Dissertation

Regional finance and growth

Empirical evidence on the relationship between financial and economic development on the local level

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Abstract

Empirical research on regional financial structures and economic growth development is rare, due to two reasons. First, in many countries disaggregated data on regional banking structures are not available for research. Second, empirical economic research on the finance and growth sector faces an inherent problem of endogeneity. This work solves both problems by presenting a unique and just recently created database on regional German banking structures and by using the historic event of the German reunification and the unique German savings bank system as instruments.

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Abbreviations used, in alphabetical order.

Abbrev.	English term	German term
BHG	Farming Trade Cooperatives	Bäuerliche Handelsgenossenschaften
BLN	Bank for Agriculture	Bank für Landwirtschaft und Nahrungsgüterwirtschaft der DDR
CCT	Cooperatives for Craft and Trade	Genossenschaftskassen für Handwerk und Gewerbe
DABA	German Foreign Trade Bank	Deutsche Außenhandelsbank
DNB	German National Library	Deutsche Nationalbibliothek
FRG	Federal Republic of Germany	Bundesrepublik Deutschland (BRD)
GDR	German Democratic Republic	Deutsche Demokratische Republik (DDR)
HBO	Hoppenstedt Banking Database	Hoppenstedt Bankenortslexikon
OSV	East German Savings Banks Association	Ostdeutscher Sparkassenverband
SED	Socialist Unity Party of Germany	Sozialistische Einheitspartei Deutschland
SMAD	Soviet Military Administration	Sowjetische Militäradministration
SME	Small and medium sized enterprises	Mittelstand
USSR	Union of Soviet Socialist Republics	Sowjetunion

Throughout this thesis, the following names are used as equivalent terms:

Terms used equivalently	German term
State Bank / central bank of the GDR	Staatsbank der DDR
Rural district / county / country district	Landkreis
Urban district / city district / independent city	kreisfreie Stadt
East Germany / new eastern states (of Germany)	Neue deutsche Bundesländer
West Germany / western states (of Germany)	Alte deutsche Bundesländer

1 Introduction

Do regional banking structures matter? Examining this question provides important answers on the effects of ongoing banking consolidation and the increasing concentration of the banking market in Germany. Due to a recent and unique dataset on the German banking structure, the empirical attempt presented in this work allows for a detailed analysis of the finance and growth nexus on a local level. What makes this research most interesting is not only the novelty of the compiled data, but also the opportunity to solve the inherent endogeneity problem by using historical banking data as an instrumental variable. The achieved results are ambiguous for the East and West German regions.

Financial markets have always played an important role in economic activity, either as an economic sector itself or through monetary relations, credit, lending and saving mechanisms. In theory, well-developed financial markets, such as a well-established system of financial intermediaries, give rise to the efficient allocation of capital, and thus they foster economic development. This efficient allocation of capital is achieved mainly by acquiring and improving information on technologies, processes, entrepreneurs or markets and their profitable usage (see, for example, Allen (1990), Boyd and Prescott (1986) or King and Levine (1993*b*)). Various authors support this theoretical argument in cross-country studies; for instance, according to Levine et al. (2000), economic growth is influenced positively by a well-developed financial intermediation system. The *Handbook of Economic Growth*, Chapter 12, by Levine (2005) provides a profound overview of the theoretical and empirical literature on the finance and growth nexus.

However, whilst to date theories on the finance and growth nexus are rich and provide some convincing arguments for an essential effect of financial markets on economic development, there are opposing arguments, too. Robinson (1952) and Lucas (1988), for example, are well-known for arguing that financial markets follow economic growth or designate them as overestimated. Additionally, reliable empirical evidence on the local level is hard to find, as most of the existing empirical work is cross-country-specific. Studies on a more local level, by concentrating, for instance, on a country's regions, are very scarce, due to two main reasons: first, in many countries disaggregated data on regional banking struc-

tures is not available for research, and second, empirical economic research on the finance and growth sector faces a significant endogeneity problem. Both of these limiting factors, however, will be resolved in the work presented herein.

In this research, when talking about 'financial markets' I refer to 'banking markets', based on three arguments. First, financing conditions, or rather financial markets, are very often proxied by the respective banking sector (e.g. Jayaratne and Strahan (1996) or Guiso et al. (2004)). Second, in bank-based economies such as Germany or Japan, banks represent the financial sector largely (see e.g. Langfield and Pagano (2016) or Allen and Gale (2000), page 4 for an insightful description). Third, applying a within-country approach, for German regions there are no significant regional differences in stock markets or any other form of financial intermediation besides banks.

The within-country, regional approach takes us back to the question with which this research started: why might regional markets matter? As just explained, most empirical studies on the finance and growth nexus are cross-country analyses (such as King and Levine (1993a) or Levine et al. (2000)); nonetheless, research on regional markets is highly interesting, especially in times of ongoing digitalisation and the question whether distance, such as the distance from a client to a provider, is still a relevant factor. In today's highly integrated financial world, does distance still matter? This very question is asked by Petersen and Rajan (2002), who find that distance between small borrowers and their lenders matters less nowadays. On the other hand, authors like Cetorelli and Strahan (2006) or Guiso et al. (2004) present evidence on the relevance of local financial markets.

The question surrounding the relevance of local markets is even more interesting, as in countries like Germany significant heterogeneity of economic well-being in between different local areas can be observed. Consequently, taking for granted that in Germany overall, legal frameworks, political decisions and other determining factors do not vary as severely as in a cross-country analysis, the remaining question relates to whether these differences can be explained by variations in the local financial market. As financial markets are still imperfect, whereby informational friction exists, local markets are segmented and firms are restricted to obtaining external financing from local banks (see e.g. Freixas and Rochet

(2008)), regional differences in financial markets might have larger effects – as anticipated.

Additionally, there was a considerable reduction in the number of bank branches across German regions over the last ten years, thereby leading to an increase in local bank concentration. Examining local banking structures and thus financing conditions is therefore of great interest, especially in terms of the effects they may have on regional economic performance.

The next question asks why do the former two East and West German sectors need to be approached separately, even though Germany reverted back to a one-nation state over 25 years ago? If no differences between the economic situation in East and West Germany were observed, any attempt to revise the banking sector of the former German Democratic Republic (GDR) - besides its function as a valid instrument - would be moot. The savings bank branch network of Germany in 1992 could have been used as instrument. Such an attempt, however, would dismiss the extinguished economic situation of post-GDR German regions. Additionally, there are still distinct economic disparities between East and West Germany (see Aumann and Scheufele (2010)). Likewise the East German economic situation is converging in decreasing terms and the German Federal Ministry for Economic Affairs and Energy affirms in its latest report (Bundesministerium für Wirtschaft und Energie (BMWi) (2014)) significant economic and social differences between the two nations, even 25 years after reunification. Thus, it is interesting to answer not only the question as to whether regional banking markets matter, but also whether the presumed effects are similar in East and West Germany.

Most probably there are, or at least were, differences in the regional German banking structures, too. To evaluate whether disparities in the number of banks and branches, banking market concentration and other banking structure variables occur between East and West Germany – and hence might determine differences in economic growth – a regional empirical survey on the East German banking structure is necessary. Consequently, the work presented herein focuses on a profound descriptive depiction, by identifying the banking structures of the late GDR and thereby providing missing work on the banking transition process and highlighting ongoing consolidation and concentration within the German bank-

ing sector.

Finally, this research combines two major contributions to the empirical finance and growth literature. First, building on the existing literature, it attempts to enrich the research area by focusing on the local banking structure and financing conditions and their effects on regional economic performance in Germany. To the author's knowledge, there is currently no dataset like the one presented herein. The combination of detailed bank branch data, as well as firm-specific and macroeconomic data on a highly disaggregated regional level, is unique and allows for examining various questions. Second, in the econometric approach, two new instruments are proposed to tackle potentially existing endogeneity problems: the banking structure of the former German Democratic Republic (GDR) in East Germany and the West German savings bank branch network of 1982. Using valid instruments is important, because even though the positive correlation between finance and growth is well-documented, the question of causality is still not ultimately resolved. A convincing identification strategy would thus contribute to the existing paucity of relevant literature, and so implementing a new and valid instrument ensures significant visibility. The objective of the work presented herein is to examine the economic impacts of local financing conditions, namely local economic growth, firm registration, employment, etc. Given banking sector variables, the effect of local financial conditions on regional economic well-being is also tested.

The rest of this work is organised as follows. In Chapter 2, I present some of the most important existing theories and literature on the regional finance and growth nexus. Chapter 3 thoroughly approaches the problem of endogeneity, whilst compiled data is presented in Chapter 4. Detailed descriptive statistics are given in Chapter 5. In Chapter 6 I report on the econometric approach and results as given in the linked working paper by Beck et al. (2016). Finally, in Chapter 7 I summarise the major findings, provide a number of conclusions and present an outlook on remaining research questions.

2 The finance and growth nexus in the literature

Economic research on finance and growth has grown in line with the banking and finance sector itself. Within this process theoretical models and arguments have developed, too. The two most famous arguments were posited by Joseph Schumpeter and Joan Robins. While Schumpeter (1912) postulated that well-developed financial markets spur economic growth, Joan Robins argued the reverse, defending the opinion that a prosperous economy supports other industry sectors' growth and thus entails the development of proper financial markets (Robinson (1952)).

In the past few decades, a range of studies have tried to answer this question on causality and the importance of financial markets for economic development, albeit without finding a general agreement on the matter. Nonetheless, since the work of King and Levine (1993*a*), who find financial markets to be crucial for a country's economic growth, the empirical economic literature has brought forth a series of studies on the relationship between financial sector development and economic progress. Jayaratne and Strahan (1996), Guiso et al. (2004) and Cetorelli and Strahan (2006) for instance, all cite the existence of a well-developed banking market to be related positive effects on (regional) economic development. Thus, Lucas (1988)'s argumentation on the over-stressed relevance of financial markets appears questionable but not refuted. As previously mentioned, Levine (2005) offers a profoundly controversy and dispute about the theoretical and empirical literature on finance and growth.

Much of the existing work focuses on country-level comparisons (for instance, see Rajan and Zingales (1998), Levine et al. (2000), LaPorta et al. (2002), Berger et al. (2004)) and therefore might not be able to estimate the mechanism that correlates financial and economic development within national structures. Berger (1995) shows the relevance of local financial markets on a theoretical basis; yet, empirical literature on local banking structures and economic performance within the regions of one single country is scare and mostly based unilaterally on Italian and US data. For local Italian markets, Benfratello et al. (2008) find that well-developed banking structures positively influence the innovativeness of – particularly small and financially-dependent – firms. Empirical research on the local level for

Germany, to my knowledge at least, does not exist. As research stimulates itself and evolves over time, the most important steps in local empirical research on finance and growth, with special focus on solving the endogeneity problem, are outlined in the subsequent passages.

In their empirical work, Jayaratne and Strahan (1996) show that economic growth can be affected directly by changes in financial markets. In using the intrastate branch banking reform of the US as an external shock to examine financial markets and economic growth, the authors solve the problem of reverse causality and find the mode of action within the quality of loans provided. A nice implication of Jayarathne and Strahan's work is that intrastate branch banking reform in the United States can be equated to the reformation of the GDR banking system in line with the German reunification, thereby extinguishing the causality problem.

Guiso et al. (2004) are the first to estimate empirically the effect of banking market structures on local economies in an integrated financial world. They do so for Italian provinces and test financial structures against whether or not a person is shut off from the credit market. This is a very interesting approach, especially as the Italian banking market structure went through seminal changes after the Amato-Law (Law 218/1990) was introduced in 1990 which ordered savings banks to be transformed into joint stock ventures, thus causing a huge amount of consolidation in the Italian banking market. Guiso et al. (2004) find that local financial development is an important factor for regional economic growth. The authors solve the inherent problem of endogeneity by using historical banking data dating from to 1936. This works as in 1936 in Italy a banking reform took place impacting the overall bank and branch structure up until today.

Cetorelli and Strahan (2006) highlight two different theoretical approaches in their empirical study of manufacturing firms in US states between 1977 and 1994. By investigating the impact of bank concentration and bank deregulation on two different groups of firms, namely organisations in industry sectors with high financial dependence (e.g. chemical or electrical firms) and those with low financial dependence (e.g. leather and tobacco manufactures), the authors are able to exclude any endogenous factor affecting economic and financial market structure which might bias the estimation results in applying a difference-

in-difference estimation. Cetorelli and Strahan (2006) find lower bank concentration to be indeed linked with a higher number of SMEs as well as firms in total, albeit each at a smaller average size. Therefore, the authors promote the theory that local banking market concentration might have ambiguous impacts on the economic performance of a given region, depending on the underlying market structure, though they also conclude that increased banking concentration diminishes firm entry.

