Kicking the can down the road or giving idlers the boot? The effect of asset purchase programs on plant exits*

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Abstract

Very loose monetary policy may allow banks to postpone the termination of credit provision to unproductive corporate customers. We combine unique administrative data at the plant level with detailed exposures of individual banks to a specific asset purchase program shock in Germany to test if shocked banks deter Schumpeterian destruction in the real economy. Our results show that unproductive plants tied to shocked, but financially weak banks are less likely to close. We also show that both entry and exit rates in regional markets with high exposures to the shock are suppressed. Thus, asset purchase programs appear to reduce efficient churn, which may hamper the re-allocation of production factors and aggregate productivity growth.

JEL classification: E58, G21, G28, G33
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1 Motivation

The reallocation of production factors from unproductive to more productive firms is crucial to maximize aggregate total factor productivity (TFP) growth (Hsieh and Klenow, 2009). Such reallocation implies that more productive firms become larger (e.g. Bartelsman et al., 2013) and, consequentially, that unproductive firms shrink and are ultimately more likely to exit the market.

But how much of a cleansing effect is left after a decade of ultraloose monetary policy since the Great Financial Crisis of 2007/2008? We test empirically if and how a heterogeneously transmitted unconventional monetary policy shock mutes the factor reallocation mechanism that works in conventional times through forcing the exit of unproductive plants. Recent dynamic theory models highlight the role of micro-founded frictions – both in labor (e.g. Jovanovic, 2014) and financial markets (see e.g. Moll, 2014) – that endogenously prevent TFP growth either through the distortion of market entry or via the misallocation of capital across incumbent firms (see also Bueara et al., 2011; Restucia and Rogerson, 2017).

The main contribution of this paper is to empirically isolate this new channel, how unconventional monetary policy measures may distort factor reallocation: the deterrence of necessary plant exits due to exogenously increased bank lending capacity. The novel combination of granular plant exit data and individual exposures of banks to (unconventional) monetary policy cover literally the population of all German banks and around a 1/6 of all plants in the economy. This comprehensiveness of the data enables us to also identify the effect of monetary policy shocks on industry dynamics at the level of regional markets.

We do so by mobilizing both admistrative data on German corporates, plant, and banks. First, we observe a unique sample from the universe of all plant closures in Germany based on the Establishment History Panel between 2007 and 2013 (Hethey and Schmieder, 2010). Second, we observe the purchase schedule of the European Central Bank (ECB) during the Securities Market Program (SMP) at the security level, which has been previously analyzed regarding financial markets and macroeconomic effects in Eser and Schwaab (2016) and Gibson et al. (2016). We combine these data with the security holdings of all German banks obtained from the national central bank as in Koetter et al. (2017). Thereby, we identify financial intermediaries exposed to the unexpected regime change of the ECB to purchase Eurozone periphery debt in secondary markets between May 2010 and September 2012.

By linking SMP banks to their corporate customers, we trace the transmission of the first European asset purchase program all the way from the ECB via national (central) banking systems to corporate bank customers and, ultimately, their plants. To the best of our knowledge, we are the first to study such a granular chain from the financial to the real sector of a large, developed economy with regards to the implications of loose UMP on the cleansing effects reflected by forced attrition of unproductive plants.

We find robust evidence for significantly delayed exit rates of treated plants that are connected to banks which received an unexpected positive monetary policy shock. Especially firms linked to treated weak banks drive the effect.

We distinguish between strongly and weakly capitalized banks whereby it is the latter group that delays their customers' market exits. Zooming in we find that the effect is strongest for unproductive firms connected to weak banks. It is this unhealthy connection which produces a reduction in efficient churn rates. This result is in line with evidence provided by Jiménez et al. (2014) that an exuberantly loose monetary stance in Spain causally induced weak banks to extend credit inefficiently to unproductive firms. Our study complements their finding of increasing credit inefficiently by showing an undue reduction in necessary churn. Quantitatively, the marginal effect of having access to the SMP shock by a weak bank on unproductive plant exit probabilities amounts to a reduction by 0.5 percentage points. This magnitude is large in light of average churn rates on the order of 2.6% during the sample period.

Reduced market exits are considered by themselves not sufficient proof for inefficient capital misallocation. We test further whether on the aggregate level we find changes in the entry and exit rates of plants. We make use of more than ten million plant-year observations to derive aggregate entry and exit rates on the region and industry level. We find that entry rates are depressed the higher the share of treated plants in the surrounding. Lower churn rates for unproductive plants connected to weak banks seem to block new entrants from entering the market. Thus, an unintended consequence of the asset purchase program to support stressed members of the Eurozone appears to be to block the exit of and to spur the misallocation of resources towards the least productive plants in this non-stressed economy of the Eurozone.

Our empirical work closely complements recent theoretical advances by Osotimehin and Pappadá (2017), who model the relationship between (voluntary and forced) firm exits, financial constraints, and aggregate productivity. They predict that the presence of credit constraints modifies the cleansing such that some high productivity firms are forced to leave the market whereas other unproductive firms remain because exit choices depend also on the expected net worth of firms. Thereby, we seek to fill the void left in the empirical literature as to the effect of financial frictions on plant exits

Whereas exits are generally rarely studied, the flip side of industry dynamics has been the subject of an ample literature. In finance, for example, exist indeed a large body of research that investigates the role of credit market and other financial frictions on the entry of young firms and resulting industry dynamics. Cetorelli and Strahan (2006) show that lackluster banking market competition deters new entrants in U.S. markets. And Kerr and Nanda (2010) show indeed that branch deregulation in the U.S. – which increased competitive pressure – causally increased entry rates of firms without necessarily increasing the size of these contestants. They conclude that the elimination of financial frictions in the form of banking market competition affects real economic activity in particular via the birth of new firms. However, Kerr and Nanda (2010) and also other studies focus primarily on the provision of financial funds to incumbent firms or the entry of new contestants, but neglect the effect of changes to financial frictions on the exit of unproductive units – which is key for a re-allocation of production factors. One of the few studies that also considers churn – that is the exit of unproductive corporations – is Kerr and Nanda (2009). They report that in the aftermath of U.S. banking market deregulation not only market entry, but also exit rates increased.

Regarding empirical evidence for Europe, the lack of homogenous administrative data paired with relatively low public listing frequency of European firms poses a severe hurdle to the availability of comparable data on market exits. An exception are Bertrand et al. (2007), who demonstrate that the deregulation of French banking markets also reduced the bailout of unproductive corporates by the financial sector and that industries with a larger exposure to more competitive banking markets exhibit faster factor reallocation. This important insight on less frequent bailouts of unproductive firms via their bank does not observe direct exits, but infers inefficient lending from below-equilibrium lending conditions (see also Caballero et al., 2008, on the phenomenon of "zombie" firms). We, in turn, observe exits. And in contrast to inferring churn based on financial data at the level of the firm, we also directly observe the exit of productive units of physical activity: plants.

