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Working Paper No. 152

The Economic and Fiscal Value of German Guarantee Banks

by

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The Economic and Fiscal Value of German Guarantee Banks

Peter Hennecke^a, Doris Neuberger^b and Dirk Ulbricht^c

Abstract

Guarantee banks backed by the state aim to close the gap in the financing of small and medium-sized enterprises or start-ups caused by lacking collateral or equity and high information asymmetry. The present study quantifies the economic and fiscal net benefits of guarantee banks in the new federal states of Germany, where economic development is still lacking behind those in the old federal states. Using data of five guarantee banks and results from enterprise and bank surveys, we measure finance and project additionality of loan and equity guarantees provided over the period 1991-2015. Cost-benefit analyses show that the economic benefits of the guarantee banks are considerable because of increased production and employment, while the economic costs are negligible. The real GDP increases by about 1.2 euro per euro guarantee each year. In the years 2008 to 2014, there were net fiscal gains of several hundred million euros in the respective federal states.

JEL classification: D61, E17, G21, G28, G38, H81, O16

Keywords: Small business finance, loan guarantee schemes, collateral, credit rationing, public guarantees, cost-benefit analysis

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1. Introduction

It is a stylized fact across countries that small firms are more likely to face credit constraints than large firms. At the end of 2016, 19% of small firms and 12% of medium-sized firms, but only 7% of large firms in the manufacturing sector in Germany indicated that credit access was restrictive (Ifo 2016). In another enterprise survey, 22% of young firms and 23% of small firms reported that credit constraints have increased, nearly three times more frequently than large firms (7.7%). The main reasons are banks' collateral, equity and disclosure requirements (KfW 2015). Since SMEs are the backbone of the German economy, representing more than 99% of enterprises and about 60% of employees (IfM 2017), these credit constraints hamper economic growth and employment.

German guarantee banks aim to close this financing gap. They have been founded as non-profit oriented private self-help institutions since 1949 to encourage post-war reconstruction in Germany and after the reunification in 1990 in the new German regions. Today, there are 17 guarantee banks operating at the federal state level with a banking status, being owned by banks, insurance companies and business associations. They support credit (and, to a smaller extent, equity) financing of enterprises and professionals by granting loan (respectively equity) guarantees to the enterprises' main banks (respectively investment firms), backed by counter guarantees (respectively counter securities) from the state. While the guarantee banks and the state cover up to 80% of the risk, the borrowers' main banks (respectively investment firms) bear at least 20% of the risk.

The present paper examines the economic and fiscal net benefits of five out of six guarantee banks in East Germany¹. We focus on East Germany (former GDR) where the need for small business loan guarantees is likely to be higher than in West Germany due to weaker economic conditions. Compared to national figures East Germany has below average productivity, disposable income per capita, employment and entrepreneurial activities, while the incidence of small firms, insolvency rates and credit constraints are above average (Hebebrand et al. 2016). We use a cost benefit analysis to evaluate the investments of the federal and state governments into the guarantees provided through the guarantee banks.

The paper contributes to the empirical literature on the effectiveness of state-backed credit guarantee schemes around the world. It closes a gap in this literature by providing for the first time a comprehensive assessment of the economic and fiscal net benefits of guarantee banks in the new federal states of Germany. It uses a large data set from the internal statistics of five guarantee banks over the period 1991-2015, own surveys of enterprises and credit institutions that use state-backed credit guarantees as well as multipliers from macroeconomic simulation models to quantify the overall macroeconomic and fiscal net benefits. Previous evaluations of German guarantee banks estimated macroeconomic and fiscal net benefits for shorter time periods and Germany at a national level (Schmidt and Elkan 2006, 2010, Brautzsch et al. 2015) or quantified only microeconomic benefits for enterprises and banks in single federal states (Kramer 2008, Neuberger and Räthke 2008, Althammer et al. 2011, Valentin and Henschel 2013, BMWT 2010). We find that the guarantee banks provide a high added value by extending credit availability and investment activity among SMEs and start-ups. The economic benefits through increased production and employment are considerable, while the economic costs are negligible. The real GDP increases by about 1.2 euro per euro guarantee each year. In the years 2008 to 2014, there were net fiscal gains of several hundred million euros in the respective federal states.

¹ Situated in the federal states Berlin, Brandenburg, Mecklenburg Western Pomerania, Saxony-Anhalt and Thuringia.

The paper is structured as follows. Section 2 discusses the economic rationale of guarantee banks, and section 3 reviews the empirical literature on their effectiveness. Section 4 presents descriptive statistics about the guarantee banks' activities. Section 5 shows the results of own surveys of enterprises and banks. On their basis and deploying multipliers from macroeconomic models we estimate the economic and fiscal net benefits of the five guarantee banks in Section 6. Section 7 concludes.

2. The economic rationale of guarantee banks

State-backed loan and equity guarantee programs may be justified by market failure in financing SMEs and start-ups, which do not have access to external funds because of lacking equity capital or collateral and high information asymmetry. Credit rationing may be prevented by collateral, which serves both *ex post* as a buffer against default risk and *ex ante* as a signaling or sorting device (Berger et al., 2011a,b). Credit guarantees schemes may increase economic welfare through four channels: (1) By correcting information-based market failure they help to increase credit availability and information, which may kick-start SME lending. (2) They may exploit positive externalities from the entrepreneurial dynamism of under-resourced entrepreneurs. (3) They may correct for unequally distributed endowments, since lack of collateral is most acute for low wealth individuals and poorer geographical areas. (4) They may offset a credit crunch (Honohan 2010).

State-backed credit guarantee schemes are more efficient than investment subsidies, grants or state-backed investment loans. Since they do not subsidize prices or volumes, they are less distortionary and more market-conform. Based on the subsidiarity principle, only those investment projects shall be supported, which would not have been realized without guarantees because of lacking collateral (Schiereck 2002, Saldana 2000). By guaranteeing only part of the credit risk, state-backed credit guarantee schemes do not eliminate the banks' incentives to screen and monitor borrowers. Adverse incentive effects and windfall gains are minimized by joint liability of profit-maximizing banks, where guarantee banks increase operational efficiency by specializing on assessing creditworthiness of rationed borrowers without collateral (Honohan 2010). Financial strain on the government budget remains low, because payments are only necessary if the guarantee becomes due, while costs of information and administration are born by the private sector (banks and guarantee banks). Theoretical literature shows that state-backed credit guarantees are more effective and less costly instruments to provide access to external finance than direct loans or loan subsidies provided by the state (Arping et al. 2010).

Today, credit guarantee programs backed by the state are not only the most widely used instrument to foster SME finance in OECD countries, but are also increasingly used in non-OECD countries (Schich und Kim 2011, Uesugi et al. 2010, OECD 2012). The different schemes can be categorized into three types (OECD 2012; Beck et al 2010): (1) public schemes, which are generally managed by government related agencies, while credit risk assessment, management and loss recovery are mostly in the hand of private institutions, (2) public-private schemes, either in the form of public financial institutions with minority stakes of private enterprises or private institutions with minority stakes of public entities, (3) private schemes, either directly through mutual guarantee schemes or indirectly through guarantee banks, both usually backed by state counter-guarantees. Such counter-guarantees are necessary because of a coordination failure of private institutions in providing private guarantee funds (Anginer et al. 2014).

The German guarantee banks („Bürgschaftsbanken“) fall under category (3). As the mutual guarantee associations of e.g. Italy and Spain, they exploit the local knowledge of decentralized organizations. Social benefits of guarantee banks may arise from improved information result-

ing from specialization advantages in credit assessments of local borrowers (Langer und Schiereck 2002). These information advantages get even more important when ‘normal’ banks retreat from relationship lending or when the lending relationship is less intense (Bigus et al. 2004). Guarantee banks with local knowledge may also compensate disadvantages of enterprises in peripheral regions. Procyclical lending of ‘normal’ banks may be compensated by extending guarantees in times of recessions, when the value of collateral and the banks’ willingness to lend are usually low.

3. Overview of the empirical literature

In the empirical literature, the economic value of guarantee banks is usually measured by finance additionality, i.e. benefits from additional finance (e.g. increase in credit availability, access to cheaper loans, faster loan provision, build-up of a lending relationship) and project additionality, i.e. additional investments, which would not have been possible or would have been possible to a smaller degree without the guarantee. The additional benefit exceeds the guaranteed loan volume, if the provision of the loan guarantee enables additional non-guaranteed finance, or if the investments thus brought about will kick multiplier or spillover effects on entrepreneurial activities, without replacing productive firms without such guarantees (Honohan 2010). To estimate the net benefit of guarantee banks, the additional benefits have to be confronted with the costs of administration and default. Most previous studies are based on qualitative data from surveys of enterprises or banks, while only few use quantitative bank data to compare firms with and without credit guarantees. Because of missing data, often only additional employment is contrasted with the default rate (Samuji et al. 2012).

3.1 Evidence for Germany

Table 1 presents an overview of previous studies about the effectiveness of German guarantee banks.

Schmidt and Elkan (2006) used data from guarantee banks and own surveys of enterprises and banks for the whole of Germany to estimate the social benefits of guarantee banks by a macroeconomic simulation model. They find high finance and project additionality. 60% of the supported enterprises indicated that without the loan guarantee they would not have obtained a loan, and 40% indicated that they would have obtained a loan at significantly higher interest rates. The lending banks indicated that even 82% of the loans to established enterprises and 95% of the loans to start-ups would not have been granted without the guarantee. 43% of them agreed to a large or very large extent that their information about borrowers or investment projects improved through the credit assessment provided by the guarantee banks. For the majority (90%) of the enterprises, the guarantee affected the volume or time of investment. Without the guarantee, at nearly two thirds of the supported established enterprises the investment would not have been realized at all, and at 22% of them it would have been realized to a smaller extent. 72% of the investments by start-ups would not have been realized without the guarantee. Start-ups supported by guarantee banks showed above average survival rates, which is explained by the guarantee banks’ intensive credit assessment. 60% of the enterprises indicated that employment increased through the guarantee. On average, each loan or equity guarantee created 5 new jobs and saved 2.5 jobs. For the scenario that 75% of the additional investments resulted from the guarantee banks, the macroeconomic simulation model showed that per million euro guarantees each year, investments were increased by 2.14 million euro, GDP by 3.2 million euro and the state budget by 0.65 million euro, while nearly 13 jobs were created each year. The additional government expenses through due guarantees were overcompensated by increased tax income and reduced expenses for social transfers. (Schmidt and Elkan 2006, Althammer et al. 2011).