Canales and Nanda (2012) study the effect of lending to small- and medium-sized enterprises (SMEs), implemented by the Mexican government in 2002. Loans given to SMEs were backed up to 80% by a special governmental fund set up to motivate banks to grant loans to SMEs. The Mexican banking market can be divided into centralised and decentralised banks, each acting on a nationwide basis. The authors thus combine two strands of the literature – the one examining bank organisational effects and the other examining banking centralisation effects on SME lending. Their results help explain the so far ambiguous theories and empirical evidence concerning the effects of increased banking market concentration on lending conditions for SMEs. According to the results presented by Canales and Nanda (2012), increased competition can indeed lead to better financial market conditions for SMEs, as long as the market structure remains diversified. Market consolidation, leading to a concentration of local decentralised banks, can end up in any remaining local banks cherry-picking, which thus negatively impacts credit conditions for SMEs within this region. The resulting hypothesis for the underlying research is as follows: if the banking market in Germany is competitive and well-structured, the development situation for SMEs should be advantageous.

As already mentioned in the introductory section, for regional finance and growth in Germany, banks – as pre-eminent financial intermediaries – are essential. The importance of banking markets for regional economic dynamics is mainly built upon the theories of (i) relationship lending (Berger and Udell (2002)), (ii) soft information (Petersen (2004)) and (iii) the relevance of a bank's organisational form on loan conditions (Berger et al. (2005)), each of which accompanies the other.

Berger and Udell (2002) stresses the importance of bank financing, especially for small

businesses. The authors claim relationship lending depends on "*soft information about the firm, its owner and the local community*". Moreover they note that financial market consolidation is expected to decrease the availability and supply of relationship loans.

In his seminal paper, Petersen (2004) not only states that "*information [is] an essential component of all financial markets transaction*," but also discusses the impact of hard and soft information on loan conditions. Gaining soft information on a company, in most cases, is based on a close relationship between the respective managing director and loan officer. Moreover, on a regional basis, small, decentralised banks are usually more prevalent.

Berger et al. (2005) directly link organizational form and information channelling. They find favorable results for small banks lending in a long-term exclusive relation to informational opaque (local) small firms. Thus, the theoretical work on bank loans and firm development affirms a positive relation between a sound local financial system and regional economic growth. However, empirical studies on the topic are less explicit.

A broad and distinctive overview of existing theories on the economic effects of banking is given in *Microeconomics of Banking*, by Freixas and Rochet (2008). Among other topics, the authors outline the problems of asymmetric information and transaction costs in institutional lending on behalf of the existing theoretical work. Within the book, Freixas and Rochet (2008) detail the role of financial intermediaries, the lender-borrower relationship and the industrial organisational approach to banking. The emphasised theories build the foundation of the subsequent empirical literature on the finance and growth nexus. A profound summary on the empirical banking and finance literature is given by the related book *Microeconometrics of Banking: Methods, Applications, and Results*, by Degryse et al. (2009).

Today, another ambiguous question on financial structures and economic development prevails: does a concentration in regional banking markets affect the economic scene positively or negatively? New insights were gained by the seminal work of Petersen and Rajan (1995), who first published the idea of positive effects on markets through concentration in the finance sector. Ever since, empirical research has tried to find evidence for one of the contradictory banking concentration theories.

Authors such as Cetorelli and Strahan (2006) conclude that the rate of new incorporations increases after branching or entry deregulation, while Beck et al. (2004) find evidence that an increase in the concentration of a credit market enhances the availability of financing resources, also pointing out that bank concentration may proxy for more effective regulation and greater diversification within the financial sector. Moreover, banking power does not seem to be associated with increased net interest margins, at least according to the results provided by Demirgüc-Kunt et al. (2004). In their cross-country study of 14 European countries, Ratti et al. (2008) show that with a highly concentrated banking sector firms are less financially constrained. Additionally, Guiso et al. (2004), in one of the rare empirical researches on a national regional level, highlight that a greater degree of financial development increases economic activity.

However, other authors find contradicting results. Valverde et al. (2009), for instance, cite decreasing banking market competition as negatively affecting credit supply for firms. Additionally, di Patti and Dell'Ariccia (2004) show that a higher concentration in the banking market reduces credit availability for informationally opaque borrowers and adversely affects firms' entrance into sectors with high informational asymmetries. Then again, authors like Cetorelli and Gambera (2001) are ambiguous in their results on the effect of financial market concentration and economic growth. In short, a change of concentration in the financial market structure seems definitely to have a real economic effect, though the economic literature to date has not agreed upon its direction.

The underlying work lines up with the present empirical work on financial markets and their assumed effect on economic development on local level. By establishing a new reliable instrument, the endogeneity problem can be attracted and thus data on German regions can be used for research. This broadens the perspective and provides additional information for finding answers within the finance and growth nexus.

2.1 Literature on (banking) development in East Germany

As explained above, the econometric approach presented herein employs instruments not used previously in finance-correlated econometric research before, namely the banking

structure of the former GDR area in East Germany and the West German savings bank branch network of 1982. Especially for East Germany during GDR times, very little non-national literature is available, the following section will present currently accessible information.

The breakdown of the USSR provides a great deal of interesting and unique attempts to test and examine the development of and the relationship between the market-based financial and economic sectors, and so one might expect the economic literature on the USSR collapse and its consequences to be brimming with research on banking transition. Yet, there is very little to find on Eastern European countries (e.g. Corbett and Mayer (1991) or Calvo and Frenkel (1991)) and none at all on the financial sector development of the former German Democratic Republic (GDR).

Although several papers were written about the GDR's transformation process regarding politics, economics and social life in the first years after the fall of the Iron Curtain, most research on the transition of the former GDR concentrates on the development of the labour market, such as Bellmann et al. (1995) or von Furstenberg (1995). Other literature is business-related, such as Schütte (1993), who focus on the work of the *Treuhandgesellschaft* like Dyck (1997), or has a theoretical approach like De Grauwe (1992). In line with the economic development literature, Próchniak (2011) recently found financial sector development to be an important economic growth determinant in ten Central and Eastern European countries.

Nevertheless, there is a paucity of literature on GDR banking transition, and up to now, there was no empirical research at all. To my knowledge, only the work of Wagner (1993) has examined GDR banking system transformation. Despite the author's focus on currency conversion and a comparison of financial system transformation in other Eastern European countries, Wagner (1993) gives a short impression of the GDR banking sector and its implementation in the West German system in 1990. Nonetheless, his reflection is descriptive and does not include any statistics or empirical analysis.

The lack of research in this area might be due, on the one hand, to the fact that the transformation of the GDR banking model into a marked-based system was performed quickly

and quietly. In contrast to other economic sectors, the banking sector had already completed the transition to a marked-based system by the end of 1990, directed by the Bundesbank (West German central bank). In theory, the East and West German banking systems should thus were equally well-developed, in which case the GDR banking transition might not were of much interest for economic research.

In gathering basically all available information and data on the GDR banking system, plus adding an empirical analysis, this research enriches the existing literature on GDR banking structures by far.

3 The endogeneity problem

The direction of causality concerning financial and economic development is still being discussed, but to date it could not been fully answered by the literature. If a spurring economy demands a high level of financial development, and thus influences regional banking structures, empirical results will be biased, and in some cases, these biased results will simply yield slightly over- or underestimated values, whilst in others false conclusions might be drawn, thereby making research outcomes untenable. Thus, one of the biggest problems for empirical research on the finance and growth nexus is the problem of endogeneity arising from simultaneity.

The recently compiled dataset on German banking structures allows new empirical research on the link between regional financial and economic development. As explained, pretty much every empirical study on finance and growth relations faces the problem of endogeneity, leading to biased results and leaving unanswered the question about causality. Therefore, in order to acquire credible estimation results, the endogeneity problem needs to be solved. In this part of the work, I will summarise the endogeneity problem and explain how it can be dealt with by using specific techniques, such as implementing an instrumental variable. Subsequently, I shall outline in detail the two instruments applied in the estimation in Chapter 6. Due to the German history of partition, separate instruments are adopted for East and West Germany: for the former, information on the banking structure immediately after reunification is employed, whereas for the latter the number of savings bank branches in the year 1982 is used.

The problem of endogeneity is an immense obstacle in empirical economic research, as the possibly resulting bias might lead to false conclusions. In the finance and growth nexus, the endogeneity problem usually arises from two sources, namely omitted variables and simultaneity. The problem of omitted variables is quite common in empirical research, as most likely there are unobserved third factors influencing the estimated results. For one thing, it is simply not possible to involve all interactive variables, but then again, there are also factors such as political decisions or (local) legal requirements. The simultaneity problem on the other hand lies within the finance and growth topic itself, as it is still questionable

as to whether financial development follows economic growth or spurs it on, or if both are mutually dependent.

To address the problem of endogeneity, omitted variables and simultaneity need to be controlled for. In using, for example, region- and time-specific variables, it is most likely to filter possible unobserved factors influencing the dependent variable and thus control for omitted variables. The simultaneity problem, however, is a far more complicated issue to address. One econometric technique to solve this problem involves using an instrumental variable, which is employed to proxy the net effect that the endogenous variable has on the dependent one. For an instrument to do so, two conditions need to be met. First, the instrument needs to be relevant to the effect that there is a partial correlation between the instrument and the endogenous variable. Second, the instrument should not have an effect on the dependent variable other than through its influence on the endogenous variable, i.e. it needs to be exclusive. Finding a valid instrument is a hard undertaking; hence, especially the second condition of exclusion is hardly met by an incident that performs the relevance condition. In short, relevance and exclusion conditions determine a valid instrument.

Roberts and Whited (2013) provide a detailed and comprehensive debate on endogeneity in empirical corporate finance, including possible approaches which can be adopted for the finance and growth nexus. In their work the authors state that good instruments often have an exogenous source, such as institutional changes or biological features. This way it is much easier to prove an instrument's exclusion. Authors such as Jayaratne and Strahan (1996) and Bertrand et al. (2007) use publicly mandated banking deregulations in the US and France, respectively, to set up their empirical finance and growth research and thus are able to elude the simultaneity problem.

Applied to the attempted research on German regional banking and economic development, the used instrument has to influence the distribution of the regional banking structures in the relevant period of examination (herein 2003-2013), in order to fulfil the relevance condition. Second, but equally as important, the instrument needs to be excluded from any correlation with the dependent variable, i.e. regional economic development.

As already mentioned, due to the German partition, two region-specific instruments are

applied. In using the East German banking structure of 1990 as an instrument for East Germany, this research relies strongly on the idea of Guiso et al. (2004), who applied the Italian banking structure of 1936 as an instrument for regional financial development in Italy in 1990. The authors examine whether local banking structures still matter for regional economic development in the modern-day highly integrated and technology-based banking market. In doing so, the authors also face the endogeneity problem, due to simultaneity. The national banking reform in 1936 allows them to use the banking structure back then as a valid instrument. An instrument similar to the applied West German savings banks branch density in 1982 for West Germany has not been employed in the literature to date.

Now, following the example of Guiso et al. (2004), the questions to be answered are: (i) has the distribution of East German bank branches in 1989/90 (West German savings banks branches in 1982) been influenced by region-specific or economic factors, or has it been more or less random? And (ii) does the number of East German bank branches in 1990 (West German savings banks branches in 1982) affect the regional economic development during the examined period in any other way than via its influence on the banking structures? To answer these questions, I now provide a detailed description of the banking systems in East and West Germany, in 1990 and 1982, respectively.

3.1 The instrument for East Germany

As previously explained, for the instrument to be valid it is crucial that the regional distribution of bank branches in the GDR 1990 has not been established due to region-specific or economic needs but instead is more or less random. To conceive the GDR banking structure of 1989/90, a deeper insight into the GDR banking system is essential. In doing so, the main questions about branch distribution, their relevance and randomness are answered. To start with, I shall explain the fundamental details of the GDR's socialist banking system, as in the main these are not common knowledge. Like other Central and Eastern European countries, the GDR implemented a centrally planned economy, the two major characteristics of which were: (i) collective ownership of production factors and (ii) central planning and steering of

the economy.[1]

3.1.1 The GDR banking system

Information on the GDR banking system, given in this section, was gathered mainly from the work of Ashauer (1990), Ashauer (1991), DG Bank (1990), Ehlert et al. (1976), Ehlert et al. (1985), Ehlert (1989), Mann (1996), Pütsch (1978) and Wysocki and Günther (1996). Sources provided by documents accessible at the *German Federal Archive* in Berlin and other references are indicated accordingly. Parts of the following section are taken from Bernhardt (2016).