Empirical evidence on the plant level regarding aggregate productivity effects of financial frictions is generally still scarce, yet apparently crucial to the comprehension of aggregate phenomena. For example, Hsieh and Klenow (2014) estimate from plant-level data that aggregate manufacturing productivity in Mexico and India lags that of the U.S. by a quarter due to insufficient investment in process efficiency and product quality. Whereas they remain agnostic as towards the sources of this under-investment, a natural candidate are financial frictions.

The effect of such frictions on aggregate productivity through distortions at the plant level are, however, virtually absent from the literature. Midrigan and Xu (2014) exploit establishment data from South Korean, Colombia, and China to differentiate between entry distortions versus capital misallocation among existing plants due to financial frictions. However, they neither speak to the heterogenous policy effects nor to the role of delaying the attrition of unproductive plants, which is focus of our paper.

A study closely related to our work is Gopinath et al. (2017). They demonstrate that the dispersion of capital returns across Spanish (and further Southern European) manufacturing firms increased between 1999 and 2012. Declining real interest rates due to European financial integration during this time caused the misallocation of abundantly inflowing capital that was directed towards too unproductive firms, ultimately reducing TFP. As such, their study shares the spirit of ours to analyze the effects of excessive provision of financial funds. But whereas their paper provides important evidence on the intensive margin of misallocation, we can complement this evidence with insights on the extensive margin of misallocation, i.e. the delay-of-exit effect due to the loose supply of financial funds. And whereas they model financial frictions to depend on firm size, we can actually directly observe the exposure of plants to loose monetary policy shocks through their banking relationship. A further contribution is our ability to observe small and medium sized enterprises as, within this group of firms, market exit is more likely in general (Fackler et al. (2013)) and driven by competitive reallocation forces in particular (e.g. Dosi et al. (2015)).

2 Data

2.1 Monetary policy and bank data

The impact of the SMP program on German plants provides a good testing ground for analyzing the impact of larges scale asset purchase programs (LSAPs) on firms. The SMP was set up in order to stabilize the Eurozone after the outbreak of the European Sovereign Debt crisis. As a response to soaring risk premiums in May 2010, the ECB decided to buy sovereign bonds of Greece, Ireland and Portugal. It extended the purchases to Italian and Spanish bonds in August 2011. In total, the program lasted until September 2012 and entailed a notional volume of EUR 218 billion.

Whereas the size of the SMP is small compared to contemporary LSAP, the ECB was very reluctant to intervene into securities markets in contrast to the US Federal Reserve until then. As such, the SMP was unexpected by market participants and marked a regime shift of the ECB. The SMP was designed to reduce risk premia for sovereign bonds of crises countries. It was not a response either to a crisis in Germany or as a response to troubled German banks. Therefore, it represents an arguably exogenous shock that allows to assess whether LSAPs had unintended consequences on firms located in Germany.

We identify German banks that are affected by the SMP shock as in Koetter et al. (2017) by matching the ISIN codes of the purchase schedule of the ECB to individual security holdings reported by all German banks to the central bank. Thereby, we identify those banks that hold eligible SMP assets.

Exposures to SMP securities increase excess reserves and associated credit generating capacity either through an unloading channel if assets are sold to the ECB or through a valuation channel if they are retained but revalued at higher market prices (Eser and Schwaab, 2016).

To limit concerns about further confounding policies, we focus on regional savings and cooperative banks. These local banks held sovereign debt at the time primarily as a store of liquidity given its regulatory treatment as a risk-free asset. At the same time, sovereign debt holdings from the EU periphery, which were subject of the SMP, were pervasive. According to (Buch et al., 2016) two out of three banks, including very small ones, had such EU periphery exposures. Large German banks, in turn, engaged much more actively in (proprietary) securities trading and have also been subject to various alternative confounding policy events, such as changes to the collateral framework, long-term refinancing operations, or even foreign policy measures that affected them via their cross-border activities (Buch et al., 2018). Excluding these large financial institutions mitigates the possibility that banks in our sample loaded up purposefully on Southern European bonds in anticipation of some form of rescue plan from the ECB or the EU. We add financial accounts data from the Bankscope database to be able to distinguish between bank strength according to their capital ratios.

2.2 Firm and plant data

To identify the effect of the SMP on the real economy through plant exits, we need to link banks in a next step to non-financial corporates. To this end, we rely on Bureau van Dijk's Amadeus database, which contains financial information at the firm level. Amadeus encompasses financial data for 6,332,435 firm-year observations in our sample period from 2007 until 2013. We obtain the link between banks and firms from BvD's Dafne database, where missing firm-bank links in early years are extrapolated using 2010 as a base year.

To isolate the effect of the expansionary monetary policy shock represented by the SMP, we confine the sample to single-bank firms. Thereby, we ensure that the sample comprises mainly SMEs – with a mean (median) number of employees of 11 (4) – which cannot substitute their non-treated bank with a link to a treated bank. We only assess the impact on single plant firms, which further ensures that we only look at SMEs with a tight link between firms and banks. Also, as the treatment is at the firm level that is connected to a bank, there is no variance in treatment within firms.

Neither Amadeus nor Dafne contain information on the production plants of these firms though. In fact, only very few studies shed light on the production sites of such SME, which in turn account for a large share of GDP in many developed economies though. Therefore, we merge our firms with the Establishment History Panel (BHP, Betriebshistorikpanel) provided by the Institute for Employment Research (IAB, Institut für Arbeitsmarkt und Berufsforschung Nürnberg), which aggregates worker level social security notifications at the plant level. This dataset provides us with information on the constitution of the workforce of plants and the employee's wages. We follow Hethey and Schmieder (2010) and use worker flows to identify plant exits reliably.

– Table 1 around here –

Table 1 summarizes the variables from these three building blocks at the plant-year level: plant level exits and observable traits; financial data of the firms associated with these plants; and bank traits based on financial indicators. Table A.2 in the Appendix provides the definition and source of each variable. In addition, we show summary statistics of financial weakness indicators for both banks and firms, which we return to in later sections.

In total, the merged dataset contains 2,560,878 plant-year observations. As explained, we restrict these data to firms linked to regional savings and co-operatives and single bank firms in the interest of isolating the SMP effect better from possible confounding credit supply and demand effects of large banks and multi-bank firms, respectively. In addition, we condition on firm existence since 2006 and exclude firms from forestry, agriculture, and finance. After this culling, the sample comprises 593,357 German plant-year observations corresponding to approximately 85,000 plants per year between 2007 and 2013. In the following, we estimate all models on the most restricted sample for which we can obtain all necessary indicator variables to distinguish between weak and strong banks as well as productive and unproductive plants. This final sample covers 202,386 plant-year observations.

The median plant, and thus firm, in our dataset has four employees and is therefore very small. This feature reflects the fact that our firms are mainly SME, which depend more heavily on financial frictions compared to e.g. large listed multinationals. Note that in Germany 47% (66%) of plants have less than 5 (10) employees in full-time equivalents and the vast majority of all firms are single-plant firms (Koch and Krenz (2010)). Hence, our sample of small firms mimics the population quite well. We define a bank as treated if it held an SMP asset in all three years during which the SMP was in operation, i.e. 2010-2012. According to this definition, 10.3% of all observations are treated.

