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Inside asset purchase programs: the effects of unconventional policy on banking competition

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Abstract

We test if unconventional monetary policy instruments influence the competitive conduct of banks. Between q2:2010 and q1:2012, the ECB absorbed €218 billion worth of government securities from five EMU countries under the Securities Markets Programme (SMP). Using detailed security holdings data at the bank level, we show that banks exposed to this unexpected (loose) policy shock mildly gained local loan and deposit market shares. Shifts in market shares are driven by banks that increased SMP security holdings during the lifetime of the program and that hold the largest relative SMP portfolio shares. Holding other securities from periphery countries that were not part of the SMP amplifies the positive market share responses. Monopolistic rents approximated by Lerner indices are lower for SMP banks, suggesting a role of the SMP to re-distribute market power differentially, but not necessarily banking profits.

Key words: Security markets program, unconventional monetary policy, competition
JEL: C30, C78, G21, G28, L51

Non-technical summary

To ensure the transmission of monetary policy and restore the smooth functioning of selected financial market segments after the Great Financial Crisis of 2007/2008, the European Central Bank (ECB) complemented conventional monetary policy with a range of less conventional policy instruments. The use of these policy instruments continues to raise controversial debates among policy makers, politicians, and academics alike.

Especially the effects for banking competition remain unchartered, which is remarkable given the efforts to ensure a level-playing field in an integrated European Banking Market. Asset purchase programs might entail a differential treatment of market participants and thereby competitive effects. First, banks that held assets that were subject to a surprise purchase by the ECB could convert more risky assets into cash at higher prices (duration risk channel). Second, even if banks continued to hold these assets, positive price effects due to the additional demand by the ECB would result in higher portfolio values and thus excess reserves (capital relief channel), which constitute comparative advantages in loan and deposit markets relative to competitors without such access.

We combine micro data on purchases under the Securities Markets Program (SMP) by the ECB and detailed security holdings of all German banks. Between May 2010 and September 2012, the ECB purchased selected government bonds from Greece, Italy, Ireland, Portugal, and Spain on the order of 210 billion Euros. We match the quarterly holdings of all securities of all 1,700 or so German banks ISIN-by-ISIN to the SMP purchases to test if banks with SMP-security exposure gained market shares. To ensure a valid comparison of banks to identify any differential effects, we focus on small regional banks that held SMP securities and compare them to a matched sample of other regional banks based on observable financial account traits.

Our results indicate a robust effect of SMP exposure on regional market shares in terms of loans, deposits, and gross total assets. Banks with SMP exposure exhibit around 70 basis points higher market shares, which represents mild economic magnitudes given average regional markets shares on the order of 22 percentage points. At the same time, this result provides evidence of existing side effects of unconventional policies, in this case the restoration of monetary transmission in the Eurozone periphery having effects on banking competition in regional banking markets of Germany. We also show that lending growth of SMP banks is significantly faster compared to non-SMP banks whereas deposit and overall asset growth is not. Moreover, our findings appear to be driven mostly by those local banks that actually expanded their portfolio shares of SMP securities over the spell of the program and held the largest relative volumes of SMP securities compared to total portfolio size. This result indicates that at least German banks did not conduct any outright unloading of Eurozone periphery sovereign debt at the ECB in response to the SMP. We also document an amplification effect of the policy on local market shares for those banks that held other periphery securities that were not part of the SMP.

1 Motivation

Do asset purchase programs (APP) conducted by central banks affect competition in banking? APP are an important instrument of monetary policy in times of sustained near-zero interest rates since the financial crisis of 2008. But central bank purchases of selected securities in secondary markets inevitably imply that financial institutions are treated differently. After all, APP securities can only be bought from financial institutions that actually hold them. Yet Beck et al. (2010) highlight that any such differential policy treatment might lead to welfare losses if it results in competitive changes, a concern shared by both European and US policymakers after passing various emergency policies in response to the Lehman crisis (European Commission, 2008; Congressional Oversight Panel, 2011). But the effects of more recent unconventional monetary policy measures on the competitive conduct of banks remain unclear.

We take a detailed security-level perspective at a specific unconventional monetary policy measure, the Securities Markets Programme (SMP), to identify potential competitive changes due to the differential treatment of banks with versus banks without SMP securities holdings. We benefit from three features of novel micro data that permit a clean identification of banking competition effects of this specific APP policy measure.

First, we analyze a unique combination of detailed security-by-security information on the purchase schedule of the ECB under the SMP and the security-by-security holdings of all banks in a large EMU banking system: Germany. We observe, which quantities of individual securities were purchased when and at what prices under the SMP by the ECB between q1:2010 and q2:2012. By combining these purchases with quarterly observed securities portfolios of all 1,700 or so German banks, we can exactly trace the positive liquidity shock represented by the SMP to banks that held assets

purchased by the ECB. To identify changes in competitive conduct, we compare market power indicators of SMP-banks to those without according exposures in their securities portfolios before and after the SMP.

Second, whereas the ongoing expanded Asset Purchase Programme (APP) [1] hardly posed a surprise to financial markets participants, the SMP was the first outright APP in secondary security markets. As such it represents an unexpected regime shift in May 2010 (Stolz and Wedow, 2010).

Third, our setting mitigates concerns about endogeneity arising from reverse causality faced by any policy impact study (Chemla and Hennessy, 2016) considerably. The obvious example is here that the dire state of financial institutions ignites asset purchases by the central bank. But the SMP was launched against the backdrop of soaring sovereign debt yields for Eurozone *periphery* economies. The declared objective of the program was to "[...] address the malfunctioning of securities markets and restore an appropriate monetary policy transmission mechanism." (European Central Bank, 2010). To this end, the ECB purchased sovereign bonds from five countries (Italy, Ireland, Spain, Portugal, and Greece) worth €218 billion by February 2013 (Manganelli, 2012), equal to around 3% of Eurozone GDP at the time. Clearly, bank responses in these countries are to be expected given the home bias of sovereign debt holdings this is less clear for banks in non-stressed countries. [2] We thus use the *German* banking market as a testing ground for

[1] The extended APP consists of the third covered bond purchase programme (CBPP3), asset-backed securities purchase programme (ABSPP), and the public sector purchase programme (PSPP). As of March 2015, the ECB purchased a monthly volume of €60 billion and as of April 2016 this amount is increased to €80 billion. The program is scheduled to last until the end of 2017.

[2] See, for example, Hildebrand et al. (2012) for the existence of home-bias in sovereign debt holdings of German banks, Ongena et al. (2015) on politicians influence banks to hold domestic debt, and Acharya et al. (2016) for evidence that other unconventional policies, the open market transactions program (OMT), fostered bank health and lifted credit constraints for low quality borrowers in the Eurozone periphery, but failed to spark investment and job creation as well as easier credit access of high quality borrowers.

changes in competition due to the SMP.

This approach has two important benefits. First, regulatory treatment regarding risk-weighted capital requirements of any Eurozone sovereign debt was (and still is) identical (Acharya and Steffen, 2015). Whether a German bank held a French or an Italian bond prior to the program to store liquidity was therefore fairly random.[3] Second, around 12% of regional banks held SMP-affected securities. These two features allow us to construct a counterfactual sample of non-SMP banks with comparable traits like SMP-banks. Contrary to large, multinational banks that trade securities more actively, it is reasonable to assume that local banks, on which we focus for identification, were least likely to anticipate the SMP and strategically load up with periphery bonds. Likewise, we consider it defendable to assume that the ECB's decision to launch the SMP was not triggered by financial stability concerns pertaining to regional savings and cooperative banks in Germany.

According to the European Central Bank (2015), unconventional monetary policy affects the behaviour of financial intermediaries mainly via three channels. The first is the direct pass-through channel, which directly reduces re-funding cost of banks, thereby sparking additional lending and ultimately investment. Policies exemplifying this channel are, for example, the targeted and non-targeted long-term refinancing operation (TLTRO) analyzed in Ferrando et al. (2015) and Acharya et al. (2016).

The second channel is the signalling channel, by which the central bank demonstrates its commitment to pursue its mandate also by conducting balance sheet relevant activities, for instance by purchasing government securities. These policies may reduce general uncertainty in financial mar-

[3] Buch et al. (2016) show that macroeconomic factors did not explain bond holdings by German banks from individual Eurozone countries (see their Table 4). In fact, holdings of GIIPS bonds remained constant until the first rescue package for Greece in q2:2010 (see their Figure 3), i.e. after the start of the SMP.

kets, thereby easing funding conditions of banks and subsequently sparking credit supply by all banks, not only those directly affected by a specific policy. Eser and Schwaab (2016) show indeed that yields on stressed sovereign debt declined substantially after the SMP. Resulting positive valuation effects increase excess reserves and thus the credit-bearing capacity of banks. This restoration of the monetary transmission mechanism may either arise from outright realizations of excess reserves when selling these assets to the central bank or through an increase in the value of collateral used in interbank and central bank borrowing, and thus a reduction of information asymmetries in money markets regarding counterparty risks (Bindseil, 2013; Heider et al., 2015; Garcia-de-Andoain et al., 2016).

The third main channel through which APP can influence credit and deposit market competition is the portfolio rebalancing channel. This channel acts through the removal of duration risk and the relaxation of leverage constraints. The purchase of securities by a central bank reduces the holdings of long term bonds exposed to duration risk and increases the liquidity holdings of the sellers of these securities. The sellers might subsequently rebalance their portfolios towards other assets, thereby increasing prices of these assets and reducing external funding costs. Moreover, the reduction in the yields of securities makes bank lending generally more attractive. Bank lending is further impacted through higher prices of sovereign bond portfolios which is similar to a capital injection lifting leverage constraints. Acharya et al. (2016) provide evidence that the funding conditions of banks in the affected Eurozone countries eased considerably after the so-called Outright Monetary Transactions (OMT) promise of July 2012 (see also Krishnamurthy et al., 2015).

If these benefits of improved access to and conditions of bank funding apply to all banks equally, no differential market power effects between banks that are (not) subject to an unconventional monetary policy shock should

exist. But as Beck et al. (2010) highlight, any policy in support of banks causes externalities for non-supported banks. Such differential treatment is likely to undo many of the efficiency gains and resulting welfare improvements from the continuous efforts to create a level playing field in the European banking system (Dermine, 2002). The available evidence on emergency policies geared towards the rescue of selected banks indicates the existence of unintended consequences, such as more risk-taking among non-supported banks (Gropp et al., 2011) as well as supported banks (Duchin and Sosyura, 2014) or more market power of supported banks at the expense of unsupported banks (Berger and Roman, 2015). However, these studies usually focus on outright bailout policies, such as the Troubled Asset Relief Plan (TARP) in the U.S. or capital injections by national insurance schemes rather than the effects of unconventional monetary policy instruments, such as APP or liquidity lines.

We bridge these literatures on the competitive implications of policies that are motivated by financial stability concerns, such as bank bailout and support schemes, with studies how unconventional monetary policy affects bank behavior. The latter strand of literature has so far focused on banks' responses other than competitive conduct, such as lending volumes, terms, and quality in developed (Acharya et al., 2016) and developing countries (Altunok et al., 2016) or investment and employment behaviour of associated corporates (Chodorow-Reich, 2014). Regarding the specific evidence on the effects of the SMP, a number of studies document significant price impacts of these SMP transactions in bond markets (De Pooter et al., 2012; Doran et al., 2013; Ghysels et al., 2014; Eser and Schwaab, 2016). Other studies consider the restoration of regular monetary transmission through long term interest rates (Stapf, 2013) or the impact of SMP on the real economy (Casiraghi et al., 2013). But to our knowledge no paper investigates potential implications for competition of the SMP.

To measure the exposure of individual German banks to unconventional monetary policy, we link the purchase schedule of the SMP to the individual securities held by all German banks q1:2006 until q4:2014. The former data is obtained from the ECB and has been used elsewhere, for instance Eser and Schwaab (2016) and Gibson et al. (2016). The latter data are obtained from the securities holdings statistics database ("Wertpapierhandelsstatistik") of Deutsche Bundesbank. It contains for each ISIN the number of securities held, the nominal, and the book value on a quarterly basis.

Between q2:2010 and q1:2012, around 12% of all banks held at least one security that was purchased under the SMP (see Figure 1). The median share of SMP securities in the total securities portfolio value is around 2% and as such small (see Figure 2). Yet some local banks exhibit significantly higher shares of up to 75%. Our preferred gauge of market power are bank-specific market shares, which we observe in each of the 392 sampled counties ("Kreise") per quarter. We measure these on the basis of the monthly balance sheet statistics ("Monatliche Bilanzstatistik") reported to Deutsche Bundesbank for customer loans, customer deposits, and gross total assets. Mean market shares are around 22% for banks with exposure to SMP securities and around 25% for banks without SMP securities. These relatively high market shares corroborate the institutional feature of German banking, which is characterized by a large number of small universal banks in the savings and the cooperative sector. These banks operate on *de jure* or *de facto* delineated local markets (see also German Council of Economic Advisors, 2014, for further institutional details). By focusing on these local banks for the identification of possible competitive changes due to the SMP, we ensure a comparison between banks that pursue identical business models and face very similar business environments.

Our main result are significantly larger customer loan and deposit market shares realized by SMP banks compared to non-SMP banks after the

program stopped. These results hold after including a large set of controls, bank and quarter fixed effects, and a matched sample of local banks without access to the SMP. Whereas the economic magnitude of these effects is small, they provide thus strong indications of possibly unintended side effects of unconventional monetary policy already for this specific, relatively small asset purchase program. We also find mild reductions of economic markups among SMP banks, corroborating that even this economically small positive liquidity shock induced banks exposed to it to expand their lending significantly faster compared to banks without access to the SMP.

2 The Securities Markets Program: Identification

2.1 Channels and specification

We consider the SMP program a positive liquidity shock to selected segments of the sovereign bond markets. Banks with SMP securities should primarily benefit because of the portfolio rebalancing channel (European Central Bank, 2015), which may provide SMP banks with a competitive advantage.

Specifically, banks that hold SMP securities at the time of the launch of the policy might choose to sell them to the ECB. Direct asset sales generate excess reserves that can be converted into loans. Alternatively, banks that continue to hold on to their SMP securities benefit from the increased value of these securities that results from the additional demand from the ECB. Eser and Schwaab (2016) document mild positive price effects of ECB purchases of selected SMP securities, thereby giving rise to such a positive valuation effects, which would also enlarge a banks loan generating capacity relative

to banks without SMP exposures. Either mechanism should therefore result in an expansion of loan market shares at the expense of those banks that do not benefit from the SMP shock.

