. *Weakly-Capitalized* is a dummy variable that equals one if a bank is less than 2% above the regulatory capital requirement post-OMT. *PostOMT* is an indicator variable equal to one starting in quarter four of 2012, and zero before. For the definition of a zombie firm see the caption of Figure 2. Bank level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. Standard errors are double-clustered at the bank- and firm-cluster level. *t*-statistics are reported in parentheses. Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$).

Table A7. Loan Volume Regressions - Zombie Lending Robustness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Government Ownership	Government Ownership	Non-GIIPS Borrower	Non-GIIPS Borrower	Non-GIIPS Banks	Non-GIIPS Banks	Government Ownership	Government Ownership	Bank Size	Bank Size	Loans/ Assets	Loans/ Assets	Cash/ Assets	Cash/ Assets
OMT windfall gain*PostOMT	0.543** (2.20)		0.241*** (2.97)		0.513* (1.90)		0.513** (2.32)		0.458** (2.28)		0.456*** (2.77)		0.434** (2.66)	
OMT windfall gain*PostOMT*Zombie	-0.531** (-2.60)	-0.594*** (-2.79)	-0.440** (-2.43)	-0.465** (-2.47)	-0.573* (-1.92)	-0.592* (-1.92)	-0.582** (-2.19)	-0.552** (-2.11)	-0.524** (-2.15)	-0.531** (-2.13)	-0.583** (-2.14)	-0.558* (-1.94)	-0.534** (-2.27)	-0.560** (-2.36)
OMT windfall gain*PostOMT*Weakly-capitalized	-0.635** (-2.00)		-0.415** (-2.08)		-0.529** (-1.99)		-0.555** (-2.16)		-0.493** (-2.08)		-0.518** (-2.22)		-0.582** (-2.45)	
OMT windfall gain*PostOMT*Weakly-capitalized*Zombie	0.807* (1.85)	0.814** (2.05)	0.757** (2.00)	0.788** (2.02)	0.843** (2.18)	0.881** (2.01)	0.813** (2.48)	0.784** (2.20)	0.755** (2.02)	0.741** (1.95)	0.835** (2.11)	0.820** (2.12)	0.859*** (2.99)	0.834*** (2.87)
OMT windfall gain*PostOMT*High Gov Own	0.001 (0.55)													
OMT windfall gain*PostOMT*High Gov Own*Zombie	0.009 (1.41)													
High Gov Own*PostOMT		0.011 (1.39)					-0.001 (-0.01)							
High Gov Own*PostOMT*Zombie							0.106 (1.24)	0.052 (1.29)						
High Gov Own*PostOMT*Weakly-capitalized							-0.008 (-0.79)							
High Gov Own*PostOMT*Weakly-capitalized*Zombie							0.003 (0.06)	-0.005 (-0.08)						
Large Bank*PostOMT									0.006 (0.90)					
Large Bank*PostOMT*Zombie									0.012 (0.52)	-0.003 (-0.13)				
Large Bank*PostOMT*Weakly-capitalized									0.004 (0.79)					
Large Bank*PostOMT*Weakly-capitalized*Zombie									0.008 (1.32)	0.009 (1.37)				
Loans/Assets*PostOMT											0.011 (0.37)			
Loans/Assets*PostOMT*Zombie											0.006 (0.19)	0.007 (0.23)		
Loans/Assets*PostOMT*Weakly-capitalized											0.008 (1.44)			
Loans/Assets*PostOMT*Weakly-capitalized*Zombie											0.022 (0.86)	0.019 (0.76)		
Cash/Assets*PostOMT													-0.026 (-0.34)	
Cash/Assets*PostOMT*Zombie													-0.117 (-0.72)	-0.128 (-0.78)
Cash/Assets*PostOMT*Weakly-capitalized													-0.043 (-1.37)	
Cash/Assets*PostOMT*Weakly-capitalized*Zombie													-0.380 (-1.37)	-0.421 (-1.49)
R^2	0.713	0.720	0.794	0.800	0.735	0.741	0.707	0.714	0.706	0.714	0.713	0.720	0.716	0.722
N	18,098	18,098	4,085	4,085	10,283	10,283	18,098	18,098	18,098	18,098	18,098	18,098	16,065	16,065
Mean Dependent Variable	0.026	0.026	0.021	0.021	0.018	0.018	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026
SD Dependent Variable	0.121	0.121	0.110	0.110	0.100	0.100	0.121	0.121	0.121	0.121	0.121	0.121	0.121	0.121
Mean OMT windfall gain	0.029	0.029	0.08	0.08	0.011	0.011	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029
SD OMT windfall gain	0.06	0.06	0.054	0.054	0.019	0.019	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Bank Level Controls	YES	NO	YES	NO	YES	NO	YES	NO	NO	NO	NO	NO	YES	NO
FirmCluster-Time Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effect	YES	YES	YES	NO	YES	NO	NO	NO	YES	YES	YES	NO	YES	YES
Bank-Time Fixed Effect	NO	YES	NO	YES	NO	YES	YES	YES	NO	YES	NO	YES	NO	YES

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Table A7 presents various robustness checks for the bank lending results in Table 5. 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 zombie or non-zombie firms. *OMT windfall gain* is the value gain on banks' sovereign debt holdings as a fraction of total equity. *Weakly-Capitalized* is a dummy variable that equals one if a bank is less than 2% above the regulatory capital requirement post-OMT. *High Gov Own* is a dummy for whether a bank has government ownership. *Large Bank* is a dummy for whether the bank has an above median size (based on total assets). *Loans/Assets* and *Cash/Assets* are a bank's total loans and cash from central banks over total assets, respectively. *PostOMT* is an indicator variable equal to one starting in quarter four of 2012, and zero before. For the definition of a zombie firm see the caption of Figure 2. 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 A8. Loan Volume Regressions – Zombie Lending Robustness (Firm-Cluster Level Clustering)