In the following we assess whether treatment and control group are comparable. In our analyses, we estimate differences-in-differences models. For the parallel trend assumption to be fulfilled, we conduct t-tests on the change of selected variables on the plant, firm and bank level.

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– Table 3 around here –

Table 2 shows differences in levels across treated and non-treated observations for the pre and post period, respectively, as well as the corresponding difference-in-difference term. Both, non-treated and treated plants show an average exit probability of 1.1% in the pre period. The exit rate for both groups increases in the post period, though more so for the group of the non-treated. As such, any potential effect of unconventional monetary policy to block the exit of firms tied to banks with additional credit-bearing capacity is not obviously visible from this non-parametric, unconditional comparison. Treated plants are larger than non-treated plants in terms of average number of employees (10.5 versus 14.32) and are slightly older. In terms of firm financials, both groups are very similar, only the cash ratio shows a statistically significant difference, though the difference is economically small.

Treated banks have slightly lower equity ratios and a lower return on assets. Also, they are statistically significantly larger in size. But economically, the difference is small.

For the parallel trend assumption to be fulfilled, treated and non-treated plants maybe different in terms of levels, but must show same trends. Therefore, Table 3 reports t-tests for changes of the respective variables. Results show that none of the plant, firm or bank characteristics show differences in their trends. We hence conclude that treatment and control groups are comparable, the parallel trend assumption is fulfilled and that we can apply a differences-in-differences approach.

In a further step of our analysis, we estimate aggregate effects of the monetary policy shock. We can make use of the whole BHP which enocmpasses 10,085,408 plant-year observations of the years 2007–2013. Figure 1 shows the number of plants which are in the market (stock), the number of entering firms (entries) and the number of exiting firms (exits) per year. Further, we distinguish between regions, which exhibit a share of treated firms, extrapolated from our merged data above, that is below median (0), or above median (1). It can be seen that regions with a above median share of treated plants are larger in terms of number of plants. In the analysis, we will control for this fact by employing region fixed effects.

– Insert Figure 1 around here –

3 Headline results

In the following, we first analyze the link between an unexpected monetary policy shock and plant survival on the plant level. We assess whether heterogeneous effects drive our results by distinguishing between weak and strong banks, as well as productive and unproductive plants. Second, we assess aggregate effects on plant entry and exit rates on the regional and industry level, respectively.

3.1 Micro level evidence on plant exits

To quantify the effect of a link between a SMP bank and a firm that closed its plant after the launch of the asset purchase program, we specify the following regression model:

$$Y_{it} = \alpha_i + \alpha_{rt} + \alpha_{kt} + \gamma SMP_i \times Post_t + \delta_x X_{it-1} + \epsilon_{it} \tag{1}$$

The dependent variable Y_{it} is an indicator variable, which equals one in the year t when plant i exits the market. To control for unobservable firm heterogeneity, we specify firm fixed effects α_i. Another concern are region- or industry-specific demand shocks, which may give rise to systematically different plant exit rates that we would falsely attribute to the SMP exposure. Therefore, we include region-time fixed effects α_{rt} as well as industry-time fixed effects α_{kt}.

Specifically, the indicator variable SMP_i equals one if plant i is linked to a bank that held SMP eligible assets in all three treatment years. $Post_t$ equals one in the post period 2010-2013. The interaction of interest is then an indicator whether the bank was considered to be weak and whether the firm was considered to be unproductive in 2007. We estimate the model for the whole sample with lagged bank level controls as well as the second, third and fourth polynomial of firm age (X_{it-1}). Table 4 presents the according results.

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All regressions include firm age. We add bank controls in the second column and thenceforward include fixed effects in various combinations. The last column shows results for the most conservative model saturated with all possible fixed effects. The unexpected monetary policy shocks leads to lower exit rates for plants connected to treated plants. The effect amount to -0.3% points if only plant and time fixed effects are included. The effect becomes even stronger when we control for industry and regional demand shocks, as well as bank controls. A plant that is linked to a beneficiary bank shows on average a exit probability which is 0.5% points lower than plants linked to non-treated banks. The impact is economically meaningful; average exit rates amount to 2.3% for the whole sample, hence, treated plant have on average a 21.7% higher survival probability.

We augment the specification of the main variable of interest in Equation (1) – the interaction between SMP and the post-treatment period – with an additional interaction first with an indicator for weak banks, and then with both an indicator for weak banks and weak firms, as can be seen in Equation 2.

$$Y_{it} = \alpha_i + \alpha_{rt} + \alpha_{kt} + \cdots + \gamma SMP_i \times Post_t \times WB_i \times WF_i + \delta_x X_{it-1} + \epsilon_{it} \quad (2)$$

WB_i is an indicator which equals 1 if the bank was in the lower 25% percentile in terms of equity in the year 2007. WF_i is an indicator which equals 1 if the firm was in the lower 25% percentile in terms of labour productivity, measured according to the turnover per employee, within its industry in the pre period. In robustness checks, we show results for varying the thresholds for the definition of weak banks and weak firms. This quadruple difference-in-difference term gauges the effect of a weak bank being exposed to the expansionary policy shock represented by the SMP on churn rates of plants of unproductive firms relative to the pre-SMP period. Table 5 reports marginal effects for the treatment in the post period conditional on the weak bank and weak firm indicators.

– Insert Table 5 around here –

Column I in Table 5 repeats the previous results from Table 4 which serves as a reference point. Column II reports marginal effects from a model including a triple interaction term with a weak bank indicator. Marginal effects are calculated for the treatment in the post period for the two groups of weak and strong banks separately. Plants connected to weak banks show lower exit rates. The effect is statistically and economically strong. Plants connected to a weak bank show on average a probability of default which is 0.8% points lower than non-treated plants. Plants connected to strong banks do not show a different probability of default. We conclude from the results that our baseline effect as it is reported in column I is driven solely by weak banks.

Column III reports results from a model including further an indicator for weak firms. Again, marginal effects for all possible subgroups are estimated. Plants connected to strong banks do not show changes in their probability of default no matter if they are productive or unproductive. In contrast, firms connected to weak banks show lower probabilities of default (PD). Productive firms connected to weak banks have 0.8% points lower PDs. Unproductive plants connected to weak banks even show a reduction in PD of 1% point, which compared to the average PD of 2.3% is a large reduction. In the vein of the zombie lending literature, we find a critical link between weak banks and weak firms, which might contribute to capital misallocation as a result of loose monetary policy.

Table A.1 in the appendix shows the underlying regression results from which we derive marginal effects. In robustness checks, we hold one indicator variable stable while we vary the other indicator over all percentiles to test the sensitivities of the chosen thresholds.