To test if SMP exposure increases banks' market shares, we use security-by-security data at the individual bank level from the security holdings statistics of Deutsche Bundesbank ("Wertpapierhandelsstatistik") in a diff-in-diff setting. For each *German* bank i, we identify its exposure with an indicator variable SMP_{ij} at the security-level j. This indicator equals one if a bank held securities in the quarter t prior to the start of the program that eventually became part of the SMP. We obtain the identity of securities purchased under the SMP including the purchase date and terms from the ECB (see also Eser and Schwaab, 2016; Gibson et al., 2016). These data are matched to banks' security portfolios ISIN-by-ISIN. Next, we aggregate the security-bank-quarter data to the bank-quarter level, such that SMP_i is a simple discrete indicator. [4]

$$MP_{it} = \alpha_{i,t} + \beta_1 SMP_i + \beta_2 POST_t + \beta_3 SMP_i \times POST_t + \gamma X_{it-1} + \epsilon_{it}. \quad (1)$$

The primary measures of bank market power MP_{it} are regional market shares of customer loans and deposits. They are derived from monthly financial accounts data reported by each bank in Germany to Deutsche Bundesbank. [5] We allocate each bank to one of the $r = 1, ..., 392$ German coun-

[4] We test below for increasingly conservative thresholds to define SMP exposure, separate banks that shed their SMP securities during the spell of the program ("Reducers"), maintained these positions ("Stayers"), and those that expanded their exposures ('increasers"'), as well as different considerations to periphery securities other than those government bonds purchased under the SMP.

[5] We also specify implied price-cost margins, Lerner indices, and regional market structure indicators (Hirschman-Herfindahl), which are only available annually. Therefore, these indicators are not our prime measure of interest though to gauge

ties ("Kreise") based on the location of the headquarter. Whereas this procedure is noisy for large, (multi)nationally active commercial banks, it reflects very accurately the regional markets of the many smaller, regional savings and cooperative banks that are our main focus here. Market shares are then calculated as the percentage share of each bank i per county r at time t relative to county r's total loans, assets, or deposits in the same period.

We estimate (1) with ordinary least squares specifying fixed effects for banks and quarters alongside bank-specific quarterly and annual controls. Hence, the effect of β_1 will be subsumed by the bank fixed effects. The coefficient of interest is the differential effect of being a bank with SMP-security exposure during the spell of the program from q2:2010 until q1:2012 versus being a bank without such an exposure compared in the pre-SMP period (q1:2006–q2:2010) relative to the period after the SMP started indicated by *POST* (q3:2012–q4:2014). [6]

As noted in Manganelli (2012), any impact analysis of the SMP faces a serious endogeneity challenge. [7] Here, one may argue that the sovereign debt of SMP participants was primarily held by domestic banks. If the program's motivation to restore orderly monetary transmission was related to strengthening confidence in banking systems of the SMP participating states, the relationship between SMP transactions and indicators of refinancing cost and competition would be endogenous, too.

The upshot of this paper is that we tackle these crucial endogeneity concerns by analyzing portfolio compositions and competition indicators of

the effect of the SMP.

[6] We provide various robustness checks and exclude the SMP period itself in a matched-sample setting for regional banks only in the preferred specification.

[7] The SMP was specifically designed to restore the functioning of the monetary transmission mechanism by alleviating excessive pressure on selected sovereign yields. As such, observed changes in yields of affected sovereign debt is hard to disentangle from spurious correlation and attributable to the launch of the SMP.

banks in a *non-participating* SMP economy: Germany. Buch et al. (2016) show that only around $\frac{2}{3}$ of all German banks hold non-German sovereign debt prior to 2008, and even fewer hold non-German sovereign debt thereafter. Whereas the correlation between the execution of the SMP, banks refinancing cost, and markets shares might be spurious in periphery countries, we argue that German banks' portfolios have neither been held in anticipation of unorthodox monetary policy represented by the SMP nor induced the ECB to launch the program so as to alleviate strain on German banks.

2.2 *Exposure of German banks to the SMP*

Irrespective of whether one considers the assumption that the ECB did not launch the SMP with the objective to mitigate German banks' funding cost and liquidity pressure plausible or not, it is necessary that the program affected a sufficiently large number of German banks. Figure 1 shows that it was not only the few, largest, multinational German banks with sizeable capital markets operations that held SMP securities. During the six quarters when the ECB reported purchases of sovereign debt from the EMU-periphery, on average 15% of the approximately 1,700 universal banks in Germany held at least one security that was part of the SMP.

– Insert Figure 1 around here –

The third panel of Figure 1 confirms that most large banks were exposed, largely reflecting security portfolios that are simply much larger compared to those of regional banks.[8] But the second panel also clearly supports the notion that a very similar share of small, local banks was affected by the

[8] Large banks comprise the "Big Four", head institutions of the savings banks ("Landesbanken"), central cooperatives, and mortgage banks. They held on average 1,612 securities in their portfolio in any given quarter. This number compares to 70 securities held by the average regional bank, which comprise privately owned, smaller commercial banks, savings banks, and cooperatives.

SMP. Throughout q2:2010 until q1:2012, around 15% of these regional banks held securities that were purchased under the SMP by the ECB.

The market share response of regional banks to observed SMP exposures is our main approach to identification since these banks operate on *de jure* (savings) and *de facto* (cooperatives) delineated local markets. For example, savings banks are not allowed to cater to credit customers or depositors that reside outside their own county. This regional segmentation provides a quasi-natural experimental setting to assess whether regional markets shares measured at the level of each of the 392 counties ("Kreise") included in our sample exhibit statistical differences between banks with and without SMP security exposures before and after the policy was launched.

The SMP provides an interesting tool of unconventional monetary policy conducted by the ECB because it was the first outright asset purchase of Eurozone sovereign debt in secondary markets. Compared to the Quantitative Easing programs conducted by the Federal Reserve, however, it remained fairly small with an entire volume of 218 billion Euros.[9] Whereas the vast majority of sovereign debt from countries exhibiting soaring spreads in 2010, namely Greece, Italy, Ireland, Portugal, and Spain, was held by their respective domestic banking systems, Figure 2 shows that both large and regional German banks were also exposed to these bonds.

– Insert Figure 2 around here –

We show for both groups of banks box plots of the share of end-of-quarter holdings of SMP securities relative to banks' total security portfolios during

[9] This volume compares to, for example, bank debt, mortgage backed securities, and treasury bills worth 1.8 trillion USD purchased between late November 2008 and March 2009 (QE1), another 600 billion USD worth of treasury bills purchased between q3:2010 and q2:2011 (QE2), and monthly bond and ABS purchases between September 2012 until October 2014 that resulted in accumulated assets on the order of 4.5 trillion USD (QE3) in the United States of America.

the six quarters when the ECB conducted security purchases. The left panel shows these data based on the nominal value of portfolios whereas the right panel provides data based on book values. Both figures show that the median share of SMP securities is between 1 and 2 %. This fairly low share thus provides a a conservative testing ground for any potential competitive changes. If already for these low portfolio shares significant differences in the evolution of market shares and other indicators of competition cannot be rejected, the effects are presumably even more pronounced for larger scale programs. Interestingly, this median share tends to be larger among regional banks and exhibits considerable variation, especially in the earlier periods of the SMP. For some non-reported extreme values, it even accounts for up to three quarters of small banks' entire portfolio value.

Figure 3 further shows that despite well-documented home-country bias in sovereign bond holdings (see, for example, Hildebrand et al., 2012), the aggregate nominal value of securities subject to purchases by the ECB under the SMP is considerable. At the end of q2:2010, the first quarter of the SMP with transactions affecting German banks, cumulative holdings were around 32 billion Euros, i.e. around 15% of the overall volume of the SMP program. Whereas the major share of the SMP securities' value was held by large banks, the Figure also shows that regional banks held a non-negligible amount of comparable relative size as well. This trait of the data therefore gives rise to reasonably suspect competitive changes also among regional banks, which are particularly unlikely to strategically load up on selected sovereign debt in anticipation of unconventional monetary policy.

– Insert Figure 3 around here –

The development of aggregate exposures over time further illustrates considerable changes in the aggregate holdings of SMP securities, suggesting significant re-allocation of portfolios during the SMP. To distinguish below

whether any potential market share responses are primarily due from outright unloading of these positions upon the ECB as opposed to valuation effects of maintained positions, we therefore show in Figure 4 a separation of banks based on the direction of changes of SMP exposures for each of the six quarters of the program's spell.

– Insert Figure 4 around here –

Quarterly transactions are calculated as the difference between the number of reported stocks of each security at the end of each quarter. We aggregate the number of traded securities per ISIN across all SMP securities held by each bank in each quarter when the ECB executed purchases in secondary bond markets to identify three groups. "Increasers" are those banks that expanded over the entire purchase period q2:2010–q1:2012 the number of securities bought by the ECB. "Stayers" are banks that maintain their respective positions of SMP securities whereas "Reducers" are banks exhibiting declining numbers of SMP securities. Hence, the last group are those banks that might have benefited from directly unloading securities with the ECB whereas "Stayers" might have expanded market shares solely due to potential valuation effects that increased their loan granting capacity.

The Figure shows that most regional banks with an exposure to the SMP maintained their holdings of SMP securities. The lower panel shows that more large banks, in contrast, traded actively over the entire SMP period. With the exception of the last SMP quarter with purchases affecting German banks, the number of buying and selling large banks is fairly equal. Among regional banks, the majority of banks that re-allocated portfolios of SMP securities expanded the number of securities, in particular towards the end of the program. For this group of financial intermediaries, the positive valuation effects due to the SMP therefore seem to dominate a potential unloading of SMP securities effect on market shares, which we will test below.

Note that the approach to tag any change in the number of securities disregards potentially very different value adjustments. A bank might have significantly increased the number of deeply discounted Greek bonds at the height of financial market doubts about the viability of these debt instruments, but sold at the same time a small number of securities from other periphery countries with much larger monetary value.

Therefore, we show in Figure 5 the share of buy-side and sell-side trades involving SMP securities during a quarter relative to the stock of SMP securities at the end of the quarter.

– Insert Figure 5 around here –

In terms of nominal value, buy-side transactions dominated any re-allocation of SMP portfolios only towards the end of the program for both regional as well as large German banks whereas they were roughly equal at the beginning of the program. The data does overall provide little indication that German banks were unloading SMP securities at a large scale to the ECB. Any potential competitive changes most likely hinges on valuation effects that enhanced banks' loan generating capacities. Therefore, we focus in our baseline specifications of possible SMP effects on regional market shares on the mere presence of SMP securities in banks' portfolios and test only lateron for possible difference among banks that increased, reduced, or just maintained their according exposures.

2.3 Regional market shares and other traits of German banks

When estimating Equation (1), we treat each bank that held at least once a SMP security during the purchase period as exposed to unconventional monetary policy and compare it to banks that never held SMP securities before and after the spell. This difference-in-difference setting requires that

the treatment is exogenous to the individual bank and that compared subjects are sufficiently akin to another in terms of observable traits.

Table 1 compares in the upper panel descriptive statistics for the levels of dependent variables and quarterly bank-specific controls for banks without and with SMP securities. Market shares are calculated per county ("Kreis") and quarter as the percentage share of each bank's customer loans, customer deposits, and gross total assets relative to the county aggregate, respectively. All three market shares are on average four percentage points larger for SMP exposed banks compared to those without according securities in their portfolios. These differences are significantly different from zero as shown in the last two columns.

– Insert Table 1 around here –

The next panel shows that market share differences might simply reflect that these banks were already prior to the SMP too heterogenous to compare. Based on the monthly balance sheet statistics reported to Deutsche Bundesbank ("Bista"), we specify observable controls for the size, capitalization, funding structure, security share, latent credit risks from credit commitments, and liquidity position of each bank. SMP banks tend to be larger, less capitalized, more dependent on both interbank markets and capital markets for funding, hold larger shares of securities to generate revenues, maintain more credit lines, and hold slightly more liquidity compared to non-SMP banks. Since all these differences are also significantly different, it is therefore crucial to account als for unobservable differences across banks that might exert market power effects that can be confounded with the effect of the SMP by means of bank fixed effects in addition to control for these observable characteristics.

A valid difference-in-difference comparison requires though that observable traits did not develop significantly different prior to the effect of inter-

est. Therefore, we show in the bottom panel of Table 1 according changes in market shares and controls. Whereas the convolution of market shares remains statistically faster for banks with SMP exposures at the 5%-level of significance, almost all covariates' growth rates are no longer significantly different between treated and non-treated banks. Figure 6 confirms indeed that especially the market shares of regional savings and, to a somewhat lesser extent, cooperative banks that held SMP securities exhibit substantially faster increases. In the years prior to the start of the SMP, market shares of banks with and without SMP securities did in contrast not exhibit obvious differences in growth rates, thereby giving rise to a valid comparison in a difference-in-difference setting.

– Insert Figure 6 around here –

Given that in particular changes in bank size, and also the dependence on money market funding remain statistically different, we therefore will focus especially on those regional banks, which operate either *de jure* or *de facto* on delineated regional markets: savings and cooperatives.

3 Main results

Table 2 shows the main results for the full sample of banks' market shares with and without SMP securities in their portfolios during q2:2010 and q1:2012. The coefficient of interest is the interaction term between SMP, the indicator if a bank held SMP securities during the purchase period, and $POST$, an indicator equal to one as of q2:2010, the start of the program.

The first three columns show difference-in-difference specifications to explain county-level market shares in terms of customer loans. Column (1) shows results for a sample that includes all regional and large banks and

indicates that banks with SMP securities experienced 60 basis points higher market shares after the start of the SMP program compared to non-SMP banks. Economically, these effects are moderate given average county market shares on the order of 22% for non-SMP banks (see Table 1). At the same time, they provide important evidence for possibly unintended consequences of unconventional monetary policy.

But given valid concerns of confounding effects in terms of significant differences between SMP and non-SMP banks especially in terms of size and funding structure, we show in column (2) results pertaining only to regional savings and cooperative banks. Since these financial intermediaries are neither particularly active in capital markets nor have frequent and direct privileged access to central bank facilities like large, money-center like banks, this sample provides a more conservative setting to identify possible SMP effects on regional market shares. The estimated interaction term remains statistically significant and positive.