Table 1: Previous studies on the effectiveness of German guarantee banks

| Authors (region) | Finance additinality | Project additinality | Economic and fiscal benefits |
|------------------------------|--|--|--|
| Schmidt and Elkan (2006) | 60-82% (95%) additional loans to SMEs (start-ups), 43% additional information | 67% (72%) additional investments at SMEs (start-ups), 60% additional jobs, 5 new jobs and 2.5 saved jobs per guarantee | Multipliers per million euro guarantees, scenario 75% project additinality: investments: 2.14, GDP: 3.2, state budget: 0.65, jobs: 12.66 |
| Schmidt and Elkan (2010) | | 71% (60%) additional investments at SMEs (start-ups), 31% additional sales | Growth of GDP, employment, state budget (7 times the costs of counter-guarantees) |
| Neuberger and Räthke (2008) | 50% add. loans, 23% higher loan volume, 9% lower loan rates, 16% higher loan volume and lower loan rates | 61% additional sales | |
| Kramer (2008) | Credit institutions: 67% additional security during credit assessment, 33% additional information | | per million euro counter-guarantee: 64.1 million euro additional investments, 2.000 additional or saved jobs |
| Althammer et al. (2011) | 67% additional loans, lower loan rates | 100% additional start-ups | Growth of GDP and employment |
| Valentin and Henschel (2013) | 68% add. loans, 68% more regular information, 49% add. information, 43% more intensive lending relation | | |
| BMWT (2010) | 90% better loan access during crisis, lower loan rates | | |
| Brautzsch et al. (2015) | | | GDP-multiplier: 1.3-1.5 |

A similar study in 2009 showed an even higher net benefit of German guarantee banks after the global financial crisis. 71% (60%) of additional investments at established enterprises (start-ups) were realized by loan or equity guarantees, and 31% of annual sales would not have been realized without these guarantees. A permanent provision of these guarantees in the period 2009-2015 increased GDP and employment such that the increase in the state budget exceeded 7 times the costs of counter-guarantees (Schmidt und Elkan 2010).

A survey of enterprises supported by the guarantee bank of Mecklenburg Pomerania until 2007 also found high finance and project additinality. Without the loan guarantee, 50% of the firms would not have obtained a loan, 23% would have obtained a smaller loan, 9% would have obtained a loan at a higher interest rate, and 16% would have obtained a smaller loan at a higher interest rate. 71% of the firms experienced better access to loans and 32% access at lower prices after the guarantee. 61% of the respondents reported additional sales through the

guarantee. 59% of the firms gained market shares on their sales markets (Neuberger and Räthke-Döppner 2008).

Kramer (2008) conducted surveys of supported enterprises and lending banks in Brandenburg and Berlin. Two thirds of the credit institutions gained additional security and one third of them gained additional information through the second credit assessment provided by the guarantee bank. Under the assumption that the investments of the supported enterprises would not have been realized without the guarantees, each million euro counter-guarantee brought about 64.1 million euro additional investments, and 2.000 additional or saved jobs.

Althammer et al. (2011) examined effects of the guarantee bank in Saxony. Expert interviews with the lending banks showed that two thirds of the loans would not have been granted without the guarantee and that loan rates declined by the guarantee. The credit institutions confirmed the high competency of the guarantee bank, but less that they gained additional information. 100% of the additional start-ups would not have been realized without the support by the guarantee bank. Estimations based on the investment and GDP multipliers found by Schmidt und Elkan (2006) showed positive effects of the guarantee bank on GDP Growth and employment in Saxony.

Also a survey of firms that were supported by the guarantee bank of Hesse in the period 2003-2008 found high finance and project additioality. For 68% of the enterprises, the loan guarantee was important or very important to obtain a bank loan. Also the information flow and the lending relationship between banks and borrowers improved through the guarantees. 68% of the enterprises provided more regular information, and 49% provided additional information to the lender, while 43% confirmed that the lending relationship got more intensive. The improved information flow was reported mainly by those firms for which the guarantee was important for gaining loan access. This indicates that guarantees gave the initial spark for the development of lending relationships with learning to reduce information asymmetries. Most of the firms for which the guarantee was important to gain loan access did not need further support after the guarantee (Valentin und Henschel 2013).

In March 2009, the German credit guarantee program was temporarily extended until end of 2010 to foster credit availability for SMEs during the crisis.² An evaluation of this extension showed that loan guarantees of guarantee banks were often without alternative for the financing of SMEs (BMWT 2010, p.3). 90% of the surveyed partners (credit institutions, chambers of commerce, guarantee banks) agreed that the guarantee program was important or very important for improving SMEs' loan access during the crisis. With risk-adjusted interest rates and risk-independent guarantee fees, particularly enterprises with poor creditworthiness profited from lower loan rates. During the crisis, guarantee banks fulfilled their task to bear higher credit risks (BMWT 2010).

A further study found that the government measures to support the German economy including the extended guarantee program in 2008 and 2009 had positive macroeconomic and fiscal effects. The initial GDP-multiplier was estimated at 1.3-1.5, which could be explained to a large extent by the guarantee program (Brautzsch et al. 2015, p. 103).

² The target group was extended from sound firms to firms in difficulties, the maximum coverage ratio was increased from 80% to 90%, the guarantee ratio covered by the state was increased from 65% to 80% in the "old" federal states and from 80% to 90% in the "new" federal states, the guarantee volume was increased from 1 million Euro to 2 million Euro, and the decision paths were shortened.

3.2 Evidence for other countries

A large international literature shows the effectiveness of state-backed loan guarantee programs in fostering access of SMEs to finance and overcoming financial crises. Credit institutions agree that such programs are more effective than subsidizing loans or investments (Beck et al. 2010, Zia, 2008). Table 3 summarizes the results of recent studies on the effectiveness of loan guarantee programs for SMEs in countries other than Germany. It shows that the coverage ratio of loan guarantees backed by the state varies between 70 and 90%. The median ratio around the world is 80% (Beck et al. 2010), which corresponds to the maximum coverage ratio in Germany.

For the privately organized Mutual Guarantee Institutions with state support in Italy (Confidi) it was shown that during the financial crisis 2007-2009, firms with guarantees had easier access to loans than those without guarantees, in particular in cases with short lending relationships. This indicates an additional benefit through improved information of the Mutual Guarantee Institutions (Bartoli et al. 2013). Small enterprises which were members of a Mutual Guarantee Institution had to pay lower loan rates for non-guaranteed loans compared to similar enterprises outside such institutions. Banks benefit from the search for information and provision of guarantees by such institutions, indicating that private guarantee institutions are superior to banks in the credit assessment and monitoring of opaque borrowers (Columba et al. 2010). Also for an Italian public guarantee program (SGS) for SMEs, which do not have to be members of a mutual guarantee fund, positive effects were shown. A comparison of enterprises with and without guarantees showed that the guarantees increased access to credit and reduced lending rates. The failure rate of the guaranteed loans was lower than the credit loss rate in the average of the Italian banking system (Zecchini and Ventura 2009). The effectiveness of this guarantee scheme depends on the amount of the guarantee rate, which should not be lower than a minimum threshold (Boschi et al. 2014). An evaluation of the Italian public guarantee system Fondo di Garanzia (FG), which uses a scoring system to identify eligible firms showed a positive effect on credit availability, but no effect on loan rates. Guaranteed loans were mostly used to finance working capital and defaulted more often than unguaranteed ones (De Blasio et al. 2017).

An evaluation of the private loan guarantee system with mutual guarantee societies in Spain (CERSA) compared enterprises with guarantees to those supported by soft loans for investment and those that were not supported. Guarantees improved especially the access to credit of the weakest companies with little equity and high financing costs, but could not reduce their financing costs. Promoted were the most efficient companies, which indicates benefits of a private credit assessment (García Tabuenca and Crespo Espert 2010).

For a public-private guarantee scheme (SOFARIS) in France, a high added value could be shown up by promoting business start-ups. Enterprises supported by this program received more external financing, paid lower loan rates and grew faster than non-supported companies with similar characteristics. However, assisted enterprises had higher failure rates than non-assisted (Lelarge et al. 2010).

Studies for the United Kingdom, which are based on extensive surveys of funded and non-funded SMEs, have shown a high added value and a high cost effectiveness of State SFLG (Small Firms Loan Guarantee) and EFG (Enterprise Finance Guarantee) programs (Cowling 2010a, 2010b, Allinson et al. 2013). In the current EFG program ongoing since 2009, more than 83% of the companies confirmed that they would not have received a loan without the guarantee. In the previous SFLG programs of 2006 and 1999, this proportion was 76% and 70%, respectively. The credit crunch following the financial crisis in 2009 led to a much higher use of government guarantees. A comparison of companies with and without guarantees, which have similar characteristics shows that the growth rates of turnover and employment

hardly differ. Thus, impediments to growth of credit rationed firms could be successfully eliminated. Two to three years after receiving the guarantee 0.96 jobs could be created and 1.84 jobs could be maintained per company. A macroeconomic and fiscal cost-benefit analysis showed a positive net benefit for the economy as well as for the State. The estimated benefit cost ratio reached 7.1 for the economy as a whole and 16.4 for the State, making it higher than at other State programs. For a longer time period the net benefit is even higher, as the probability of default decreases after the first three years, while the economic benefit is lasting for many years (Allinson et al. 2013). For the SFLG, the additional benefit was particularly high for disadvantaged groups, such as businesses in economically weak regions and entrepreneurs with a migration background (Cowling 2010a).

In Canada, the promotion of SMEs through Government guarantees (SBLA, Small Business Loan Act) had an additional benefit by improving access to credit and creating additional jobs. A comparison of funded with non-funded companies showed significant differences between the growth rates of employment. With low cost (\$2,000) per job, the guarantee scheme turned out to be extremely efficient and more efficient than any other employment creating program (Riding und Haines 2001, Riding et al. 2006). However, an increase in the guaranteed coverage led to a reduction in loan rates only for working capital loans rather than investment loans (Ughetto et al. 2017).

In the United States, loans to SMEs guaranteed through the U.S. Small Business Administration (SBA) in the period 1990-2000 increased the overall economic growth rate, employment, wages and salaries and were less affected by equity capital shortages at banks compared to not guaranteed loans. The State guarantees helped to stabilize the macro-economic development by counteracting the decline in bank lending as a result of recessions or equity capital losses (Hancock et al. 2007). Additional jobs could be created especially in low-income regions (Craig et al. 2008).

A study on the effectiveness of a comprehensive Government guarantee program in Japan (SCG, Special Credit Guarantee Program for Financial Stability) found that SMEs which have been promoted by Government guarantees over the years 1998-2001 were given better access to credit. However, only those companies' profitability could be raised that already had plenty of equity, which indicates windfall effects. Particularly equity-weak big banks took advantage of the guarantee program to reduce their credit risk by guaranteeing loans that they would have granted anyway. As the banks were secured completely (guarantee rate 100% of the credit volume), they had no incentive to select and monitor borrowers carefully (Uesugi et al. 2010). Because of this experience, the guarantee coverage ratio was reduced to 80% recently (Yoshino und Taghizadeh-Hesary 2016).