3.2 Aggregate effects

It is not self evident how to interpret suppressed churn rates which result from unexpected windfall gains due to loose monetary policy. Even though the impact is economically relevant when compared to average churn rate, the share of plants affected might be small, and hence it is not clear whether churn rates in aggregate are affected by this. Second, the effect on competitors which aim to enter the market is not clear. If lower churn rates of long-established firms blocks the entry of competitors, turnover dynamics are thwarted resulting in less Schumpeterian destruction and following new innovation. To assess the impact on aggregate entry and exit rates, we use the share of treated plants within a region, or industry, respectively, as a measure for the affectedness of the region or industry and observe resulting changes in mean entry or exit rates. We estimate the following model:

$$Y_{it} = \alpha_i + \alpha_t + \gamma SMPshare_i \times Post_t + \epsilon_{it} \tag{3}$$

The dependent variable is the mean entry or exit rate in region or industry i. We interact the share of treated plants per region (industry) ($SMPshare_i$) with an indicator $Post_t$ which equals 0 for the pre period 2007-2009 and 1 for the post period 2010-2013. We include region (industry) fixed effects and time fixed effects. Standard errors are clustered on the region (industry) level. The sample consists if 10,085,408 plant-year observations, which is the full BHP by the IAB which covers 50% of the German plant population. We aggregate entries and exits at the region (industry) level to derive entry and exit rates per region (industry). The sample comprises of 402 regions and 66 industries. Table 6 shows the results.

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Column I reports change of average entry rates depending on the post period and on the share of treated plants in the same region. The higher the share of treated plants in the region, the lower are average entry rates. Mean entry rates are 5.0%. The economic impact depends on the SMPshare in the region. For the mean region with a SMPshare of 0.419 this implies a lowered entry rate of 0.419*(- 0.007), which equals to 0.0029. For a region with an average exposure to the SMP, the entry rate will be lower by 0.003 percentage points, or 5.8%. The results show that mean entry rates are the more suppressed the higher the exposure of plants in a region. Loose monetary policy not only results in lower exit rates for unproductive firms connected to weak banks, but also blocks the entry of new competitors. Column II reports the impact of the share of treated plants in the region on average exit rates. Exit rates are also lower for regions which have a large exposure to the SMP shock. This reflects our previous finding that plants connected to weak banks show lower exit rates after their bank benefits from the liquidity shock.

Column III reports entry rates on the industry level. We do not find a significant change of entry rates on the industry level conditional on the treatment in the same region. Column IV shows the impact of the share of treated plants in the same industry on exit rates. Again, we find that a higher share of treated plants in the same industry goes along with lower average exit rates.

The results hint at adverse effects of loose monetary policy in terms of factor reallocation: (unproductive) firms connected to weak banks survive, new competitors cannot enter the market, and turnover rates decrease. Aggregate effects are based on a significant share of German plants and confirm adverse effects which we find in the micro-level analyses.

4 Robustness

We choose thresholds for bank and firm weakness as the lowest quartile in terms of equity ratios or turnover per employee, respectively. We next test the sensitivities of our results with regard to the choice of the thresholds. We do so by first holding the threshold for the weak firm indicator constant and we vary the threshold for weak banks over all 100 percentiles. Figure 2 shows the result.

– Insert Figure 2 around here –

The figure shows the marginal effect of the treatment for unproductive plants connected to weak banks in the post period varying over different thresholds for the weak bank indicator. A bank is defined to be weak if it is among the lowest X percentile. We look at all 100 percentiles of the distribution. The figure shows that we find an adverse effect on the probability of default of unproductive firms connected to banks which are below the fifth and until below the thirtieth percentile. According to these results, our chosen threshold of 25% is sensible.

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Figure 3 shows marginal effects of the treatment for firms connected to weak banks in the post period over varying thresholds for the definition of a unproductive firm. In our baseline analyses above, we define an unproductive firm as a firm that is in the lower quartile in terms of turnover per employee before the treatment. From Figure 3 we can conclude that a threshold of 25% until 60% is reasonable to apply. Hence, it is not only the very unproductive, but also firms with medium productivity which show lower probabilities to exit the market when they have a link to a treated weak bank.

For further robustness checks, we perform placebo estimations over time and treatment.

– Insert Table 7 around here –

We estimate a differences-in-differences model as in Equation 1. Column I in Table 7 reports results for a placebo treatment assigned randomly across firms according to the overall treatment share in our sample. Column II shows results for a placebo treatment which is assigned randomly for each year across firms according to the treatment share per year. Column III reports results for a placebo treatment which is assigned randomly across plants and years. All three placebo estimations show no results.

Finally, we want to rule out that estimation results on the aggregate level entry and exit rates are driven by financial centers. If entry and exit dynamics were different from other regions and meanwhile banks had a higher probability to reap benefits from asset purchases, we would report merely spurious correlations. We estimate Equation 3 without financial centers Frankfurt (Main), Munich, Hamburg and Duesseldorf.

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The results remain stable when we exclude regions with a high concentration of finance industry. All signs and sizes of coefficients are exactly the same as before. Hence we conclude that our results are not driven by financial centers.

5 Conclusion

In this paper, we test whether unconventional monetary policy in the form of asset purchase programs obstructs Schumpeterian cleansing in the real economy. By directly observing both plant exits and the detailed origins of monetary policy shocks, this paper fills an important gap in the literature investigating the effects of factor market frictions on the re-allocation of production factors and ensuing productivity growth. Specifically, we gauge the direct implications of ultraloose monetary policy on the delay and prevention of unproductive plant exits.

To this end, we rely on a unique combination of granular data of plant exits sampled from the universe of all production sites in Germany with equally granular data on financial firms and monetary policy between 2007 and 2013. These exits and associated employment and productivity data are combined with financial information at the firm level from public sources, which also contains the identity of each firms' bank relationship. Via this latter link, we then connect the micro-level information on churn in the real economy to bank-level information. We observe financial indicators of banks from public sources, which allows us to classify weak and non-weak banks. Finally, we observe the identity and volume of sovereign bonds from five stressed Eurozone economies that the European Central Bank (ECB) purchased for the first time in secondary markets under the securities markets program (SMP) between May 2010 and September 2012. Based on detailed portfolio holdings data of the universe of German banks, we can therefore identify those banks that are subject to this surprise expansionary policy shock, which was arguably exogenous especially to local German banks tied to small and medium enterprises (SME) and their production plants in Germany.

Within this quasi-experimental setting, we first conduct a simple differences-in-differences analysis and find that overall, exit probabilities for plants connected to treated banks decrease. Second, we test what drives the effect. We classify weak banks as those with capitalization in the lowest quartile of the distribution, and estimate a triple differences-in-differences model. Results show that the whole effect of lowered exit rates results from firms connected to weak banks. We further distinguish between productive and unproductive firms. We classify weak firms as those in the bottom quartile of the labor productivity distribution at the onset of our sample period. It turns out that the adverse effect on churn rates is mostly pronounced for unproductive firms tied to weak banks. In robustness checks, we vary the chosen thresholds for bank or firm weakness to confirm our findings. This result therefore corroborates earlier evidence on the misallocation of credit to so-called zombie firms when monetary policy is overly loose or when governance and market discipline exert too little pressure on banks to enforce weak firm restructuring.