	(1) Government Ownership	(2) Government Ownership	(3) Non-GIIPS Borrower	(4) Non-GIIPS Borrower	(5) Non-GIIPS Banks	(6) Non-GIIPS Banks	(7) Government Ownership	(8) Government Ownership	(9) Bank Size	(10) Bank Size	(11) Loans/Assets	(12) Loans/Assets	(13) Cash/Assets	(14) Cash/Assets
OMT windfall gain*PostOMT	0.543* (1.95)		0.241** (2.37)		0.513* (1.83)		0.513** (2.04)		0.458** (2.01)		0.456** (2.15)		0.434** (2.26)	
OMT windfall gain*PostOMT*Zombie	-0.531** (-2.28)	-0.594** (-2.38)	-0.440** (-2.36)	-0.465** (-2.53)	-0.573** (-2.05)	-0.592** (-2.01)	-0.582** (-2.10)	-0.552** (-2.06)	-0.524** (-2.07)	-0.531** (-2.08)	-0.583** (-2.06)	-0.558** (-2.04)	-0.534** (-2.16)	-0.560** (-2.14)
OMT windfall gain*PostOMT*Weakly-capitalized	-0.635** (-1.97)		-0.415* (-1.92)		-0.529** (-2.01)		-0.555** (-2.07)		-0.493* (-1.95)		-0.518* (-1.94)		-0.582** (-2.38)	
OMT windfall gain*PostOMT*Weakly-capitalized*Zombie	0.807** (1.94)	0.814** (2.10)	0.757** (1.98)	0.788** (2.00)	0.843** (2.09)	0.881** (1.97)	0.813** (2.38)	0.784** (2.14)	0.755** (2.08)	0.741** (2.03)	0.835** (2.05)	0.820** (2.08)	0.859** (2.41)	0.834** (2.32)
OMT OMT windfall gain*PostOMT*High Gov Own	0.001 (0.46)													
OMT windfall gain*PostOMT*High Gov Own*Zombie	0.009 (1.44)													
High Gov Own*PostOMT		0.011 (1.35)					-0.001 (-0.02)							
High Gov Own*PostOMT*Zombie							0.106 (1.38)	0.052 (1.25)						
High Gov Own*PostOMT*Weakly-capitalized							-0.008 (-0.68)							
High Gov Own*PostOMT*Weakly-capitalized*Zombie							0.003 (0.08)	-0.005 (-0.12)						
Large Bank*PostOMT									0.006 (0.57)					
Large Bank*PostOMT*Zombie									0.012 (0.35)	-0.003 (-0.26)				
Large Bank*PostOMT*Weakly-capitalized									0.004 (0.95)					
Large Bank*PostOMT*Weakly-capitalized*Zombie									0.008 (1.35)	0.009 (1.25)				
Loans/Assets*PostOMT											0.011 (0.62)			
Loans/Assets*PostOMT*Zombie											0.006 (0.63)	0.007 (0.65)		
Loans/Assets*PostOMT*Weakly-capitalized											0.008 (1.37)			
Loans/Assets*PostOMT*Weakly-capitalized*Zombie											0.022 (0.74)	0.019 (0.62)		
Cash/Assets*PostOMT													-0.026 (-0.38)	
Cash/Assets*PostOMT*Zombie													-0.117 (-1.45)	-0.128 (-1.40)
Cash/Assets*PostOMT*Weakly-capitalized													-0.043 (-1.22)	
Cash/Assets*PostOMT*Weakly-capitalized*Zombie													-0.380 (-1.28)	-0.421 (-1.10)
R^2	0.713	0.720	0.794	0.800	0.735	0.741	0.707	0.714	0.706	0.714	0.713	0.720	0.716	0.722
N	18,098	18,098	4,085	4,085	10,283	10,283	18,098	18,098	18,098	18,098	18,098	18,098	16,065	16,065
Bank Level Controls	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
FirmCluster-Time Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Bank-Time Fixed Effects	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES

This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression as in Table A7. 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 zombie or non-zombie firms. *Weakly-Capitalized* is a dummy variable that equals one if a bank is less than 2% above the regulatory capital requirement post-OMT. *PostOMT* is an indicator variable equal to one starting in quarter four of 2012, and zero before. For the definition of a zombie firm see the caption of Figure 2. Bank level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. Standard errors are clustered at the firm-cluster level. *t*-statistics are reported in parentheses. Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$).

Table A9. Loan Volume Regressions – Zombie Lending Robustness (Double-Clustering)

	(1) Government Ownership	(2) Government Ownership	(3) Non-GIIPS Borrower	(4) Non-GIIPS Borrower	(5) Non-GIIPS Banks	(6) Non-GIIPS Banks	(7) Government Ownership	(8) Government Ownership	(9) Bank Size	(10) Bank Size	(11) Loans/Assets	(12) Loans/Assets	(13) Cash/Assets	(14) Cash/Assets
OMT windfall gain*PostOMT	0.543** (1.98)		0.241** (2.10)		0.513* (1.89)		0.513** (2.11)		0.458** (2.00)		0.456** (2.26)		0.434** (2.33)	
OMT windfall gain*PostOMT*Zombie	-0.531** (-2.45)	-0.594*** (-2.70)	-0.440** (-2.03)	-0.465** (-2.26)	-0.573** (-2.06)	-0.592* (-1.87)	-0.582** (-2.21)	-0.552** (-2.04)	-0.524** (-2.10)	-0.531** (-2.08)	-0.583** (-2.08)	-0.558** (-2.03)	-0.534** (-2.20)	-0.560** (-2.23)
OMT windfall gain*PostOMT*Weakly-capitalized	-0.635** (-1.98)		-0.415** (-2.05)		-0.529** (-2.29)		-0.555** (-2.10)		-0.493** (-2.03)		-0.518** (-2.08)		-0.582** (-2.23)	
OMT windfall gain*PostOMT*Weakly-capitalized*Zombie	0.807** (2.00)	0.814** (2.09)	0.757** (2.08)	0.788** (2.01)	0.843** (2.03)	0.881** (1.98)	0.813** (2.33)	0.784** (2.04)	0.755** (2.06)	0.741** (2.01)	0.835** (2.04)	0.820** (2.06)	0.859** (2.33)	0.834** (2.25)
OMT windfall gain*PostOMT*High Gov Own	0.001 (0.53)	0.011 (1.36)												
OMT windfall gain*PostOMT*High Gov Own*Zombie	0.009 (1.39)													
High Gov Own*PostOMT							-0.001 (-0.04)							
High Gov Own*PostOMT*Zombie							0.106 (1.35)	0.052 (1.46)						
High Gov Own*PostOMT*Weakly-capitalized							-0.008 (-0.75)							
High Gov Own*PostOMT*Weakly-capitalized*Zombie							0.003 (0.04)	-0.005 (-0.11)						
Large Bank*PostOMT									0.006 (0.63)					
Large Bank*PostOMT*Zombie									0.012 (1.23)	-0.003 (-0.29)				
Large Bank*PostOMT*Weakly-capitalized									0.004 (0.71)					
Large Bank*PostOMT*Weakly-capitalized*Zombie									0.008 (1.45)	0.009 (1.15)				
Loans/Assets*PostOMT											0.011 (0.77)			
Loans/Assets*PostOMT*Zombie											0.006 (0.41)	0.007 (0.27)		
Loans/Assets*PostOMT*Weakly-capitalized											0.008 (1.22)			
Loans/Assets*PostOMT*Weakly-capitalized*Zombie											0.022 (0.88)	0.019 (0.51)		
Cash/Assets*PostOMT													-0.026 (-0.24)	
Cash/Assets*PostOMT*Zombie													-0.117 (-1.23)	-0.128 (-1.26)
Cash/Assets*PostOMT*Weakly-capitalized													-0.043 (-1.43)	
Cash/Assets*PostOMT*Weakly-capitalized*Zombie													-0.380 (-1.43)	-0.421 (-1.36)
R^2	0.713	0.720	0.794	0.800	0.735	0.741	0.707	0.714	0.706	0.714	0.713	0.720	0.716	0.722
N	18,098	18,098	4,085	4,085	10,283	10,283	18,098	18,098	18,098	18,098	18,098	18,098	16,065	16,065
Bank Level Controls	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
FirmCluster-Time Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Bank-Time Fixed Effects	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES

This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression as in Table A7. 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 zombie or non-zombie firms. *Weakly-Capitalized* is a dummy variable that equals one if a bank is less than 2% above the regulatory capital requirement post-OMT. *PostOMT* is an indicator variable equal to one starting in quarter four of 2012, and zero before. For the definition of a zombie firm see the caption of Figure 2. Bank level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. Standard errors are double-clustered at the bank- and firm-cluster level. *t*-statistics are reported in parentheses. Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$).