– Insert Table 2 around here –

As a third check to account for possibly confounding events, we exclude in column (3) the SMP period itself. Since the descriptive evidence indicated earlier considerable re-allocation of security portfolios among SMP banks during the purchase period, we compare in this specification customer loan market shares of SMP and non-SMP banks in the pre-SMP period with those after the program stopped in q1:2012. Also here, we find a statistically significant positive effect, which is even larger compared to the baseline result.

This overall insight carries over to customer deposit shares in columns (4)–(6) and gross total assets in columns (7)–(9). Thus, in line with the mechanism indicated in Hakenes and Schnabel (2010), these findings suggest that banks with exposure to SMP securities were able to attract more funding

from retail depositors and expand shares in (regional) loan markets at the expense of non-SMP security holding intermediaries.

A crucial concern remains that banks with SMP exposure at the start of the program's period might have been already significantly different in terms of other observable traits, as indicated in Table 2. Therefore, we create a counterfactual sample of banks without SMP securities based on all control variables and banking group indicators observed during the last period preceding the start of the SMP, i.e. q1:2010 (Caliendo and Kopeinig, 2008). Table 3 shows the descriptive statistics resulting from a one-to-one matching for both the levels and the changes of all control variables.

– Insert Table 3 around here –

With the exception of the proxy for market funding, the descriptive evidence shows that in the quarter preceding the SMP banks in the control group are no longer statistically different in terms of observable traits. Therefore, we reproduce the results from Table 2 based on this matched sample in Table 4. As before the first three columns depict specifications to explain the county market share of customer loans, whereas the subsequent two blocks show results for the county markets shares based on customer deposits and gross total assets, respectively.

– Insert Table 4 around here –

The positive effect of having an exposure to SMP securities on market shares is confirmed. The reduced sample size implies a lower significance level regarding customer loan market shares, yet the magnitude is virtually identical compared to the estimates based on the full sample. Especially the results pertaining only to local banks and without the treatment period itself in column (3) provide important evidence that the SMP allowed banks that happened to hold EU periphery bonds to expand their loan market share.

Columns (6) and (9) further confirm the full-sample results that SMP exposures also led to larger regional market shares in terms of retail deposits and gross total assets.

The importance of the concern that instead of the SMP it is one or more of the numerous other unorthodox policy measure pursued by central banks around the globe since 2007 that causes market shares to respond differently warrants some further discussion. Ideally, one would observe which bank used which kind of policy measure when to what extent. Alas, neither we nor central planers do so given that monetary policy makers do not observe the comprehensive details on all banks security trading and prudential accounting information, which is monitored by prudential supervisors at the Single Supervisory Mechanism (SSM) and national competent authorities (NCA). Against the backdrop of these limitations, we argue that the main results in Table 4, especially those for regional savings and cooperative banks, provide robust evidence despite for two main reasons.

First, the propensity score matching ensures that whichever policies affected these already similar banks from an institutional point of view, small savings and cooperative banks with comparable objective functions confined to operating in regional markets, that they exhibited no statistically discernible differences in important observable traits just before the start of the SMP in q1:2010.

Second, the specified covariates control for important candidates of possibly confounding policy events. A first important change in policies that preceded the SMP and affected how banks could access central bank liquidity was the move to a fixed-rate full allotment policy as of October 2008. Related, the maturity of central bank facilities was starkly increased, most notably in the form of the three-year Long Term Refinancing Operations (LTRO) in December 2011. For one, these measures affected all German

banks equally at the time of the policy change and as such are captured by the quarterly fixed effects. But such easily accessible central bank lines could have been the major source of funds for banks to increase lending and associated market shares. Therefore, we control for *Liquidity*, which contains both cash as well as cash with central banks. The according coefficient is significantly positive for county market shares of regional banks for customer loans, deposits, and gross total assets. Hence, whereas we do not observe, which banks used central bank facilities to what extent, we control for the variation in resulting liquidity on banks' quarterly balance sheets when explaining the variation in county market shares.

A second important candidate of confounding SMP effects with other policy responses of banks relates to the flip-side of money markets, namely the interbank market for liquidity. After the demise of Lehman Brothers at the latest, the (unsecured) interbank market dried up quickly. Heider et al. (2015) show theoretically that during times of stress counter-party risks matter also in interbank markets. If information asymmetries about these risks exist and when both the level and the dispersion of these risks across the market are sufficiently high, liquidity is hoarded by banks (see also Freixas et al., 2011). Empirically, Garcia-de-Andoain et al. (2016) show on the basis of TARGET2 payments data that the liquidity provision by the ECB in its role of lender-of-last-resort indeed crowded out the unsecured interbank market during the financial crisis of 2008 and until 2010. However, it increased the supply of interbank credit during the subsequent sovereign crisis between 2011 and 2013, in particular in periphery country interbank markets. Therefore, we control for banks' *Net interbank lending* positions, the difference between interbank loans and interbank borrowing, in each quarter to ensure that the SMP indicator does not gauge spuriously interbank market liquidity effects. The coefficient is significantly negative for the preferred customer loan share equation in column (3), possibly indi-

cating that expanding interbank lending implies a contraction of customer loan market shares. Conversely, the coefficients are significantly positive regarding the effect on deposit and gross total asset shares. Thus, a reduction of interbank borrowing by the the mean bank reduces its reliance on customer deposit funding and might primarily funnelled into other than customer loans, thereby increasing the banks gross total asset share. Note at the same time that for our purposes, we do not dare to draw firm inference on the causal relationships between observed bank balance sheet traits. Instead, our intention is to ensure that we do not confuse policy effects in the interbank market with the SMP effects by controlling explicitly for observable differences across banks in terms of their quarterly interbank market positions.

A third crucial policy change was the so-called OMT ("Outright Monetary Transactions") promise made by the ECB in August 2012. Acharya et al. (2016) show that the ECB's commitment to absorb sovereign debt in secondary markets if need be without any ex ante limitation on either duration or volume of the policy, effectively alleviated capital market funding pressure especially of banks located in the GIIPS countries. Based on syndicated loan data, they provide important evidence that the weakest banks' liquidity positions improved, which was intermediated into more lending to riskier firms. Ferrando et al. (2015) show in addition evidence of a relatively short-lived relaxation effect on financing constraints especially among SME in European countries. Besides the aforementioned importance to gauge this credible policy change by quarter fixed effects, we also specify the variable *Market Funding* to gauge differences across banks' ability and willingness to refinance by means of securitised debt. In the preferred specifications in columns (3), (6), and (9) the coefficient of this variable is negative and significant at the 10%-level for customer loan and deposit market shares. This result might suggest that securitised funding substitutes for re-

tail deposit-based funding, which correlates also with lower market shares in customer lending in regional markets.

A fourth possibly confounding policy measure are the revisions in the collateral framework, i.e. the set of securities and assets that is eligible to be pledged by banks to obtain central bank liquidity.[10] Fecht et al. (2015) argue that the expansion of this set induced banks to use the most risky assets with the ECB, possibly leading to an increase in (risky) lending afterwards. Related, Abbassi et al. (2016) show that German banks with trading expertise invested in securities, especially those that exhibited large price declines after the 2008 crisis, at the expense of corporate credit. While not a policy effect in and of itself, the widening of the collateral framework paired with a systematic credit contraction especially by those banks with the historically largest security portfolios, and thus a larger likelihood to also hold some SMP security, necessitates to control for the *Securities share* of banks. We estimate only for the relationship with county loan market shares a significantly negative coefficient, which indicates in line with Abbassi et al. (2016) that more security business crowded out customer loan market shares.

A final possible policy effect that we consider are international liquidity provisions by other central banks, such as the the Term Auction Facility and other emergency liquidity lines provided by the Federal Reserve System. Through overseas affiliates, foreign positive liquidity shocks may transmit via the internal capital markets of global banks also to their home markets (see, for example, Galema et al., 2016), in this case Germany. Since only very large banks, however, maintain such foreign affiliates (Buch et al., 2011), the specification of bank fixed effects paired with our focus on small, regionally

[10] Starting in 2007, there was both an expansion in terms of collateral due to changes in credit rating requirements and tightening of collateral rules e.g. for ABS. In aggregate, these changes resulted in an expansion of eligible collateral while the net effect was negative for some asset classes and for some banks.

active savings and cooperative banks is an effective approach to mitigate that foreign emergency policies confound the SMP effects documented in the mated sample result of Table 4.

Next, we investigate the effects of SMP exposures on banks' market power in more detail by relying on the matched sample in conjunction with fixed effects and controls for the most plausible confounding policy factors.

4 Further results

4.1 Alternative outcomes and explanations

As a first set of further results, we assess if the SMP also affects lending and funding quantities, alternative metrics to gauge competition, and how sensitive the results are towards the inclusion of additional bank-specific (annual) control variables.

4.1.1 Changes in lending and deposit taking volumes

Differential responses of market shares to the SMP in and of itself do not provide information as towards the channel how these market shares developed differently. It is for example conceivable that banks without SMP securities had to shrink their balance sheets by contracting credit supply due to binding funding constraints rather than local banks with the opportunity to sell SMP securities expanding credit. To test more directly whether treated banks expanded lending and deposit taking more compared to non-treated banks after the SMP shock, we show in Table 5 regression results explaining quarterly changes of both quantities.

– Insert Table 5 around here –

Whereas the effect shown in column (1) indicates no discernible difference in loan growth rates for the entire sample of all banks, customer loan growth of local banks both when including (column(2)) and when excluding (column (3)) the SMP period itself is significantly positive at the 10%-level. The coefficient indicates an increase of the loan growth rate rate of 18 basis points after the program stopped for local banks with an exposure to the SMP. The bottom panel of the Table also shows the mean and the standard deviation of the quarterly growth rates in percent. Thus, the SMP exerted an economically significant effect on regional competitive conduct by inducing increasing loan growth of treated local banks by 22%(=0.175/0.792). This result renders alternative explanations for a positive loan market share increase in response to the SMP other than additional opportunities to convert excess reserves less likely.

Also note that this is the differential effect on top of the anyhow positive growth rate across all banks captured by the significantly positive direct term *POST*. Tables A.1 and A.2 in the online appendix show furthermore the average growth rates per quarter and banking group for banks with and without SMP exposure. These data show that the mean loan growth rates during the SMP disbursement period were slightly larger for both savings and cooperative banks with and without SMP exposure compared to the pre-SMP period. The according differences for customer deposits, in turn, are negligible. All together, the evidence provides little indication of a crowding-out effect of non-SMP bank lending by SMP-bank lending.

The results in columns (5) and (6) further indicate that the effects of the SMP were primarily due to adjustments on the asset side of local banks' balance sheets. We do not find any indication of statistically significant differences in the growth rates of customer deposit growth. This result is consistent with the notion that the SMP purchases were primarily geared towards easing funding pressure of banks domiciled in stressed Eurozone

countries. The possible side-effects among German banks that we investigate here are therefore not emerging on the funding side of the mean bank in German regions – which compared to periphery banks presumably faced much less if any immediate funding pressure. Instead, potential side-effects of this policy induced only traceable effects in terms of banks exhibiting faster loan growth either by an asset swap of SMP securities into credit or by converting additional excess reserves due to valuation effects, compared to non-SMP holding competitors. We investigate the question whether this is primarily due to valuation effects or due to outright conversion of security holdings in central bank liquidity further below.

4.1.2 Controlling for bank performance and health

The monthly balance sheet statistics that underly the generation of quarterly bank-specific controls employed until now does not contain information on the profit and loss account of banks. We therefore augment in Table 6 the quarterly regression with a vector of annual covariates, which are obtained from prudential supervisory reports that gauge the financial performance of banks. The Table shows results for the three county market shares on the basis of the matched sample featuring only local banks before and after the SMP period.

– Insert Table 6 around here –

Annual covariates are also lagged by one year and mimic so-called CAMEL vectors. [11] By specifying controls for differences in the credit risk of the bank (non-performing loans, loan-loss provisions), their profitability (return on equity and assets), managerial efficiency (cost-income ratio), and

[11] CAMEL is an acronym for Capitalization, Asset quality, Management quality, Earnings, Liquidity. These variables are employed by prudential supervisors to rate banks (see, for example, Berger et al., 2000). We also specified contemporaneous covariates, which does not alter the results shown here.

bailout support by respective banking sectors' insurance schemes, we control for possibly different effects of the SMP on financially sound versus weak banks.

The empirical results do not support any significant effect of these annual covariates on the quarterly evolution of either one of the three market shares. Rather than suggesting that performance and risk of the bank do not matter for their competitiveness, we take these results as evidence that the specified quarterly controls paired with the fixed effects already gauge all the relevant information. The most important upshot of this specification is, however, that the positive effect of the SMP treatment documented earlier is robust towards the inclusion of these controls.

4.1.3 Measuring competition

Our preferred measures of banking market competition are market shares measured at the county level for two main reasons. First, the monthly balance sheet statistics available for all German banks permit thereby a quarterly measure of two core choice variables of banks that we suspect to respond to any SMP effects: customer lending and deposit-taking. Second, in a near-zero interest rate environment, the room to compete on prices rather than quantities seems limited.

– Insert Table 7 around here –

But the latter assumption is not beyond challenge. For example, Acharya et al. (2016) document significant reductions of loan prices in syndicated loan markets after unorthodox monetary policy interventions. Whereas we do not observe such detailed levels of bank-internal loan-level pricing in the Bundesbank data, we can derive two alternative measures of price competition at the annual level. In the first column, we specify so-called Lerner

indices as the dependent variable. Lerner indices are the scaled difference between the average revenues realized by a bank and their marginal cost and they are used increasingly often to study the competitive conduct in banking (Delis, 2012; Kick and Prieto, 2014). We follow prior studies using data from the Deutsche Bundesbank and use annual data from prudential supervisory accounts to estimate the marginal cost of banks as the derivative of total operating cost with respect to outputs from a latent class stochastic cost frontier analysis (Greene, 2005). Average revenues are observed and calculated as the ratio of total operating income over gross total assets, i.e. including interest, fee, and trading income.

The first column in Table 6 shows that even for this slow-moving indicator of imperfect price competition, the SMP had a statistically significant impact on a non-periphery banking system. After the program ended, banks with SMP securities on their balance sheets exhibited around 40 basis points lower Lerner indices, which amounts to approximately 8% of one standard deviation. As such, these effects are therefore economically also small. The reduction in economic markups paired with the significant increase in both customer loan and deposit market shares suggests that banks with access to additional excess reserves due to the SMP indeed pursued opportunities to compete on quantities by also foregoing some of their pre-SMP monopolistic rents.