For two State guarantee schemes in Korea (KODIT Korea Credit Guarantee Fund, KOTEC Korea Technology Finance Corporation Act) an additional benefit was demonstrated by removal of credit rationing and increased sales and productivity growth, but not employment growth (Kang and Heshmati 2008).

Also the Government guarantee scheme for SMEs (Fogape) in Chile has proved to increase access to credit. A dollar loan guarantee increased lending by 0.65 dollar, however the guaranteed loans defaulted more frequently (Cowan et al. 2015). Supported enterprises could achieve higher sales and profit growth as not supported. The failure rates were no higher than the average for the banking sector, and the revenue from the guarantee fee (one or two per cent of the guarantee, paid by the borrower) covered the payments (Larraín and Quiroz 2006). This success is attributed among others to the credit assessment in the hands of private banks which will be excluded from future guarantees in the case of too high failure rates.

Table 2: Effectiveness of small business loan guarantee programs in countries other than Germany

| Authors | Country | Guarantee scheme (type, coverage ratio) | Effects |
|---|---------|--|--|
| Bartloli et al. (2013), Columba et al. (2010), Zecchini and Ventura (2009), Boschi et al. (2014), De Blasio et al. (2017) | Italy | Confidi (private, min. 50%), SGS (public, max. 80%, counter-guarantee max. 90%); FG (public) | Better credit access (Confidi, SGS, FG), better information (Confidi), lower loan rates (Confidi, SGS), below average default rate (SGS), higher default rate (FG) |
| Garcia-Tabuenca and Crespo-Espert (2010) | Spain | CERSA (private, 100%, counter-guarantee 30-75%) | Better credit access for the weakest firms, support of the most efficient firms |
| Lelarge et al. (2010) | France | SOFARIS (mixed, max. 70%) | Better credit access, lower loan rates, higher sales and employment growth, but higher default rates at supported firms |
| Cowling (2010a, 2010b), Allison et al. (2013), Ughetto et al. (2017) | UK | SFLG, EFG, (public, 75%) | Better credit access, finance additionality up to 83%, reduction of growth barriers, job creation and maintenance, lower loan rates for working capital loans |
| Riding and Haines (2001), Riding et al. (2006) | Canada | SBLA (public, max. 90%) | Better credit access, creation of new jobs, low costs per additional job, positive and increasing net benefit for economy and state, benefit-cost ratio: 7.1 for the economy, 16.4 for the state |
| Hancock et al. (2007), Craig et al. (2008) | USA | SBA (public, 90%) | Higher economic growth, employment, wages, higher stabilization of the economy, additional jobs mainly in low-income regions |
| Uesugi et al. (2010), Yoshino and Taghizadeh-Hesary (2016) | Japan | SCG (public, 100%, today: 80%) | Better credit access, but windfall gains because of full coverage of credit risk |
| Kang and Heshmati (2008) | Korea | KODIT (public, 85%), KOTEC (public) | Better credit access, higher sales and productivity growth |
| Cowan et al. (2015), Larraín and Quiroz (2006) | Chile | Fogape (public, max. 80%) | Better credit access, higher sales and profits, costs covered by revenues |

4. Descriptive statistics about guarantees granted

To measure the activities of the guarantee banks we use data about granted guarantees, firm and loan characteristics from 5 (out of 6) guarantee banks in East Germany: Berlin, Brandenburg, Mecklenburg-Western Pomerania, Saxony-Anhalt, and Thuringia from January 1991 until November 2015.

Table 3 shows the mean, median and maximum volumes of loan and equity guarantees, as well as loans and equity investments. In total, loan and equity guarantees amounting to seven billion euros allowed for loans and investments amounting to nine billion euros. The volumes vary between the five states. The largest guarantee as a whole has been granted with around two million euros in Thuringia, the largest single loan was 4.1 million euros in Berlin. On average 78% of the loan or equity volume was covered by loan or equity guarantees.

Table 3: *Loan and equity guarantees, loans and equity holdings (volumes), 01/1991-11/2015*

| Federal state | Loan and equity guarantees | | | | Loans and equity investments | | | | Vol. of loan and equity guarantees / Vol. of loans and equity |
|---------------|----------------------------|------------------|--------|-------|------------------------------|------------------|--------|-------|---|
| | Vol. | Mean | Median | Max. | Vol. | Mean | Median | Max. | |
| | in Mio. euro | in thousand euro | | | in Mio. euro | in thousand euro | | | |
| Total | 6,997 | 120 | 67 | 2,045 | 8,975 | 154 | 87 | 4,090 | 78% |
| Berlin | 1,114 | 127 | 76 | 2,000 | 1,481 | 168 | 100 | 4,090 | 75% |
| Brandenburg | 1,508 | 99 | 48 | 1,760 | 1,951 | 128 | 61 | 3,000 | 77% |
| Meckl.-W.P. | 1,175 | 144 | 92 | 1,396 | 1,491 | 182 | 118 | 1,745 | 79% |
| Saxony-Anh. | 1,511 | 166 | 98 | 2,000 | 1,912 | 210 | 124 | 3,605 | 79% |
| Thuringia | 1,689 | 99 | 49 | 2,045 | 2,141 | 126 | 62 | 2,700 | 79% |

Source: Data of guarantee banks, own calculations.

The Federal Government took over a share of around 48%, and the individual states of about 32%. The remaining 20% are covered by the guarantee banks. In the wake of the financial crisis, the share of the Federal Government increased to 60% for the benefit of the guarantee banks. In recent years, the guarantee banks assumed a higher proportion around 26% while the shares of both the Federal Government and the states fell by around 3%. The majority of contracts are attributable to the regional savings banks (32%) and cooperative banks (29%), followed by the big private banks Deutsche Bank (11%) and Commerzbank (11%).

Table 4 shows that of around nine billion euros of loans around 6.8 billion were used for investments. The proportion of investment credits to total credits is 76% on average, and ranges between 75% and 79%.

Table 4: *Credit volume and purpose per federal state in million euro*

| Federal state | no investment credit | Investment credit | Total | Share investment credits |
|---------------|----------------------|-------------------|-------|--------------------------|
| Total | 2,121 | 6,855 | 8,976 | 76% |
| Berlin | 346 | 1,135 | 1,481 | 77% |
| Brandenburg | 493 | 1,458 | 1,951 | 75% |
| Meckl.-W.P. | 341 | 1,150 | 1,491 | 77% |
| Saxony-Anhalt | 407 | 1,505 | 1,912 | 79% |
| Thuringia | 534 | 1,607 | 2,141 | 75% |

Source: Data of guarantee banks, own calculations.

On average, about one third of the loans were used for financing start-ups, and two thirds for financing established enterprises or take-overs. Table 5 shows the respective shares in the five federal states.

Table 5: *Kind of enterprises supported (in%)*

| Firm type | Berlin | Brandenburg | Meckl.-W.P. | Saxony-Anhalt | Thuringia |
|-------------------------|--------|-------------|-------------|---------------|-----------|
| Established enterprises | 51 | 58 | 59 | 64 | 47 |
| Start-ups | 31 | 31 | 38 | 29 | 36 |
| Take-overs | 18 | 10 | 3 | 7 | 17 |

Source: Data of guarantee banks, own calculations.

Guarantees were provided mainly to firms in the craft sector, followed by retail trade and manufacturing. The majority of supported firms are micro and small firms. The median firm size is 10 employees and 1.4 million euro sales.

Table 6 shows the total number of jobs created and secured by the loan and equity guarantees. Due to the large outliers, the mean values are not very meaningful. With regard to the median, one to two jobs were created and three to five jobs were secured per company. In total, 174,700 jobs were created and 500,800 jobs were secured.

Table 6: Newly created and secured jobs

| Federal state | New jobs | | | Secured jobs | | | New and secured |
|---------------|----------|--------|---------|--------------|---------|---------|-----------------|
| | Mean | Median | Total | Mean | Medi-an | Total | |
| Total | 4.4 | 1 | 174,657 | 12.5 | 3 | 500,799 | 675,456 |
| Berlin | 3.5 | 2 | 26,545 | 11.9 | 4 | 90,516 | 117,061 |
| Brandenburg | 4 | 2 | 31,683 | 12 | 3 | 94,372 | 126,055 |
| Meckl.-W.P. | 4.1 | 1 | 29,086 | 10.2 | 2 | 72,813 | 101,899 |
| Saxony-Anhalt | 3.4 | 1 | 28,658 | 15.5 | 5 | 129,821 | 158,479 |
| Thuringia | 6.5 | 1 | 58,685 | 12.5 | 3 | 113,277 | 171,962 |

Source: Data of guarantee banks, own calculations.

In total, 12% of the guaranteed credit volume failed. The failure rate ranged from 8% in Brandenburg to 16% in Mecklenburg-Western Pomerania.

5. Survey results

5.1 Enterprise survey

To assess finance and project additionality, we use results from a survey of supported enterprises. In February 2016, 1,216 companies, which had received a loan or equity guarantee by the guarantee bank Mecklenburg-Western Pomerania were requested to complete an electronic questionnaire. 70 companies participated in the survey. 96% of them have already obtained a loan guarantee and 12% an equity guarantee. Approximately three quarters of these guarantees have been awarded since 2011. 81% of the companies have received a single loan guarantee, 15% two and 4% (two companies) more than two. Of the eight companies to which an equity guarantee has been granted, six have received only one such guarantee and two received two.

All enterprises are SMEs with fewer than 250 employees, the majority of which are micro and small enterprises with fewer than 50 employees. The share of micro-enterprises has declined from 51% in the year of the investment to 40% in the last financial year. This indicates that the subsidized companies have recruited additional staff. The high proportion of small enterprises corresponds to the above-average share of small enterprises in Mecklenburg-Western Pomerania compared to the federal average (Hebebrand et al. 2017).

65% of the guaranteed loans were investment loans with an average maturity of twelve years, and 34% were operating loans with an average maturity of 7.9 years. 42% of the investment loans were used for the construction of new facilities and 28% for the capacity expansion of an existing plant. 85.6% of the investments were done within the federal state, 13.6% in other federal states and only 0.8% abroad.

Regarding finance additionality, without the guarantee 59% of the firms would not have obtained a loan, which is higher than the 50% found in a previous survey of enterprises in Mecklenburg-Western Pomerania (Neuberger and Räthke-Döppner 2008). 19% of the enterprises would have obtained a smaller loan at a higher loan rate, 6% would have obtained the same loan at a higher loan rate, and 15% would have obtained a smaller loan. After having obtained the guarantee, 84% of the firms got easier access to loans, and 57% got cheaper loans.