From these results alone it is not clear whether there are adverse or positive effects on the aggregate level. Exit rates might be lower for a specific subgroups, but the rest of the economy might not be affected. To assess whether lower exit rates also block the entrance of competitors, we rely on a sample of more than 10 million plant-year observations and conduct analysis on the aggregate level on entry and exit rates on the region and industry level. Mean entry rates for regions with a high exposure to the monetary policy shock show lower entry rates of plants as a result. Ultra loose monetary policy not only drives down exit rates of a subgroup of plants, but also reduces total entry rates on the regional level.

In sum, ultra-loose monetary policy reflected by asset purchase programs appears to have the unintended consequence to block the exit from markets by unproductive units and prevents the entry of new competitors. Figuratively speaking: whether the cost of parking in the wrong spot versus those associated with circling the block for ages and ending up in an even worse place – i.e. not having assisted the European periphery members during the sovereign debt crisis – is clearly out of the scope of this partial equilibrium exercise. What we do show beyond doubt is, however, that misallocation of resources at the extensive margin due to expansionary unconventional monetary policy exists and should be taken into account in estimating the cost of any supporting pan-European policy action.

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6 Tables

Table 1: Summary statistics for baseline scenario

This table reports summary statistics for the baseline estimation. Variables on the plant level are the following: *Exits* is an indicator variable which equals 1 if firm i exits in year t, *Age* reports the age, $Number\ FTE$ is the number of full time equivalents. Variables on the firm level are the following: *Assets* is the log of total assets (in EUR), $Long-term\ debt$ is the ratio of long-term debt over total assets, *Equity* is the share of equity over total assets, *Cash* is the share of cash holdings over total assets. Variables on the bank level are the following: *Equity* is the share of equity over total assets, $Cost-to-income$ is the cost to income ratio, *Return on assets* is the return on total assets, *Liquidity* is the share of liquid assets over total assets and *Assets* is the log of total assets (in EUR). In the regressions, the following indicator variables are used: SMP is an indicator variable equal to 1 if the bank to which the firm is connected to held SMP eligible assets in all three treatment years 2010-2012. It equals 0 if the bank did not hold SMP eligible assets. $Weak\_bank$ equals 1 if the bank was in the lower 25% percentile in terms of equity in the year 2007. $Weak\_firm$ equals 1 if the firm was in the lower 25% percentile in terms of labour productivity, measured according to the turnover per employee, within its industry in the pre period. *Post* is an indicator variable which equals 0 for the years 2007-2009, and 1 for the years 2010-2013. Variable on the regional level include $SMPshare$, which is the share of treated plants in region r. *Entryrate* is the mean entry rate across regions, and *Exitrate* is the mean exit rate across regions. All variables are winsorized before transformed into logs at the top and bottom 1% percentile. *, **, *** indicate significant coefficients at the 10%, 5%, and 1% level, respectively.

	Obs	Mean	Std. Dev.	Min	Max
Plant					
Exits	202,386	0.023	0.150	0.000	1.000
Age	202,386	15.825	10.023	1.000	38.000
Number FTE	202,386	11.441	52.794	0.000	9911.000
Firm					
Assets	180,398	-0.783	1.713	-12.429	5.763
Long term debt	176,903	0.306	0.314	0.000	0.990
Equity	154,798	30.973	26.802	0.000	99.841
Cash	175,173	0.170	0.199	0.000	0.824
Bank					
Assets	202,386	7.954	1.327	5.142	12.470
Equity	202,386	6.656	1.795	2.538	12.331
Cost-to-income	202,369	69.296	10.027	44.640	145.120
Return on assets	202,384	0.199	0.155	-1.310	0.880
Liquidity	202,386	13.617	8.656	2.144	66.974
Indicators					
SMP	202,386	0.116	0.320	0.000	1.000
Weak_firm	202,386	0.243	0.429	0.000	1.000
Weak_bank	202,386	0.383	0.486	0.000	1.000
Post	202,386	0.548	0.498	0.000	1.000
Region					
SMPshare	2,814	0.418	0.188	0.100	0.921
Entry rate	2,814	0.050	0.010	0.024	0.088
Exit rate	2,814	0.055	0.009	0.029	0.100

Table 2: T-tests on levels

This table shows t-tests on mean levels of plant, firm and bank level variables within the pre and post period between treated and control groups. The last two columns report the differences-in-differences tests between the means of the two groups over both periods. The sample covers the years 2007-2009 in the pre period and 2010-2013 in the post period. The table reports tests on the following plant-level variables: *Exits* is an indicator variable which equals 1 if firm i exits in year t, *Number FTE* is the number of full time equivalents, *Share minor* is the share of marginal employed employees, *Age* reports the age. Tests on the following firm-level variables are reported: *Assets* is the log of total assets (in EUR), $Long - term\ debt$ is the ratio of long-term debt over total assets, *Equity* is the share of equity over total assets, *Cash* is the share of cash holdings over total assets. Tests on the following bank-level variables are reported: *Equity* is the share of equity over total assets, $Cost - to - income$ is the cost to income ratio, *Return on assets* is the return on total assets, *Liquidity* is the share of liquid assets over total assets and *Assets* is the log of total assets (in EUR). All variables are winsorized before transformed into logs at the top and bottom 1% percentile. *, **, *** indicate significant coefficients at the 10%, 5%, and 1% level, respectively.

		Pre period				Post period					
LEVELS	N	Non-treated	Treated	Diff	SE	Non-treated	Treated	Diff	SE	DiD	SE
Plant											
Exits	202,386	0.011	0.011	0.000	0.002	0.033	0.031	-0.002	0.001	-0.002	0.002
Number FTE	202,386	10.511	14.318	3.808***	0.545	11.310	15.940	4.63***	0.495	0.822	0.737
Share minor	202,386	0.289	0.263	-0.026***	0.003	0.273	0.242	-0.031***	0.003	-0.005	0.004
Age	202,386	13.825	14.198	0.373***	0.102	17.377	17.940	0.563***	0.093	0.190	0.138
Firm											
Assets	166,450	-1.109	-1.124	-0.015	0.017	-0.862	-0.873	-0.011	0.016	0.004	0.023
Long term debt	163,239	0.326	0.325	-0.002	0.004	0.297	0.305	0.008**	0.004	0.010*	0.005
Equity	142,209	28.952	29.032	0.108	0.337	32.984	32.099	-0.885***	0.323	-0.992**	0.467
Cash	161,375	0.167	0.161	-0.006**	0.002	0.181	0.173	-0.008***	0.002	-0.003	0.003
Bank											
Equity	6,265	6.382	5.939	-0.443***	0.129	7.771	7.481	-0.289**	0.113	0.154	0.172
Cost-to-income	6,263	71.954	72.058	0.104	0.617	67.251	66.893	-0.357	0.617	-0.431	0.820
Return on assets	6,264	0.233	0.193	-0.039***	0.013	0.286	0.249	-0.038***	0.011	0.001	0.017
Liquidity	6,265	15.520	15.815	0.294	0.560	12.253	13.129	0.877*	0.489	0.582	0.743
Assets	6,265	6.414	6.718	0.304***	0.083	6.517	6.797	0.280***	0.073	-0.024	0.111