The second column shows results when specifying imputed price-cost margins. We calculate these accounting based measures of competition as the difference between interest revenues over interest bearing assets and interest expenses over interest bearing liabilities. This measure therefore gauges more directly the competitive stance pertaining to the credit and deposit taking business of banks, but disregards other cost components, such as maintaining a branch network or an IT-based rating system, captured in the cost function to calculate Lerner indices. Consistent with the description of

profitability and competitiveness in German banking in German Council of Economic Advisors (2014), the direct effect of the *POST* dummy is significantly negative, corroborating continuously declining interest margins. However, we do not find any statistically discernible differential effect of the presence of SMP securities on bank's balance sheets.

Finally, the result in column (3) show that market structure, as measured by annual Hirschman-Herfindahl-Indices (HHI) in terms of gross total assets, was also not affected significantly by the SMP. Overall, we find evidence that economic markups of banks declined due to the SMP, possibly indicating that banks with access to resulting excess reserves competed with non-affected banks primarily in terms of quantities of customer lending and deposit-taking.

4.2 Scrutiny on mechanisms and channels

Recall the three channels emphasized by the European Central Bank (2015) how different tools of unconventional monetary policy can have effects on financial intermediaries: the direct pass-through channel, the signalling channel, and the portfolio rebalancing channel. Whereas the former channel is not applicable to asset purchase programs like the SMP, the latter two are. Therefore, we identify next the mechanisms how the SMP affected regional market shares and thus banking competition.

4.2.1 Portfolio rebalancing channel: valuation or sales effects?

Whereas the fact that relatively many German banks were affected by the SMP in terms of holding these securities (see Figure 1), Figure 4 also underpins that these banks' reactions towards the offer of the SMP to purchases selected securities under the SMP differed vastly. Table 8 provides a de-

tailed separation of transactions based on the security-by-security data for each bank in each quarter. Separated for large and regional banks, we show the number of transactions per type pertaining to SMP securities. Transactions are inferred from the quarter-on-quarter change in the number of securities. Most SMP securities are simply held in equal numbers as shown in the first column. The next three columns are grouped as "Increasers" in Figure 4. Large banks mostly expanded holdings of SMP-securities they already held in the preceding quarter (see column *Increasers*) or in the earlier past holdings of their portfolios (see column *Previous*). In contrast, the column labelled *Initial* shows that especially regional banks purchased SMP securities for the first time since the start of the security holdings statistics in q4:2005.

– Insert Table 8 around here –

The expansion of SMP securities in terms of purchased numbers of securities is generally substantially larger compared to the number of sell-side transactions shown in the last column of Table 8. These patterns suggest that the valuation channel of the SMP program was much more important to explain competitive effects on the average German bank.

However, especially those banks facing severe liquidity constraints or other forms of distress might have been those exhibiting the largest competitive subsidy from the SMP. Therefore, we specify in Table 9 three different interaction terms to classify banks as in Figure 4. "Increasers" are those banks where the aggregate net nominal asset value of SMP securities, i.e. the stock of SMP securities plus any increases and less reductions, is growing over the six quarters in question. "Stayers" exhibit no change of their SMP exposure in nominal value over the course of the program and "Reducers" accordingly hold a lower stock in terms of nominal value of SMP securities.

– Insert Table 9 around here –

Table 9 shows results for customer loans (columns (1)–(3)), customer deposits (columns (4)–(6)), and gross total assets (columns (7)–(9)). Across three different samples, the unconstrained one in the first column of each block, the one for local banks including annual bank controls in the next, and the most conservative matched sample of local banks excluding the SMP period itself all provide the identical qualitative evidence. The positive effects of the SMP program on market shares are driven by the group of banks that actually expanded their share of SMP securities during the program's duration.

Therefore, we find little evidence that competitive changes from the SMP, at least among German banks, resulted from an outright unloading of securities subject to a purchase program of monetary policy. Instead, possibly unintended consequences of such unorthodox monetary policy measures arose most likely from the valuation effects associated with purchases documented in Eser and Schwaab (2016).

4.2.2 Signalling channel: non-SMP periphery holdings

The effects on market shares documented so far accrue due to the portfolio rebalancing channel, specifically due to the capital relief effect as a consequence of improved pricing. Another potential channel is the signaling channel, which we consider next.

To this end we specify in Table 10 an additional indicator of banks' exposures to the SMP purchases. The variable *PERIPHERY* equals one if and only if a bank held any security from the five countries that were subject to the SMP between q1:2010 and q2:2012, but not the securities actually purchased by the ECB. This indicator therefore gauges any potential effects on banks' market shares that are due to holding periphery securities that are not directly subject to the central banks purchase program. As such, any

benefit arising from holding non-affected securities from affected countries during the spell of the program captures what is coined by the European Central Bank (2015) the signalling of a firm commitment by the central bank to its mandate.

– Insert Table 10 around here –

In column (1) we reproduce the baseline result for the most conservative specification in Table 4, that is the comparison of matched regional banks only with and without SMP securities before and after the SMP. We compare this result with the interaction of policy exposure through holding securities from periphery countries, which have not been purchased during the program though in column (2) ($PERIPHERY$). The according interaction term to gauge the signalling channel is statistically significant at the 1%-level. Also the interaction term capturing the portfolio rebalancing channel is now different from zero at this confidence level. Both effects are also economically significant. A bank that holds both securities that were and were not part of the SMP increase their regional market share in terms of customer loans by 2.8 percentage points, which is more than 10% of mean market shares across all banks (cf. Table 1).

In column (3), we add a continuous variable $COVERAGE$ and the associated interaction terms. This variable is defined as the share of all periphery securities held by a bank in any given quarter relative to its total security holdings in the same quarter. It is therefore a time-variant measure per bank to gauge not only whether, but also how intensively a bank is exposed to stressed Eurozone countries. [12] The mean share of any periphery securities

[12] We present here results based on the nominal value of securities and include both stocks and bonds. Results are identical when excluding only stocks or bonds and when using the book value of securities. Ideally, we would also control for other exposures of the bank to periphery countries, such as cross-border lending or foreign subsidiaries. These data are not available to us, but given that only the very largest banks are very active in either mode of international banking (Galema

relative to banks' total portfolios is 2.2%, but almost all banks in the sample hold at least at some stage securities from the five SMP countries (623 out of 737 matched banks). Figure 7 vividly illustrates that despite a fairly moderate share of directly held SMP securities by German banks of around a mere 2%, the total GIIPS-exposure is substantially larger. Hence, the potential effects of the SMP by means of spillovers in affected countries' asset prices might be also substantially larger compared to what the estimated baseline coefficients suggest.

Both interaction terms, whether a bank held an SMP security and whether it held any non-SMP periphery security, remain statistically significant and continue to indicate an increase of customer loan market shares on the order of 3 percentage points. Larger portfolio shares of periphery securities in and of itself exert no statistically significant effect. However, the triple interaction term shows that an increase of periphery security shares by one standard deviation (which is 4.4%) reduces customer loan market shares by approximately 1 percentage point (=-0.239 $\times$ 4.38), i.e half the magnitude of the signaling channel effect of 1.81. Banks with larger exposures to stressed Eurozone countries thus exhibit a somewhat reduced market share hike due to the SMP program compared to competitors with milder overall periphery security exposures.

The remaining two columns complete the results for markets shares measured in terms of customer deposits and total assets. Also for funding and the more general asset market share gauged by the latter metric, we find that both interaction terms, SMP and $PERIPHERY$, are statistically positive but somewhat smaller regarding their magnitude. In addition to the differential negative effect due to larger periphery security shares in banks' total portfolios of a magnitude similar to the one for customer loan mar-

et al., 2016), we consider this limitation a lesser source of serious concern for our sample of matched regional banks.

ket shares, we also find significantly negative direct terms. An increase of *COVERAGE* by 1 percentage point reduces market shares in retail funding and gross total assets by a mere 8 to 9 basis points.

4.3 Scrutiny on treatment definitions

Our main indicator of the SMP shock is an indicator if a bank held any SMP security at some stage between q2:2010 and q1:2012. In our preferred specification, the baseline indicator variable does not differentiate how many or how much in value of SMP securities a bank held. As shown in Figure 2, these shares are rather small. We also calculate the share of SMP securities on the balance sheet of the bank divided by the total holdings of periphery securities held at the end of the same quarter. For the most conservative sample of matched regional banks only, this ratio is 50.6%. Because we average SMP exposures over the disbursement period, this ratio is in contrast to the share of any periphery securities relative to total securities used above time invariant, and thus collinear with the SMP indicator. Put differently, we cannot specify the continuous shares because of the difference-in-difference setting where we compare pre-SMP periods with post-SMP periods.

A first alternative solution to scrutinize our finding that the SMP indicator suggests a competitive effect on regional market shares is shown in Table 11. We gauge whether and how the intensity of SMP exposures matters for the identified competition effects by means of alternatively defined SMP thresholds, beyond which a bank is considered exposed to the SMP.

– Insert Table 11 around here –

Based on the distribution of the portfolio share of SMP securities in banks' portfolios, we categorize the indicator variable to equal one whenever it

is larger than the according decile threshold indicated in the top panel of the table. Coefficient estimates of the interaction terms clearly show that regional market shares exhibit only positive differential effects in response to SMP securities holdings for those banks holding SMP bond shares larger than the 6th decile, which corresponds to a portfolio share of 1.8%. This result suggests that even within the group of banks holding periphery debt, the magnitude of exposure yields statistically significantly different effects on market shares despite generally very low SMP securities shares.

5 Conclusion

We investigate in this paper whether the SMP by the ECB had possibly side effects on the competitive conduct in banking markets. To this end, we combine securities-level information on purchases of individual assets by the ECB under the Securities Markets Program between q1:2010 and q2:2012 to individual security holdings of all German banks before and after this unconventional monetary policy shock.

Our identification rests on the premise that the SMP was launched to restore a functioning monetary transmission mechanism in times of soaring bond yields for government debt issued by Greece, Italy, Ireland, Portugal, and Spain rather than the financial stability of local German banks. To the extent that these banks presumably neither anticipate a regime shift by the ECB in the form of outright purchases of sovereign debt in secondary markets nor were the trigger for the policy maker to launch the SMP, we consider this setting an ideal testing ground where unconventional monetary policy can be traced to the bank level and is arguably exogenous.

The comparison of market shares between SMP and non-SMP banks prior and after the program yields statistically significant and positive effects of

SMP exposure on market shares. Holding at least one SMP-eligible security increases market shares in the preferred specification between 64 basis points (customer deposits) to 76 basis points (customer loans). Whereas economically small at first sight, these effects provide important indications of possibly side effects of unconventional monetary policy aiming to calm financial (GIIPS) bond markets.

These results remain robust to the inclusion of a wide array of quarterly and yearly control variables, which in part control for possibly confounding policy events, the specification of both bank- and quarter-fixed effects, the exclusion of nationally active larger banks, the creation of a counterfactual sample based on a 1-to-1 propensity score matching, and a sample period excluding the entire SMP period itself.

We also find that the channel of market share expansion effects works through significantly faster loan growth of SMP banks compared to non-SMP banks after the program stopped which is consistent with the portfolio rebalancing channel. Deposit growth, in turn, does not differ significantly, which such suggests that this APP's side effects did not change funding strategies of German local banks. We also report some negative effects on price competition. SMP-banks exhibit significantly lower Lerner Index, a measure of economic mark-ups, which is consistent with an expansion of output in monopolistic regionally confined markets.

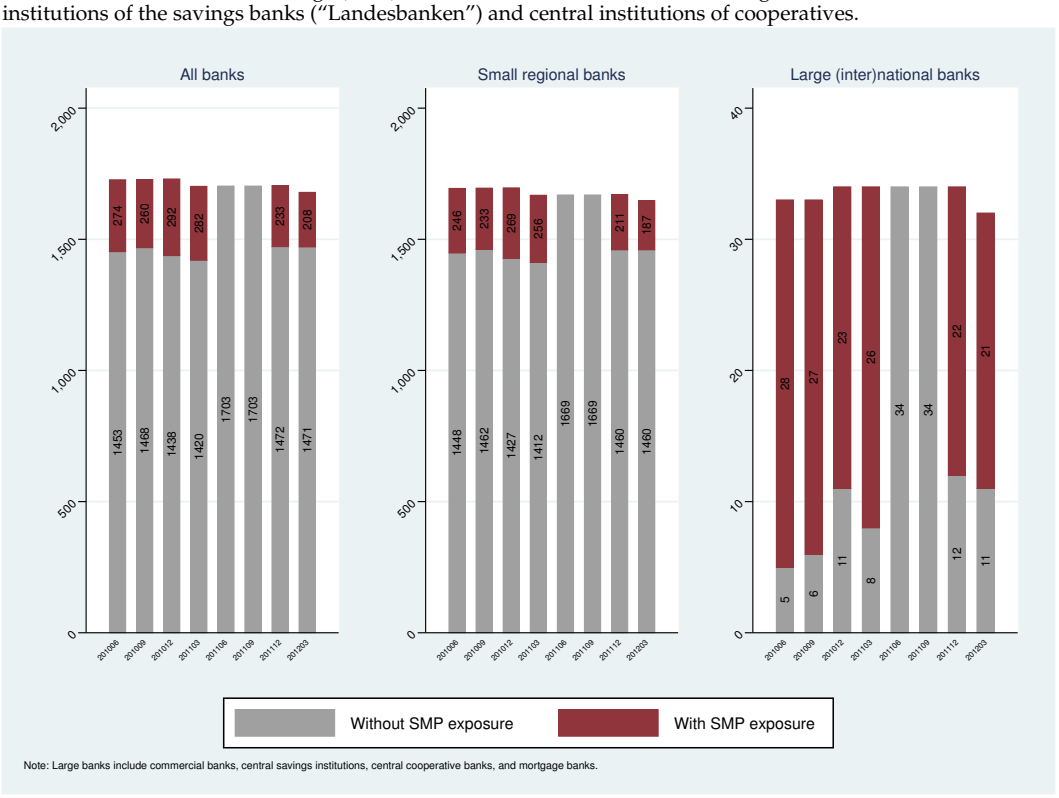
To shed further light on the channels how the SMP affected regional banking market competition among German banks, we then distinguish banks that actually reduced the value of their SMP security holdings between q1:2010 and q2:2012 from those banks that either maintained stable normal stocks of SMP-eligible assets or even increased them. Our results suggest that German banks that realised larger market shares due to the SMP were in fact those increasing their holdings. This finding does therefore not

indicate that banks unloaded their SMP securities to the ECB, possibly at favourable prices, to realise excess reserves. In contrast, those banks hoarding and expanding SMP-eligible securities appear to have benefited from valuation effects alone sufficiently to explain a significant portion of the cross-sectional variation in market shares compared to banks without SMP exposures. This pattern is consistent with both the capital relief and the leverage relaxation mechanisms that are part of the portfolio rebalancing channel, via which unconventional monetary policy transmits through financial intermediaries to the real economy according to the European Central Bank (2015).