Since the year of the supported investment, the number of full-time jobs increased by 24%, sales by 32%, and equity/total assets more than doubled from 9% to 18.8%. Regarding project additionality, more than 70% of the firms reported that the sales growth was due to the guarantee. This percentage is again higher than previously found (61%) for Mecklenburg-Western

Pomerania (Neuberger and Rähke-Döppner 2008). Among the surveyed companies, a large part of the market share on their sales markets increased from the year of the project to the last financial year. 40% of companies surveyed indicated that competition in the sales markets got stronger, 3% that it had weakened, and the majority of companies (57%) said that the competitive pressure remained roughly the same.

5.2 Bank survey

To measure finance additionality and possible windfall gains we use results from a survey of credit granting banks in the five federal states. Around 1,000 bank officers were asked about their experience with individual loans or participations. The questionnaire has been filled by 111 bank officers. The bulk of responding financial institutions are savings banks (48%), followed by private banks (29%), cooperative banks (19%) and other financial institutions (4%). Each question should be answered for the cases that the customer is either an established company or a start-up.

96% respectively 81% of the bank officers answered that they worked regularly or sporadically with the guarantee bank in the case of established companies, respectively start-ups. When asked whether the loan could be granted only on the basis of cooperation with the guarantee bank, 63% of the respondents indicated that this was the case when the company was an established company. For start-ups, this figure rises to 89%. These results indicate that in particular in the case of incumbent companies as customers, there seem to be some windfall gains, as in 37% of the cases the loan would have been granted anyway. In the case of start-ups, this applies only to 11% of the cases.

In addition, the bank officers should provide information on how the interest rate and the credit volume have changed as a result of the involvement of the guarantee bank. For established companies, the interest rate has fallen in 85% of cases, for start-ups in 78% of cases. The credit volume, on the other hand, appears to be relatively independent of the guarantee. In three out of four cases, the volume has remained the same, while it increased only in one of four cases. A reduction in the volume of credit after receipt of the guarantee is an exception. These results are independent of whether the customer is an established company or a founder.

As to the question whether the bank officers received new information about the borrower through the creditworthiness check of the guarantee bank, only 35% respectively 36% answered that this was the case with established companies respectively start-ups.

6. Economic costs and benefits

In this chapter, the macroeconomic costs and benefits of guarantee banks are compared. The benefits stem, as explained above, from overcoming credit rationing which enables additional productive investments which, in turn, lead to higher production and employment. Potential economic costs are incurred by state-subsidized mal-investments that lead to credit defaults and thus a recourse of the guarantee. Moreover, supporting individual firms might distort competition to the detriment of the not supported companies. However, the following analyses show that they are, if incurred at all, negligible. In contrast, the economic benefits in terms of increased production and employment are substantial.

6.1 Macroeconomic benefits

The first step to estimate the economic benefits is to assess the size of the impulse on investments generated by guarantees.³ Simply applying the sum of the guarantee falls short for several reasons. For one, the guarantee covers only a fraction of the overall credit. Data from the German guarantee banks shows that, on average, only between 75% and 79% of the credit is guaranteed (Table 3). Moreover, we need to add the non-guaranteed share of the credit which is also used for investing. Own funds of the investor, however, do not need to be added as they would be available without the guarantee as well.

Windfall effects on the other hand mitigate the impulse.⁴ If loans would have been extended even without guarantees, the guarantees do not initiate additional investments. In that case, the default risk would simply be transferred to the guarantee banks and public budgets. The results of our firm survey in Mecklenburg-Western Pomerania point towards significant windfall effects. While 59% of firms responded that they would not have been able to obtain a loan without the guarantee, the remaining 41% expected that they would have gotten the loan even without the guarantee, however, often associated with higher interest rates. That result fits to the results of an earlier, nationwide survey by Schmidt and Elkan (2006), where 60% of the companies responded that they would not have been able to obtain a loan without the guarantee. However, our survey among banks points towards lower windfall effects. For credits to established companies, 37% of the banks responded with “Yes” to the question if they would have extended the loan without the guarantee. For credits to start-ups, merely 11% of the banks would have handed out the loan. Given the shares of start-ups and established companies according to Table 5, the share of windfall effects ranges between 25 and 28% (Table 8). Schmidt and Elkan (2006) found even lower windfall in their nation-wide survey among banks of merely 18%. Due to the fact that the banks are the ones who decide, they, in our view, can better assess the hypothetical question whether they would have extended the loan even without a guarantee rather than the companies who received the guaranteed credit. Hence, for the following analysis we assume windfall effects according to Table 8.

Taking all discussed effects into account, we calculate the impulse of guarantees on investments as the overall credit sum less the windfall effect. Thus, between 72 and 75% of the credit sum initiates additional investments. This calculation equals the approach of Brautzsch et al. (2015). Schmidt and Elkan (2006) calculated a similarly high effect on investments of 75% of the credit sum.

In the following we use the impulse to estimate the macroeconomic effects on production and employment. The overall effect is not limited to the initial effects on the investments and turnovers⁵ of the companies benefitting from the guarantee. Owing to spillover, feedback and income effects, the initial impulse will trigger further economic activities, for instance, additional investments at external suppliers. Moreover, the additional investments render extra income for company owners and employees that generate additional demand for various goods and services that generate additional production, employment and income of their own.

³ In our study, we do not differentiate between various forms of credits and guarantees. We assume that they, directly or indirectly, equally stimulate investments (see also Brautzsch et al. 2015, p. 58).

⁴ Note: For the costs and benefits analysis we use averages of the survey over all federal states because the sample sizes for the individual states are too small.

⁵ The results of our firm survey indicate considerable positive effects on the turnover of the firms that received a guarantee credit. Of all responding companies 88.9% replied that their revenues increased after they invested. 71% of the companies link that directly or at least partially to the investment financed by the guaranteed credit. On average their turnover increased by a factor of 1.5 in the first year after the investment and by a factor of 2 in the last year.

This process continues over time, however it weakens and eventually vanishes because some of the additional income will be saved or used for imported goods. In the economic literature the described process is known as the multiplier effect. Usually, it is differentiated between the simple multiplier and the cumulated multiplier. The former describes the effect on production in a certain period of time, for instance in the first year after the initial impulse (often referred to as the impact multiplier). The latter describes the overall effect since the initial impulse until a certain point in time, for instance the combined effect in the first 5 years. Hence, the cumulated multiplier is the sum of the simple multipliers (Splimbergo et al. (2009) and Gechert and Will (2012)).

Table 7: Cumulated multipliers of real GDP

| Year | D*-Model | IWH-Model | INFORGE | Model-Average |
|------|----------|-----------|---------|---------------|
| 1 | 1.3 | 1.5 | 1.1 | 1.3 |
| 2 | 1.5 | 1.8 | 1.3 | 1.5 |
| 3 | 1.6 | 1.5 | 1.3 | 1.5 |
| 4 | 1.6 | 1.0 | 1.4 | 1.4 |
| 5 | 1.5 | 0.8 | 1.5 | 1.3 |
| 6 | 1.3 | 0.5 | 1.5 | 1.1 |
| 7 | 1.1 | 0.3 | 1.4 | 0.9 |

Source: Brautzsch et al. (2015), Schmidt and Elkan (2006), Own table and calculations.

In order to estimate the multiplier, we need a macroeconomic model that takes the spillover, feedback and income effects into account. To isolate the effect of the guarantees we need to simulate two different scenarios, one with (alternative scenario) and one without the impulse on investments initiated by the credit guarantees (base scenario). The multiplier can be calculated by comparing both scenarios, i.e. it is the factor to which the GDP in the alternative scenario exceeds the GDP in the base scenario. In this study, we do not dispose of our own macroeconomic model to estimate the multiplier; we use multiplier estimates of earlier studies instead. Brautzsch et al. (2015) use two different macroeconomic models for Germany as a whole (D*-Model and IWH-Model) to estimate the effects of the temporarily expanded credit guarantee program that was part of Germany's fiscal stimulus program in response to the great recession 2008 and 2009. Schmidt and Elkan (2006) utilized another model (INFORGE-Modell) to estimate the macroeconomic effects of German guarantee banks⁶. The parameters

⁶ Brautzsch et al. (2015) use two structural, dynamic, macroeconomic simultaneous equation models (D*-Model and IWH-Model). Hearts of these models are a combination of a demand side based on the final expenditures compilation of the national accounts and a neoclassical supply side based on a Cobb-Douglas type production function with technological progress. The long-term solution of the model is a neoclassical growth equilibrium (steady state) that is entirely determined by the growth of production factors and technological advancement. However, in the short-run, their production and price levels can diverge from the growth path because of changes in macroeconomic demand or supply owing to delayed price reactions. In the long-run, changes of relative prices ensure a return to the steady state growth path. The steady state growth path (also known as the production potential) is entirely exogenous in the IWH-Model. In the D*-Modell it is partially endogenous because the capital stock is incremented with the net-investments (Brautzsch et al. (2015), p. 15-16). The INFORGE model of Schmidt and Elkan (2006) belongs to the class of macroeconomic input-output models. INFORGE's main difference to the other models is that it explicitly models 59 interdependent sectors of the Germany economy while the D*-Model and IWH-Model only models the aggregated German economy. Furthermore, the INFORGE Model does not have an exogenous long-term steady state solution. Its long-term solution is the endogenous result of updating and aggregating its sectorial and macroeconomic values (Schmidt and Elkan (2006), p. 109-111).

of all three models are estimated using statistical data for Germany as a whole.⁷ The heterogeneity in the multiplier estimates of the models (Table 7) shows that there is considerable uncertainty about the size and timing of the multiplier. For instance, the multiplier of the IWH-Model is the highest in the first two years, but declines the fastest. By contrast, the INFORGE Modell exhibits the most persistence of the multipliers. Moreover, the medium to long run effects are very different. While all positive effects in the IWH-Modell vanish after eight years, the effects are more long-lasting in the D*-Model and INFORGE, but will eventually level out with the depreciation of the additional capital stock generated by the additional investments.⁸ In order to take the uncertainty about the multiplier into account, we use the average multiplier of all three models (Table 7) for the first seven years after the initial investment.