Table 3: T-tests on changes

This table shows t-tests on mean changes of plant, firm and bank level variables within the pre and post period between treated and control groups. The last two columns report the differences-in-differences tests between the means of the two groups over both periods. The sample covers the years 2007-2009 in the pre period and 2010-2013 in the post period. The table reports tests on the following plant-level variables: *Number FTE* is the first difference of the number of full time equivalents, *Share minor* is the first difference of the share of marginal employed employees. Tests on the following firm-level variables are reported: *Assets* is the the first difference of log of total assets (in EUR), *Long−term debt* is the first difference of the ratio of long-term debt over total assets, *Equity* is the first difference of the share of equity over total assets, *Cash* is the first difference of the share of cash holdings over total assets. Tests on the following bank-level variables are reported: *Equity* is the first difference of the share of equity over total assets, *Cost−to−income* is the first difference of the cost to income ratio, *Return on assets* is the first difference of the return on total assets, *Liquidity* is the first difference of the share of liquid assets over total assets and *Assets* is the first difference of the log of total assets (in EUR). All variables are winsorized before transformed into logs at the top and bottom 1% percentile. *, **, *** indicate significant coefficients at the 10%, 5%, and 1% level, respectively.

		Pre period				Post period					
CHANGES	N	Non-treated	Treated	Diff	SE	Non-treated	Treated	Diff	SE	DiD	SE
Plant											
Number FTE	202,386	0.245	0.278	0.033	0.173	0.176	0.242	0.066	0.157	0.033	0.233
Share minor	202,386	-0.004	-0.002	0.002	0.001	-0.004	-0.005	-0.001	0.001	-0.003	0.002
Firm											
Assets	134,937	0.007	0.013	0.007	0.005	0.020	0.018	-0.001	0.004	-0.008	0.006
Long term debt	131,708	-0.016	-0.012	0.004	0.003	-0.001	0.000	0.002	0.003	-0.002	0.004
Equity	115,891	1.071	0.846	-0.225	0.180	1.066	0.931	-0.134	0.140	0.091	0.228
Cash	116,093	0.004	0.005	0.001	0.002	0.004	0.003	-0.001	0.002	-0.002	0.002
Bank											
Equity	5,351	0.012	0.101	0.089	0.056	0.551	0.575	0.023	0.040	-0.065	0.068
Cost-to-income	5,350	-1.776	-1.797	-0.021	0.576	-0.348	-0.392	-0.044	0.410	-0.023	0.707
Return on assets	5,351	0.011	0.015	0.004	0.012	0.001	0.002	0.001	0.009	-0.003	0.015
Liquidity	5,351	-1.018	-0.992	0.026	0.403	-0.757	-0.645	0.111	0.286	0.085	0.494
Assets	5,351	0.036	0.029	-0.007	0.006	0.025	0.022	-0.003	0.004	0.004	0.008

Figure 1: Number of plants per year conditional on treatment share of region
This figure shows the number of plants per year in thousands. We categorize plants as belonging to the stock of plants, entering that year (entries), or exiting that year (exits). Further, we distinguish between highly and lowly exposed regions. Regions in which the share of treated plants, as extrapolated from our matched bank–firm–plant sample, is below median are considered to be lowly treated (0), and regions with a treatment share above median fall into the category of intensive treatment (1).

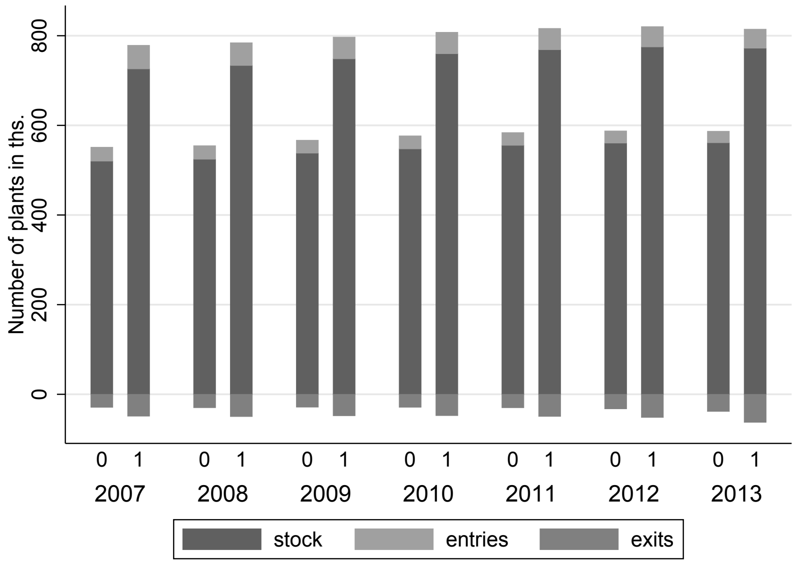

Table 4: Probability of default of firms in differences-in-differences setting

This tables reports results from differences-in-differences analysis on plant-level covering the years 2007-2013. Dependent variable is an indicator which equals 1 if plant i exits the market in year t and 0 otherwise. SMP is an indicator variable equal to 1 if the bank to which the firm is connected to held SMP eligible assets in all three treatment years 2010-2012. It equals 0 if the bank did not hold SMP eligible assets. *Post* is an indicator variable which equals 0 for the years 2007-2009, and 1 for the years 2010-2013. Mean Exit reports the mean of the dependent variable in the regression sample and SD Exit the standard deviation. Standard errors are clustered on the bank level and reported in parentheses. *, **, *** indicate significant coefficients at the 10%, 5%, and 1% level, respectively.

	I	II	III	IV	V
Post*SMP	-0.003*	-0.004**	-0.005**	-0.005**	-0.005**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Firm age	Yes	Yes	Yes	Yes	Yes
Bank controls	-	Yes	Yes	Yes	Yes
Plant FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	-	-	-
Region-Time FE	-	-	Yes	-	Yes
Industry-Time FE	-	-	-	Yes	Yes
N	202,386	202,386	202,386	202,386	202,386
R2	0.248	0.248	0.250	0.251	0.253
Mean Exit	0.023	0.023	0.023	0.023	0.023
SD Exit	0.150	0.150	0.150	0.150	0.150

Table 5: Marginal effects from triple and quadruple differences-in-differences analyses

This tables reports marginal effects of the treatment SMP in the post period (2010-2013) covering years 2007-2013 derived 6from the following estimation: $Y_{it} = \alpha_i + \alpha_{rt} + \alpha_{kt} + \gamma SMP_i \times Post_t + \delta_x X_{it-1} + \epsilon_{it}$. Table A.1 reports the complete regression table. The dependent variable is an indicator which equals 1 if plant i exits the market in year t and 0 otherwise. SMP is an indicator variable equal to 1 if the bank to which the firm is connected to held SMP eligible assets in all three treatment years 2010-2012. It equals 0 if the bank did not hold SMP eligible assets. All estimations include as controls (X_{it-1}) firm age and lagged bank financials, as well as plant (α_i), region-time (α_{rt}), and industry-time (α_{kt}) fixed effects. Columns I reports results for all firm-bank observations. Column II reports marginal effects of SMP conditional on the bank weakness. A bank is defined as weak it was in the lower 25% percentile in terms of equity in the year 2007. Column III reports marginal effects of SMP conditional on the firm weakness. A firm is defined as weak if it was in the lower 25% percentile in terms of labour productivity, measured according to the turnover per employee within its industry in the pre period. Column IV reports marginal effects of SMP conditional on bank and firm weakness. Mean Exit reports the mean of the dependent variable in the regression sample and SD Exit the standard deviation. Standard errors are clustered on the bank level. *, **, *** indicate significant coefficients at the 10%, 5%, and 1% level, respectively.