Figures

Figure 1. **Number of banks holding SMP securities**

This figure shows the number of banks that held and did not hold securities purchased by the European Central Bank under the Securities Purchase Program (SMP) between Q2:2010 and Q2:2012. The distinguished banking groups follow the three-pillar taxonomy of Deutsche Bundesbank. Small regional banks include savings, cooperative, and commercial banks. Large (inter)national banks include the so-called Big-Four commercial banks, head institutions of the savings banks ("Landesbanken") and central institutions of cooperatives.



Note: Large banks include commercial banks, central savings institutions, central cooperative banks, and mortgage banks.

Figure 2. **Share of SMP securities in banks' portfolios**

This figure shows box plots for the percentage share of SMP securities relative to the total portfolio of banks. Security portfolios and SMP securities are measured in nominal value and book values, respectively. The distinguished banking groups follow the three-pillar taxonomy of Deutsche Bundesbank. Small regional banks include savings, cooperative, and commercial banks. Large (inter)national banks include the so-called Big-Four commercial banks, head institutions of the savings banks ("Landesbanken") and central institutions of cooperatives.

Note: Large banks include commercial banks, central savings institutions, central cooperative banks, and mortgage banks. Outside values excluded.

Figure 3. **Aggregate nominal value of banks' securities subject to SMP purchases**
This figure shows the nominal value of securities that were purchased by the European Central Bank under the Securities Purchase Program (SMP) between Q2:2010 and Q2:2012. as of each quarters end. All values are measured in millions of Euros. The distinguished banking groups follow the three-pillar taxonomy of Deutsche Bundesbank. Small regional banks include savings, cooperative, and commercial banks. Large (inter)national banks include the so-called Big-Four commercial banks, head institutions of the savings banks ("Landesbanken") and central institutions of cooperatives.

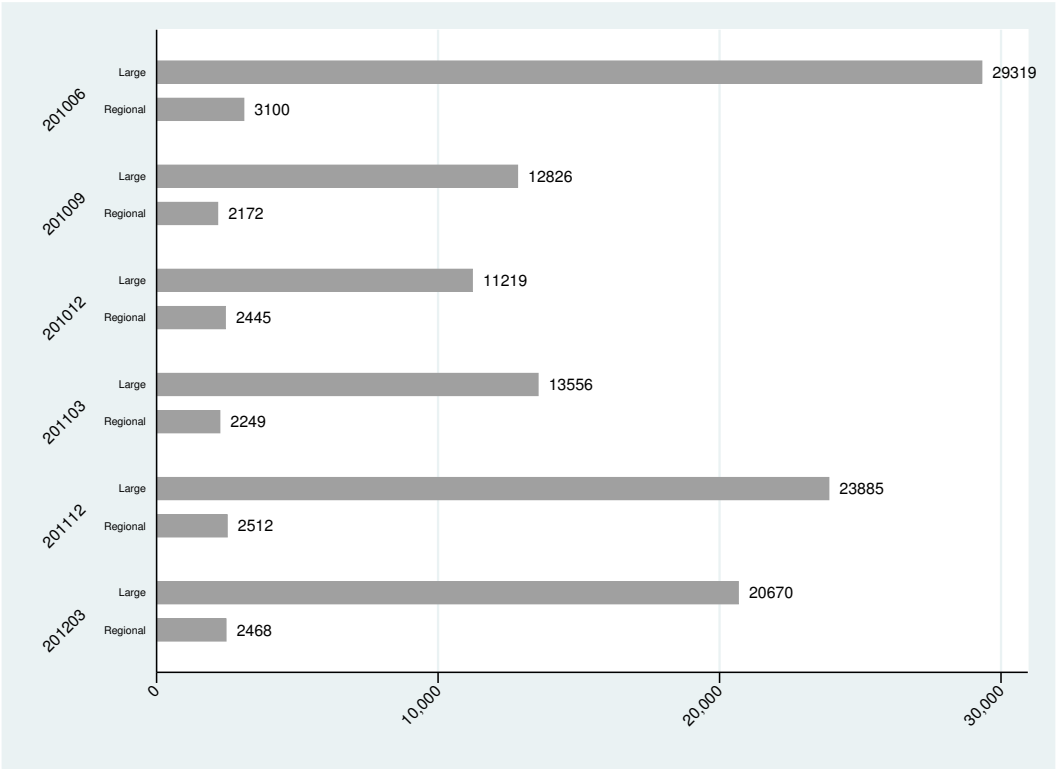
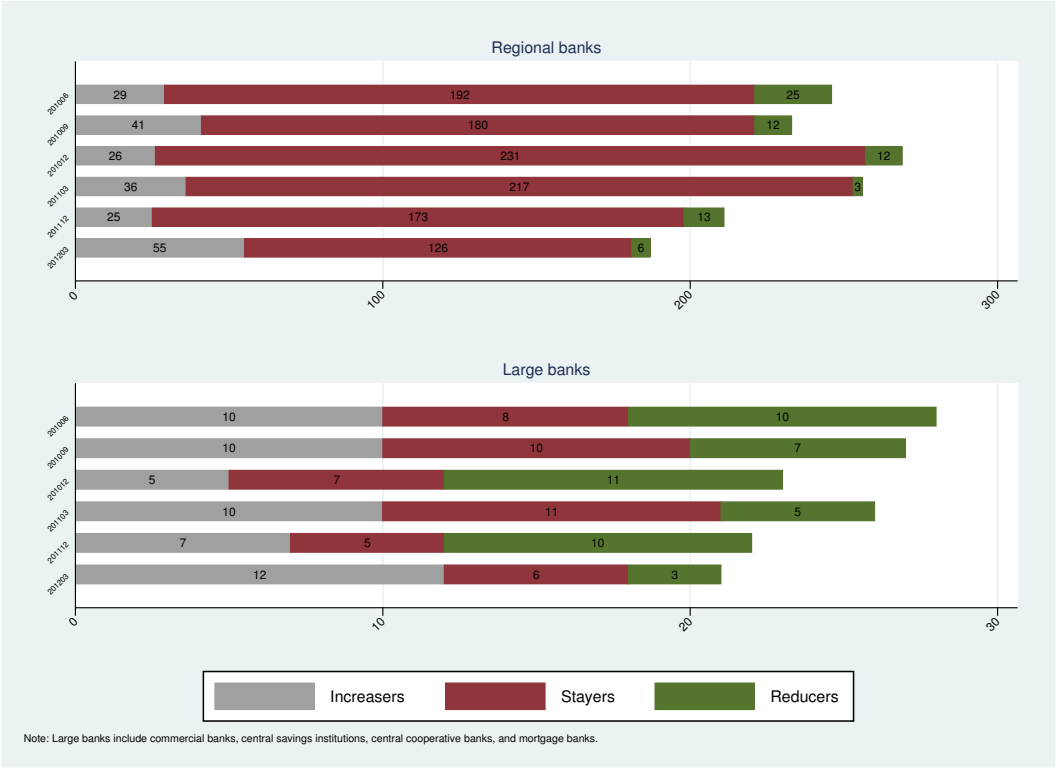
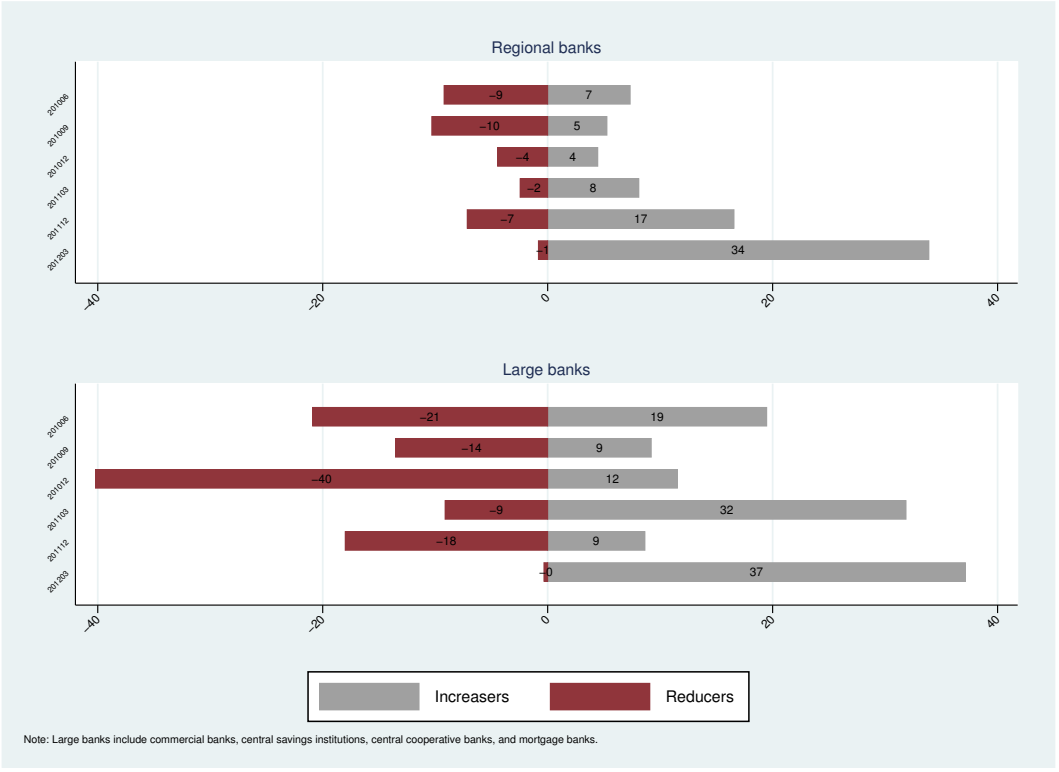


Figure 4. **Number of banks reducing, holding, or increasing SMP securities**
This figure shows the number of banks reducing, holding, or reducing the number of SMP securities between Q2:2010 and Q2:2012. Transactions are derived from the change in the reported number of SMP securities between quarters. Reductions are calculated as the quarter-on-quarter change of observed SMP security holdings. Increases are measured likewise as the quarter-on-quarter positive differences in banks' holdings of SMP securities. The distinguished banking groups follow the three-pillar taxonomy of Deutsche Bundesbank. Small regional banks include savings, cooperative, and commercial banks. Large (inter)national banks include the so-called Big–Four commercial banks, head institutions of the savings banks ("Landesbanken") and central institutions of cooperatives.



Note: Large banks include commercial banks, central savings institutions, central cooperative banks, and mortgage banks.

Figure 5. **Mean shares of sell and buy trades of SMP securities**
This figure shows the mean share of sell and buy trades of SMP securities during the quarter relative to the nominal value of SMP security holdings in percent. Transactions are derived from the change in reported security holdings per security between quarters. Reductions are calculated as the quarter-on-quarter change of reported nominal values of SMP security holdings. Increases are measured likewise as the quarter-on-quarter positive differences in banks' nominal holdings of SMP securities. The distinguished banking groups follow the three-pillar taxonomy of Deutsche Bundesbank. Small regional banks include savings, cooperative, and commercial banks. Large (inter)national banks include the so-called Big-Four commercial banks, head institutions of the savings banks ("Landesbanken") and central institutions of cooperatives.



Note: Large banks include commercial banks, central savings institutions, central cooperative banks, and mortgage banks.

Figure 6. **Quarterly market shares of customer loans per county**
This figure shows mean market shares of customer loans by banking group and quarter for banks that held and did not hold securities purchased by the European Central Bank under the Securities Purchase Program (SMP) between Q2:2010 and Q2:2012.