Table 8: Effect of an average guarantee on real GDP in federal states.

| | Berlin | Brandenburg | Mecklenburg-W. Pomerania | Saxony-Anhalt | Thuringia |
|---|---------|-------------|--------------------------|---------------|-----------|
| Share of windfall effects (in %) | 27.6 | 27.6 | 24.8 | 28.4 | 25.6 |
| Guarantee coverage ratio (in %) | 75.2 | 75.4 | 78.8 | 79.0 | 78.9 |
| Guarantee (in €) | 126,654 | 121,883 | 143,515 | 165,882 | 99,338 |
| Impulse on investments (in €) | 121,863 | 116,969 | 136,888 | 150,208 | 93,624 |
| Cumulated multiplier of real GDP | | | | | |
| 1 | 1.3 | 156,954 | 150,651 | 176,305 | 193,461 |
| 2 | 1.5 | 187,212 | 179,694 | 210,294 | 230,757 |
| 3 | 1.5 | 177,727 | 170,589 | 199,639 | 219,066 |
| 4 | 1.4 | 165,910 | 159,247 | 186,365 | 204,500 |
| 5 | 1.3 | 154,679 | 148,467 | 173,750 | 190,657 |
| 6 | 1.1 | 132,056 | 126,752 | 148,337 | 162,771 |
| 7 | 0.9 | 111,444 | 106,968 | 125,184 | 137,366 |
| Average effect per year (in €) | 155,140 | 148,910 | 174,268 | 191,225 | 119,190 |
| Average effect per year and euro guaranteed (in €) | 1.22 | 1.22 | 1.21 | 1.15 | 1.20 |

Note: Real GDP in 2008 Prices. Source: Data of the guarantee banks (1991-2015), Own table and calculations.

The calculations (Table 8) show that guarantees yield considerable positive effects on macroeconomic production levels. Per euro guarantee, the real GDP of a federal state increases between 1.15 and 1.22 euro. Given an average guarantee volume between 100,000 and 166,000 euro, depending on the federal state, real GDP increases between 117,000 and 191,000 euro per guarantee during the first seven years.

Applying these calculations⁹ to the annual guarantee sums (new business) of the guarantee banks between 2008 and 2014 (Table 9) shows considerable macroeconomic effects. The GDP level of the federal states increased between 296 and 560 million euro. The elevated GDP levels are the result of the accumulated effects of new credit guarantees in every year. Assuming the guarantee banks would have discontinued their business at the end of 2014, the positive effects would level out according to the operating life of the investment objects that were purchased with the guaranteed credit.

⁷ Using multiplier effects that were estimated for Germany as a whole for some of Germany's federal states makes the implicit assumption that their economies react in the same way to stimulated investments as the overall German economy. Thus, any potential specifics of the economies of these states are neglected.

⁸ In the D*-Model and INFORGE Model the additional investments lead to a temporarily higher capital stock and, hence, a temporarily higher production potential. In contrast, the production potential of the IWH-Model is fully exogenous.

⁹ This approach assumes a constant guarantee coverage ratio and a constant share of windfall effects according to Table 8. Data of the Association of German guarantee banks' annual reports show that the coverage ratio fluctuates only marginally between 2008 and 2014.

Table 9: Effects of guarantees banks on the real GDP of federal states 2008-2014

| | Berlin | | Brandenburg | | Mecklenburg-Western Pomerania | | Saxony-Anhalt | | Thuringia | |
|------|--|---|--|---|--|---|--|---|--|---|
| Year | Guarantee volume (new busin.) in million € | Cumulated effect on real GDP in million € | Guarantee volume (new busin.) in million € | Cumulated effect on real GDP in million € | Guarantee volume (new busin.) in million € | Cumulated effect on real GDP in million € | Guarantee volume (new busin.) in million € | Cumulated effect on real GDP in million € | Guarantee volume (new busin.) in million € | Cumulated effect on real GDP in million € |
| 2008 | 44 | 55 | 66 | 80 | 23 | 28 | 56 | 66 | 50 | 61 |
| 2009 | 54 | 132 | 67 | 176 | 28 | 68 | 64 | 153 | 64 | 150 |
| 2010 | 50 | 204 | 91 | 297 | 34 | 116 | 67 | 242 | 77 | 254 |
| 2011 | 46 | 265 | 63 | 384 | 38 | 166 | 65 | 323 | 53 | 328 |
| 2012 | 36 | 308 | 64 | 457 | 36 | 212 | 56 | 388 | 44 | 378 |
| 2013 | 49 | 356 | 63 | 518 | 39 | 255 | 52 | 436 | 46 | 419 |
| 2014 | 41 | 389 | 57 | 560 | 40 | 296 | 35 | 382 | 51 | 458 |

Note: Real GDP in 2008 Prices. Source: Data of the Association of German guarantee banks' annual reports (2008-2014), Own table and calculations.

The positive effects on production are associated with positive effects on employment. One way to estimate the employment effects would be to apply the employment effects of the macroeconomic models that were used before to estimate the multiplier. However, that would ignore the considerable differences in productivity between the federal states. Therefore, we estimate the employment effect by dividing the additional GDP (Table 9) by the GDP per employed person according to the national accounts of the federal states.¹⁰ Our calculations show that employment increased considerably (Table 10). In 2014, employment in Berlin increased by 6,000 persons, in Brandenburg by 9,500, in Mecklenburg-Western Pomerania by 5,500, in Saxony-Anhalt by 6,900 and in Thuringia by 8,200 persons.

Table 10: Effects of guarantees on employment in federal states 2008-2014

| | Berlin | | Brandenburg | | Mecklenburg-Western Pomerania | | Saxony-Anhalt | | Thuringia | |
|------|--|----------------------|--|----------------------|--|----------------------|--|----------------------|--|----------------------|
| Year | Real GDP per employed person in thousand € | Employment (persons) | Real GDP per employed person in thousand € | Employment (persons) | Real GDP per employed person in thousand € | Employment (persons) | Real GDP per employed person in thousand € | Employment (persons) | Real GDP per employed person in thousand € | Employment (persons) |
| 2008 | 60 | 904 | 52 | 1,552 | 46 | 618 | 49 | 1,330 | 45 | 1,337 |
| 2009 | 58 | 2,294 | 48 | 3,684 | 45 | 1,536 | 45 | 3,418 | 42 | 3,575 |
| 2010 | 61 | 3,377 | 51 | 5,826 | 46 | 2,502 | 49 | 4,899 | 46 | 5,559 |
| 2011 | 64 | 4,132 | 53 | 7,267 | 50 | 3,322 | 50 | 6,473 | 50 | 6,581 |
| 2012 | 62 | 4,951 | 54 | 8,501 | 51 | 4,176 | 53 | 7,335 | 50 | 7,532 |
| 2013 | 62 | 5,734 | 56 | 9,208 | 53 | 4,847 | 54 | 8,034 | 53 | 7,883 |
| 2014 | 64 | 6,122 | 59 | 9,510 | 54 | 5,513 | 55 | 6,911 | 56 | 8,245 |

Note: Real GDP per employed person in 2008 prices. Source: National accounts of the federal states, Own table and calculations.

¹⁰ This approach assumes that the additional production is equally labour-intensive as the overall GDP and that the additionally employed persons have the same productivity as an average employed person.

6.2 Macroeconomic costs

In order to calculate the net effects of guarantee banks, the formerly estimated benefits need to be compared with the costs that guarantees incur. From a macroeconomic perspective, credit defaults and the subsequent honoring of the guarantees cannot directly be considered as costs. The losses they incur for the guarantee banks and the public sector are offset by lower losses of the banks. Macroeconomic costs are incurred if guarantees enable a misallocation of scarce resources in ultimately unproductive uses (mal-investments). However, a comparison of the default ratio¹¹ of guaranteed credits with similar non-guaranteed credits shows that they do not significantly differ. Between 2008 and 2014, on average, 1.8% of the guarantee credits in the portfolio of the guarantee bank in Brandenburg, 2.4% in Thuringia, 3.0% in Saxony-Anhalt and 3.3% in Mecklenburg-Western Pomerania and Berlin defaulted. A study from Creditreform (2012) shows that the default ratios of guaranteed credits to SMEs are somewhat higher than average default ratios of SMEs in Germany as a whole (1.77% in 2011). However, the Germany-wide average default ratios of start-ups (3.61% in 2011), a significant customer group of the guarantee banks, are significantly lower for guaranteed credits. Also, the data from Creditreform (2012) show that the credit ratings of companies in the five federal states considered in our study is significantly lower. Taking all that into consideration, the default ratios of the guaranteed credits point to the conclusion that guaranteed credits are not associated with more mal-investments than regular, not guaranteed credits. Hence, they do not incur economic costs due to misallocations.

Another reason for economic costs are potential distortions of competition as some single companies receive state-backed credit guarantees while their competitors do not. Hence, the supported companies might gain market shares to the detriment of their competitors. However, that might even strengthen competition if companies that dominate the market lose market shares. Also, the credit guarantees might help to maintain existing competition if it prevents the drop of market shares of the supported companies or even their entire dropout from the market. Moreover, it could also lead to stronger and fairer competition as it removes one major competitive disadvantage of the supported companies, their lack of access to credits. Given the fairly small guarantee volumes per company their impact on the competition in the overall market is likely to be very limited. That view is supported by the results of our survey among recipients of credit guarantees. Admittedly, about 58% of them responded that their market share increased after having received the guaranteed credit but merely 3% perceive competition as less fierce. Almost 40% even reported a stronger competition while 57% responded that competition remained unchanged. Hence, competition seems not be obstructed or distorted by state-backed credit guarantees.

Beside the potential costs discussed above, propping up inefficient companies with structural overcapacities is another possible source of economic costs of state-backed credit guarantees. In extreme cases, delaying an inevitable structural change of inefficient and uncompetitive companies or even whole industries might be the result. Hence, scarce resources are misallocated to unproductive uses. The high share of companies receiving a credit guarantee that have a negative net equity indicates that this might be a reasonable concern. In Berlin, 28% of the companies having received guaranteed credits have less assets than liabilities (Data of guarantee banks, no separate table provided). In Brandenburg the share is 24.3%, in Mecklenburg-Western Pomerania 27.7%, in Saxony-Anhalt 36.6% and 26% in Thuringia. However, considering that the support of companies with weak net equity and the lack of assets that

¹¹ The default ratio is defined as the guarantee volume honored in a certain year due to credit defaults in relation to the overall outstanding guarantee volume in the same year in percent. It can also be interpreted as the average yearly risk that a guarantee needs to be honored due to a credit default. Assuming an equal distribution of the risk, that risk occurs every year until the credit matures.

could be used as collateral is the lawful assignment of guarantee banks, a high percentage of customers with negative net equity is to be expected. The average annual default rate of merely 2.8% (Table 11) points to the conclusion that the vast majority of companies receiving credit guarantees is sound and not uncompetitive. Moreover, one has to take into consideration that a significant share of credit guarantee recipients are young, innovative and highly competitive start-ups. Thus, a large-scale support of inefficient and uncompetitive does not seem to be a concern.