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Table A10. Loan Volume Regressions - Zombie Lending Robustness (Capital and CDS)

Panel A: Capital Buffer	(1)	(2)	(3)	(4)	(5)
	All Banks	All Banks	All Banks	All Banks	GIIPS Banks
	ΔLoans	ΔLoans	ΔLoans	Loan Inc.	ΔLoans
OMT windfall gain*PostOMT	0.423**	0.388**			
	(2.58)	(2.40)			
OMT windfall gain*PostOMT*Zombie	-0.509**	-0.453***	-0.507***	-0.602**	-0.567***
	(-2.70)	(-2.90)	(-3.04)	(-1.97)	(-3.13)
OMT windfall gain*PostOMT*Capital buffer	-0.431**	-0.467***			
	(-2.69)	(-2.95)			
OMT windfall gain*PostOMT*Capital buffer*Zombie	0.776***	0.805**	0.747**	0.823***	1.003***
	(2.81)	(2.29)	(2.24)	(2.83)	(2.94)
R^2	0.706	0.740	0.747	0.710	0.772
N	18,098	18,098	18,098	18,098	7,815
Panel B: Sovereign Risk Adjusted					
OMT windfall gain*PostOMT	0.454**	0.405*			
	(2.22)	(1.89)			
OMT windfall gain*PostOMT*Zombie	-0.515***	-0.495***	-0.510***	-0.584**	-0.638***
	(-3.25)	(-3.82)	(-4.08)	(-2.35)	(-3.52)
OMT windfall gain*PostOMT*Weakly-capitalized	-0.430*	-0.410*			
	(-1.94)	(-1.79)			
OMT windfall gain*PostOMT*Weakly-capitalized*Zombie	0.698***	0.729***	0.691***	0.784**	0.977***
	(3.66)	(2.79)	(2.83)	(2.31)	(2.93)
R^2	0.706	0.740	0.747	0.709	0.775
N	18,098	18,098	18,098	18,098	7,815
Panel C: Zombie Lending (CDS Return)					
CDS OMT Return*PostOMT	0.052***	0.058***			
	(2.93)	(2.86)			
CDS OMT Return*PostOMT*Zombie	-0.087***	-0.093***	-0.095***	-0.134**	-0.103***
	(-3.93)	(-3.09)	(-3.03)	(-2.15)	(-2.98)
CDS OMT Return*PostOMT*Weakly-capitalized	-0.077**	-0.082***			
	(-2.51)	(-2.85)			
CDS OMT Return*PostOMT*Weakly-capitalized*Zombie	0.138**	0.143**	0.141**	0.221**	0.166***
	(2.46)	(2.68)	(2.57)	(2.40)	(2.65)
R^2	0.718	0.752	0.757	0.654	0.809
N	15,532	15,532	15,532	15,532	6,219
Bank Level Controls	YES	YES	NO	YES	YES
Bank Fixed Effects	YES	NO	NO	NO	NO
Bank-Time Fixed Effects	NO	NO	YES	YES	YES
FirmCluster-Bank Fixed Effects	NO	YES	YES	YES	NO
FirmCluster-Time Fixed Effects	YES	YES	YES	YES	YES

This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression as in Table 5. 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 zombie or non-zombie firms. *OMT windfall gain* is the value gain on banks' sovereign debt holdings as a fraction of total equity. *PostOMT* is an indicator variable equal to one starting in quarter four of 2012, and zero before. For the definition of a zombie firm see the caption of Figure 2. Panel A presents results for a continuous measure of capitalization, i.e., *Capital buffer*, which measures the distance of a bank from the regulatory capital threshold. Panel B defines a bank as *Weakly-Capitalized* if a bank is less than 2% above the regulatory capital requirement post-OMT after adjusting for sovereign risk in the regulatory capital ratio. Panel C replaces a bank's *OMT windfall gain* with its *CDS OMT Return* (i.e., its CDS return on the three OMT announcement dates: July 26, August 2, and September 6, 2012). 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 A11. Loan Volume Regressions - Zombie Lending Robustness (Ownership)

Panel A: Excluding Government Owned Firms

	(1)	(2)	(3)	(4)	(5)
	All Banks	All Banks	All Banks	All Banks	GIIPS Banks
	ΔLoans	ΔLoans	ΔLoans	Loan Inc.	ΔLoans
OMT windfall gain*PostOMT	0.414***	0.455**			
	(3.05)	(2.66)			
OMT windfall gain*PostOMT*Zombie	-0.524***	-0.486***	-0.549***	-0.563*	-0.557***
	(-2.78)	(-3.47)	(-3.66)	(-1.89)	(-4.423)
OMT windfall gain*PostOMT*Weakly-capitalized	-0.458**	-0.435**			
	(-2.31)	(-2.37)			
OMT windfall gain*PostOMT*Weakly-capitalized*Zombie	0.713**	0.724**	0.667**	0.764***	0.882***
	(2.48)	(2.32)	(2.37)	(2.76)	(2.92)
R^2	0.709	0.741	0.749	0.718	0.774
N	17,080	17,080	17,080	17,080	7,346

Panel B: Excluding Firms with Bank Equity Ownership

OMT windfall gain*PostOMT	0.408*	0.429*			
	(1.83)	(1.94)			
OMT windfall gain*PostOMT*Zombie	-0.491**	-0.495***	-0.532***	-0.602**	-0.562***
	(-2.72)	(-3.75)	(-4.09)	(-2.23)	(-3.76)
OMT windfall gain*PostOMT*Weakly-capitalized	-0.455**	-0.432**			
	(-2.02)	(-2.04)			
OMT windfall gain*PostOMT*Weakly-capitalized*Zombie	0.741**	0.688**	0.647**	0.772***	0.843***
	(2.62)	(2.38)	(2.49)	(2.72)	(2.83)
R^2	0.722	0.753	0.760	0.733	0.802
N	16,022	16,022	16,022	16,022	6,827
Bank Level Controls	YES	YES	NO	YES	YES
Bank Fixed Effects	YES	NO	NO	NO	NO
Bank-Time Fixed Effects	NO	NO	YES	YES	YES
FirmCluster-Bank Fixed Effects	NO	YES	YES	YES	NO
FirmCluster-Time Fixed Effects	YES	YES	YES	YES	YES