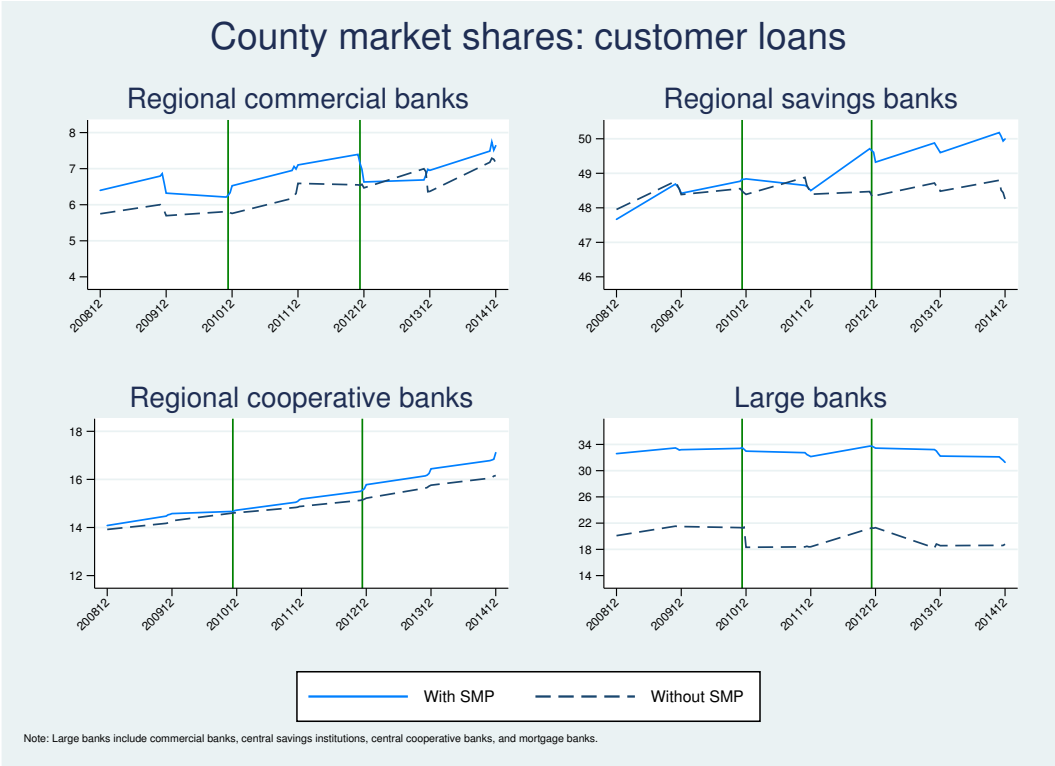
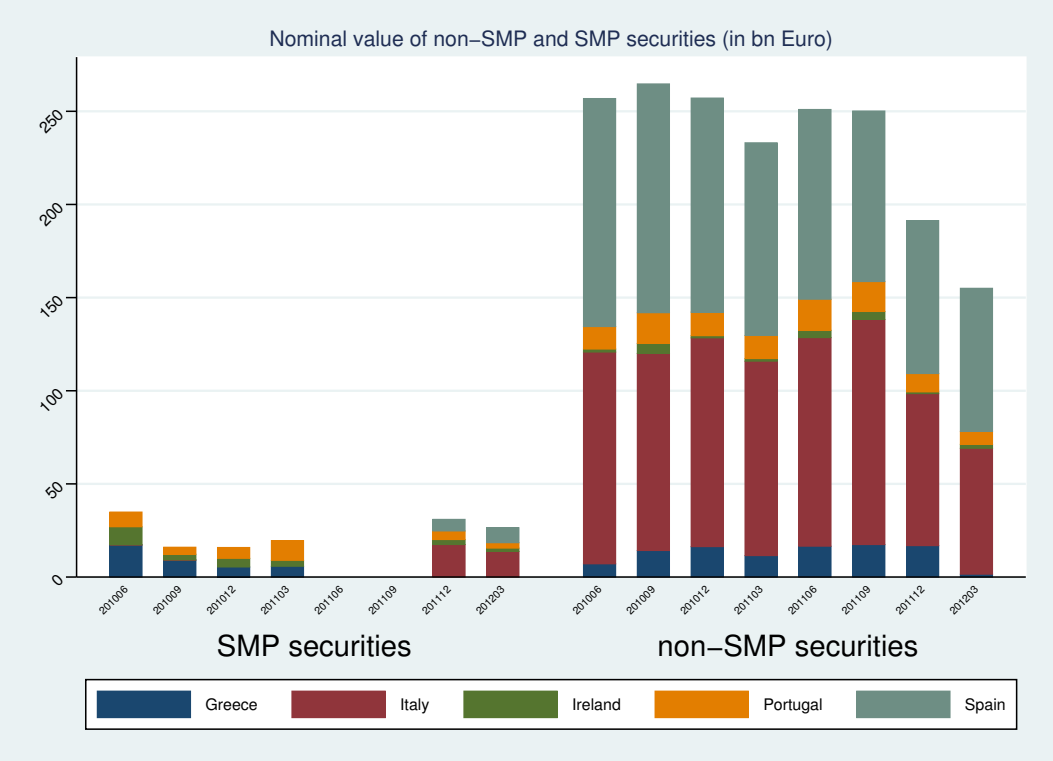


Figure 7. **Quarterly stock of SMP securities per country**
This figure shows the stock of SMP securities purchased by the European Central Bank under the Securities Purchase Program (SMP) between Q2:2010 and Q2:2012 that were held by all German banks country-by-country.



Tables

Table 1
Regional market shares and bank traits of banks with and without SMP securities

This Table shows descriptive statistics of the three dependent variables, regional market shares in terms of total customer loans, customer deposits, and gross total assets, as well as quarterly bank-specific control variables. Regional markets correspond to 392 counties ("Kreise"). The upper panel shows levels of variables and the lower panel shows quarter-on-quarter growth rates. We distinguish in the first three columns the moments for the control group of banks that did not hold SMP-eligible securities between q2:2010 and q1:2012 from those of banks with exposures to SMP-eligible securities during the duration of the SMP. Variables are defined in Table A.4. All ratios are measured in percent.

	Banks without SMP exposure			**Banks with SMP exposure**				
	N	Mean	SD	N	Mean	SD	Delta mean	p-value
Dependent variables: markets shares per municipality								
Corporate loans	47,647	21.695	26.058	14,713	25.494	28.290	-3.799	0.000
Customer deposits	47,647	21.698	25.394	14,713	25.483	27.477	-3.785	0.000
Gross total assets	47,647	21.643	25.740	14,713	25.662	27.992	-4.019	0.000
Control variables: quarterly levels of bank-specific covariates lagged by one quarter								
log Total assets	46,129	13.013	1.376	14,289	13.705	1.858	-0.692	0.000
Equity ratio	46,129	6.205	3.951	14,289	5.765	4.501	0.440	0.000
Net interbank lending	46,129	-2.603	15.362	14,289	-3.724	13.146	1.122	0.000
Security share	46,129	22.793	11.941	14,289	27.867	12.891	-5.074	0.000
Market funding	46,129	2.069	4.185	14,289	4.217	8.767	-2.148	0.000
Credit lines	46,129	6.697	19.625	14,289	7.214	8.765	-0.517	0.002
Liquidity	46,129	1.981	2.462	14,289	1.932	3.019	0.049	0.052
Dependent variables: changes in markets shares per municipality								
Corporate loans	46,129	0.052	1.331	14,289	0.085	1.736	-0.034	0.014
Customer deposits	46,129	0.051	1.268	14,289	0.080	1.561	-0.029	0.025
Gross total assets	46,129	0.051	1.299	14,289	0.083	1.706	-0.032	0.019
Control variables: quarterly changes of bank-specific covariates lagged by one quarter								
log Total assets	44,612	0.010	0.058	13,865	0.009	0.057	0.001	0.037
Equity ratio	44,612	0.015	0.915	13,865	0.005	0.899	0.010	0.268
Net interbank lending	44,612	-0.021	2.896	13,865	-0.030	3.028	0.008	0.770
Security share	44,612	0.108	1.876	13,865	0.095	2.043	0.013	0.481
Market funding	44,612	-0.057	0.532	13,865	-0.100	0.674	0.043	0.000
Credit lines	44,612	0.039	10.531	13,865	0.007	2.763	0.032	0.725
Liquidity	44,612	-0.014	1.221	13,865	-0.006	1.117	-0.008	0.516

Table 2

Difference-in-difference regressions of SMP exposure on county market shares

This Table shows regression results from a difference-in-difference specification to explain regional market shares per county and quarter. The sampled time period ranges from q1:2006 until q4:2014 unless noted otherwise. The sample labelled "All banks" comprises all commercial, savings, and cooperative banks and includes the latter two banking sectors' head institutions. The sample labelled "Local banks" comprises only the regional savings and cooperative banks. The sample labelled "]q2:10-q1:12[" comprises only the regional savings and cooperative banks and excludes the quarters of the SMP program itself, i.e. q2:2010–q1:2012. *POST* is an indicator variable equal to one as of the start of the SMP program in q2:2010 unless noted otherwise. *SMP* is an indicator variable equal to one if the bank held at least one security in its portfolio that was among the ones purchased by the ECB under the the SMP during the quarter. All variables are lagged by one quarter and defined in Table A.4. Clustered standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
County market shares		Customer loans			Customer deposits			Gross total assets	
Sample	All banks	Local banks	]q2:10-q1:12[	All banks	Local banks	]q2:10-q1:12[	All banks	Local banks	]q2:10-q1:12[
POST	-0.594***	-0.947***	-1.909***	-0.558***	-0.932***	-2.138***	-0.663***	-1.044***	-2.070***
	(0.177)	(0.256)	(0.403)	(0.165)	(0.220)	(0.334)	(0.171)	(0.243)	(0.384)
SMP × POST	0.603**	0.593**	0.763**	0.502**	0.507**	0.639**	0.633**	0.593**	0.769**
	(0.264)	(0.258)	(0.316)	(0.245)	(0.239)	(0.296)	(0.252)	(0.246)	(0.304)
log total assets	9.144***	17.02***	17.21***	9.658***	17.34***	17.50***	10.13***	17.83***	18.05***
	(1.202)	(1.594)	(1.619)	(1.198)	(1.467)	(1.495)	(1.225)	(1.470)	(1.496)
Equity ratio	0.325***	0.875***	0.841***	0.318***	0.886***	0.881***	0.324***	0.727***	0.717***
	(0.0548)	(0.204)	(0.214)	(0.0512)	(0.170)	(0.175)	(0.0521)	(0.179)	(0.187)
Net interbank lending	-0.0399***	-0.0487***	-0.0448***	0.0476***	0.0758***	0.0791***	0.00668	0.0200*	0.0239*
	(0.0127)	(0.0143)	(0.0150)	(0.0121)	(0.0125)	(0.0132)	(0.0115)	(0.0122)	(0.0130)
Securitites share	-0.0590***	-0.0967***	-0.0990***	0.0377***	0.0311**	0.0292**	0.0240*	0.0105	0.0105
	(0.0136)	(0.0151)	(0.0162)	(0.0122)	(0.0136)	(0.0145)	(0.0129)	(0.0142)	(0.0151)
Market Funding	-0.0669**	-0.0886**	-0.0999**	-0.153***	-0.201***	-0.210***	-0.0757**	-0.0940**	-0.107***
	(0.0303)	(0.0393)	(0.0407)	(0.0327)	(0.0375)	(0.0386)	(0.0336)	(0.0371)	(0.0385)
Credit lines	-0.00151	-0.0691	-0.0759	-0.00263	-0.0517	-0.0547	-0.00239	-0.0937	-0.102
	(0.00427)	(0.0799)	(0.0911)	(0.00295)	(0.0493)	(0.0561)	(0.00425)	(0.0800)	(0.0912)
Liquidity	-0.0955***	0.400**	0.399**	-0.0240	0.406***	0.392**	-0.0641***	0.283*	0.269
	(0.0255)	(0.173)	(0.198)	(0.0213)	(0.137)	(0.154)	(0.0247)	(0.168)	(0.187)
Constant	-98.33***	-201.9***	-203.2***	-107.3***	-209.0***	-209.6***	-113.3***	-213.8***	-215.5***
	(16.17)	(21.83)	(22.04)	(16.15)	(20.08)	(20.33)	(16.51)	(20.14)	(20.37)
Observations	60,418	54,631	42,313	60,418	54,631	42,313	60,418	54,631	42,313
R-squared	0.142	0.220	0.226	0.165	0.245	0.252	0.165	0.244	0.250
Number of banks	1,918	1,701	1,701	1,918	1,701	1,701	1,918	1,701	1,701
Bank FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 3
Matched sample properties

This Table shows descriptive statistics after 1:1 propensity score matching procedure (Caliendo and Kopeinig, 2008) based on explanatory lagged covariates and banking group fixed effects in the quarter preceding the start of the SMP, i.e. q1:2010. The upper panel shows the comparison between banks with and without SMP exposure in terms of levels. The lower panel shows descriptive statistics for the two groups in terms of quarterly growth rates and tests the parallel trends assumption prior to the treatment represented by the SMP program.

	Banks without SMP exposure			**Banks with SMP exposure**				
	N	Mean	SD	N	Mean	SD	Delta mean	p-value
Control varibles: quarterly levels of bank-specific covariates lagged by one quarter								
log total assets	418	13.440	1.409	418	13.663	1.897	-0.222	0.055
Equity ratio	418	6.017	5.475	418	6.252	7.856	-0.234	0.617
Net interbank lending	418	-3.834	15.413	418	-4.387	13.732	0.553	0.584
Securitites share	418	28.880	13.018	418	28.963	12.537	-0.083	0.925
Market Funding	418	2.892	4.114	418	4.330	8.582	-1.438	0.002
Credit lines	418	5.981	7.641	418	6.657	7.939	-0.676	0.210
Liquidity	418	2.005	0.719	418	2.034	3.280	-0.029	0.860
Control variables: q-on-q changes of bank-specific covariates								
log total assets	416	0.107	0.438	415	0.064	0.804	0.043	0.343
Equity ratio	416	-0.251	6.087	415	1.206	21.158	-1.457	0.177
Net interbank lending	416	-35.911	628.802	415	-11.292	212.317	-24.619	0.450
Securitites share	416	0.711	9.749	415	4.680	36.090	-3.969	0.031
Market Funding	270	-9.786	23.255	274	-4.569	25.289	-5.217	0.013
Credit lines	410	4.545	41.917	408	4.635	47.999	-0.090	0.977
Liquidity	415	13.167	115.794	415	76.969	922.494	-63.803	0.162