6.3 Net benefits

In the previous section, we argued that potential economic costs are, if incurred at all, negligible. Therefore, the net value of guarantees equals the considerable positive effects on production and employment estimated above. However, guarantees are no *perpetuum mobile* of economic policy. They can only be applied in limited amounts as they can only exhibit the positive effects that we estimated if they remove actual credit constraints. Brautzsch et al. (2015) show empirically that this is particularly the case in phases of economic weakness. By contrast, supporting firms that have access to credits or the capital markets does not generate positive macroeconomic effects. On the contrary, such a support raises the risk of propping up inefficient and uncompetitive companies and delaying necessary structural changes.

7. Fiscal costs and benefits

Economic theory demands that all actions of the state and government are directed at maximizing social welfare. Levying taxes and duties and subsequently spending them is merely a means to that end. Generating permanent surpluses is, in contrast to private enterprises, neither the goal nor purpose of public budgets. Hence, the economic net effects rather than the fiscal effects of state-backed credit guarantees should be the primary determinant in decisions on credit guarantees and their backing by public counter guarantees. If, as estimated above, the economic net effects of state-backed guarantees are positive then they might be justified even if fiscal effects are negative. Nonetheless, as fiscal effects obviously are a major concern for policy makers, we estimated those in the following section. Our estimates show that the fiscal net effects are highly positive and amount to several billion euro between 2008 and 2014 in the respective federal states.

7.1 Revenue effects

The effects on public revenues are of an indirect nature and originate from the positive effects of state-backed credit guarantees on production and employment that increase tax revenues and social security contributions and, hence, improve the governments' overall budget balance. As that improvement is not visible in the government's revenue statistics we estimate it based on the macroeconomic effects estimated above. By multiplying the additional GDP with the average tax-to-GDP ratio (prior to tax redistribution between the states and the federal government), we get an estimate of the additionally generated tax revenues.¹² In order to appraise the additional social security contributions we first subtract the average share of self-employed from the additional employment estimated above as they do not pay social security contributions. Multiplying the remaining number of persons with the average salary per employee (according to national accounts data) and Germany's overall social security contribu-

¹² That assumes a fixed tax-to-GDP ratio. As not all taxes increase proportionally with GDP, that estimate is rather crude.

tion rate yields the sum of additional contributions.¹³ Our calculations render considerable positive revenue effects. The general government revenues of all five federal states combined between 2008 and 2014 were almost 3 billion euro higher owing to the credit guarantee programs of the guarantee banks. A decomposition of that number into various taxes and contributions can be found in Tables A1 to A5 in the annex. The additional revenues were roughly equally composed of taxes and social security contributions. With respect to taxes, the biggest contributions came from the income tax and the sales tax.

7.2 Spending effects

While the revenue effects are entirely positive, the net effect on spending is composed of a positive and a negative effect. On the one hand, if a guaranteed credit defaults, because of the partial counter-guarantee, public budgets get charged with 80% of the remaining credit sum while the other 20% are covered by guarantee banks themselves. Such defaults are common and inevitable events as the data of the guarantee banks show. However, the annual net default payments (after realization of collateral) are fairly modest (Table 12) compared to the overall outstanding guarantee volumes. Between 2008 and 2009 the average annual default ratio was 1.8% in Brandenburg, 2.4% in Thuringia, 3.0% in Saxony-Anhalt and 3.3% in Berlin and Mecklenburg-Western Pomerania.

Table 11: Net default payments and default ratios in federal states

| Year | Berlin | | | Brandenburg | | | Mecklenburg-Western Pomerania | | | Saxony-Anhalt | | | Thuringia | | |
|----------------|-----------------------------|--------------------|----------|-----------------------------|--------------------|----------|-------------------------------|--------------------|----------|-----------------------------|--------------------|----------|-----------------------------|--------------------|----------|
| | Outsta. guarant. in million | default paym. in € | ratio % | Outsta. guarant. in million | default paym. in € | ratio % | Outsta. guarant. in million | default paym. in € | ratio % | Outsta. guarant. in million | default paym. in € | ratio % | Outsta. guarant. in million | default paym. in € | ratio % |
| 2008 | 213.6 | 2.6 | 1.2 | 263.9 | 4.0 | 1.5 | 172.6 | 7.8 | 4.5 | 349.1 | 9.6 | 2.7 | 299.3 | 7.9 | 2.6 |
| 2009 | 220.9 | 6.7 | 3.0 | 265.9 | 8.0 | 3.0 | 160.8 | 6.9 | 4.3 | 355.0 | 16.5 | 4.6 | 306.1 | 7.6 | 2.5 |
| 2010 | 227.7 | 5.0 | 2.2 | 296.7 | 4.5 | 1.5 | 162.6 | 5.5 | 3.4 | 361.9 | 12.0 | 3.3 | 330.8 | 3.6 | 1.1 |
| 2011 | 224.7 | 5.4 | 2.4 | 293.7 | 4.9 | 1.7 | 167.5 | 4.7 | 2.8 | 361.3 | 11.9 | 3.3 | 321.0 | 6.0 | 1.9 |
| 2012 | 206.4 | 13.3 | 6.5 | 296.1 | 4.8 | 1.6 | 168.3 | 7.3 | 4.4 | 358.3 | 7.9 | 2.2 | 298.3 | 7.5 | 2.5 |
| 2013 | 199.9 | 7.3 | 3.6 | 289.8 | 4.7 | 1.6 | 169.5 | 3.8 | 2.2 | 356.0 | 6.7 | 1.9 | 287.2 | 6.9 | 2.4 |
| 2014 | 191.4 | 7.4 | 3.8 | 288.2 | 5.8 | 2.0 | 173.6 | 3.1 | 1.8 | 327.4 | 10.5 | 3.2 | 276.4 | 9.9 | 3.6 |
| Average | 212 | 7 | 3 | 285 | 5 | 2 | 168 | 6 | 3 | 353 | 11 | 3 | 303 | 7 | 2 |

Note: The default ratio is defined as the guarantee volume honored in a certain year due to credit defaults in relation to the overall outstanding guarantee volume in the same year in percent. It can also be interpreted as the average risk that a guarantee needs to be honored due to a credit default. Source: Data of the guarantee banks and the Association of German Guarantee Banks' annual reports (2008-2014), Own table and calculations.

On the other hand, due to the positive effects on employment, public budgets profit from less social security spending, i.e. unemployment benefits for short-term unemployed (UB I), short-time work compensation and long-term unemployed (UB II). As the decreased spending cannot be seen in the governments' statistics we estimate it here. However, the estimates are complicated and, owing to the lack of data, need to rely on some assumptions that limit their

¹³ That assumes that the additional employment exhibits the same share of self-employed persons as in the whole population and that the additional employees are paid on average as much as an average employee in the respective federal state.

accuracy. One major problem is that it is unknown where the additionally employed persons came from. If they were recruited from the stock of long-term unemployed people, than UB II spending would be reduced. However, it is more likely that the majority of additional employees was recruited from the short-term unemployed who received UB I.¹⁴ Another part of the additional labor demand was likely served by decreasing short-time working arrangements. For them, lower short-time working compensation, which equals the UB I replacement rate, needed to be paid. Moreover, some of the additional workers might have come from other federal states or even a foreign country. Hence, in that cases, other jurisdictions enjoy lower social security spending. In our estimates we assume that 90% of the additionally employed persons according to Table 10 were formerly unemployed residents of the respective federal states and 85% of them were short-term and 15% long-term unemployed. For the short-term unemployed we calculate with a 63.5 replacement rate of net salaries and the UB II standard rate under German law. The results of our estimation are displayed in Table 12. Our estimates yield considerable savings in social security spending between 2008 and 2014 of 1.4 billion € for all federal states combined.

Table 12: Lower social security spending in federal states

| Year | Berlin | | | Brandenburg | | | Mecklenburg-Western Pomerania | | | Saxony-Anhalt | | | Thuringia | | |
|------------|----------------------|-------------------------------------|--------------------|----------------------|-------------------------------------|--------------------|-------------------------------|-------------------------------------|--------------------|----------------------|-------------------------------------|--------------------|----------------------|-------------------------------------|--------------------|
| | Employees in persons | UB I, Short-time comp. in million € | UB II in million € | Employees in persons | UB I, Short-time comp. in million € | UB II in million € | Employees in persons | UB I, Short-time comp. in million € | UB II in million € | Employees in persons | UB I, Short-time comp. in million € | UB II in million € | Employees in persons | UB I, Short-time comp. in million € | UB II in million € |
| 2008 | 904 | 7.3 | 0.0 | 1,552 | 10.6 | 0.1 | 618 | 4.1 | 0.0 | 1,330 | 9.0 | 0.1 | 1,337 | 9.1 | 0.1 |
| 2009 | 2,294 | 18.8 | 0.1 | 3,684 | 25.8 | 0.2 | 1,536 | 10.3 | 0.1 | 3,418 | 23.7 | 0.2 | 3,575 | 24.8 | 0.2 |
| 2010 | 3,377 | 28.7 | 0.2 | 5,826 | 42.3 | 0.3 | 2,502 | 17.5 | 0.1 | 4,899 | 35.1 | 0.2 | 5,559 | 39.9 | 0.3 |
| 2011 | 4,132 | 35.4 | 0.2 | 7,267 | 53.7 | 0.4 | 3,322 | 24.1 | 0.2 | 6,473 | 48.2 | 0.3 | 6,581 | 49.1 | 0.3 |
| 2012 | 4,951 | 43.2 | 0.2 | 8,501 | 64.7 | 0.4 | 4,176 | 30.8 | 0.2 | 7,335 | 55.6 | 0.4 | 7,532 | 57.8 | 0.4 |
| 2013 | 5,734 | 51.4 | 0.3 | 9,208 | 72.1 | 0.5 | 4,847 | 36.8 | 0.2 | 8,034 | 63.0 | 0.4 | 7,883 | 62.6 | 0.4 |
| 2014 | 6,122 | 57.1 | 0.3 | 9,510 | 77.7 | 0.5 | 5,513 | 43.4 | 0.3 | 6,911 | 56.7 | 0.4 | 8,245 | 68.1 | 0.4 |
| Sum | 242 | 1.4 | | 347 | 2.3 | | 167 | 1.1 | | 291 | 1.9 | | 311 | 2.0 | |

Note: UB II only standard rate, UB I net replacement rate: 63.5%, gross salaries per employee according to national accounts of federal states, net salaries calculated from gross salaries by subtracting social security contributions of 21% of gross salaries and the average income tax rate of the federal state according to data from the national statistical office. Own table and calculations.

7.3 Net effect

The fiscal net effect for the federal states (Table 13) is calculated by summing up the additional revenues from taxes and social security contribution as well as the lower social security spending and subtracting the net default payments. Our computations show that the fiscal net effects were not only always positive between 2008 and 2014 but also of a significant magnitude. The overall budget balance improved by an estimated 832 million euro in Berlin, 1,104 million euro in Brandenburg, 472 million euro in Mecklenburg-Western Pomerania, 829 million euro in Saxony-Anhalt und 898 million euro in Thuringia.