This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression as in Table 5. Panel A excludes firm with positive government ownership, whereas Panel B excludes firms in which banks that provide a bank loan also have an equity ownership stake. 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 zombie or non-zombie firms. *OMT windfall gain* is the value gain on banks' sovereign debt holdings as a fraction of total equity. *Weakly-Capitalized* is a dummy variable that equals one if a bank is less than 2% above the regulatory capital requirement post-OMT. *PostOMT* is an indicator variable equal to one starting in quarter four of 2012, and zero before. For the definition of a zombie firm see the caption of Figure 2. 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 A12. Externalities - Placebo Tests

Panel A: Entire Sample				
	(1)	(2)	(3)	(4)
	Int. Payment	CAPX	Emp. Growth	Productivity
Random Industry Frac Zombie*Non-Zombie	-0.010	0.007	-0.001	-0.001
	(-0.48)	(0.65)	(-0.17)	(-0.47)
R^2	0.794	0.582	0.565	0.783
N	5,574	5,070	4,280	4,932
Panel B: Pre-OMT				
Industry Frac Zombie*Non-Zombie	0.001	-0.000	-0.001	0.000
	(0.257)	(-0.321)	(-0.293)	(0.491)
R^2	0.870	0.648	0.600	0.909
N	2,830	2,543	2,144	2,428
Panel C: Post-OMT				
Industry Frac Zombie*Non-Zombie	0.026**	-0.019**	-0.008***	0.009**
	(2.18)	(-2.21)	(-2.60)	(2.39)
R^2	0.892	0.679	0.656	0.958
N	2,744	2,527	2,136	2,504
Firm Level Controls	YES	YES	YES	YES
Firm Fixed Effects	YES	YES	YES	YES
Industry-Country-Year Fixed Effects	YES	YES	YES	YES

This table presents firm-level regressions. The dependent variables are interest payments, investments, employment growth, and productivity, respectively. In Panel A, we employ *Random Industry Frac Zombie*, which is the randomly reassigned asset-weighted fraction of zombie firms, i.e., the zombie fractions in a given industry-country-year are randomly reassigned to a different industry-country pair in a given year. In Panels B (pre-OMT period) and C (post-OMT period) *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. For the definition of a zombie firm see the caption of Figure 2. Firm control variables include the logarithm of total assets, leverage, tangibility, IC 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 A13. Industry Productivity Growth

	(1)	(2)	(3)
	ΔProductivity	ΔProductivity	ΔProductivity
ΔIndustry Frac Zombie	-0.012**		
	(-2.43)		
ΔIndustry Frac Zombie2		-0.012**	
		(-2.57)	
ΔIndustry Frac Zombie3			-0.013***
			(-3.00)
R^2	0.256	0.261	0.260
N	481	481	481
Country Fixed Effects	YES	YES	YES
Industry Fixed Effects	YES	YES	YES

This table presents results of cross-sectional regressions at the country-industry level. The dependent variable is the change in the average productivity from the pre-OMT period (2009-2011) to the post-OMT period (2012-2015). The explanatory variable is the change in the fraction of zombie firms in an industry from the pre-OMT period (2009-2011) to the post-OMT period (2012-2015). For the definition of a zombie firm see the caption of Figure 2. t-statistics are reported in parentheses. Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$).

Online Appendix B: *Alternative Zombie Definitions*

B1   Definitions

To ensure the robustness of our results with respect to the zombie classification, we employ various alternative zombie definitions which are summarized in Table B1.

We start with using alternative benchmark rates below which a firm is classified as zombie firm. For our first alternative zombie definition, we employ an industry-specific benchmark rate instead of an unique interest rate benchmark across all industries. In particular, we use the median interest rate paid by public firms with a AAA rating (inferred from ICs) incorporated in the same two digit SIC code industry h in non-GIIPS countries in a given year t as the benchmark interest rate, split according to their reliance on short- versus long-term debt. Given this benchmark, we calculate the thresholds $R_{ijht}^{A_h^*}$ (industry-specific benchmark) below which the interest payment of firm i in country j and industry h in year t is considered subsidized as

$$R_{ijht}^{A_h^*} = r_{ght}^A \cdot Debt_{ijht}, \tag{9}$$

where we also split the firms into two groups based on their reliance on short- versus long-term debt.

Next, we compare the actual interest payments of the borrowers in our sample with the two hypothetical interest payments to calculate the interest expense gap:

$$x_{ijht}^{A_h^*} = R_{ijht} - R_{ijht}^{A_h^*}. \tag{10}$$

For our first alternative zombie classification, labeled *Zombie2*, we then replace the unique interest rate benchmark across all industries with an industry-specific benchmark interest rate to classify firms as zombie.

As a second robustness check for calculating the interest rate benchmarks we use loan information from DealScan (denoted with index D). For this approach, we first compute the median interest rate on newly issued loans in a given year paid by public firms with an AAA rating (inferred from ICs) incorporated in non-GIIPS countries. The advantage of this approach is that we know the loan maturities and can thus calculate benchmark interest rates for two different maturity buckets (i.e., short- and long-term). To be 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 r_{gt}^D (with $g \in \{s, l\}$ where s is short-term and l is long-term) in year t. Given these benchmark rates, we calculate the thresholds $R_{ijht}^{D^*}$, below which the interest payment of firm i in country j and industry h in year t is considered subsidized as

$$R_{ijht}^{D^*} = \sum_m r_{gt}^D \cdot Debt_{ijght}, \tag{11}$$

where we split a firm's total debt $Debt_{ijht}$ into short- $(g = s)$ and long-term $(g = l)$ debt.

Unfortunately, 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 in DealScan is missing for more than 50% of the non-benchmark firms in our sample. Therefore, we compare both benchmark interest expenses (from DealScan and Amadeus) to the firms' interest expense information derived from Amadeus. Note that we are not able to derive an industry-specific benchmark from DealScan, as we are not able to find a loan to a AAA rated company for every period and every two digit SIC code industry.[49] All results are qualitatively and quantitatively similar using this alternative benchmark. To preserve space, we will thus only present results for the Amadeus benchmark rates.

For our second alternative zombie definition, we drop all zombie criteria except criterion (i), that is, we classify a firm as zombie based only on its interest rate being below the benchmark and do not impose restrictions on the quality

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[49]As information on other elements of loan pricing (e.g., fees) are only scarcely available for our sample of European borrowers, we are not able to use the total cost of borrowing as defined in Berg, Saunders, and Steffen (2015).

of the firm (other than excluding firms that are used to derive the benchmark from the possible zombie candidates) or the syndicate composition. This zombie classification is labeled *Zombie3*.