Table 4

County market share regressions for the matched sample

This Table shows regression results from a difference-in-difference specification to explain regional market shares per county and quarter using only banks included in the propensity score matched sample. The sampled time period ranges from q1:2006 until q4:2014 unless noted otherwise. The sample labelled "All banks" comprises all commercial, savings, and cooperative banks and includes the latter two banking sectors' head institutions. The sample labelled "Local banks" comprises only the regional savings and cooperative banks. The sample labelled "]q2:10-q1:12[" comprises only the regional savings and cooperative banks and excludes the quarters of the SMP program itself, i.e. q2:2010–q1:2012. *POST* is an indicator variable equal to one as of the start of the SMP program in q2:2010 unless noted otherwise. *SMP* is an indicator variable equal to one if the bank held at least one security in its portfolio that was among the ones purchased by the ECB under the the SMP during the quarter. All variables are lagged by one quarter and defined in Table A.4. Clustered standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
County market shares		Customer loans			Customer deposits			Gross total assets	
Sample	All banks	Local banks	]q2:10-q1:12[	All banks	Local banks	]q2:10-q1:12[	All banks	Local banks	]q2:10-q1:12[
POST	-0.919***	-1.131***	-2.161***	-0.924***	-1.121***	-2.409***	-1.055***	-1.263***	-2.326***
	(0.301)	(0.406)	(0.627)	(0.261)	(0.342)	(0.524)	(0.272)	(0.380)	(0.601)
SMP × POST	0.697**	0.597*	0.732*	0.628**	0.563**	0.674*	0.733**	0.609**	0.737**
	(0.322)	(0.325)	(0.389)	(0.283)	(0.286)	(0.350)	(0.297)	(0.298)	(0.363)
log total assets	12.32***	19.50***	19.75***	13.15***	20.15***	20.34***	13.52***	20.49***	20.77***
	(1.691)	(2.373)	(2.407)	(1.641)	(2.173)	(2.203)	(1.654)	(2.190)	(2.225)
Equity ratio	0.376***	1.028***	0.997***	0.386***	0.919***	0.914***	0.391***	0.792***	0.783***
	(0.0728)	(0.268)	(0.274)	(0.0669)	(0.247)	(0.251)	(0.0661)	(0.248)	(0.252)
Net interbank lending	-0.0358*	-0.0368**	-0.0334*	0.0572***	0.0978***	0.100***	0.0147	0.0320*	0.0343*
	(0.0191)	(0.0176)	(0.0193)	(0.0181)	(0.0167)	(0.0182)	(0.0165)	(0.0167)	(0.0184)
Securitites share	-0.0855***	-0.118***	-0.120***	0.0223	0.0268	0.0250	0.00682	0.000882	0.000917
	(0.0194)	(0.0195)	(0.0205)	(0.0170)	(0.0176)	(0.0184)	(0.0181)	(0.0181)	(0.0190)
Market Funding	-0.0862**	-0.0765	-0.0873*	-0.150***	-0.159***	-0.163***	-0.0835*	-0.0575	-0.0674
	(0.0362)	(0.0500)	(0.0523)	(0.0431)	(0.0498)	(0.0508)	(0.0428)	(0.0471)	(0.0487)
Credit lines	-0.0131	-0.115	-0.128	-0.00907	-0.0742	-0.0817	-0.0134	-0.136	-0.151
	(0.0256)	(0.126)	(0.142)	(0.0160)	(0.0770)	(0.0868)	(0.0257)	(0.127)	(0.144)
Liquidity	-0.0752*	0.567**	0.639**	-0.00153	0.572***	0.616***	-0.0435	0.466*	0.507*
	(0.0455)	(0.257)	(0.296)	(0.0426)	(0.186)	(0.215)	(0.0453)	(0.251)	(0.288)
Constant	-141.2***	-237.1***	-239.2***	-155.2***	-248.8***	-249.9***	-159.9***	-251.6***	-254.4***
	(23.27)	(33.18)	(33.43)	(22.63)	(30.36)	(30.58)	(22.82)	(30.64)	(30.91)
Observations	28,549	25,356	19,512	28,549	25,356	19,512	28,549	25,356	19,512
R-squared	0.191	0.261	0.267	0.231	0.303	0.310	0.220	0.290	0.296
Number of banks	836	737	737	836	737	737	836	737	737
Bank FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Table 5

Quarterly growth of loans and deposits for the matched sample

This Table shows regression results from a difference-in-difference specification to explain quarterly loan and deposit growth using only banks included in the propensity score matched sample. The sampled time period ranges from q1:2006 until q4:2014 unless noted otherwise. The sample labelled "All banks" comprises all commercial, savings, and cooperative banks and includes the latter two banking sectors' head institutions. The sample labelled "Local banks" comprises only the regional savings and cooperative banks. The sample labelled "]q2:10-q1:12[" comprises only the regional savings and cooperative banks and excludes the quarters of the SMP program itself, i.e. q2:2010–q1:2012. *POST* is an indicator variable equal to one as of the start of the SMP program in q2:2010 unless noted otherwise. *SMP* is an indicator variable equal to one if the bank held at least one security in its portfolio that was among the ones purchased by the ECB under the the SMP during the quarter. All variables are lagged by one quarter and defined in Table A.4. Clustered standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)	(4)	(5)	(6)
County market shares		Customer loans			Customer deposits	
Sample	All banks	Local banks	]q2:10-q1:12[	All banks	Local banks	]q2:10-q1:12[
POST	0.716***	0.994***	1.318***	1.568***	1.611***	0.686***
	-0.181	-0.137	-0.162	-0.183	-0.147	-0.169
SMP × POST	-0.0827	0.146*	0.175*	-0.187*	-0.0122	0.0164
	-0.109	-0.0833	-0.0945	-0.105	-0.0788	-0.0864
log total assets	-1.285***	-2.764***	-2.538***	-2.680***	-3.586***	-3.325***
	-0.38	-0.335	-0.362	-0.532	-0.342	-0.376
Equity ratio	0.00235	-0.197***	-0.201***	0.066	0.0837	0.0598
	-0.0362	-0.0583	-0.0623	-0.0462	-0.0589	-0.0623
Net interbank lending	0.0185**	1.04E-05	-0.00161	-0.0642***	-0.0738***	-0.0700***
	-0.00936	-0.00507	-0.00567	-0.00914	-0.00623	-0.00684
Securitites share	0.0645***	0.0295***	0.0268***	-0.0308***	-0.0433***	-0.0397***
	-0.0108	-0.0063	-0.00666	-0.0114	-0.00588	-0.00626
Market Funding	0.016	-0.0112	-0.0171	0.112***	0.0428***	0.0365**
	-0.0223	-0.0137	-0.0149	-0.0289	-0.0134	-0.0149
Credit lines	0.0440**	0.0806***	0.0706***	0.0236**	0.0111*	0.00644
	-0.0188	-0.0218	-0.0207	-0.0105	-0.00646	-0.00664
Liquidity	-0.0615	0.000157	-0.00508	-0.0759	-0.164***	-0.186***
	-0.0382	-0.055	-0.0672	-0.0583	-0.048	-0.0568
Constant	16.17***	37.43***	34.22***	36.83***	48.99***	46.51***
	-5.257	-4.668	-5.002	-7.404	-4.753	-5.165
Observations	28,549	25,356	19,512	28,473	25,356	19,512
R-squared	0.035	0.074	0.07	0.082	0.147	0.154
Number of banks	836	737	737	834	737	737
Bank FE	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES
Mean of dependent	0.899	0.836	0.792	1.091	0.972	1.002
SD of dependent	3.253	2.174	2.250	3.509	2.558	2.661

Table 6
Sensitivity of annual bank performance measures

This Table shows regression results from a difference-in-difference specification to explain regional market shares per county and quarter using only banks included in the propensity score matched sample. The sampled time period ranges from q1:2006 until q4:2014 unless noted otherwise. The sample labelled "All banks" comprises all commercial, savings, and co-operative banks and includes the latter two banking sectors' head institutions. The sample labelled "Local banks" comprises only the regional savings and cooperative banks. The sample labelled "]q2:10-q1:12[" comprises only the regional savings and cooperative banks and excludes the quarters of the SMP program itself, i.e. q2:2010–q1:2012. *POST* is an indicator variable equal to one as of the start of the SMP program in q2:2010 unless noted otherwise. *SMP* is an indicator variable equal to one if the bank held at least one security in its portfolio that was among the ones purchased by the ECB under the the SMP during the quarter. In addition to lagged quarterly control variables, we specify annual control variables for bank performance lagged by four quarters. All variables are defined in Table A.4. Clustered standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)
Market shares	Customer loans	Customer deposits	Gross total assets
POST	-1.819**	-2.113***	-1.857**
	(0.855)	(0.627)	(0.855)
SMP × POST	0.700**	0.634**	0.680**
	(0.333)	(0.310)	(0.318)
Non-performing loan ratio	-0.0658	-0.0748*	-0.0716*
	(0.0455)	(0.0417)	(0.0432)
Loan loss provision share in TCL	0.114	0.0342	-0.0524
	(0.287)	(0.261)	(0.289)
Return on equity	-0.104	-0.0947	-0.0983
	(0.181)	(0.141)	(0.181)
Return on assets	1.928	1.597	1.947
	(2.292)	(1.807)	(2.304)
Cost-income ratio	0.0987	0.0926	0.0912
	(0.0795)	(0.0642)	(0.0791)
Capital injection dummy	1.386	0.931	0.691
	(1.042)	(0.778)	(0.973)
Constant	-253.5***	-264.2***	-263.2***
	(35.08)	(32.21)	(33.36)
Observations	13,728	13,728	13,728
R-squared	0.265	0.301	0.280
Number of banks	737	737	737
Bank FE	YES	YES	YES
Quarter FE	YES	YES	YES
Quarterly controls	YES	YES	YES

Table 7

Alternative annual measures of market power

This Table shows regression results from a difference-in-difference specification to explain three alternative measures of bank market power for banks included in the propensity score matched sample. All measures are based on annual data. The Lerner index is the difference between imputed average operational revenues and marginal cost estimated with a latent stochastic frontier model (Greene, 2005) scaled by average revenues. *PCM* denotes price-cost margins obtained as the ratio of interest revenues of interest bearing assets less interest expenses over interest bearing liabilities. The sampled time period ranges from q1:2006 until q4:2014 unless noted otherwise. The sample labelled "All banks" comprises all commercial, savings, and cooperative banks and includes the latter two banking sectors' head institutions. The sample labelled "Local banks" comprises only the regional savings and cooperative banks. The sample labelled "]q2:10-q1:12[" comprises only the regional savings and cooperative banks and excludes the quarters of the SMP program itself, i.e. q2:2010–q1:2012. *POST* is an indicator variable equal to one as of the start of the SMP program in q2:2010 unless noted otherwise. *SMP* is an indicator variable equal to one if the bank held at least one security in its portfolio that was among the ones purchased by the ECB under the the SMP during the quarter. We include lagged quarterly and annual control variables. All variables are defined in Table A.4. Clustered standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)
	Lerner index	**PCM**	**HHI**
POST	1.772***	-0.281***	-0.088
	(0.186)	(0.013)	(0.062)
SMP × POST	-0.395**	-0.010	0.036
	(0.186)	(0.012)	(0.049)
Observations	19,512	19,512	19,512
R-squared	0.722	0.500	0.080
Number of banks	737	737	737
Bank FE	YES	YES	YES
Quarter FE	YES	YES	YES
Quarterly controls	YES	YES	YES
Annual controls	YES	YES	YES
Mean of dependent variable	53.734	2.466	4.382
SD of dependent variable	5.099	0 .301	2.071

Table 8

Frequency and type of SMP transactions at security level

This Table shows the number of transactions per security and the number of individual securities eligible to the SMP that remained unchanged in banks' portfolios. Frequencies are calculated on the basis of the bank-security-quarter sample. "Equal" indicates the number of securities held by all banks a the time that were purchased during the quarter by the ECB. "Increase" indicates the number of securities, which were increased relative to the preceding quarter. "Initial" denotes the number of securities that were purchased by banks in the indicated quarter for the first time since the start of the securities holding statistics, i.e. q5:2005. "Previous" shows the number of securities purchased by banks during the quarter which they held in an earlier than the preceding quarter. "Reduction" indicates the number of securities reduced from one quarter to the other. Regional banks include here local savings and cooperative as well as small commercial banks. Large banks shown in the lower panel comprise the five largest commercial banks, central banks of the savings bank sector ("Landesbanken") and the cooperative banking sector.

Date	**Number of transactions**					**Total**
	Equal	*Increase*	*Initial*	*Previous*	*Reduction*	
All banks						
201006	476	108	60	26	158	828
201009	419	73	45	33	83	653
201012	563	89	35	16	110	813
201103	516	92	43	25	92	768
201112	457	143	56	36	195	887
201203	313	156	104	32	110	715
Regional banks						
201006	393	17	32	1	31	474
201009	342	5	39	3	17	406
201012	466	3	27		16	512
201103	425	17	34	5	3	484
201112	364	3	33	1	15	416
201203	262	16	88	4	9	379
Large banks						
201006	83	91	28	25	127	354
201009	77	68	6	30	66	247
201012	97	86	8	16	94	301
201103	91	75	9	20	89	284
201112	93	140	23	35	180	471
201203	51	140	16	28	101	336

Table 9
Differential effects of directions of transactions

This Table shows regression results from a difference-in-difference specification to explain regional market shares per county and quarter using only banks included in the propensity score matched sample. The three additional interaction terms *increasers*, *reducers*, and *stayers* are indicators equal to one if the aggregate net nominal amount of SMP securities per bank changed accordingly over the time of the SMP duration. The sampled time period ranges from q1:2006 until q4:2014 unless noted otherwise. The sample labelled "All banks" comprises all commercial, savings, and cooperative banks and includes the latter two banking sectors' head institutions. The sample labelled "Local banks" comprises only the regional savings and cooperative banks. The sample labelled "]q2:10-q1:12[" comprises only the regional savings and cooperative banks and excludes the quarters of the SMP program itself, i.e. q2:2010–q1:2012. *POST* is an indicator variable equal to one as of the start of the SMP program in q2:2010 unless noted otherwise. We include lagged quarterly and annual control variables. All variables are defined in Table A.4. Clustered standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
County market shares		Customer loans			Customer deposits			Gross total assets	
Sample	All banks	Local banks	]q2:10-q1:12[	All banks	Local banks	]q2:10-q1:12[	All banks	Local banks	]q2:10-q1:12[
POST	-1.111***	-2.978***	-3.254***	-1.726***	-3.739***	-4.283***	-1.688***	-3.472***	-3.657***
	(0.405)	(0.656)	(1.158)	(0.397)	(0.532)	(0.878)	(0.417)	(0.631)	(1.147)
SMP increasers × POST	0.650*	0.655**	0.826**	0.454	0.674**	0.856**	0.649**	0.710***	0.861**
	(0.339)	(0.280)	(0.421)	(0.335)	(0.283)	(0.421)	(0.321)	(0.272)	(0.408)
SMP reducers × POST	1.825	2.240	2.276	1.865	1.922	2.009	2.023	2.153	2.303
	(1.376)	(1.745)	(1.871)	(1.235)	(1.572)	(1.685)	(1.336)	(1.671)	(1.810)
SMP stayers × POST	0.254	0.249	0.313	0.205	0.156	0.208	0.271	0.214	0.240
	(0.249)	(0.217)	(0.345)	(0.224)	(0.196)	(0.310)	(0.234)	(0.201)	(0.323)
Constant	-98.109***	-216.472***	-251.233***	-106.502***	-221.415***	-261.262***	-112.679***	-223.942***	-260.471***
	(15.986)	(25.060)	(34.885)	(15.952)	(22.703)	(31.990)	(16.301)	(23.052)	(33.163)
Observations	60,418	42,298	13,728	60,418	42,298	13,728	60,418	42,298	13,728
R-squared	0.143	0.225	0.266	0.166	0.250	0.302	0.166	0.249	0.282
Number of sysnr	1,918	1,699	737	1,918	1,699	737	1,918	1,699	737
Bank FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Monthly controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Annual controls	NO	YES	YES	NO	YES	YES	NO	YES	YES