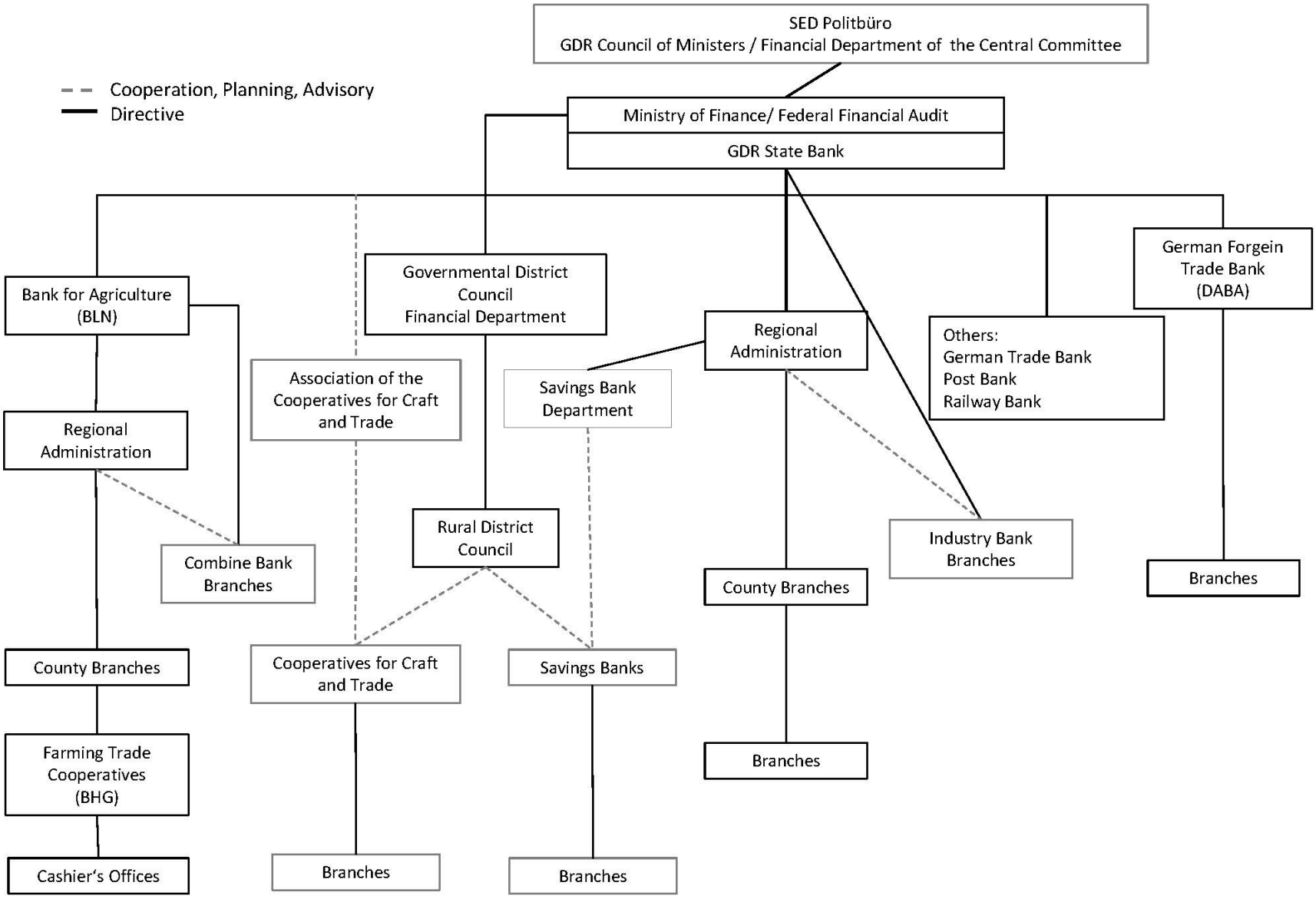
The GDR banking system was built strictly upon Lenin's draft of a socialist banking system outlined in his work Lenin (1918). From the author's viewpoint, banks should play a key role in financing and structuring the economic activity of a socialist state. In line with this notion, they should be implemented within the business cycle and be active political units. Furthermore, in Lenin's socialist scheme, banks should not work as the financial intermediaries found in a market-based system. As a result, the GDR banking sector was not competitive. Customers were assigned by law and interest rates regulated by the GDR State Bank. In fact, banks were used for collecting basically all private financial resources and embodied as an extended arm of the GDR government's monitoring system.[2]

As is evident in Figure 1, in the type of socialist banking system implemented in the GDR the central bank takes on a universal function in governing and controlling all financial activities. The GDR's central bank (Staatsbank der DDR – referred to as the 'State Bank' from now on) was a credit, money-issuing and clearing centre, as well as the cabinet's central institution for realising the government's resolved monetary and credit policy. The State Bank was in charge of scheduling money supply, balancing the credit system, being a 'bank of all banks' (including refinancing loans), accounting for all state finances and setting the currency exchange rate. When, in 1974, the State Bank inherited the Bank for

[1] See Mülhaupt and Fox (1971) and the Appendix for more information.

[2] The GDR government monitored its population in various ways. There was even a special authority set up for controlling and observing all national actions, namely the Ministry of State Security (MfS). The GDR's political units are highlighted in Figure22 in the Appendix. For more information on the MfS see Auerbach et al. (2008). Additionally, a more detailed impression of the financial market structures and their relevance to a command-economic system is given in the Appendix.

Figure 1: The GDR banking system 1949-1990



Based on: DG Bank (1990), p. 14; Deutsches Institut für Wirtschaftsforschung (DIW) (1990), p. 25 and Ashauer (1990), p. 10 et seq.

Industry and Trade, it became a commercial bank for all kinds of industry and trade, too. Additionally, the State Bank was in charge of controlling all other financial institutions, as highlighted in Figure 1.

Not only were the structures of the GDR banking system very different from a marked-based system, but also banking as a business was quite remarkable; indeed, all bank account deposits were administered by the local bank, but the real assets had to be transferred to accounts held by the State Bank. As already mentioned, a credit and loans system was quasi non-existent, since loans were only given in the form of private credit such as, for example, credit for newly-weds and commercial credit for very small businesses. In 1985, the percentage of consumer loans granted amounted to less than 1% of all loans provided. Commercial credit not granted by the State Bank or BLN stood at about 2.5% for fixed assets (1.8% for cash assets) for all economic loans (see Wysocki and Günther (1996), p. 109-111). The banking system in the GDR was detached from the prime position as a financial intermediary, as known in western economies.

In the GDR all financial and economic actions were planned by the Socialist Unity Party of Germany (SED)[3] and implemented by the State Bank. To ensure the central collection of funds and the State Bank's supremacy, all nationwide bank records had to be reported and deposits invested at fixed rates in State Bank accounts. The State Bank's directorate could not independently set interest rates or other banking standard values, as it was a political organ. The State Bank's directorate depended on the objectives determined by the GDR Council of Ministers and the SED party's economic and financial plans. Essentially, the GDR banking system was strictly controlled. In the following, I will explain how the socialist system was set up.

The historically grown three-pillar banking structure in Germany was officially diminished by the Soviet Military Administration in 1945 (Neuorganisation der deutschen Finanz- und Kreditversorgung (SMAD Befehl Nr. 01 vom 23. Juli 1945) (1945), also see Figure 16 in the Appendix). But although savings banks and cooperative banks existed, at least in

[3]The Socialist Unity Party of Germany (SED) was the single governing party in the GDR up until 1990. The five-year plans (sometimes also one-year or seven-year plans) of the GDR government were routinely set at the SED party congresses. They entailed political and economic goals as well as the allocation of monetary and natural resources in the best possible way. See Pütsch (1978), p. 21 et seq. for more details.

name and alongside the State Bank within the GDR banking system, those banks can rather be considered to be executive operational departments of the State Bank.

Part of the cooperative banking sector was the Bank for Agriculture (BLN), the Council of Ministers' central organ for controlling and financing all agricultural, forestry and food industries. Additionally, the BLN was the principal financial institution of all cooperative enterprises in the GDR. The BLN and its subsiding Farming Trade Cooperatives (BHG) were governed directly by the State Bank – and thus according to the SED's economic objectives. As such, BHGs were the State Bank's institutional investor for rural areas and for performing deposit banking, though they hardly did any loan business.

Another pillar of the GDR's cooperative banking sector involved the numerous cooperatives for craft and trade (CCT). Besides providing necessary financial services, these CCTs should support the work and outcome of small craft and trade businesses. The CCTs were the only banking institutions indirectly guided by the State Bank, as is evident in Figure 1.

The GDR's savings bank system was immersed deeply in the centrally planned banking system. There was no savings bank association, and savings bank directors were not only nominated by, but also had to report to the respective district council. Additionally, all surpluses had to be transferred, to fund the respective communal public plans.

Additional actors in the GDR banking system were the German Foreign Trade Bank and the German Trade Bank, both of which were in charge of handling foreign exchange and transit trade relations with other countries. The trade banks and others, such as postal and railway banks, were of minor relevance to the GDR banking structure, because, either their importance within the banking system was negligible or the numbers of bank branches and customers were insufficient, or both. Nonetheless, not only were the structures of the GDR banking system very different, but banking as a business was also important. Thus, for instance, a credit and loans system was virtually non-existent as already explained earlier.

Despite the points outlined above, critics could say that the GDR branch network could trace its roots back to the 19th century. In line with this logic, regional economic dynamics and financial development could still be correlated; yet, there is a final argument against any correlation. Within its forty years of existence, the GDR banking system additionally

went through various major restructuring phases, all of them increasing political influence and decreasing the sort of tasks undertaken within financial systems running market-based economies.

Each financial actor was affected at different times. The State Bank and its branches were set up in every bigger city, in line with Act 1/45, by the SMAD in 1945.[4] The same Act shut down all private bank branches, at which time the State Bank system was set up as part of the centrally planned economy. Consequently, there is no relationship between State Bank branches and any historical development process.

The savings bank system was rearranged according to the administrative reform in 1952, leading to an increase in independent savings banks. According to Wysocki and Günther (1996), p. 159, this reform was not an economic but a purely political decision which was meant to break remaining federal structures and strengthen the central government. In 1955, then, savings banks were forced by law (Ministerium der Finanzen (1955)) to open up branches in all villages populated by more than 500 inhabitants, unless a BHG already provided an office in the respective village.

Finally, in 1980, so-called 'territorial rationalisation' started, in order to coordinate and consolidate similar regional functions. Due to this rationalisation process, in 1983 all existing cooperative accounts were assigned to local savings banks. As a result, about 90% of the cooperative branches and cashiers' offices were shut down (see also Wysocki and Günther (1996), p. 160 et seq.). Therefore, the savings bank and cooperative branch networks likewise were detached from any historical development roots, which might have gone in hand with an economic development process.

3.1.2 The transformation of the GDR banking system

In the previous section, I explained – upon some theoretical facts of the East German banking system – that the bank branch structure of 1989/90 was mainly driven by political decisions. Therefore, the instrument's exclusion from regional economic dynamics can be seen as given. In the following section, I explain why the East German banking structure of 1990

[4] See Neuorganisation der deutschen Finanz- und Kreditversorgung (SMAD Befehl Nr. 01 vom 23. Juli 1945) (1945).

is still relevant to the banking structure in the sample period. The instrument's relevance lies within its transformation from a socialist into a market-based system, in line with German reunification.

German reunification took place politically over a period of less than one year. Table 1 lists the most important steps in 1989 and 1990 towards political German reunification. The political transformation of the banking system proceeded even faster, in just 3 months. The State Bank Law[5], enacted by the first free and democratically elected parliament of the GDR, diminished the mono-banking system and started a market liberalisation process. This was the basis of the banking transformation. From April 1st 1990 onward, domestic private merchant banks were allowed to be founded, and foreign banks could open up branches on GDR territory. The State Bank's merchant bank business was outsourced to the derived *Deutsche Kreditbank AG* and *Berliner Stadtbank AG*. The State Bank itself was left with common central bank functions and renamed *Staatsbank Berlin*. The BLN had already been diminished and rendered into succession of the *Genossenschaftsbank Berlin* (Ministerrat der Deutschen Demokratischen Republik (1990), p.30.). Thus, the two most important financial institutions of the former GDR were neutralised and basically shut off from the financial market. In line with the socialist political structure, the first GDR parliament shut down the socialist banking structure.