Finally, in addition to the two alternative crisp zombie definitions (i.e., *Zombie2* and *Zombie3*), which classify a firm as a 100% zombie if x_{ijht}^{A*} is negative, and as a 100% non-zombie else, we follow Caballero et al. (2008) and create fuzzy zombie measures. Under these definitions, a firm can be a zombie "to a certain degree". To define the degree of zombiness of a firm we use a membership function of the following form

$$z(x, d_1, d_2) = \begin{cases} 1 & \text{if } x < d_1 \\ \frac{d_2 - x}{d_2 - d_1} & \text{if } d_1 \leq x \leq d_2 \\ 0 & \text{if } x > d_2. \end{cases} \tag{12}$$

For each of the three crisp zombie definitions (i.e., *Zombie* (our main definition), *Zombie2*, *Zombie3*), we use two different cutoff points for the interest rate gap: (–25bp; +75bp) for the definitions labeled *Zombie4*, *Zombie5*, and *Zombie6*, respectively, and (0bp; +50bp) for the definitions labeled *Zombie7*, *Zombie8*, and *Zombie9*, respectively. Hence, based on the first cutoff point, any firm with an interest rate of 25bp or more below the threshold is classified as 100% zombie. Conversely, a firm which pays at least 75bp more than the benchmark interest rate is a 100% non-zombie. Firms with interest payments between –25bp and +75bp around the benchmark interest rates are partial zombies. A firm exceeding the benchmark rate by 25bp would thus be a 50% zombie.

Figure B1 plots the asset-weighted fraction of zombie firms in our sample over time for the crisp zombie definitions (*Zombie*, *Zombie2*, and *Zombie3*, Panel A) and fuzzy zombie definitions (*Zombie4* to *Zombie6*, Panel B; *Zombie7* to *Zombie9*, Panel C), respectively.[50] First, the figure shows that for all zombie definitions the fraction of firms identified as zombies increased significantly in the post-OMT period. Second, it shows that the increase is much more pronounced when using an industry-specific benchmark rather than a unique benchmark across all industries. Conversely, the evolution of the asset weighted zombie fraction is very similar, independent of whether we apply the additional restriction that a zombie firm must have a low IC or not. This suggests that misclassification when focusing only on the interest rate as zombie criterion seems to be rather low.

Given the very similar pattern in the evolution of the asset-weighted fraction of zombie firms across all nine definitions, in the following, we will report just the results for the crisp zombie definitions (i.e., *Zombie*, *Zombie2*, and *Zombie3*) to preserve space. All results are qualitatively and quantitatively similar when using the fuzzy zombie definitions.

Panel A of Figure B2 plots the evolution of the benchmark interest rates over time, as well as, the median interest payment of zombie firms for each of the three crips zombie definitions. Panel B of Figure B2 shows that the average interest rate gap (i.e., the difference between the benchmark rate and a firm's actual interest payments) for firms that become a zombie for the first time after the OMT announcement is very similar across all three crisp zombie definitions (i.e., *Zombie*, *Zombie2*, and *Zombie3*).

Table B2 presents a breakdown of the number of zombie firms by country for the crisp zombie classifications. The table shows that the zombie definition that we employ in our main analysis seems to be the most conservative one, as it identifies the fewest firms as zombies. While omitting the quality criterion in the zombie definition (*Zombie3*) only leads to a moderate increase in the number of zombie firms in a given country, employing an industry-specific benchmark (*Zombie2*) increases the number of firms classified as zombies significantly.

Furthermore, Table B3, Panels A and B compare the characteristics of zombie firms to non-zombie firms for the two alternative crisp zombie definitions (*Zombie2* and *Zombie3*). Again, zombie firms are on average of much lower quality than non-zombie firms, irrespective of the employed zombie definition (see also Table 4, Panel B).

Moreover, Panel C of Table B3 shows that, relative to the most conservative zombie definition (i.e., our main zombie classification), firms that are additionally classified as zombies according to *Zombie2* (i.e., with an industry-specific benchmark) are significantly better than firms classified as zombie using a unique benchmark for all firms.

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[50]Figure B3 presents the ratio of zombie loans to total assets for the three crisp zombie definitions (*Zombie*, *Zombie2*, and *Zombie3*), separately for the subsample of high-gain and GIIPS banks.

However, firms classified as zombie based on *Zombie2* are still worse than the average low-quality non-zombie firm.[51]

In Table B4, we redo the zombie lending loan volume regressions from Table 5 for our alternative crisp zombie definitions, while in Table B5 we redo the financial and real effects analysis from Table 6. These tables show that all our zombie lending and real effects results remain similar when using the alternative zombie classifications.

Finally, comparing Panels B and C of Figure 5 and Figure B4 shows that the evolution of the cumulative firm default rates has a very similar pattern across all zombie classifications.

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[51]Due to the low number of firms that are classified as zombie based on *Zombie3* but as non-zombie according to our main zombie definition, we cannot conduct a meaningful statistical analysis of their similarity.

B2 Figures

Figure B1. Fraction of Zombie Firms (Crisp Zombie Definitions)
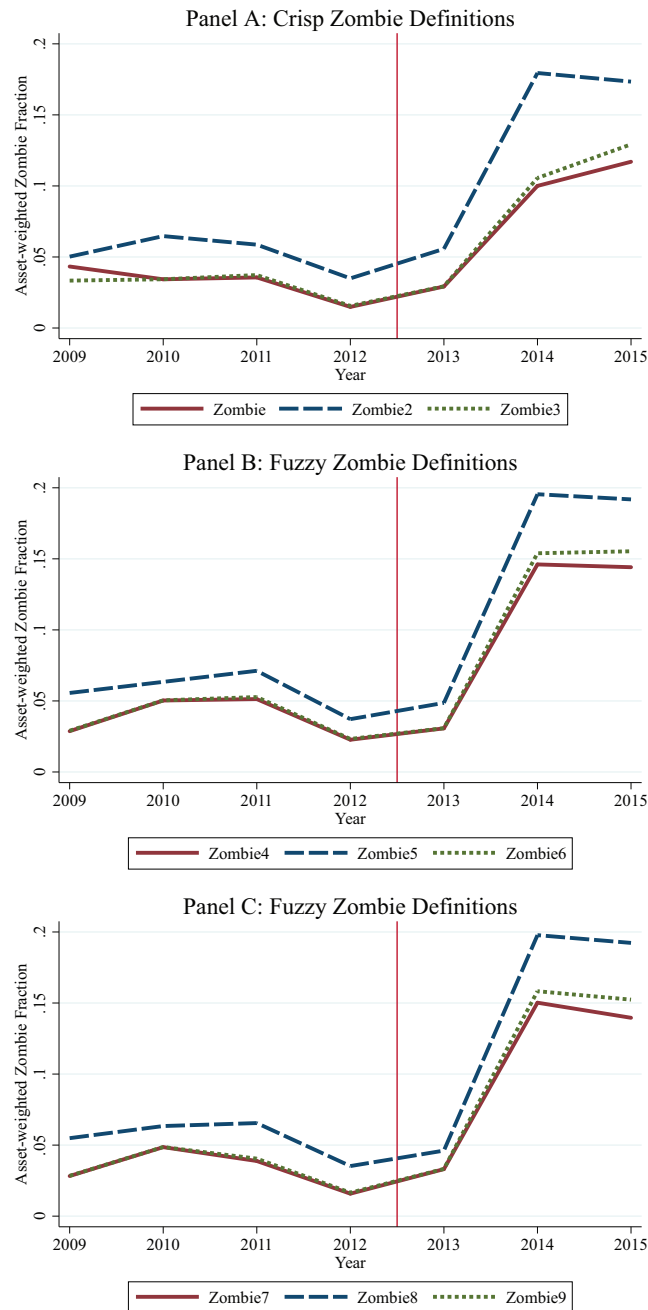
Panel A shows the asset weighted fraction of zombie firms in our sample for the three crisp zombie definitions (*Zombie*, *Zombie2*, and *Zombie3*). Panels B and C show the asset weighted fraction of zombie firms in our sample for the fuzzy zombie definitions *Zombie4* to *Zombie6* and *Zombie7* to *Zombie9*, respectively. For the zombie definitions see Table B1.