		I	II	III
All		-0.005**		
		(0.002)		
Banks	strong		-0.002	
			(0.003)	
	weak		-0.008***	
			(0.003)	
Strong banks	strong firms			-0.005
				(0.003)
	weak firms			0.004
				(0.006)
Weak banks	strong firms			-0.008**
				(0.003)
	weak firms			-0.010**
				(0.004)
N		202,386	202,386	202,386
R2		0.253	0.253	0.253
Mean Exit		0.023	0.023	0.023
SD Exit		0.150	0.150	0.150

7 Aggregate effects

Table 6: More than 10 million plant-year observations aggregated

This tables reports results from differences-in-differences estimations on the aggregate level from the following regression: $Y_{it} = \alpha_i + \alpha_t + \gamma SMPshare_i \times Post_t + \epsilon_{it}$. Results are based on sample of 10,085,408 plant-year observations, covering the years 2007-2013. The dependent variables are mean exit or mean entry rates aggregated on the region level (Kreis), or industry level respectively. The data covers 402 regions and 66 industries. $Post$ is an indicator variable which equals 0 for the years 2005-2009, and 1 for the years 2010-2014. $SMPshare$ is the share of treated plants per region or industry. Standard errors are clustered on the region or industry level. Mean dependent reports the mean of the dependent variable in the regression sample and SD dependent the standard deviation. *, **, *** indicate significant coefficients at the 10%, 5%, and 1% level, respectively.

	Region		Industry	
	Entry	Exit	Entry	Exit
	I	II	III	IV
Post*SMPshare	-0.007***	-0.004***	-0.023	-0.027**
	(0.001)	-0.001	(0.022)	(0.012)
Time FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	-	-
Industry FE	-	-	Yes	Yes
N	2,814	2,814	462	462
R2	0.782	0.746	0.782	0.880
Mean dependent	0.050	0.055	0.055	0.055
SD dependent	0.010	0.009	0.030	0.028
Mean SMPshare	0.418	0.418	0.476	0.476
SD SMPshare	0.188	0.188	0.106	0.106

8 Robustness

Figure 2: Varying weak bank indicator

This figure shows the marginal effects of the treatment in the post period for weak firms connected to weak banks as in column IV in Table 5. Regressions are based on quadruple differences-in-differences estimations including plant FE, Region*Time and Industry*Time FEs. **The threshold for bank weakness varies over 99 percentiles.** Weakness indicators are defined as the following: *weak_bank* equals 1 if the bank's equity ratio was among the lowest X percentile. A firm is defined as weak if it was in the lower 25% percentile in terms of labour productivity, measured according to the turnover per employee within its industry in the pre period.

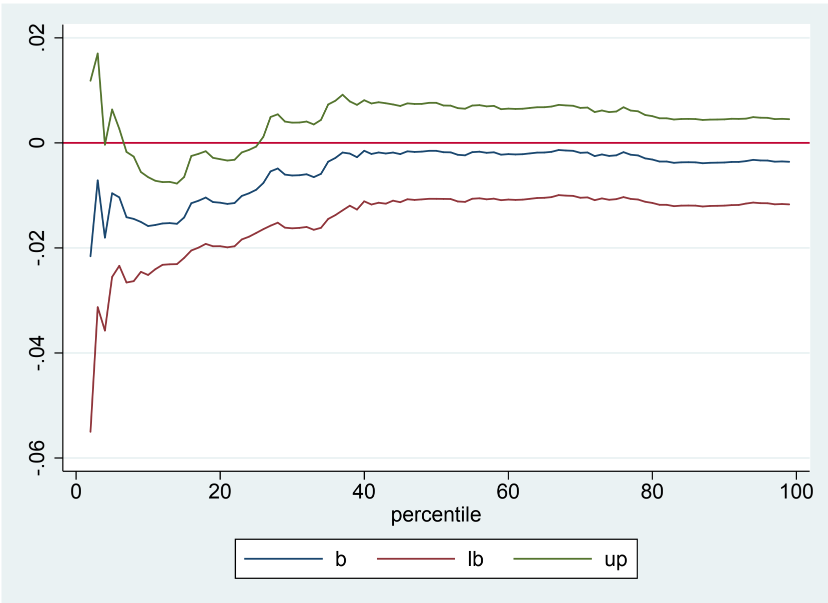

Figure 3: Varying weak firm indicator

This figure shows the marginal effects of the treatment in the post period for weak firms connected to weak banks as in column IV in Table 5. Regressions are based on quadruple differences-in-differences estimations including plant FE, Region*Time and Industry*Time FEs. **The threshold for firm weakness varies over 99 percentiles.** Weakness indicators are defined as the following: *weak_firm* equals 1 if the firm's labour productivity was among the lowest X percentile. A bank is defined as weak it was in the lower 25% percentile in terms of equity in the year 2007.

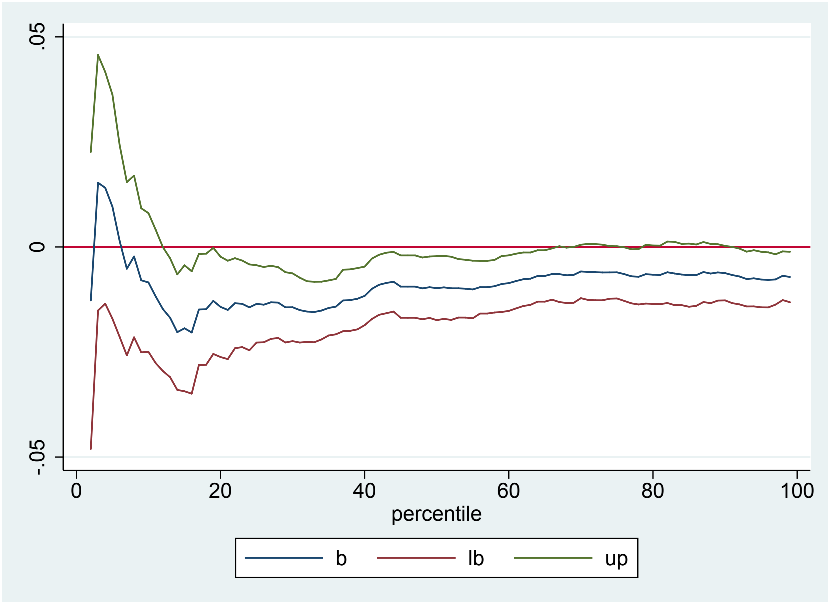

Table 7: Placebo treatment across firms and time

This tables reports results from placebo differences-in-differences estimations from regression models on the plant level covering years 2007-2013. Dependent variable is an indicator which equals 1 if plant i exits the market in year t and 0 otherwise. In column I, the treatment $SMPplacebo$ is assigned randomly across firms according to the overall treatment share. In column II, the treatment $SMPplacebo$ is assigned randomly across firms per year according to the yearly treatment share. In column III, the treatment $SMPplacebo$ is assigned randomly across plants and years according to the overall treatment share. Mean Exit reports the mean of the dependent variable in the regression sample and SD Exit the standard deviation. Standard errors are clustered on the bank level and reported in parentheses. *, **, *** indicate significant coefficients at the 10%, 5%, and 1% level, respectively.