From July 1st 1990, the East and West German parts were united by the treaty on the creation of a monetary, economic and social union[6], thereby transferring the GDR's sovereignty in monetary terms to the Federal Republic of Germany (FRG). Thus, politically and legally, the financial system of the GDR changed substantially from a command into a market economy. Consequently, the Bundesbank became the head of the banking system, although Staatsbank Berlin remained formally active, albeit without any operative business, until merging into the KfW-Group in 1994.[7] As a result, Bundesbank branches were estab-

[5]Gesetz zur Änderung des Gesetzes über die Staatsbank der Deutschen Demokratischen Republik vom 6. März 1990. (GBl. DDR 1990 I) (1990)

[6]Vertrag über die Schaffung einer Währungs-, Wirtschafts- und Sozialunion zwischen der Bundesrepublik Deutschland und der Deutschen Demokratischen Republik vom 18. Mai 1990 (BGBl. 1990 II S. 537 / GBl. DDR 1990 I S. 332). (1990)

[7]The *Kreditanstalt für Wiederaufbau* (KfW) is a German development bank, owned by the federal overnment and German regional states. The KfW was founded in 1948 to support the reconstruction of Germany after the Second World War.

lished in every large city to manage the transition into monetary union by: (i) operationally transforming the East German banking system, (ii) implementing West German banking laws and (iii) launching the D-Mark as a single German currency.

In line with the treaty of July 1st, every bank headquartered in D-Mark currency area was allowed to open up branches without any restriction (Ministerrat der Deutschen Demokratischen Republik (1990), p. 8-9). All relevant financial institutions remaining in East Germany entered into extensive partnerships or cooperatives. The Deutsche Kreditbank AG, which operated the former State Bank branches, went into a joint-venture with the private West German Deutsche Bank AG and Dresdner Bank AG. Thus, all former State Bank branches were overtaken by the West German private banking sector (ibid., p. 21) but remained in operation. West German private banks focused on customer acquisition and the development of a strong market position within the new market and the extensive State Bank branch network provided optimal market entrance in terms of structure, customer proximity and visibility. During the first few years, Deutsche Bank AG and Dresdner Bank AG were operating even temporary branches, to build new customer relations.[8]

In contrast to the private banking sector, the public and cooperative sector was and still is limited in its action, because, in Germany, savings banks and cooperative banks are regionally bound by their regulations. They were simply not allowed to open up branches or take over East German banks. However, on their own, East German savings banks and banking cooperatives were most probably not be able to continue business. The lack of knowledge, financially educated employees and missing technological infrastructure are just a few examples illustrating the desolate (compare Mann (1996)). As such, both the *(West) German Savings Banks Group* and the *Federal Cooperative Association* entered into extensive partnerships with their East German affiliates. These partnerships included the exchange of employees, training programmes and the implementation of a technological infrastructure for the existing branch network. Due to this support the existing cooperative and savings banks of the former GDR continued business, now no longer operating as system-inherent organs but as part of a market-based financial intermediaries system.

[8] See Mann (1996) and the Appendix chapter on the GDR banking structure for more details.

Table 1: Chronology 1989/1990

1989	
Summer	Increasing civil rights protests across the GDR, strengthening the call for reform. Thousands of East German citizens demonstrate for their freedom.
	Moreover thousands flee the country and seek asylum in West German embassies.
11. September	Hungary opens its borders, even more East Germans flee. Within three days a further 15,000 people flee to West Germany via Austria.
18. October	Erich Honecker, GDR leader and key members of the Politbüro are forced to resign.
7./8. October	The GDR Council of Ministers, the Prime Minister and most of the Politbüro resign.
9. November	The fall of the Berlin Wall. The opening of border crossings after 28 years leads to the emigration of several millions of GDR inhabitants to the FRG within the next few days.
28. November	Presentation of the Ten-Point Program by Chancellor Kohl in the Bundestag. Entailing steps towards the German unification, the process is planned to last about five years.
1. December	Constitutional change in the GDR. The SED's claim to leadership is banished.
1990	
January	Cooperative banks start building East-West partnerships. On January 17th, the *Berliner Volksbank eG* (West) and the *Berliner Volksbank - Genossenschaftskasse für Handwerk und Gewerbe* (East) are the first to announce a partnership. Other West German banks start founding branches on East German territory, too.
February	West German savings banks start their regional partnership care concept to support the set-up of a savings banks system with 'Western' standards.
March, 1st	The GDR government passes a law allowing businesses to be built freely in the market. Foundation of the trust corporation (*Treuhand*); state-owned companies are changed into stock companies or other market-based firm types. Private credit banks start opening branches.
March 18th	The first really free and fair elections of the GDR take place.
March, 20th	Foundation of the East German (at this point still 'GDR') savings banks association.
April, 1st	The new law about the State Bank enters into force. From now on, mono-banking system is diminished, central banking and corporate banking are separated *Deutsche Kreditbank AG* and *Berliner Stadtbank AG* take over corporate banking (Gesetz zur Änderung des Gesetzes über die Staatsbank der Deutschen Demokratischen Republik vom 6. März 1990. (GBl. DDR 1990 I) (1990)).
July, 1st	The Economic, Monetary and Social Union officially comes into force. The D-Mark becomes the single currency, banks have to operate under KWG and the Bundesbank becomes the central bank of the eastern territories as well (Vertrag über die Schaffung einer Währungs-, Wirtschafts- und Sozialunion zwischen der Bundesrepublik Deutschland und der Deutschen Demokratischen Republik vom 18. Mai 1990 (BGBl. 1990 II S. 537 / GBl. DDR 1990 I S. 332). (1990), Gesetz über die Staatsbank Berlin vom 29. Juni 1990 (GBl. DDR 1990 I S. 504) (1990)).
August, 31st	The Unification Treaty is signed (Einigungsvertrag vom 31. August 1990 (BGBl. 1990 II S. 889) (1990)).
September, 12th	Two Plus Four Treaty in Moscow is signed, confirming the borders of a united Germany and its sovereignty.
October, 3rd	Finally, East Germany changes to the Federal Republic, and so the GDR ceases to exist. Instead, a reunited Germany abides by Basic Law. The allies guarantee complete and unrestricted sovereignty as negotiated in the Two Plus Four Treaty.

The acquisitions and support made by West German institutions are not surprising. The private sector jumped on evolving business opportunities and took advantage of current structures. For West German savings banks and cooperatives, associating with their East German counterparts was inevitable, because not doing so would have had enormous negative image effects, and the historically grown three-pillar structure would not have been maintained nationwide otherwise. Additionally, the enlargement of the West German associations promised to entail positive synergy effects in the long run.

The transition from a socialist- to a market-based banking system, including currency reform, is expected to have significant impacts on a nation's financial system and its branch structure. The transformation of the GDR's banking system, however, had virtually no consequences for the branch network; the banking transition in 1990 – in terms of relevance concerning the bank branch system – was tantamount to a West German takeover. Most important for using the number of bank branches in 1990 as an instrument for the banking structure nowadays however, is the fact that overtaking and continuing business in the existing bank branches has not been driven by usual economic factors that apply when marked-based banks decide on their branch network.

3.1.3 East German banking data for 1989/90

The GDR banking dataset presented herein was compiled recently and is unique, in that – to date – it has not been used for research. The dataset includes detailed bank and bank branch information, such as addresses and functions. It was compiled in a form similar to the 2003-2013 bank branch panel introduced later in this study. Compiling historical East German banking data was challenging, as no disaggregated bank branch data on the GDR are available at the Bundesbank. Due to the significant time period that has passed, chaotic circumstances in 1989/90 and a partial destruction of some documents, various sources were involved.[9]

Comprehensive data on the savings banks sector and its branches are provided by the East German Savings Banks Association (OSV). Addresses of all State Bank branches are

[9]Employees of the German Federal Archive report that the SED regime left files and documents partially destroyed, incomplete and scattered among floors and lockers, when West German officials took over.

documented and accessible at the KfW-Group archive.[10] Fortunately, the resulting branch numbers on savings banks and State Bank branches are in line with the official numbers documented in the files at the German Federal Archive and other sources, such as Ashauer (1990).

Information on cooperative bank branches can partly be found in the records of the German Federal Archive, where detailed branch data on the Cooperative Bank for Craft and Trade are recorded. These documents likewise are complete and in line with the officially reported numbers. Unfortunately, records on agricultural cooperatives are incomplete. In the documents held at the German Federal Archive only the addresses of the 272 regional Farming Trade Cooperatives' head offices (BHG) are documented. However, other sources maintain data on BHG cashiers' offices.

Information on BHG branches is listed in the Yellow Pages for GDR regional districts, available at the *German National Library*.[11] Furthermore, information on BHG branches in the former district of Cottbus is recorded at the Federal State Archive of Brandenburg. Both sources agree. Some regional districts show negligible deviations; only 2,033 of the officially reported 2,812 offices could be detected. This gap might be due to different effective dates, as unfortunately the available Yellow Pages fluctuate between 1985 and 1988. Additionally, some cashiers' offices were open just a view hours per week or were operated alongside other business activities. Most likely such branches were not affiliated in the Yellow Pages, and some might not even have had a telephone line, making a record in the telephone book obsolete.

Yet, the collected data on BHG branches display the best possible approximation of the true numbers. First, information given in the Yellow Pages for the district of Cottbus and data provided by the Federal State Archive of Brandenburg are consistent. Second, although 2,812 BHG branches are documented in an official GDR secretary report (Document, DY 19/357 (1981/82)), this number cannot be proven by a second source (like the number of savings banks and State Bank branches), and thus it might be questionable. Third, the offi-

[10] In line with the merger in 1994, all remaining GDR State Bank accounts, businesses and documents were transferred to the KfW.

[11] A BHG branch's responsibility, address and telephone number are given, see f.i. Branchenfernsprechbuch der Bezirke Cottbus Frankfurt (Oder) Potsdam (1987/88)

cial Bundesbank reports include aggregated data on 5,707 bank branches for East Germany, including Berlin, at the end of 1990, in contrast to 5,793 bank branches reported in the compiled database. Given the circumstances, a difference of 86 branches in the used data seems to be negligible. Later on, I will additionally show that the instrument's quality is not affected by these minor deviations in data.

3.2 The instrument for West Germany

Having justified – theoretically – the number of bank branches in 1989/90 on the former GDR territory as a good and valid instrument for banking structures in East Germany, I shall now explain why, for West Germany, the number of savings banks in 1982 fulfils the same instrumental requirements. Furthermore, I shall highlight the public services and regional principles of German savings banks and their relevance to the instrument criteria.

The structure of the German banking system is unique. The so-called *three-pillar* structure of private, public and cooperative banks is not comparable to any other banking system. The public banking sector in Germany consists of regional savings banks and several Federal State Banks. These publicly owned banks not only have a public mandate, but they are not purely profit-oriented, either. Within the public banking sector, savings banks play a special role, as they almost exclusively provide all retail banking activities. Also, the public banking sector is a relevant factor in the German financial market. On a regional level, the public sector's market share is about one-third.[12] In order to explain the instrument's quality at this point, I focus on savings banks. More information about the entire German banking sector is given in the Appendix.

For a very long time, savings banks have not been what would be recognised today as 'credit banks'. When, in the 18th century, the first savings banks were established, they were founded as widows and orphans funds, created by clergymen, scholars and merchants to provide insurance for the local poor. In the following decades, savings banks were founded by mayors and regional royals for the same reason.

Today, savings banks' territorial focus is determined by the Basic Law for the Federal

[12]The distribution of market share depends on the category, e.g. total assets, deposits or costumer loans (see IMF (2011) and German Council of Economic Experts (2013)).

Republic of Germany (§28 GG (1945)), which means that they are restricted to a specific region, usually their rural or municipal district. In most cases the respective municipality owns the savings bank. Additionally, savings banks' boards are – in addition to financial experts – staffed mostly by mayors, other local politicians and representatives, each serving a set of provincial interests. Within their mandate, these public service principles demand that savings banks act in favour of their clients and district. [13] Each German citizen, for example, has the right to have an account at his or her local savings bank. The regional principle is further determined by the respective Federal Savings Bank Law active in each German federal state (see e.g. §3(1) SpkG NRW (2008)). Within this laws it is affirmed that each municipality is allowed to open up its own savings bank and operate branches within the municipality's area (see e.g. §1(2) SpkG NRW (2008)).

According to the savings banks concise dictionary (Handwörterbuch der Sparkassen (HWS) (1982)), if planning a new branch location, they have to account for the following list of factors: the current population and expected population development, urban and regional development and planning, the actual number of current accounts, the number of branches operated by other banks (bank density), thoroughfares, means of transport and parking possibilities, business situation and proximity of workplaces, taxable capacity, purchasing power and (household) income structure, commuter flow and, finally, occupational statistics. Concluding, savings banks take various factors into account when deciding about branches, but although there are some economic factors, it cannot be said that they have followed economic growth perspectives or been regulated by any regional growth dynamics purely. This is an important indicator, proving the number of savings bank branches to be a valid instrument in terms of exclusion.