Figure B2. Interest Rate Benchmark (Crisp Zombie Definitions)
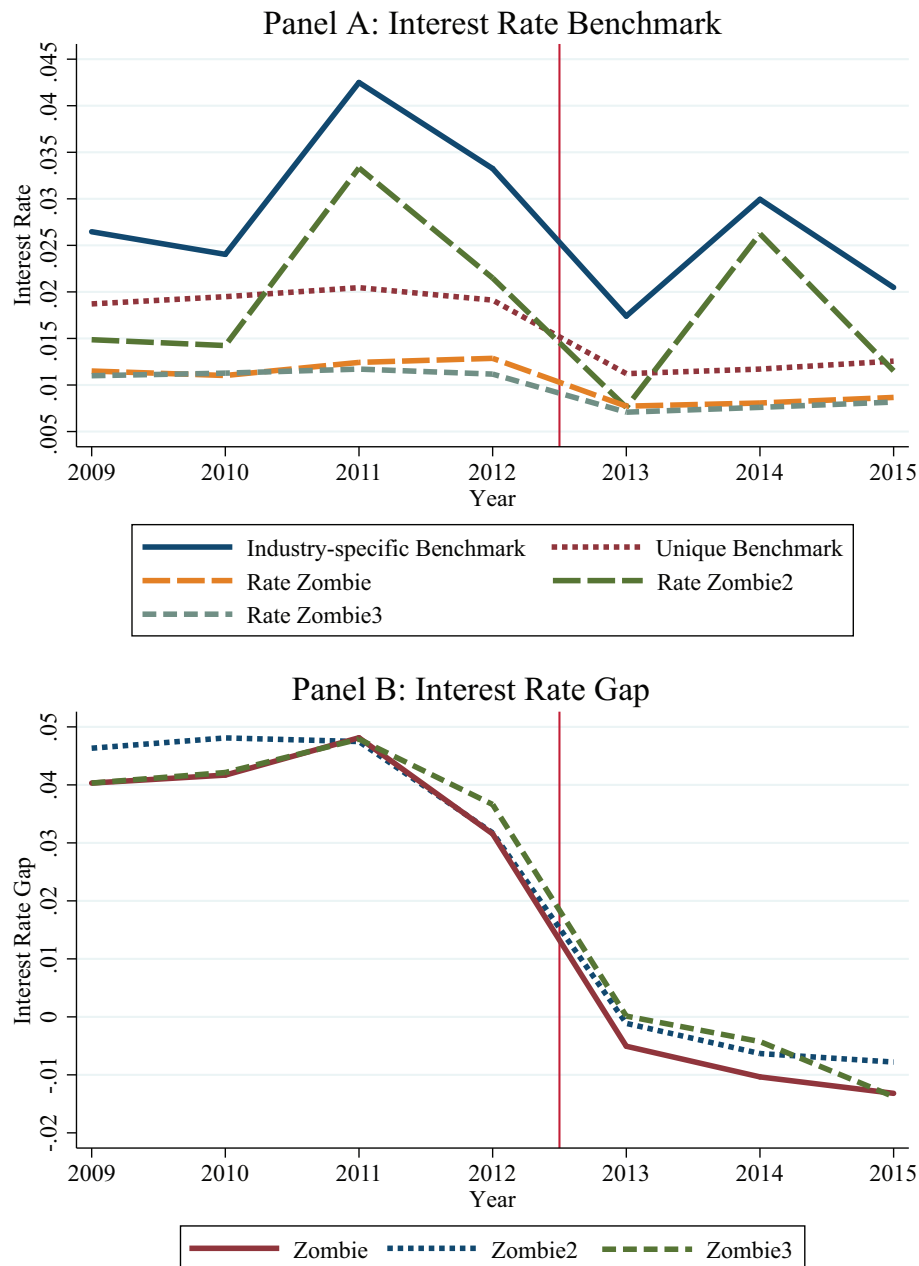
Panel A shows the benchmark interest rates when we use an industry-specific benchmark rate (blue solid line) and a unique benchmark rate across all industries (red dotted line). Moreover, it shows the average interest rate paid by firms that are classified according to the three crisp zombie definitions (*Zombie*, *Zombie2*, and *Zombie3*). Panel B shows the average interest rate gap for firms that become a zombie for the first time after the OMT announcement in 2012Q3, again for all three crisp zombie definitions. For the zombie definitions see Table B1.

Figure B3. Fraction of Zombie Loans - High-Gain and GIIPS Banks (Crisp Zombie Definitions)
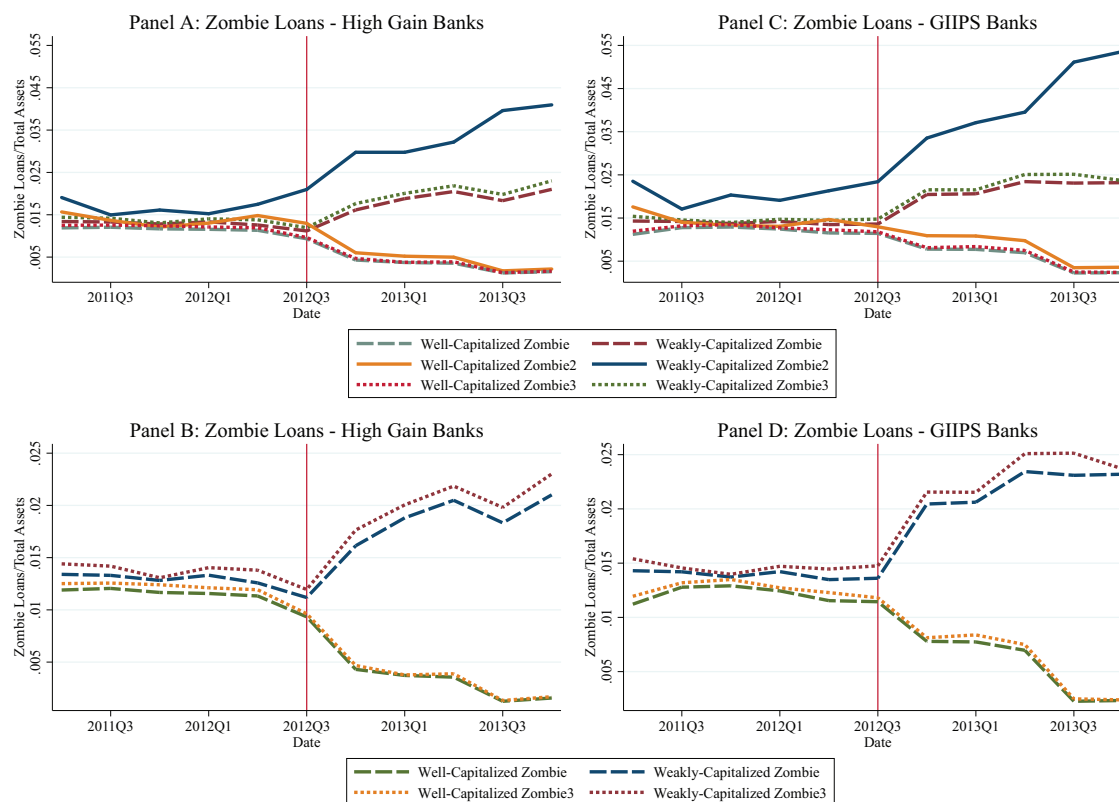
The figure presents the ratio of zombie loans to total assets for the three crisp zombie definitions (*Zombie*, *Zombie2*, and *Zombie3*), separately for the subsample of high-gain banks (Panels A and B) and GIIPS banks (Panels C and D). While Panels A and C show all three crisp zombie definitions, Panels B and D zoom in on the evolution of the zombie loans ratio for definitions *Zombie* and *Zombie3*. A bank is classified as high-gain (low-gain) bank if its equity capital increase due to the OMT announcement is above (below) the sample mean. A bank is classified as weakly-capitalized (well-capitalized) if its leverage ratio is less (more) than 2% above the regulatory threshold post-OMT. For the zombie definitions see Table B1.