¹⁴ Data from the German Federal Employment Agency show that the probability of a long-term unemployed person (unemployment of more than one year) to start a new job or self-employment within the next month is 1.5%. By contrast, the probability of a short-term unemployed person is considerably higher with 9.9% (Bundesagentur für Arbeit 2015).

Table 13: Fiscal net effects in federal states

| Berlin | | | | Brandenburg | | | | Mecklenburg-Western Pomerania | | | | Saxony-Anhalt | | | | Thuringia | | | |
|------------|--------------------------------|--|--------------------------------|--------------------------------|--|--------------------------------|--------------------------------|--|--------------------------------|--------------------------------|--|--------------------------------|--------------------------------|--|--------------------------------|--------------------------------|--|--------------------------------|--|
| Year | net default paym. in million € | add. revenue plus reduced effect in spending million € | net fiscal effect in million € | net default paym. in million € | add. revenue plus reduced effect in spending million € | net fiscal effect in million € | net default paym. in million € | add. revenue plus reduced effect in spending million € | net fiscal effect in million € | net default paym. in million € | add. revenue plus reduced effect in spending million € | net fiscal effect in million € | net default paym. in million € | add. revenue plus reduced effect in spending million € | net fiscal effect in million € | net default paym. in million € | add. revenue plus reduced effect in spending million € | net fiscal effect in million € | |
| 2008 | 2.6 | 26.0 | 23.4 | 4.0 | 34.2 | 30.3 | 6.2 | 11.7 | 5.4 | 7.7 | 27.2 | 19.6 | 7.9 | 27.2 | 19.4 | | | | |
| 2009 | 6.7 | 65.4 | 58.7 | 8.0 | 80.6 | 72.6 | 5.5 | 29.6 | 24.1 | 13.2 | 69.8 | 56.6 | 7.6 | 72.2 | 64.6 | | | | |
| 2010 | 5.0 | 101.4 | 96.3 | 4.5 | 130.7 | 126.2 | 4.4 | 49.8 | 45.5 | 9.6 | 103.5 | 93.9 | 3.6 | 116.0 | 112.4 | | | | |
| 2011 | 5.4 | 128.2 | 122.9 | 4.9 | 174.3 | 169.4 | 3.8 | 71.0 | 67.3 | 9.6 | 144.8 | 135.2 | 6.0 | 148.2 | 142.2 | | | | |
| 2012 | 13.3 | 155.0 | 141.7 | 4.8 | 212.2 | 207.4 | 5.9 | 93.3 | 87.4 | 6.3 | 172.2 | 165.9 | 7.5 | 177.0 | 169.6 | | | | |
| 2013 | 7.3 | 188.9 | 181.6 | 4.7 | 243.2 | 238.5 | 3.0 | 112.5 | 109.5 | 5.3 | 195.0 | 189.7 | 6.9 | 194.0 | 187.1 | | | | |
| 2014 | 7.4 | 214.9 | 207.6 | 5.8 | 265.0 | 259.3 | 2.5 | 135.1 | 132.6 | 8.4 | 176.2 | 167.8 | 9.9 | 213.1 | 203.1 | | | | |
| Sum | | 832 | | | 1,104 | | | | 472 | | | 829 | | | 898 | | | | |

Source: Data of the guarantee banks, own table and calculations.

8. Conclusions

The need for state-backed guarantee schemes derives from a market failure in the financing of small and medium-sized enterprises or start-ups, which due to unfavorable economic conditions - lack of equity, lack of collateral and high information asymmetry - have no access to loans or equity to finance productive investments. In order to improve the efficiency of the market allocation with as little government intervention as possible, those instruments are preferred which if possible do not distort the market mechanism, do not induce windfall effects and minimize the budgetary burden of the state. Literature shows that all three criteria are better met by government guarantees than by alternative instruments such as investment subsidies, grants or state-backed investment loans. The German system of regional private guarantee banks, which specialize in the creditworthiness assessment of rationed companies and share the credit risk with the lending banks and the government is an efficient solution. The guarantee banks provide a high added value by extending credit availability and investment activity among SMEs and start-ups. The resulting increase in overall economic growth and employment has positive effects on economic welfare and the government balance.

Our research goes beyond previous studies by providing for the first time a comprehensive assessment of the economic and fiscal net benefits of guarantee banks in five of Germany's six new federal states, which formerly formed the communist East Germany. It considers the federal states of Berlin, Brandenburg, Mecklenburg-Western Pomerania, Saxony-Anhalt and Thuringia, where disposable income per capita, employment and entrepreneurial activities are still lower than in the old federal states. We use a large data set from the internal statistics of the five guarantee banks over the period 1991-2015, own surveys of enterprises and credit institutions using the guarantee schemes as well as multipliers from different macroeconometric models to quantify the overall economic and fiscal net benefits.

In total, the five guarantee banks have secured 40,000 loans for 32,000 companies since they took up their business in 1991. Loan and equity guarantees amounting to 7 billion euro made possible loans and participations amounting to 9 billion euro. About 80% of the loans were used to finance investments. Per company, about one to two jobs were created and three to five jobs were secured. Most of the loans were provided by the small regional savings banks and cooperative banks.

A survey of supported enterprises in one of the federal states under investigation shows high benefits of additional funding and investments made possible by the guarantees provided. Some 60% of companies would not have received funding without a guarantee. More than 80% of companies got easier access to loans and 57% got cheaper loans after receiving the guarantee. The number of full-time employees has increased by a quarter and turnover by one-third after implementation of the project supported by the guarantee bank. More than 70% of the companies confirmed that the increase in sales was related to the guarantee. These results confirm previous findings on finance and project additionality of guarantee banks in Germany (Schmidt and Elkan 2006, Neuberger and Räthke-Döppner 2008, Valentin and Henschel 2013, Althammer et al. 2011) as well as of loan guarantee programs for SMEs in other countries (reviewed above). Compared to results from a previous enterprise survey in the same federal state (Neuberger and Räthke-Döppner 2008) finance and project additionality have increased in the period including the financial crisis.

A survey of credit institutions in all five federal states indicates that windfall effects of the guarantees are small, if these guarantees are provided for the financing of firm foundations. Only 11% of the loans to start-ups would have been granted anyway. However, 37% of the loans to established companies would have been granted also without the involvement of the guarantee banks in the five federal states, which is higher than previously found for the whole of Germany (Schmidt and Elkan 2006). A majority of the bank officers, after cooperating with the guarantee bank, granted loans at lower interest rates to the respective customers, although credit volumes did not increase in most cases. Most loan officers do not seem to gain additional information from the guarantee bank's creditworthiness check, which confirms previous results for the guarantee bank of Saxony (Althammer et al. 2011). This is in contrast to studies for mutual guarantee institutions in Italy, which found additional benefits through improved information (Bartoli et al. 2013, Columba et al. 2010). Both guarantee schemes have in common that they exploit the local knowledge of decentralized private organizations.

Based on a macroeconomic cost-benefit analysis we find that the economic benefits of the activity of the five guarantee banks are considerable because of increased production and employment, while the economic costs are negligible. Depending on the federal state, the real GDP increases by 1.15 to 1.22 euro per euro guarantee, which is lower than previously found for guarantee banks in the whole of Germany (Schmidt and Elkan 2006, Brautzsch et al. 2015). Comparing the default rates of guaranteed loans to those of non-guaranteed loans to companies with similar characteristics, we conclude that guarantee banks do not fund less productive investments than normal banks. This result corresponds to previous findings for guarantee banks in the whole of Germany (Schmidt and Elkan 2006) and findings for guarantee programs for SMEs in Italy (Zecchini and Ventura 2009) and Chile (Larraín and Quiroz 2006), while above average default rates of guaranteed loans have been found in France (Lelarge et al. 2010).

The fiscal benefit of the activity of the guarantee banks corresponds to the generated public gain in taxes and social contributions, plus the reduced expenditure on social security benefits. The fiscal costs arise from the losses from credit defaults. We find that the positive fiscal effects are much greater than the negative ones. The activities of the five guarantee banks in the years 2008 to 2014 provided a fiscal net benefit of more than four billion euro in the five federal states combined.

Regarding the policy question on the level of state involvement, currently about 54% of the risk is born by the state, 26% by the private guarantee banks and the remaining 20% by the lending banks. The maximum guarantee coverage ratio, i.e. share of risk covered by the guarantee banks and the state of 80% corresponds to the median level around the world. According to many practitioners, the lender should bear at least 20% of the risk (Honohan 2010). The chosen risk-sharing rate is usually justified by international benchmarking, without discussing

the optimum level (Samujh et al. 2012). Theoretically optimal would be a guarantee coverage rate, which varies with the state of the bank and the economy. To minimize adverse incentives, the guarantee rate should be higher for stable banks than for less stable ones. In order to stabilize lending to SMEs, it should be increased in bad economic situations (Yoshino and Taghizadeh-Hesary 2016). In the current low-interest phase, which particularly burdens the small savings banks and cooperative banks (Deutsche Bundesbank 2016), an increase in the state counter-guarantee rate would be appropriate.

Annex

Table A1: Additional revenues: Berlin

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | sum |
|--|------|------|------|------|------|------|------|--------------|
| cumulated nominal GDP effect in million € | 55 | 134 | 209 | 275 | 324 | 384 | 429 | 1,811 |
| additional tax revenue in million € | | | | | | | | |
| common taxes | 6.7 | 16.0 | 26.3 | 32.3 | 39.0 | 51.5 | 62.4 | 234 |
| wage tax | 2.5 | 6.1 | 8.7 | 11.8 | 15.0 | 20.6 | 23.8 | 88 |
| corporate tax | 0.3 | 0.6 | 1.2 | 1.7 | 1.8 | 2.3 | 2.9 | 11 |
| sales tax | 2.8 | 7.2 | 12.0 | 13.6 | 16.1 | 21.3 | 27.0 | 100 |
| federal taxes | 1.8 | 4.9 | 7.6 | 10.1 | 11.7 | 13.7 | 15.0 | 65 |
| state taxes | 0.6 | 1.0 | 1.6 | 2.4 | 3.3 | 4.7 | 5.5 | 19 |
| municipal taxes | 1.0 | 2.3 | 4.1 | 5.2 | 6.2 | 7.4 | 8.7 | 35 |
| sum, all jurisdictions | 10.2 | 24.2 | 39.6 | 49.9 | 60.2 | 77.3 | 91.7 | 353 |
| additional social security contributions | | | | | | | | |
| employment effect in thousand persons | 0.9 | 2.3 | 3.4 | 4.1 | 5.0 | 5.7 | 6.1 | |
| share of employees in percent | 86.7 | 86.5 | 86.4 | 86.5 | 86.7 | 87.2 | 87.4 | |
| gross salaries per employee in thousand € | 27.7 | 28.0 | 28.6 | 29.6 | 29.9 | 30.4 | 31.2 | |
| contribution rate in percent | 38.8 | 40.2 | 39.6 | 40.4 | 40.1 | 39.5 | 39.5 | |
| sum in million € | 8.4 | 22.3 | 33.0 | 42.6 | 51.4 | 59.9 | 65.9 | 283 |
| sum of additional revenues € | | | | | | | | 637 |

Note: Tax revenues prior to redistribution between central government and federal states, federal taxes calculated using the federal tax-to-GDP ratio, Social security contributions excluding voluntarily insured self-employed.