As in the previous section, after providing a plausible argument for the instrument's exclusion, I need to provide the same for its relevance. Up until 1958, the decision to open a branch was restricted only by the Bundesbank, which decided if and where a bank was allowed to open based on an economic needs test. When, in 1958, this economic needs test ended, a wave of branch openings by all banks followed. This fact supports the

[13] The German word *Daseinsvorsorge* means a legally enacted principle of services of general interest.

previously taken point of view that the decision about opening bank branches for savings banks, was driven by other factors than purely economic ones. In West Germany, by the end of 1980, one bank branch had an average of 1,400 inhabitants for whom to provide banking service. In 1982, branch expansion was considered to have reached its peak and has slowly decreased ever since. However, in the following 20 years, only a very few savings bank branches in West Germany closed down. The number of cooperative and private bank branches remained fairly even, too. Although this is speculative, I would state that it seems as if it is easier to open a bank branch than to shut it down. Long-term contracts with employees and leases, as well as negative publicity, are just some examples of factors basing the unpopularity of branch closures. For savings banks their public mandate additionally supports a branch network which is denser than purely economic reasoning would imply. [14]

The quite stable number of savings bank branches over 20 years additionally indicates that the regional financial structure in 1982 hardly correlated with regional economic development, as during the same time period, significant and regionally heterogeneous economic growth took place. The same argument supports the instrument's relevance for the banking structure during the sample period. The savings bank branch network hardly changed over the 20 years between 1982 and 2003. Moreover, it was highly correlated with the overall German branch network, as will be shown formally in Chapter 5. Concluding, the structure and development of the savings banks branch network of 1982 entail plausible arguments to fulfil the exclusion and relevance condition fairly well.

3.2.1 West German savings bank data for 1982

Savings bank branch data for West Germany in 1982 are based ostensibly on the Hoppenstedt Bankenortslexikon (HBO). Unfortunately, in contrast to banking data for the years 2003 to 2013, data for 1982 are less detailed and in an unsorted order. This is due to the fact that in 1982 there was not a standard form for reporting on banks and bank branches in the HBO collection, as will be explained later on in Chapter 4. HBO-files available at the German National Library (DNB) represent information assembled in November 1982.

[14] According to an official Bundesbank monthly report, there were 44,839 bank branches in West Germany in 1982 and 44,156 in 1989. For more details see Bundesbank (1990) No. 26 a) and Chapter 4.

Of course, once again, a back-test of the official numbers reported by the Bundesbank was done. According to the monthly bulletin, published by the Bundesbank in November 1982, there were 595 savings banks operating 17,616 branches in total. By using the available HBO files, 597 savings banks could be found and a total number of 15,526 branches operating full-time could be added to the data panel. As for the years 2003 to 2013, only full-time employed bank branches were added to the bank branch dataset, and again bank bus stops, car cash stops and currency exchange offices were excluded. The difference of about 2,000 branches can be explained by this exclusion. The difference between 595 and 597 savings banks can be explained by the non-standardised reporting form employed by HBO in 1982. It is noticeable that in some cases savings banks were listed as individual savings banks, but part of a savings bank merger. However, considering the long time period, a difference of two banks and about 2,000 branches seems to be negligible at this point. As illustrated in Chapters 5 and 6 of this work, the instrument's quality is not influenced by these deviations.

As there was no standard form of HBO reporting in 1982, unfortunately nine savings banks were reported without any bank branch information at all. Fortunately, on the other hand, all nine banks still existed and had not merged in 1990. As we have credible information on the number of bank branches of all savings banks in 1990 from the German Savings Banks Association itself (Ashauer (1991)), for the nine missing savings banks, those numbers were taken instead. The affected savings banks are: Kreis- und Stadtsparkasse Dinkelsbühl, Kreissparkasse Daun, Kreissparkasse Steinfurt, Sparkasse der Stadt Straelen, Stadtsparkasse Werne, Stadtsparkasse Weiden in der Oberpfalz, Stadtsparkasse Felsberg, Stadtsparkasse Grebenstein and Sparkasse Hennstedt-Wesselburen.

The HBO-records of 19 savings banks only list the amount of branches but no location. This is no problem. As explained previously, in 1982, savings banks were only allowed to operate within a limited area, so the reported number of branches was generated as a dummy and matched with the zip code of the corresponding central branch. As for usage of the instrument, only the number of savings bank branches per Nuts3 region is needed, no data alert should ensue from this approach. The concerned savings banks

are: the Bezirkssparkasse Aachen, Angen, Gottmadingen, Langen and Schwetzingen; the Kreis- und Stadtsparkassen Bückeburg and Worms, the Kreissparkassen Bamberg, Walsrode, Tübingen, Wesermünde and Witzenhausen; the Sparkasse Eberbach, Nordfriesland, Passau, Soest and Ulm and the Vereinigte Sparkassen des Landkreis Wunsiedel and Gunzenhausen.

Based on the arguments presented above, theoretically the East German banking system of 1989/90 and historic West German savings bank data from 1982 are assumed to be valid instruments for solving the existing endogeneity problem. The subsequent part will support the instruments' validity based on some formal tests regarding relevance and exclusion conditions.

3.3 The relevance condition

According to Roberts and Whited (2013), "An instrument, z, is a variable that satisfies two conditions that we refer to as the relevance and exclusion conditions. The first condition requires that the partial correlation between the instrument and the endogenous variable not be zero." This can be tested easily by running a simple OLS regression of the form

$$x_k = \alpha_0 + \alpha_1 x_1 + ... + \alpha_{k-1} x_{k-1} + \gamma z + \nu \tag{1}$$

For the instrument to be relevant, the coefficient γ should not be equal to zero after controlling for some exogenous variables. To gain a first impression of the relevance of the presented instruments, a simple correlation analysis is carried out. The results are presented in Figure 2 and Figure 3. To further test the relevance condition we follow (Wooldridge, 2010, Chapter 5.1) and regress our sample period's branch density on savings bank branch density in 1982 and the East German banking structure in 1989/90.

The results presented in Table 2 and Table 3 show that a strong positive relationship exists between the instruments and the variable of interest, namely banking structure in 2010-2012. There is plainly a very high correlation between the number of bank branches in a given region in 1990 and 2010, with the correlation coefficient being equal to 0.8450

Figure 2: East Germany: Number of bank branches in 1989/90 and 2010-2012

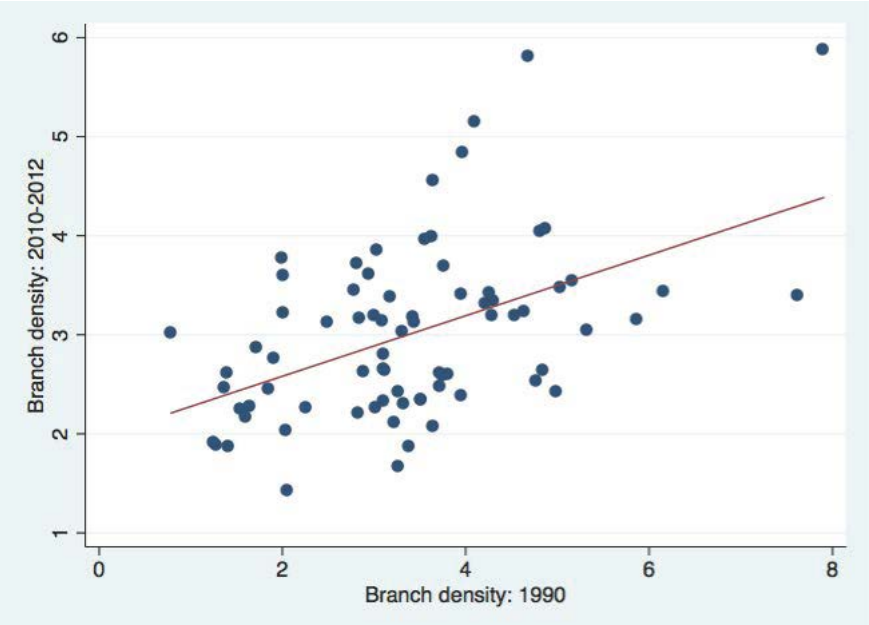


Figure 2 indicates that there is a correlation between the number of bank branches in 1989/90 and 2010-2012 in East Germany.

Figure 3: West Germany: Number of bank branches in 2010-2012 vs. number of savings bank branches in 1982

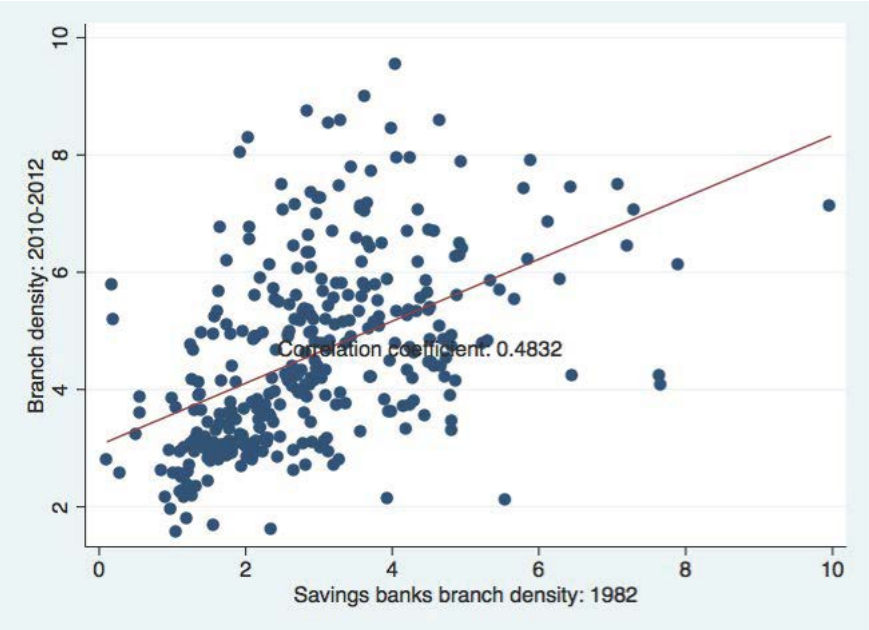


Figure 3 plots the number of West German bank branches per region in 2010-2012 vs. the number of savings bank branches in 1982.

and the coefficient from regressing branch density in 2010 on branch density in 1990 being positive and significant at the 0.1% level. R^2 (0.714) indicates the high explanatory power of the regression (see Table 2). The same is true for the number of savings banks in 1982 (see Table 3). Consequently, both instruments can be classed as relevant. Thus, the first condition for a valid instrument is met.

Table 2: East Germany: relationship between branch density in 1990 and 2010-2012 and economic development in 1992

	Branch density 1990	Branch density 1990	Branch density 2010-12
GDP p.c. (1992)	-0.342***	-0.0615	
	(0.0536)	(0.0894)	
City		-1.917***	
		(0.510)	
Branch density (1990)			0.306***
			(0.0642)
Constant	6.583***	4.425***	1.970***
	(0.511)	(0.742)	(0.235)
R^2	0.359	0.464	0.234
F	40.82	31.16	22.66
Observations	75	75	76

Columns 1 and 2 of Table 2 report results from regressing bank branch density in 1990 on GDP per capita in 1992. Column 3 reports results from regressing bank branch density in 2010 on bank branch density in 1990. * , ** and *** denote significance at the 5%, 1% and 0.1% levels, respectively.

Table 3: West Germany: Relationship between savings banks density in 1982 and branch density in 2010-2012 and economic development in 1982

	Branch density 1982	Branch density 1982	Branch density 2010-12
GDP per person	-0.111***	0.0503	
	(0.0219)	(0.0316)	
City		-1.689***	
		(0.252)	
Savings bank density (1982)			0.528***
			(0.0533)
Constant	4.043***	2.911***	3.051***
	(0.231)	(0.275)	(0.175)
R^2	0.073	0.187	0.234
F	25.50	36.87	98.09
Observations	324	324	324

Columns 1 and 2 of Table 3 report results from regressing savings bank branches in 1982 on GDP per capita in 1982. Column 3 reports results from regressing bank branch density in 2010 on savings bank branch density in 1982. * , ** and *** denote significance at the 5%, 1% and 0.1% levels, respectively.

3.4 The exclusion condition

The instruments have to be exclusive to economic development in the examined time period (2002-2006 and 2010-2012) and at the time of their emergence. As outlined previously, the banking structure in East Germany in 1990 and savings banks branch density in 1982 are obviously quite unlikely to affect local economic dynamics more than 20 years later. Unfortunately, in contrast to the relevance condition, the exclusion condition cannot be formally tested, although it is possible to provide supportive evidence on the instruments being exclusive.