Figure B4. Firm Default Rates (Alternative Crisp Zombie Definitions)
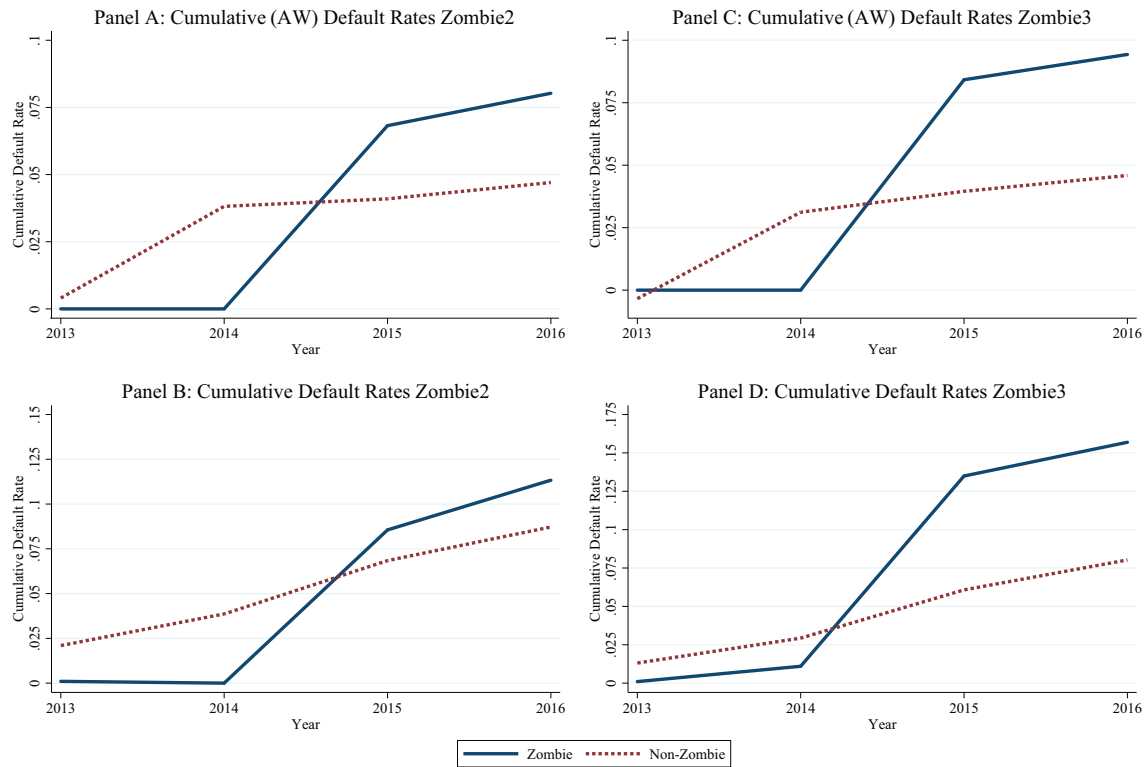
This figure presents asset-weighted cumulative default rates (Panels A and C) and equally weighted default rates (Panels B and D) for the crisp zombie definitions *Zombie2* and *Zombie3*. For the zombie definitions see Table B1.

B3 Tables

Table B1. Zombie Definitions

	Benchmark	Quality Criterion	Crisp/Fuzzy	Interest Rate Cutoffs
Zombie	Unique	✓	Crisp	(0bp, 0bp)
Zombie2	Industry-specific	✓	Crisp	(0bp, 0bp)
Zombie3	Unique		Crisp	(0bp, 0bp)
Zombie4	Unique	✓	Fuzzy	(-25bp, +75bp)
Zombie5	Industry-specific	✓	Fuzzy	(-25bp, +75bp)
Zombie6	Unique		Fuzzy	(-25bp, +75bp)
Zombie7	Unique	✓	Fuzzy	(0bp, +50bp)
Zombie8	Industry-specific	✓	Fuzzy	(0bp, +50bp)
Zombie9	Unique		Fuzzy	(0bp, +50bp)

This table provides an overview of the zombie definitions.

Table B2. Breakdown of Zombie Firms by Country (Crisp Zombie Definitions)

Country	*Zombie*	*Zombie2*	*Zombie3*	# of Firms in Sample
Germany	11 (7%)	20 (12%)	15 (9%)	167
Spain	37 (18%)	58 (29%)	45 (22%)	201
France	20 (10%)	31 (15%)	25 (12%)	203
UK	33 (12%)	62 (22%)	43 (15%)	286
Italy	40 (20%)	60 (30%)	45 (22%)	198

The table presents a breakdown of the number of zombie firms by country (fraction of all sample firms in a given country) for the three crisp zombie classifications (*Zombie*, *Zombie2*, and *Zombie3*). For the zombie definitions see Table B1.