Source: National accounts of the federal states, Federal Ministry of Labor and Social Affairs, own table and calculations.

Table A2: Additional revenues: Brandenburg

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | sum |
|--|------|-------|------|------|------|------|-------|--------------|
| cumulated nominal GDP effect in million € | 80 | 177.1 | 303 | 400 | 484 | 559 | 614 | 2,617 |
| additional tax revenue in million € | | | | | | | | |
| common taxes | 6.9 | 14.7 | 24.3 | 35.9 | 46.4 | 58.0 | 65.7 | 252 |
| wage tax | 2.4 | 5.5 | 8.4 | 12.0 | 15.5 | 19.3 | 22.1 | 85 |
| corporate tax | 0.2 | 0.2 | 1.2 | 2.1 | 2.3 | 2.9 | 3.4 | 12 |
| sales tax | 3.8 | 8.1 | 12.9 | 18.5 | 24.0 | 29.9 | 33.7 | 131 |
| federal taxes | 2.7 | 6.4 | 11.0 | 14.7 | 17.5 | 19.9 | 21.4 | 94 |
| state taxes | 0.7 | 1.0 | 0.9 | 1.6 | 1.9 | 2.4 | 2.6 | 11 |
| municipal taxes | 1.4 | 2.9 | 4.9 | 6.0 | 7.7 | 9.2 | 10.4 | 42 |
| sum, all jurisdictions | 11.6 | 25.1 | 41.0 | 58.1 | 73.4 | 89.5 | 100.2 | 399 |
| additional social security contributions | | | | | | | | |
| employment effect in thousand persons | 1.6 | 3.7 | 5.8 | 7.3 | 8.5 | 9.2 | 9.5 | |
| share of employees in percent | 87.3 | 87.2 | 87.3 | 87.4 | 87.5 | 87.9 | 88.3 | |
| gross salaries per employee in thousand € | 22.7 | 22.9 | 23.4 | 24.2 | 24.7 | 25.4 | 26.2 | |
| contribution rate in percent | 38.8 | 40.2 | 39.6 | 40.4 | 40.1 | 39.5 | 39.5 | |
| sum in million € | 11.9 | 29.5 | 47.1 | 62.1 | 73.6 | 81.2 | 86.6 | 392 |
| sum of additional revenues € | | | | | | | | 791 |

Note: Tax revenues prior to redistribution between central government and federal states, federal taxes calculated using the federal tax-to-GDP ratio, Social security contributions excluding voluntarily insured self-employed.

Source: National accounts of the federal states, Federal Ministry of Labor and Social Affairs, own table and calculations.

Table A3: Additional revenues: Mecklenburg-Western Pomerania

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | sum |
|--|------|-------|------|------|------|------|------|--------------|
| cumulated nominal GDP effect in million € | 28 | 68.22 | 118 | 173 | 223 | 276 | 324 | 1,212 |
| additional tax revenue in million € | | | | | | | | |
| common taxes | 1.5 | 3.6 | 6.4 | 9.7 | 14.1 | 18.1 | 24.5 | 78 |
| wage tax | 0.7 | 1.6 | 2.5 | 3.9 | 5.5 | 7.3 | 9.1 | 31 |
| corporate tax | 0.0 | 0.0 | 0.0 | 0.4 | 0.7 | 1.0 | 1.4 | 3 |
| sales tax | 0.6 | 1.6 | 2.9 | 3.7 | 5.1 | 6.1 | 9.0 | 29 |
| federal taxes | 1.0 | 2.5 | 4.3 | 6.4 | 8.1 | 9.8 | 11.3 | 43 |
| state taxes | 0.3 | 0.4 | 0.4 | 0.7 | 0.9 | 1.4 | 1.8 | 6 |
| municipal taxes | 0.4 | 0.9 | 1.7 | 2.5 | 3.4 | 4.4 | 5.1 | 18 |
| sum, all jurisdictions | 3.1 | 7.4 | 12.8 | 19.3 | 26.5 | 33.7 | 42.7 | 145 |
| additional social security contributions | | | | | | | | |
| employment effect in thousand persons | 0.6 | 1.5 | 2.5 | 3.3 | 4.2 | 4.8 | 5.5 | |
| share of employees in percent | 88.9 | 88.8 | 88.8 | 89.1 | 89.8 | 90.1 | 90.0 | |
| gross salaries per employee in thousand € | 21.2 | 21.6 | 22.1 | 23.0 | 23.8 | 24.2 | 24.9 | |
| contribution rate in percent | 38.8 | 40.2 | 39.6 | 40.4 | 40.1 | 39.5 | 39.5 | |
| sum in million € | 4.5 | 11.8 | 19.4 | 27.4 | 35.8 | 41.7 | 48.8 | 189 |
| sum of additional revenues € | | | | | | | | 335 |

Note: Tax revenues prior to redistribution between central government and federal states, federal taxes calculated using the federal tax-to-GDP ratio, Social security contributions excluding voluntarily insured self-employed.

Source: National accounts of the federal states, Federal Ministry of Labor and Social Affairs, own table and calculations.

Table A4: Additional revenues: Saxony-Anhalt

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | sum |
|--|------|-------|------|------|------|------|------|--------------|
| cumulated nominal GDP effect in million € | 66 | 154.5 | 247 | 338 | 412 | 468 | 418 | 2,104 |
| additional tax revenue in million € | | | | | | | | |
| common taxes | 4.4 | 9.8 | 15.0 | 21.9 | 28.4 | 34.5 | 32.4 | 146 |
| wage tax | 1.8 | 4.0 | 5.7 | 8.6 | 11.0 | 13.4 | 12.9 | 57 |
| corporate tax | 0.3 | -0.2 | 0.4 | 1.2 | 1.4 | 1.4 | 1.6 | 6 |
| sales tax | 2.0 | 5.2 | 7.2 | 8.9 | 11.2 | 13.2 | 13.2 | 61 |
| federal taxes | 2.2 | 5.6 | 9.0 | 12.4 | 14.9 | 16.7 | 14.6 | 75 |
| state taxes | 0.5 | 0.8 | 0.7 | 1.0 | 1.3 | 1.6 | 1.5 | 8 |
| municipal taxes | 1.1 | 2.4 | 3.8 | 5.7 | 7.0 | 7.6 | 7.0 | 35 |
| sum, all jurisdictions | 8.2 | 18.6 | 28.5 | 41.0 | 51.6 | 60.4 | 55.6 | 264 |
| additional social security contributions | | | | | | | | |
| employment effect in thousand persons | 1.3 | 3.4 | 4.9 | 6.5 | 7.3 | 8.0 | 6.9 | |
| share of employees in percent | 90.2 | 90.6 | 90.7 | 90.6 | 90.6 | 90.9 | 91.1 | |
| gross salaries per employee in thousand € | 21.4 | 22.0 | 22.6 | 23.4 | 24.3 | 24.7 | 25.6 | |
| contribution rate in percent | 38.8 | 40.2 | 39.6 | 40.4 | 40.1 | 39.5 | 39.5 | |
| sum in million € | 10.0 | 27.3 | 39.7 | 55.3 | 64.6 | 71.2 | 63.5 | 332 |
| sum of additional revenues € | | | | | | | | 596 |

Note: Tax revenues prior to redistribution between central government and federal states, federal taxes calculated using the federal tax-to-GDP ratio, Social security contributions excluding voluntarily insured self-employed.

Source: National accounts of the federal states, Federal Ministry of Labor and Social Affairs, own table and calculations.

Table A5: Additional revenues: Thuringia

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | sum |
|--|------|-------|------|------|------|------|------|--------------|
| cumulated nominal GDP effect in million € | 61 | 151.5 | 260 | 340 | 397 | 451 | 501 | 2,162 |
| additional tax revenue in million € | | | | | | | | |
| common taxes | 4.4 | 10.5 | 17.9 | 25.0 | 31.6 | 36.7 | 42.4 | 168 |
| wage tax | 1.7 | 4.2 | 6.5 | 8.9 | 11.2 | 13.3 | 15.7 | 62 |
| corporate tax | 0.2 | 0.0 | 0.2 | 1.0 | 1.7 | 2.1 | 1.7 | 7 |
| sales tax | 2.1 | 5.5 | 9.5 | 12.4 | 15.3 | 16.6 | 19.3 | 81 |
| federal taxes | 2.0 | 5.5 | 9.4 | 12.5 | 14.4 | 16.1 | 17.5 | 77 |
| state taxes | 0.5 | 0.8 | 0.7 | 1.0 | 1.3 | 1.6 | 1.7 | 8 |
| municipal taxes | 1.0 | 2.1 | 3.6 | 5.2 | 6.6 | 7.4 | 7.8 | 34 |
| sum, all jurisdictions | 7.9 | 18.9 | 31.6 | 43.7 | 53.9 | 61.8 | 69.4 | 287 |
| additional social security contributions | | | | | | | | |
| employment effect in thousand persons | 1.3 | 3.6 | 5.6 | 6.6 | 7.5 | 7.9 | 8.2 | |
| share of employees in percent | 89.2 | 88.9 | 88.7 | 88.5 | 88.6 | 89.0 | 89.2 | |
| gross salaries per employee in thousand € | 21.9 | 22.1 | 22.7 | 23.4 | 24.3 | 25.0 | 25.9 | |
| contribution rate in percent | 38.8 | 40.2 | 39.6 | 40.4 | 40.1 | 39.5 | 39.5 | |
| sum in million € | 10.2 | 28.2 | 44.2 | 55.1 | 65.0 | 69.2 | 75.2 | 347 |
| sum of additional revenues € | | | | | | | | 634 |

Note: Tax revenues prior to redistribution between central government and federal states, federal taxes calculated using the federal tax-to-GDP ratio, Social security contributions excluding voluntarily insured self-employed.

Source: National accounts of the federal states, Federal Ministry of Labor and Social Affairs, own table and calculations.

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