Figure 4 shows that both the number of bank branches and the per capita ratio are distributed highly heterogeneously throughout the GDR area and its administrative districts. There seems to be no geographical concentration in, for example, the northern or eastern districts, whilst district size yields no prominent trend, either. Nevertheless, if controlling for urban and rural districts, the average values differ significantly, as highlighted in Table 4. There is a significant difference between the number of bank branches and the number of

branches per 10,000 inhabitants in between urban and rural districts. For both values, rural districts have, on average, more than twice the density of bank branches, which clearly indicates that a city dummy should be taken into consideration in further tests. Based on these results, it can be concluded that if a region is an independent city or a rural district, it has kind of a levelling effect on the number of bank branches.

Table 4: Summary statistics – bank branches and branches per capita

Number of bank branches in 1990				
District type	Mean	Min	Max	Obs
City	36.94	12	85	18
Country	84.52	23	234	58
Total	73.25	12	234	76
branches per capita in 1990				
District type	Mean	Min	Max	Obs
City	2.08	1.26	2.98	18
Country	4.40	2.49	8.95	58
Total	3.85	1.26	8.95	76

Table 4 provides summary statistics on the number of bank branches and the number of bank branches per 10,000 inhabitants in 1990. Summary statistics are given for urban and rural districts separately, as the results vary significantly.

The heterogeneous distribution of bank branches in 1989/90 can be explained through the different development and restructuring phases in GDR banking, as explained earlier. Banks and their branches were directed by the GDR government according to their organisational form and not locality. The GDR government was forcing comprehensive bank branch coverage, besides any region-specific factors.

Finally, to emphasise the instrument meeting the exclusion condition, the approach by Guiso et al. (2004) is followed once again by testing whether the level of economic development is correlated with the banking structure in 1990. Of course, this regression attempt faces the same problem of endogeneity as the overall research approach of this work; nonetheless, as actually testing the instrument for exclusion is not possible (see Roberts and Whited (2013)), the estimated results at least give a hint to whether exclusion can be

assumed.

Figure 5 plots bank branch density in 1990 versus GDP per capita at that time. Unfortunately, reliable regional GDP data are not available for East German regions for the year 1990, as the Statistical Office of the GDR ceased collecting data. Moreover, the existent data is questionable and not combinable with those of the West German Statistical Office. Starting from 1991 onwards, data in East Germany were collected based on West German standards, and regional data are publicly available only since 1992. Thus, in Figure 5, GDP per capita in 1992 is used as a proxy for its value in 1990. Given the high persistence in GDP and the very short time difference, it is expected that the 1992 value is highly correlated with its 1990 value. Figure 5 suggests that there is only a very weak and slightly negative relationship between the number of bank branches and economic development in 1990. This impression is confirmed by the results from a formal regression analysis reported in Table 2. When branch density is regressed solely on GDP per capita (column 1), a small negative significant coefficient is obtained. After including a city dummy (column 2), as suggested above, the significance vanishes (Figure 6 highlights this *city* effect).

Overall, the results indicate that there is no relationship between the regional banking structure in 1989/90 as a dependent variable and the indicator of economic development, namely GDP in 1992. It can be assumed that the structure and distribution of the bank branches in 1989/90 were not driven by any region-specific or economic factors. The explanations for the GDR banking structure and the results just presented suggest that branch density in 1990 satisfies the exclusion condition of serving as a valid instrument.

A similar analysis can be carried out for the instrument on West Germany, in this case the number of savings bank branches in 1982. As is evident in Figure 7, the distribution of savings bank branches in 1982 is highly heterogeneous. Similar to the overall number of bank branches in East Germany in 1990, no obvious pattern is evident in the distribution of savings bank branches and savings bank branches per 10,000 inhabitants. Again, the graphical illustration is supported by the explanations provided herein.

Again, a regression of the instrument on an indicator of economic development can provide evidence supporting the instrument's validity. Figure 8 clearly suggests that there

is indeed no positive relationship between the numbers of savings banks branches and GDP per capita in 1982; in fact, if at all, a slightly negative correlation exists. This impression is confirmed in Table 3, which shows that regressing savings bank density in 1982 on GDP per person in that year yields either a slightly significantly negative or an insignificantly positive (when a city dummy is included) coefficient. Both results thus provide evidence in favour of the exclusion condition.

In summary, the theoretical arguments and formal tests support the choice of the East German banking structure in 1990 and West German savings banks branch density in 1982 as instrument variables for the empirical analysis of local financial markets and economic dynamics.

Figure 4: Number of bank branches and branches per capita in East Germany 1990

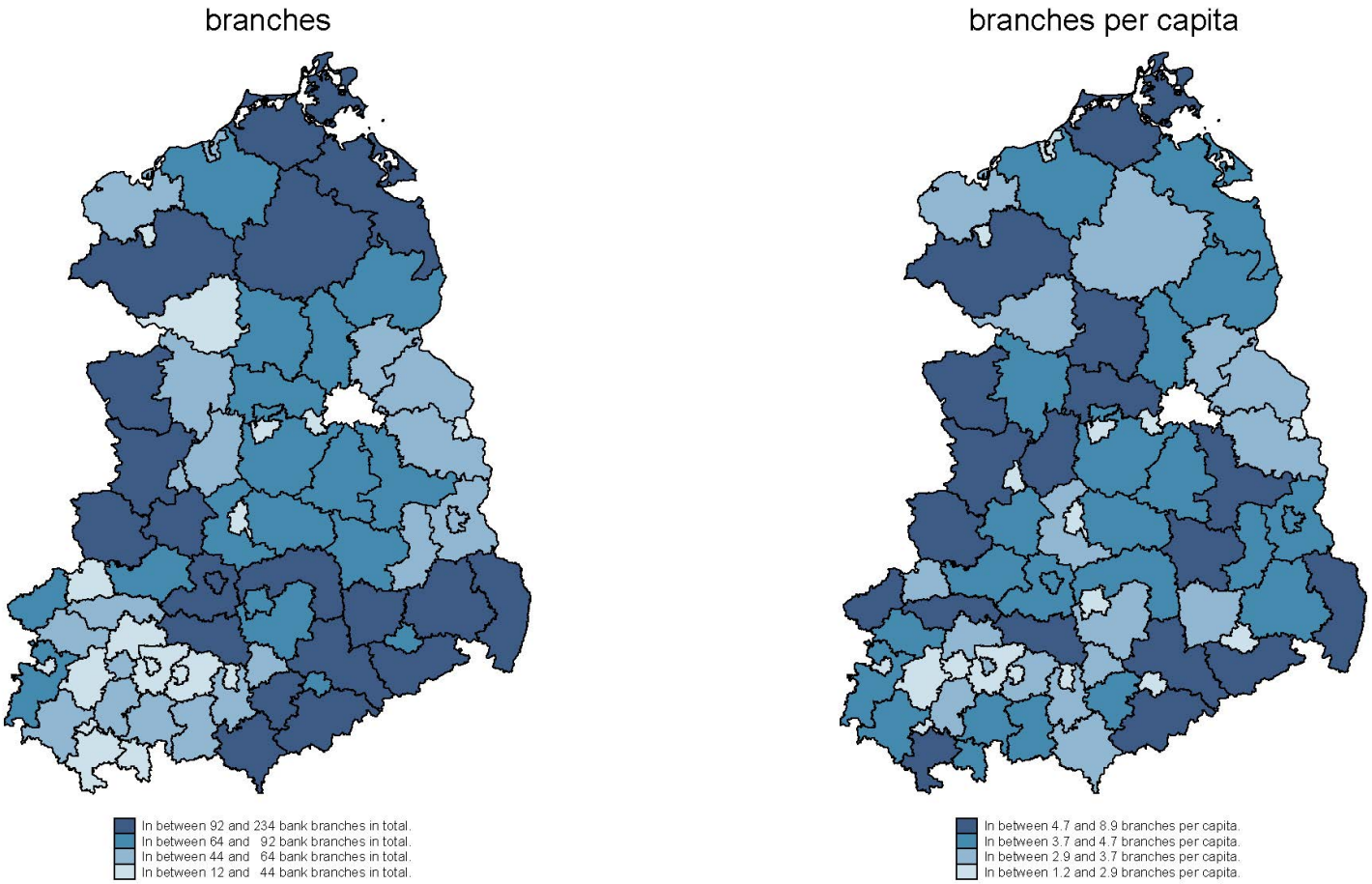


Figure 4 illustrates density in the banking market, given by i) the number of bank branches and ii) the number of bank branches per 10,000 inhabitants for each Nuts3 region of East Germany in 1990. Darker colours indicate higher density. Considered herein are 76 Nuts3 regions, including 18 city districts *kreisfreie Städte* and 58 country districts *Landkreise*. The city of Berlin was not considered, due to its separation during GDR times. It is evident that the local number of branches and the per capita value were heterogeneous in East Germany 1990.

Figure 5: Economic structures and bank branches per capita 1990

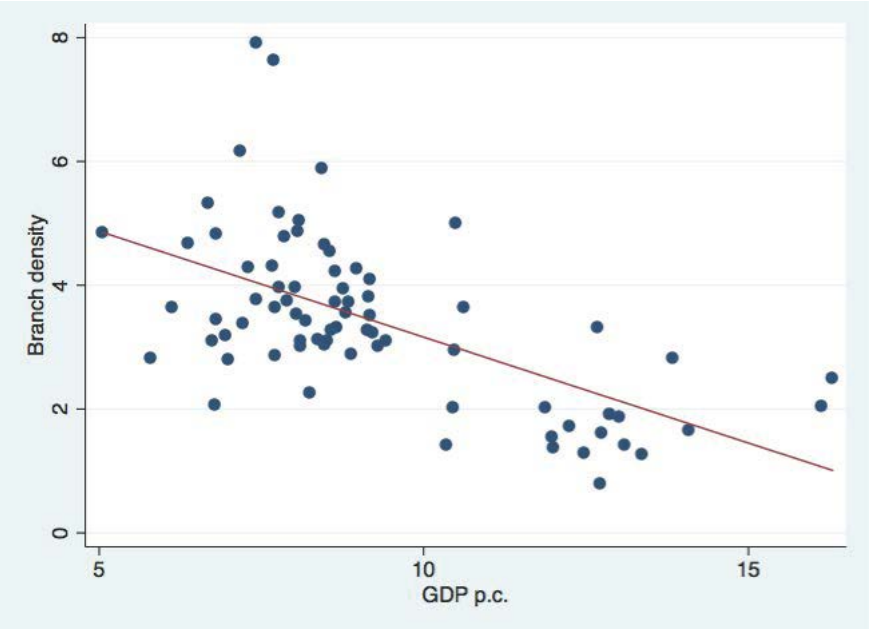


Figure 5 plots the number of bank branches per region in 1990 versus GDP per capita in this region in 1992. For GDP, the value for 1992 was taken, given that no reliable information for 1990 is available.

Figure 6: Economic structures and bank branches per capita 1990 in urban and rural districts

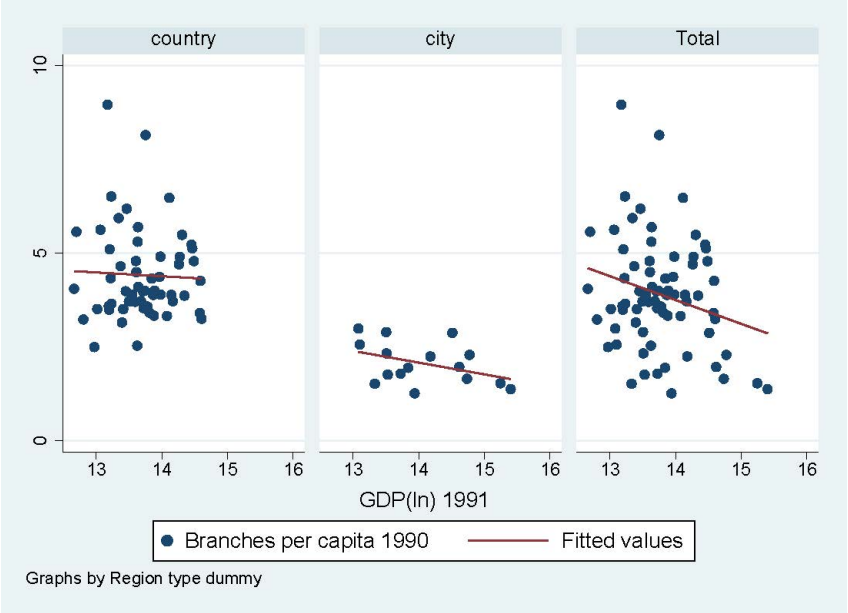


Figure 6 highlights the 'city' effect. In rural districts there is no obvious correlation between banking structure and economic dynamics. Independent cities show a slight negative correlation.