	I	II	III
Post*SMPplacebo	0.001	0.002	0.001
	0.002	0.002	0.002
Age firm	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes
Plant FE	Yes	Yes	Yes
Region-Time	Yes	Yes	Yes
Industry-Time	Yes	Yes	Yes
N	202,386	202,386	202,386
R2	0.253	0.253	0.253
Mean Exit	0.023	0.023	0.023
SD Exit	0.150	0.150	0.150

Table 8: Aggregate effects without financial centers

This tables reports results from differences-in-differences estimations on the aggregate level from the following regression: $Y_{it} = \alpha_i + \alpha_t + \gamma SMPshare_i \times Post_t + \epsilon_{it}$. Baseline results are based on sample of 10,085,408 plant-year observations, covering the years 2007-2013. The dependent variables are mean exit or mean entry rates aggregated on the region level (Kreis), or industry level respectively. The data covers 398 regions and 66 industries. Financial centers Frankfurt (Main), Munich, Hamburg and Duesseldorf are excluded. *Post* is an indicator variable which equals 0 for the years 2005-2009, and 1 for the years 2010-2014. *SMPshare* is the share of treated plants per region or industry. Standard errors are clustered on the region or industry level. Mean dependent reports the mean of the dependent variable in the regression sample and SD dependent the standard deviation. *, **, *** indicate significant coefficients at the 10%, 5%, and 1% level, respectively.

	Region		Industry	
	Entry	Exit	Entry	Exit
	I	II	III	IV
Post*SMPshare	-0.007***	-0.004***	-0.023	-0.027**
	(0.001)	(0.001)	(0.022)	(0.012)
Time FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	-	-
Industry FE	-	-	Yes	Yes
N	2,786	2,786	462	462
R2	0.773	0.739	0.782	0.880
Mean dependent	0.050	0.055	0.055	0.055
SD dependent	0.009	0.009	0.030	0.028
Mean SMPshare	0.416	0.416	0.476	0.476
SD SMPshare	0.187	0.187	0.106	0.106

A Appendix

Table A.1: Underlying table for extended differences-in-differences model

This tables reports underlying results from Table 5 from linear probability models on the plant level covering years 2007-2013. Dependent variable is an indicator which equals 1 if plant i exits the market in year t and 0 otherwise. Columns I reports results for a standard differences-in-differences analysis. SMP is an indicator variable equal to 1 if the bank to which the firm is connected to held SMP eligible assets in all three treatment years 2010-2012. It equals 0 if the bank did not hold SMP eligible assets. *Post* is an indicator variable which equals 0 for the years 2007-2009, and 1 for the years 2010-2013. Column II reports results from a triple differences-in-differences analysis which includes WB as bank weakness indicator. WB equals 1 if the bank was in the lower 25% percentile in terms of equity in the year 2007. Column III reports results from a triple differences-in-differences analysis which includes WF as firm weakness indicator. WF equals 1 if the firm was in the lower 25% percentile in terms of labour productivity, measured according to the turnover per employee, within its industry in the pre period. Column IV reports results from a quadruple differences-in-differences analysis which includes WB as well as WF as bank and firm weakness indicators, respectively. Mean Exit reports the mean of the dependent variable in the regression sample and SD Exit the standard deviation. Standard errors are clustered on the bank level and reported in parentheses. *, **, *** indicate significant coefficients at the 10%, 5%, and 1% level, respectively.

	I	II	III	IV
Post*SMP	-0.005**	-0.002	-0.006***	-0.005
	0.002	0.003	0.002	0.003
Post*Weak_bank		-0.001		0
		0.002		0.002
Post*SMP*Weak_bank		-0.006		-0.003
		0.004		0.004
Post*Weak_firm			-0.004**	-0.003
			0.002	0.002
Post*SMP*Weak_firm			0.002	0.008
			0.004	0.007
Post*Weak_bank*Weak_firm				-0.002
				0.003
Post*SMP*Weak_bank*Weak_firm				-0.011
				0.008
Firm age	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes
Plant FE	Yes	Yes	Yes	Yes
Region*Time FE	Yes	Yes	Yes	Yes
Industry*Time FE	Yes	Yes	Yes	Yes
N	202,386	202,386	202,386	202,386
R2	0.253	0.253	0.253	0.253
Mean Exit	0.023	0.023	0.023	0.023
SD Exit	0.150	0.150	0.150	0.150

Table A.2: Variable descriptions

Variable	Unit	Description
Plant variables. Source: IAB.		
Exits	0/1	Equals 1 in the year a plant exits the market. We make use of the definition of Hethey and Schmieder (2010) on small and atomized deaths.
Age	Number	Age of plant.
Firm variables, winsorized at lower and upper 1%. Source: Amadeus.		
Log of assets	EUR	Log of total assets in million EUR.
Long term debt ratio	Ratio	Long term debt over total assets.
Equity ratio (in %)	%	Equity over total assets.
Cash ratio	Ratio	Cash over total assets.
Bank variables, winsorized at lower and upper 1%. Source: Bankscope.		
Equity ratio (in %)	%	Equity over total assets.
Cost-to-income ratio (in %)	%	Costs over income.
Return on assets (in %)	%	Return on assets.
Liquidity ratio (in %)	%	Liquid assets over total assets.
Log of assets	EUR	Log of total assets, in million EUR.
Regional variables. Source: IAB.		
Mean entry rate	Ratio	Mean entry rate per region or industry.
Mean exit rate	Ratio	Mean exit rate per region or industry.

Table A.3: Variable descriptions continued

Variable	Unit	Description
Bank Weakness Indicator. Source: Bankscope.		
Weak_bank	0/1	Equals 1 if a bank's equity ratio was in the lower 25% percentile in 2007.
Firm Weakness Indicators		
Weak_firm	0/1	Equals 1 if a firm's turnover/employee ratio was in the lower 25% percentile in 2007. Sources: turnover: Amadeus, employees: IAB.
Treatment variables		
SMP	0/1	Equals 1 if bank held an SMP assets in all three treatment years 2010, 2011 and 2012. Source: Bundesbank and ECB.
SMP_share	[0;1]	Share of treated plants in the same region or industry, respectively. Source: Bundesbank and ECB.
Time indicators		
Post	0/1	In the micro-level analysis, equals 0 in 2007-2009. Equals 1 in 2010-2013.