Table 10
Signalling versus portfolio rebalancing channel

This Table shows regression results from difference-in-difference specifications to explain regional customer loan market shares per county and quarter using only regional savings and cooperative banks included in the propensity score matched sample. The treatment indicator *SMP* is equal to 1 for those banks that held securities purchased by the ECB under the SMP program. *PERIHPERY* is an indicator equal to one for those banks that held some securities, stocks or bonds, from those five Eurozone countries that were part of the SMP during the disbursement period, but did not hold the actually purchased SMP securities itself. *COVERAGE* is defined as the share of all securities issued by entities from periphery countries relative to the aggregate value of all securities held by the bank in each quarter (see Figure 7). Ratios are measured in percent and measured based on the nominal value of securities. The sampled time period ranges from q1:2006 until q4:2014 excluding the quarters of the SMP program itself, i.e. q2:2010–q1:2012. *POST* is an indicator variable equal to one as of the start of the SMP program in q2:2010. We include lagged quarterly and annual control variables. All variables are defined in Table A.4. Clustered standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

	(1)	(2)	(3)	(4)	(5)
VARIABLES	SMP	PERIPHERY	COVERAGE	Deposits	Assets
POST	-2.161***	-2.797***	-2.881***	-2.937***	-2.866***
	(0.627)	(0.751)	(0.748)	(0.640)	(0.708)
SMP × POST	0.732*	1.362***	1.163**	0.872**	0.995**
	(0.389)	(0.483)	(0.482)	(0.416)	(0.442)
PERIPHERY × POST		1.409***	1.809***	1.247**	1.345**
		(0.544)	(0.595)	(0.509)	(0.550)
COVERAGE			-0.0623	-0.0913**	-0.0839*
			(0.0452)	(0.0428)	(0.0444)
COVERAGE × POST			0.0727	0.0820*	0.0697
			(0.0507)	(0.0493)	(0.0479)
PERIPHERY × COVERAGE			0.0718	0.0879	0.0843
			(0.0621)	(0.0676)	(0.0674)
PERIPHERY × COVERAGE × POST			-0.239***	-0.200**	-0.209***
			(0.0779)	(0.0851)	(0.0804)
Observations	19,512	19,512	19,512	19,512	19,512
R-squared	0.267	0.271	0.273	0.315	0.301
Number of banks	737	737	737	737	737
Bank FE	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES
Quarterly controls	YES	YES	YES	YES	YES

Table 11
The SMP effect on competition at increasing threshold holdings

This Table shows regression results from difference-in-difference specifications to explain regional customer loan market shares per county and quarter using only regional savings and cooperative banks included in the propensity score matched sample. Each column corresponds to the percentage share of the nominal value of SMP securities averaged over the spell of the SMP program relative to the average total portfolio value in nominal terms. The treatment indicator *SMP* is accordingly defined in each column only equal to 1 for those banks with portfolio shares up and until the decile threshold. The sampled time period ranges from q1:2006 until q4:2014 excluding the quarters of the SMP program itself, i.e. q2:2010–q1:2012. *POST* is an indicator variable equal to one as of the start of the SMP program in q2:2010. We include lagged quarterly and annual control variables. Al variables are defined in Table A.4. Clustered standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

SMP share decile	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Decile threshhold in %	0.251	0.566	0.915	1.220	1.506	1.871	2.332	3.075	4.556	12.738
POST	-1.483*	-1.483*	-1.470*	-1.519*	-1.559*	-1.611*	-1.698**	-1.719**	-1.763**	-1.819**
	(0.844)	(0.839)	(0.842)	(0.839)	(0.848)	(0.833)	(0.847)	(0.844)	(0.856)	(0.855)
$SMP \times POST$	0.0421	0.0165	-0.0946	0.211	0.350	0.469	0.652*	0.624*	0.656*	0.700**
	(0.719)	(0.449)	(0.355)	(0.380)	(0.346)	(0.336)	(0.376)	(0.352)	(0.343)	(0.333)
Observations	13,728	13,728	13,728	13,728	13,728	13,728	13,728	13,728	13,728	13,728
R-squared	0.264	0.264	0.264	0.264	0.264	0.264	0.265	0.265	0.265	0.265
Number of banks	737	737	737	737	737	737	737	737	737	737
Bank FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quarterly controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

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A Additional Tables

Table A.1
Average quarterly loan growth

This Table shows mean growth rates per quarter for the matched sample of regional savings and cooperative banks with and without SMP exposure. In addition, we show average growth rates for all banks. The three panels correspond to the pre- and post-SMP period as well as the disbursement period itself. The averages of mean growth rates are indicated in each line for the respective subsamples.

Date	**Without SMP exposure**			**With SMP exposure**		
Banking group	Savings	Cooperatives	All	Savings	Cooperatives	All
Pre-SMP period	0.357	0.737	0.620	0.230	0.674	0.516
200606	0.402	0.660	0.581	0.190	0.727	0.536
200609	0.101	1.208	0.867	0.443	1.411	1.066
200612	0.023	0.664	0.467	0.017	0.796	0.519
200703	0.218	-0.186	-0.061	-0.103	-0.191	-0.160
200706	0.078	0.469	0.349	-0.300	0.340	0.112
200709	0.180	0.918	0.691	-0.080	0.808	0.492
200712	0.376	0.679	0.586	-0.069	0.484	0.287
200803	0.063	-0.056	-0.019	0.025	-0.042	-0.018
200806	0.325	0.777	0.638	0.418	0.590	0.529
200809	1.042	1.134	1.106	0.778	1.113	0.994
200812	0.386	0.762	0.646	0.311	1.051	0.787
200903	-0.011	0.083	0.054	0.530	0.034	0.211
200906	0.454	0.849	0.727	0.050	0.746	0.498
200909	0.897	1.671	1.432	0.593	1.187	0.976
200912	0.821	1.687	1.420	0.713	1.517	1.231
201003	0.353	0.474	0.436	0.158	0.213	0.193
SMP period	0.718	1.134	1.006	0.696	1.098	0.953
201006	0.923	1.557	1.361	0.959	1.103	1.051
201009	1.207	1.676	1.532	0.953	1.338	1.201
201012	0.773	1.224	1.085	0.656	0.861	0.788
201103	0.415	0.260	0.308	0.367	0.400	0.388
201106	0.641	1.138	0.985	0.677	1.171	0.992
201109	0.640	1.371	1.146	0.821	1.636	1.342
201112	0.783	1.242	1.100	0.678	1.548	1.234
201203	0.362	0.605	0.529	0.455	0.723	0.627
Post SMP period	0.636	1.334	1.116	0.693	1.408	1.149
201206	0.804	1.409	1.221	0.817	1.463	1.230
201209	0.765	1.510	1.278	0.922	1.498	1.291
201212	0.897	1.256	1.145	0.924	1.569	1.337
201303	0.397	0.584	0.527	0.240	0.562	0.446
201306	0.566	1.172	0.985	0.509	1.197	0.950
201309	0.719	1.654	1.366	0.801	1.788	1.433
201312	0.569	1.472	1.194	0.874	2.006	1.599
201403	0.371	0.734	0.620	0.234	0.804	0.596
201406	0.585	1.388	1.136	0.587	1.366	1.081
201409	0.711	1.778	1.441	0.826	1.377	1.175
201412	0.614	1.712	1.365	0.884	1.853	1.498
Total	0.527	1.011	0.861	0.479	0.993	0.809

Table A.2
Average quarterly deposit growth

This Table shows mean growth rates per quarter for the matched sample of regional savings and cooperative banks with and without SMP exposure. In addition, we show average growth rates for all banks. The three panels correspond to the pre- and post-SMP period as well as the disbursement period itself. The averages of mean growth rates are indicated in each line for the respective subsamples.

Date	**Without SMP exposure**			**With SMP exposure**		
Banking group	Savings	Cooperatives	All	Savings	Cooperatives	All
Pre-SMP period	0.923	1.119	1.058	0.754	1.102	0.978
200606	0.401	0.287	0.322	0.231	0.280	0.262
200609	0.103	0.495	0.374	0.064	0.560	0.383
200612	1.049	1.560	1.403	1.170	1.392	1.313
200703	0.305	-0.105	0.022	-0.277	-0.113	-0.171
200706	0.597	0.131	0.274	0.270	0.208	0.230
200709	0.768	0.885	0.849	0.632	0.806	0.744
200712	1.857	1.955	1.924	1.596	1.905	1.795
200803	0.316	0.455	0.412	0.203	0.245	0.230
200806	0.456	0.309	0.354	0.602	0.139	0.304
200809	0.782	0.098	0.308	0.435	0.155	0.255
200812	3.656	4.850	4.482	3.040	4.947	4.268
200903	0.277	0.791	0.633	0.735	0.995	0.902
200906	0.748	0.717	0.726	0.461	0.730	0.634
200909	0.708	1.507	1.261	0.361	1.138	0.862
200912	1.914	2.611	2.396	1.588	2.466	2.153
201003	0.836	1.352	1.193	0.957	1.782	1.488
SMP period	0.717	0.983	0.901	0.643	0.940	0.833
201006	0.879	0.870	0.873	1.085	1.044	1.058
201009	0.694	1.172	1.025	0.478	0.970	0.795
201012	1.363	2.044	1.834	1.373	1.516	1.465
201103	-0.318	0.247	0.073	0.034	0.318	0.216
201106	0.556	0.451	0.483	0.425	0.716	0.611
201109	0.870	0.713	0.762	0.575	1.045	0.875
201112	1.543	1.854	1.758	1.286	1.965	1.720
201203	0.149	0.514	0.400	-0.114	-0.057	-0.077
Post SMP period	0.761	1.111	1.002	0.731	1.062	0.942
201206	0.789	0.388	0.514	0.325	0.195	0.242
201209	0.960	0.996	0.985	0.929	1.077	1.024
201212	1.256	2.067	1.815	1.270	2.250	1.897
201303	-0.613	0.594	0.222	-0.064	0.315	0.179
201306	0.933	0.451	0.599	0.658	0.300	0.429
201309	0.765	1.106	1.001	0.756	0.930	0.868
201312	1.747	2.401	2.199	1.349	2.595	2.148
201403	-0.108	0.343	0.201	0.044	0.415	0.279
201406	0.618	0.537	0.562	0.507	0.553	0.536
201409	0.776	1.467	1.249	0.792	1.037	0.948
201412	1.244	1.871	1.673	1.475	2.010	1.814
Total	0.826	1.086	1.006	0.722	1.054	0.935

Table A.3
Number and volume of periphery and non-SMP periphery securities

This Table shows the number and the volume of periphery securities in billions of Euro per quarter that German banks held and that were either excluded from the SMP (left panel) or part of the program at some time (right panel). The data is differentiated by issuer country based on the ISIN code of individual. Securities include both fixed income as well as stocks. ISIN codes XS are excluded.

Date	**Non-SMP securities**					**SMP-securities**				
Country	ES	GR	IE	IT	PT	ES	GR	IE	IT	PT
Number of securities										
201006	4,211	207	825	2,081	799		459	183	3	235
201009	4,286	243	1,027	2,121	880		416	89	2	170
201012	4,172	270	896	2,284	770		369	218		271
201103	4,183	274	1,125	2,401	749		349	182		293
201106	4,149	570	1,351	2,416	929					
201109	3,903	519	1,333	2,365	924					
201112	3,503	481	1,047	1,894	655	211		184	372	202
Aggregate book value of securities in billions of Euro										
201006	120.3	3.5	2.6	120.5	10.7		12.07	9.45	0.05	7.60
201009	123.7	8.2	6.1	115.2	14.3		7.53	2.82	0.04	3.56
201012	108.8	8.8	2.1	117.3	10.3		4.22	3.73		5.34
201103	98.3	6.4	2.2	110.3	9.9		4.22	2.42		9.33
201106	96.2	8.3	3.7	114.7	12.1					
201109	88.3	6.1	4.9	112.7	11.1					
201112	77.2	3.9	1.6	72.0	6.7	6.22		2.28	16.30	3.04
Aggregate nominal (face) value of securities in billions of Euro										
201006	122.4	7.1	1.6	113.7	12.1		17.2	9.7	0.1	7.9
201009	122.8	14.2	5.4	105.8	16.5		9.1	3.1	0.1	3.8
201012	114.9	16.3	1.1	112.1	12.7		5.4	4.6		5.9
201103	103.5	11.5	1.4	104.4	12.4		5.8	3.2		10.7
201106	101.9	16.5	3.9	112.0	16.7					
201109	91.6	17.4	4.3	120.8	16.1					
201112	82.1	16.8	0.9	81.6	9.9	6.3		2.7	17.4	4.6

Table A.4
Variable definition

This Table shows definitions of variables. Acronyms for the sources are: BBK is Deutsche Bundesbank; ECB is European Central Bank

Variable name	Source	Unit	Description
Primary dependent variables: market shares at the county level			
Customer loan share	BBK	%	Relative to aggregate customer loans of all banks headquartered in the respective region ("Kreis")
Customer deposit share	BBK	%	Relative to aggregate customer deposits of all banks headquartered in the respective region ("Kreis")
Gross total asset share	BBK	%	Relative to aggregate total assets of all banks headquartered in the respective region ("Kreis")
Alternative dependent variables: markups, prices, and structure			
Lerner index	own	points	Scaled differences of average revenues and estimated marginal cost
Price-cost margin	BBK	%	Difference between implied asset and liability interest rates
HHI	own	points	Sum of squared regional market shares per region
Quarterly control variables lagged by one quarter			
log Total assets	BBK	log	Natural logarithm of monthly gross total assets (TA) in million Euros
Equity ratio	BBK	%	Total balance sheet equity to gross total assets
Net interbank lending	BBK	%	Interbank assets minus interbank liabilities relative to TA
Security share	BBK	%	Stocks and bonds relative to TA
Market funding	BBK	%	Issued bonds and money market instruments to total liabilities
Credit lines	BBK	%	Sum of irrevocable credit and other commitments to TA
Liquidity	BBK	%	Cash and net balances with central banks to TA
Annual control variables lagged by four quarters			
Non-performing loans	BBK	%	Loans identified by prudential supervisor as risky to total audited loans
Loan loss provisions	BBK	%	Relative to TA
Return on equity	BBK	%	Operating result relative to gross total equity
Return on assets	BBK	%	Operating result relative to gross total assets
Cost-income ratio	BBK	%	Administrative costs relative to operating revenue
Capital injection dummy	BBK	1/0	Indicator variable of outstanding capital support by insurance scheme

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