Table B3. Difference in Group of Firms (Alternative Crisp Zombie Definitions)

Panel A: *Zombie2*

	(1) High-IC Ratio	(2) Low-IC Ratio No Zombie	(3) Zombie	(4) Difference (2)-(3)
Total Assets (mn)	3130	2850	2100	750**
				(2.57)
Tangibility	0.556	0.599	0.521	0.078***
				(5.77)
Int. Cov.	6.645	1.845	0.406	1.439***
				(9.12)
Net Worth	0.309	0.222	0.205	0.017*
				(1.66)
EBITDA/Assets	0.134	0.078	0.037	0.041***
				(12.73)
Leverage	0.602	0.709	0.730	-0.021**
				(-2.05)
Loan Amount/Total Assets (%)	21.25	18.83	21.62	-2.79
				(-1.41)
Maturity (Months)	60.03	63.33	60.39	2.94
				(0.96)
Term Loan (%)	53.31	51.73	54.41	-2.68
				(-0.61)

Panel B: *Zombie3*

	(1) High-IC Ratio	(2) Low-IC Ratio No Zombie	(3) Zombie	(4) Difference (2)-(3)
Total Assets (mn)	3130	2840	2120	720**
				(2.27)
Tangibility	0.556	0.600	0.495	0.105***
				(7.29)
Int. Cov.	6.645	1.833	0.255	1.58***
				(9.31)
Net Worth	0.309	0.223	0.188	0.035***
				(3.09)
EBITDA/Assets	0.134	0.078	0.030	0.048***
				(14.10)
Leverage	0.602	0.708	0.739	-0.031***
				(-2.83)
Loan Amount/Total Assets (%)	21.25	18.77	.21.49	-2.72
				(-1.41)
Maturity (Months)	60.03	63.28	61.07	1.96
				(0.60)
Term Loan (%)	53.31	51.71	53.38	1.67
				(-0.49)

Panel C: Difference relative to *Zombie*

	Added *Zombie2*	*Zombie*	Difference (1)-(2)
Total Assets (mn)	2111	2110	1
			(0.01)
Tangibility	0.583	0.491	0.092***
			(3.15)
Int. Cov.	0.760	0.230	0.53*
			(1.68)
Net Worth	0.242	0.186	0.056***
			(2.64)
EBITDA/Assets	0.050	0.030	0.02***
			(3.85)
Leverage	0.703	0.742	-0.039**
			(-1.97)

Panels A and B present a test for the difference in means between low-IC ratio non-zombie firms and zombie firms for Zombie definitions *Zombie2* and *Zombie3*, respectively. Panel C presents a test for the difference in means between firms that are classified as zombies only under the industry-specific benchmark (*Zombie2*) but not under the main definition *Zombie*. A firm is classified as high-IC (low-IC) ratio firm if its 2009-2011 median IC ratio is above (below) the country-specific 2009-2011 median IC ratio. For the zombie definitions see Table B1. Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$).

Table B4. Loan Volume Regressions - Zombie Lending Robustness (Alternative Crisp Zombie Definitions)

Panel A: *Zombie2*	(1)	(2)	(3)	(4)	(5)
	All Banks	All Banks	All Banks	All Banks	GIIPS Banks
	ΔLoans	ΔLoans	ΔLoans	Loan Inc.	ΔLoans
OMT windfall gain*PostOMT	0.397***	0.429**			
	(2.75)	(2.24)			
OMT windfall gain*PostOMT*Zombie2	-0.469**	-0.496**	-0.535**	-0.593***	-0.581***
	(-2.50)	(-2.45)	(-2.51)	(-2.75)	(-3.01)
OMT windfall gain*PostOMT*Weakly-capitalized	-0.382***	-0.394**			
	(-2.77)	(-2.57)			
OMT windfall gain*PostOMT*Weakly-capitalized*Zombie2	0.663**	0.679**	0.658**	0.663**	0.746***
	(2.27)	(2.36)	(2.10)	(2.25)	(2.97)
R^2	0.721	0.753	0.759	0.723	0.785
N	18,566	18,566	18,566	18,566	8,112
Panel B: *Zombie3*					
OMT windfall gain*PostOMT	0.443**	0.453**			
	(2.55)	(2.26)			
OMT windfall gain*PostOMT*Zombie3	-0.488***	-0.533***	-0.555***	-0.621**	-0.557***
	(-3.63)	(-6.66)	(-4.28)	(-2.18)	(-2.94)
OMT windfall gain*PostOMT*Weakly-capitalized	-0.450**	-0.420**			
	(-2.23)	(-2.25)			
OMT windfall gain*PostOMT*Weakly-capitalized*Zombie3	0.714***	0.705***	0.741***	0.762**	0.853**
	(3.28)	(5.37)	(3.43)	(2.12)	(2.17)
R^2	0.711	0.744	0.752	0.715	0.782
N	18,162	18,162	18,162	18,162	7,953
Bank Level Controls	YES	YES	NO	YES	YES
Bank Fixed Effects	YES	NO	NO	NO	NO
Bank-Time Fixed Effects	NO	NO	YES	YES	YES
FirmCluster-Bank Fixed Effects	NO	YES	YES	YES	NO
FirmCluster-Time Fixed Effects	YES	YES	YES	YES	YES

This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression as in Table 5. 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 zombie or non-zombie firms. *OMT windfall gain* is the value gain on banks' sovereign debt holdings as a fraction of total equity. *Weakly-Capitalized* is a dummy variable that equals one if a bank is less than 2% above the regulatory capital requirement post-OMT. *PostOMT* is an indicator variable equal to one starting in quarter four of 2012, and zero before. For the zombie definitions see Table B1. 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 B5. Financial and Real Effects (Alternative Crisp Zombie Definitions)

	(1)	(2)	(3)	(4)	(5)	(6)
	ΔCash	ΔDebt	ΔCash-ΔDebt	Emp. Growth	CAPX	ROA
Panel A: *Zombie2*						
Indirect OMT windfall gain*PostOMT*Low-IC	0.514**	0.496**	0.018	0.052	-0.237	-0.288
	(2.10)	(2.00)	(0.05)	(0.55)	(-0.84)	(-1.19)
Indirect OMT windfall gain*PostOMT*Low-IC*Zombie2	-0.555**	0.560**	-1.115***	-0.046	-0.343	0.038
	(-2.57)	(2.09)	(-3.24)	(-0.31)	(-0.61)	(0.08)
R^2	0.538	0.607		0.772	0.592	0.517
N	5,324	6,599		6,486	6,492	5,544
Panel B: *Zombie3*						
Indirect OMT windfall gain*PostOMT*Low-IC	0.545**	0.532**	0.013	0.035	-0.194	-0.325
	(2.42)	(2.47)	(0.04)	(0.37)	(-0.71)	(-1.39)
Indirect OMT windfall gain*PostOMT*Low-IC*Zombie3	-0.512**	0.477*	-0.989***	-0.007	-0.103	-0.480**
	(-2.35)	(1.79)	(-2.87)	(-0.07)	(-0.23)	(-1.97)
R^2	0.574	0.626		0.772	0.592	0.516
N	5,324	6,599		6,486	6,492	5,544
Firm Level Controls	YES	YES		YES	YES	YES
Firm Fixed Effects	YES	YES		YES	YES	YES
Industry-Country-Year Fixed Effects	YES	YES		YES	YES	YES

This table presents firm-level regressions. The dependent variables are the change in cash holdings, change in leverage, employment growth, investments, and ROA, respectively. *Indirect OMT windfall gain* measures 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. For the zombie definitions see Table B1. Firm control variables include the logarithm of total assets, leverage, tangibility, IC 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: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$).