Figure 7: The number of savings bank branches and savings bank branches per capita in West Germany 1982

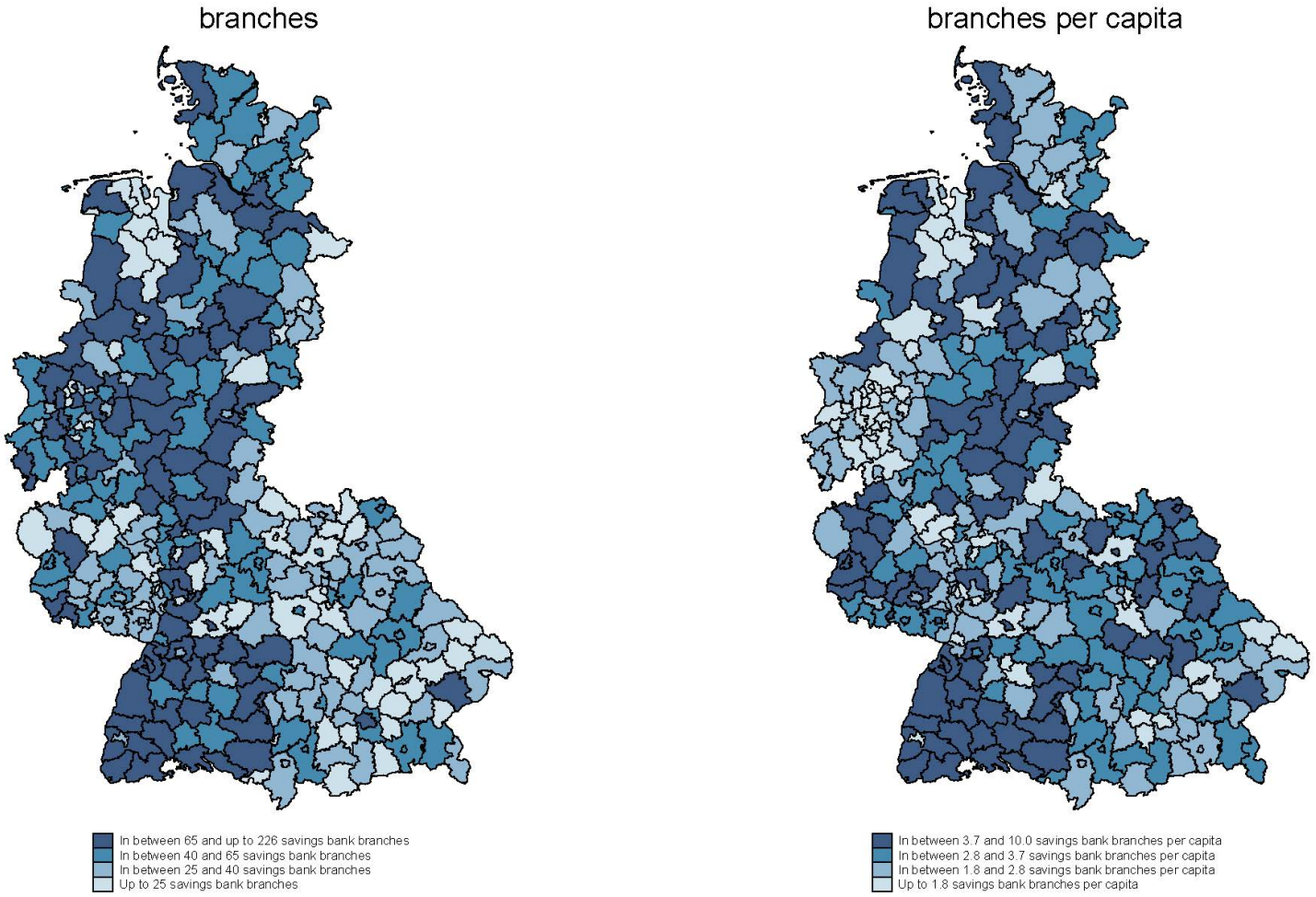


Figure 7 illustrates density in the banking market, given by i) the number of savings bank branches and ii) the number of savings bank branches per 10,000 inhabitants for each Nuts3 region of West Germany in 1982. Darker colours indicate a higher density. Considered are 325 Nuts3 regions, including 88 city districts *kreisfreie Städte* and 237 country districts *Landkreise*. Unfortunately, no savings bank data are available for the country district *Euskirchen*. It is evident that the local number of branches as well as the per capita value was heterogeneous in West Germany in 1982.

Figure 8: Economic structures and savings bank branches in 1982

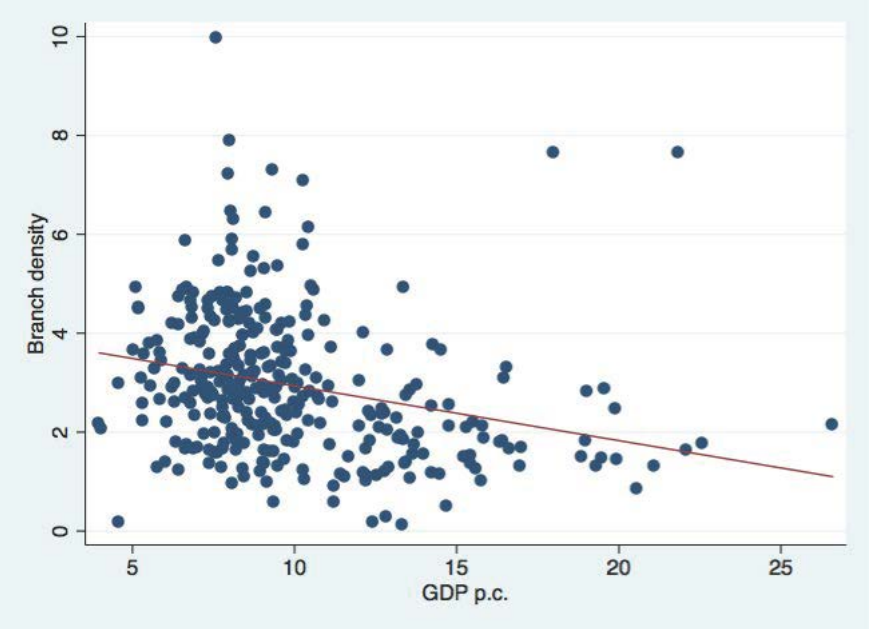


Figure 8 plots the number of bank branches per region in 1990 versus GDP per capita in this region in 1992. For GDP, the value of 1992 was taken, given that no reliable information for 1990 is available.

4 Data

In order to test empirically the relationship between the local banking structures and economic development presented in this work, two databases are used. The first database contains banking data for regional German areas from 2003 to 2013; these banking data were compiled just recently. The second database entails macroeconomic data for the same period. In the following I will explain briefly the applied regional level and describe in detail how the banking database was compiled.

The European Union (EU) applies three different levels of regional and governmental category. The first category is the Nuts1 level, which corresponds to the 16 federal states in Germany. Next, the Nuts2 level represents the 38 administrative districts (administrative regions), and finally the Nuts3 level corresponds to the 402 rural districts in Germany, effective January 2013. Within the relevant time period, from 1982 to 2013, several administrative reforms restructured the districts. These mergers and modifications were calculated backwards, to allow for consistent comparison.[15]

In line with Guiso et al. (2004), the question about relevant local markets in terms of statistical and economical aspects arose in advance of ascertaining and compiling the data. Guiso et al. (2004) use Nuts2 level data (the Italian provinces) for their analysis of the Italian market, but although the empirical approach presented herein is connected deeply to the work of Guiso et al. (2004), the databases used in this research are both based on the Nuts3 level, due to some specific German characteristics.

According to the German constitution (Sect. 28, §2, GG (1945)), German cities and municipalities have autonomy to make decisions such as setting trade or property taxes, building schools and hospitals and organising local economic promotions and traffic.[16] Moreover, German rural districts on the Nuts3 level administer all municipal actions within their respective area. Additionally, rural districts in Germany are linked to the area of (economic) influence of banks. Savings banks (with very few exceptions, such as the Sparkasse Worms-

[15] A more detailed explanation, exact calculations and data are given in the Appendix.

[16] For more information on German laws regarding regional autonomy by municipalities and rural districts, see the information provided by Deutscher Landkreistag (2015), Aufgaben der Kreise, $http://www.landkreistag.de/ueber-den-dlt/aufgaben-der-kreise.html$.

Alzey-Ried) are legally bound to one rural district. Typically, there is one savings bank per rural district, operating its branches within the district borders. Cooperative banks are usually focused on an even smaller unit in their local Nuts3 area. Therefore, choosing the Nuts3 level as a relevant local level seems reasonable.

4.1 Macroeconomic data

The macroeconomic data used in this paper are public and can be accessed via the official website of the Federal Statistic Office of Germany (Destatis). Destatis provides a special regional service, the *Regionaldatenbank Deutschland*, which is a database including official statistics segmented on the Nuts3 level. As the Federal Statistic Office of Germany – like all EU-member state statistical offices – is linked to the statistical database of the European Commission, EUROSTAT, all macroeconomic data can be downloaded there as well.[17] Additional data, such as regional GDP data, were taken from the Regional Accounts 'VGRdL', provided by the Federal Statistic Bureaus of the German States.[18] Missing population values for East Germany in 1990, 1991 and 1995 were replaced by information given by the 'European Regional Database' provided by Cambridge Econometrics. Table 17 in the Appendix lists all macroeconomic variables used, including data sources and available time periods.

4.2 Banking data

Bank data from 2003 to 2013 are based on the Hoppenstedt Bankenortslexikon (HBO). This database holds the detailed yearly bank profiles of approximately 2,200 central and 50,000 branch offices across Germany and includes information about location, management, organisational form, main office's including respective subsidiaries, and so on.[19]

Data provided by HBO were reviewed and processed manually at the German National

[17] Destatis is the short form of the Federal Statistic Office of Germany. The online database for Destatis is called GENESIS, on which all available data are published. Moreover, there is a direct link to the regional database: $https://www.regionalstatistik.de/genesis/online/logon$. The direct link to the EUROSTAT database is: $http://ec.europa.eu/eurostat/data/database$.

[18] $http://www.vgrdl.de/VGRdL/$

[19] Further information is provided at www.hoppenstedt-bankenortslexikon.de. The company offering HBO, Bisnode Deutschland GmbH, has agreed to usage of the data provided by the DNB.

Library, where yearly, non-digitalised HBO folders are available. Only full-time employed bank branches were placed into the bank branch dataset. Existing bank bus stops, service centres (SB-Center for savings banks and Servicestellen/Zahlstellen for credit cooperatives) and/or similar were excluded. Obviously these can be assumed to not have an influence on a bank's lending or credit activities. Moreover, doubling in branch data was removed; for example, if a bank lists its real estate agency, corporate banking centre and head office at the same address, this was counted as one branch, not three.

Within their data, the HBO provides detailed information regarding the main office and the related subsidiaries of a banking institution. This information was included without question, as spot tests prove validity. In the case of the three large private banks Deutsche Bank AG, Dresdner Bank AG and Commerzbank AG, regional headquarters were taken as their main offices. Officially those companies' headquarters are located in Frankfurt am Main, but loan decisions for regional firms and customers are not expected to be taken centrally from there. A factor supporting this expectation is the HBO data explicitly listing branches according to their responsible regional headquarters. There were no questions concerning a branch's affiliation.

Due to the edition process and the structure of information, there are differences in the compiled panel and the official aggregated bank branch data given by Bundesbank. These variations are assumed to be the result of two factors. First, the data editing process, concerning doubling and full-time-equivalent branches, involves deviations, as explained above. The second source of variation is believed to result from the different target dates. The Bundesbank publishes data in relation to December 31st each year, whereas HBO data refers to June (No.6) of each year (except for 2013, where only 07/2013 was available during the data collection period). Back testing the collected dataset, concerning the number of banks registered each year, hardly any non-explainable differences between the HBO information and the official Bundesbank bulletins could be identified.[20]

[20]In most cases, observed differences could be tracked down. In the case of building associations, for example, in 2009 and 2010 HBO had one bank more than the Bundesbank. This variation is explained by two mergers, one in September 2010 (Allianz Dresdner Bauspar merged with Wüstenrot Bausparkasse) and one in 2009 (Vereinsbank Victoria Bauspar merged with Wüstenrot Bausparkasse). As HBO data refer to the amount of institutions in June of each year, the merged bank institutions are counted individually, whereas the Bundesbank, referring to December 31st, entails the already merged institution.

On behalf of the differences in the number of savings banks and credit cooperatives I assume that variations are based on numerous mergers in each year. The compiled panel has a slightly higher number of registered banks than the number of institutions provided by the Bundesbank. Similar to the building associations, some mergers could be reconstructed as well. Observed differences in the number of branches, besides the already given explanations, are assumed to be a consequence of those mergers. As for the city district of Berlin, due to its separation during GDR times, reliable branch data cannot be constructed for the instruments used, and so it is excluded from all considerations.

5 Descriptive statistics

Parts of this chapter can in similar ways be found in Bernhardt and Schwartz (2014) and Bernhardt and Schwartz (2015) as well as the working papers Bernhardt (2016) and Beck et al. (2016).

After illustrating the data collection process and related problems, the following chapter highlights banking development in Germany from a descriptive point of view. First, it needs to be stated that the descriptive statistics presented in this chapter rely on complete panel data. Within the estimation later on in Chapter 6, only a sub-sample of data is used and some variables have different notations. Nonetheless, each adaptation will be explained within the respective section.

The next chapter is structured as follows. Before having a closer look at regional developments in East Germany since German reunification, an overview of the entire eastern states of Germany is given. Later on, the overall banking situation in Germany, from 2003 to 2013, is illustrated, and finally, a comparison of East and West Germany is made. To begin with the banking variables used herein will be explained. As for the city district of Berlin, due to its separation during GDR times, no comparison between 1990 and 2013 can be made, and so it is excluded completely.

The variables held in the compiled bank branch panel are *branches*, *savings*, *coop* and *credit*. While the variable *branches* represents the total number of bank branches, the variables *savings* and *coop* embody the number of savings bank branches and cooperative bank branches, respectively. The variable *credit* shows the number of credit bank branches in the private banking sector in West Germany and Germany overall after 2003. For East Germany it refers to institutions after the liquidation of the GDR State Bank, when West German private credit banks took over the State Bank branches. So, in 1989/90, *credit* expresses State Bank branches operating on GDR territory.

The variables generated as a result of the information provided are *branches per capita*, *distance* and *concentration*. While *branches per capita* is determined as the number of bank branches per 10,000 inhabitants, *distance* serves as average regional branch distance in kilometres (Km). The latter was calculated as the average distance a person has to travel within

a respective district to reach any bank branch. Finally, the banking market concentration variable *concentration* is equated with the Herfindahl-Hirschman Index, a measure of market concentration commonly used in the empirical literature. This index ranges from zero to one, with a value of zero indicating perfect competition, while a value of one indicates a monopoly. It was generated on behalf of the number of branches a bank operates within a district.

5.1 Twenty-five years of banking development in East Germany overall

As explained above, I shall first highlight the development of the East German banking sector since German reunification. To start with, the recently introduced seven variables are displayed in Table 5, revealing the average trends in different banking indicators for 1990 and 2003 to 2013. It is evident that the average number of bank branches decreased steadily from 2003 to 2013. This reduction is revealed in all banking sectors and is in line with the overall decrease in the number of branches in Germany as described in Bernhardt and Schwartz (2014). On average, the sector distribution between public, private and cooperative sector remains intact – it hardly changes about 2 percentage points within the sector share. Overall, the savings bank sector holds more than half the branches, followed by the cooperative sector, which is in charge of about every third branch, while the private bank sector stabilises by operating about every seventh bank branch (the exact values are given in parentheses below the number of branches).

Although it stabilised during the last decade, the private bank sector increased its market share significantly in the first years. An immense increase can be surveyed up until 1992 (compare Mann (1996), p. 86-88). When, in 1990, private banks started business in East Germany, limited to former State Bank branches, its market share was just 3.56 per cent, but in 2003, it shot up to 14.16 per cent. Surprisingly, the expansion of the private banking market did not lead to an even decline in the savings bank and cooperative sectors, because while the savings bank sector remained in its dominant market position, the cooperative sector lost market share to the private banking sector.

The development of the average branches per capita ratio mirrors the overall reduction

Table 5: Average development of the banking variables

year	branches	savings	coop	private	branches per capita	distance	concen - tration
1990	73.25	39.41 (53.8)	31.24 (42.65)	2.61 (3.56)	3.85	13.16	0.23
2003	55.28	30.30 (54.81)	17.14 (31.01)	7.83 (14.16)	3.17	12.91	0.27
2004	52.61	28.79 (54.72)	16.72 (31.78)	7.09 (13.48)	3.07	12.86	0.28
2005	50.93	27.57 (54.13)	16.32 (32.04)	7.05 (13.84)	3.00	12.88	0.27
2006	50.51	27.26 (53.97)	16.03 (31.74)	7.22 (14.29)	3.00	13.00	0.28
2007	50.20	26.95 (53.69)	15.93 (31.73)	7.32 (14.58)	3.00	13.05	0.28
2008	50.37	26.87 (53.35)	16.16 (32.08)	7.34 (14.57)	3.04	13.06	0.27
2009	48.95	26.13 (53.38)	15.59 (31.85)	7.22 (14.75)	3.00	13.05	0.29
2010	48.79	25.82 (52.92)	15.88 (32.55)	7.09 (14.53)	3.02	13.01	0.29
2011	48.47	25.66 (52.94)	15.78 (32.56)	7.04 (14.52)	3.01	13.00	0.30
2012	47.20	25.18 (53.35)	15.71 (33.28)	6.30 (13.35)	3.00	12.99	0.31
2013	46.59	25.16 (54.0)	15.41 (33.08)	6.03 (12.94)	2.96	13.03	0.31

Table 5 illustrates the yearly average development of the GDR banking sector since 1990. Results are rounded to two decimal points. The variable branches show the total number of bank branches, while 'savings' and 'coop' refer to the number of savings bank branches and cooperative branches, respectively. For 2003-2013, 'credit' refers to the number of private credit bank branches, and for 1990 'credit' expresses State Bank branches. Percentage shares are given in parenthesis. The branches per capita ratio was calculated as the number of bank branches per 10,000 inhabitants. Distance shows the average regional branch distance in kilometres, while concentration is the banking market concentration measure Herfindahl-Hirschman Index, indicating a monopolist market if close to one and perfect competition if close to zero.

in the number of bank branches, although the per capita reduction is not as severe. The average number of branches decreased by 36.39 per cent in total (from 73.25 in 1990 to 46.59 in 2013), whereas the number of bank branches per 10,000 inhabitants decreased by only about 23.11 per cent (from 3.85 in 1990 to 2.96 in 2013). This decrease reflects the overall reduction in population in the ongoing German demographic process (see Figure 19 in the Appendix and Bernhardt and Schwartz (2015) for more details).

In contrast to branch numbers, both average regional branch distance and banking concentration did not change significantly. On average, the regional travelling distance increased by 890 metres, while the concentration index recorded a minor increase of 0.08 points. As a result, there is a good chance that some kind of last-man-standing principle can be assumed. This principle implies that at least one branch (independently of the banking sector) in the respective area of business remains. A consequence of the last-man-standing theory is the observed increase in market concentration but unchanging average branch distance, as this last branch still remains.

After this aggregated view on banking transition in the eastern states of Germany, a more detailed look at regional effects appears necessary. The current research is supposed to focus on local developments. Due to different regional characteristics, such as urban versus rural or industrial versus agrarian, significant district heterogeneity is expected. As such, the average banking development presented just now is expected to differ significantly, too, if observed regionally. Thus, the results for the regional observation on the transition in banking structures are portrayed in the following section.

5.2 Regional development in East Germany

A major advantage of the database compiled for this research is the high level of disaggregation. Each branch is reported, including its zip code, so the regional approach presented in this section is possible. Local developments are characterised in detail, as they differ significantly in direction and amplitude. First, Table 6 displays the summary statistics for the available banking variables, broken down into whether the respective area is a city district (*kreisfreie Stadt*) or a country district (*Landkreis*) for the years 1990 and 2013. Thereafter,

Table 6: Descriptives for the country and city districts

	branches	**savings**	**coop**	**private**	**branches per capita**	**distance**	**concen - tration**
1990							
country	84.52	43.72	38.07	2.72	4.40	16.11	0.15
	(100)	(51.73)	(54.04)	(3.22)			
city	36.94	25.5	9.22	2.22	2.08	3.65	0.48
	(100)	(69.03)	(24.96)	(6.01)			
2013							
country	49.38	27.4	17.43	4.55	3.10	16.13	0.33
	(100)	(55.49)	(35.29)	(9.21)			
city	37.61	17.94	8.89	10.78	2.51	3.03	0.24
	(100)	(47.70)	(23.64)	(28.66)			

Table 6 displays summary statistics for the available banking variables, broken down into whether the respective area is a city or a country district for 1990 and 2013. Variables are rounded to two decimal places. The variable 'branches' shows the total number of bank branches, while 'savings' and 'coop' refer to the number of savings bank branches and cooperative branches, respectively. In 2013, 'credit' refers to the number of private credit bank branches, while for 1990 'credit' expresses State Bank branches. Percentage shares are given in parenthesis. The branches per capita ratio was calculated as the number of bank branches per 10,000 inhabitants. Distance shows the average regional branch distance in kilometres, while 'concentration' is the banking market concentration measure Herfindahl-Hirschman-Index, indicating a monopolist market if close to one and perfect competition if close to zero.

Figures 2, 3 and 4 show banking development within each East German Nuts3 district.

Starting with Table 6, I posit that there are significant regional differences regarding bank market structure. In 1990, the average number of bank branches in country regions was more than twice the number in city areas. The same result holds for per capita values. Not surprisingly, the average branch distance in a city was much shorter (about 12.46 kilometres less) than in country districts. Additionally, banking market concentration in cities was fairly high (0.48 index points) compared to the nearly perfect competitive banking market in country districts (0.15 index points). This result certainly emerged from the relatively large share of savings bank branches in city areas: a 69.03 per cent savings bank share in the banking market compared to a 24.96 per cent share enjoyed by the cooperatives. Unexpectedly, even in country districts, on average agriculturally-oriented cooperative banks did not run more branches than savings banks, and yet both were nearly even. This strong

savings bank position might be due to the large politically imposed restructuring processes in the cooperative market during the 1980s, as explained earlier in Chapter 3.

More interesting, though, is the development of banking structures after the implementation of a market-based banking system. It is evident that by 2013 the number of bank branches in country areas almost halved, from 84.52 branches down to 49.38. In contrast, the number of bank branches in cities increased on average. Although the savings bank sector still dominated city and country districts, each sector's market share changed significantly. Surprisingly, in country areas the cooperative sector lost its share to an increasing number of savings bank and private bank branches, while in city areas the cooperative sector maintained close to about 24 per cent. The private banking sector could increase its market share in both district types, but while the private sector in country areas still seems to be fairly minor, in cities it superseded the cooperative sector by taking nearly 29 per cent of the market share.

Corresponding to the results presented in Table 5, the average bank branch distance has not changed much since 1990. In city and country districts the variation is within walking distance (620 metres less and 20 metres more, respectively). However, in general, all three variables indicate a contrasting movement regarding city and country districts. Cities are characterised by an increasing branches per capita ratio, which consequently decreases the average branch distance. The increase in market competition is a result of the adaptation process seen by the banking sectors. In country districts instead, the branches per capita ratio decreases by more than one branch on average. Although the resulting increase in the average distance is not severe, the increase in the concentration index is, as it doubled in country districts. These regional banking structure differences are captured even better in the illustrations in Figures 9 to 11.

Figure 9 shows the change in the number of bank branches per 10,000 inhabitants for 1990 and 2013. It is evident that although there was a reduction in the overall population during this time period, too, the reduction in the number of branches prevails. According to this draft the decreasing branches per capita ratio seems to be prevailing. Nevertheless, in some districts located in the south-west, the branches per capita ratio has increased.

Figure 10 clarifies the change in the average regional branch distance from 1990 to 2013. In contrast to the average results indicated in Table 6, Figure 10 shows that the region-specific development of the average travelling distance differs significantly. Without any visible pattern, the average branch distance in some districts increases by up to about 4.1 kilometres, while in others a reduction in the average travelling distance of up to about 3.3 kilometres is recorded.

Somehow surprising is the development of the market concentration index, as embodied in Figure 11, showing the market concentration for each Nuts3 region in 1990 and 2013. In 1990, most of the East German administrative districts had very low concentration values, whereas the picture indicates that, 25 years of free market competition later, in 2013, banking market concentration increased distinctly. By implementing a market-based economy, one would expect competition to increase, not the other way round.

Although there are some highly regional drivers, the results above indicate an ongoing adaptation process within the East German banking sector. Yet, these results alone fail to assess whether the continuing banking transformation in the eastern states of Germany is in line with West German banking system developments. To postulate a concluding evaluation on this point, a comparison between both West and East German banking structures needs to be made in the following section. Before, I will shortly highlight the overall regional development of the bank branch network in Germany.

Figure 9: Change in the number of bank branches per capita in East Germany from 1990 to 2013

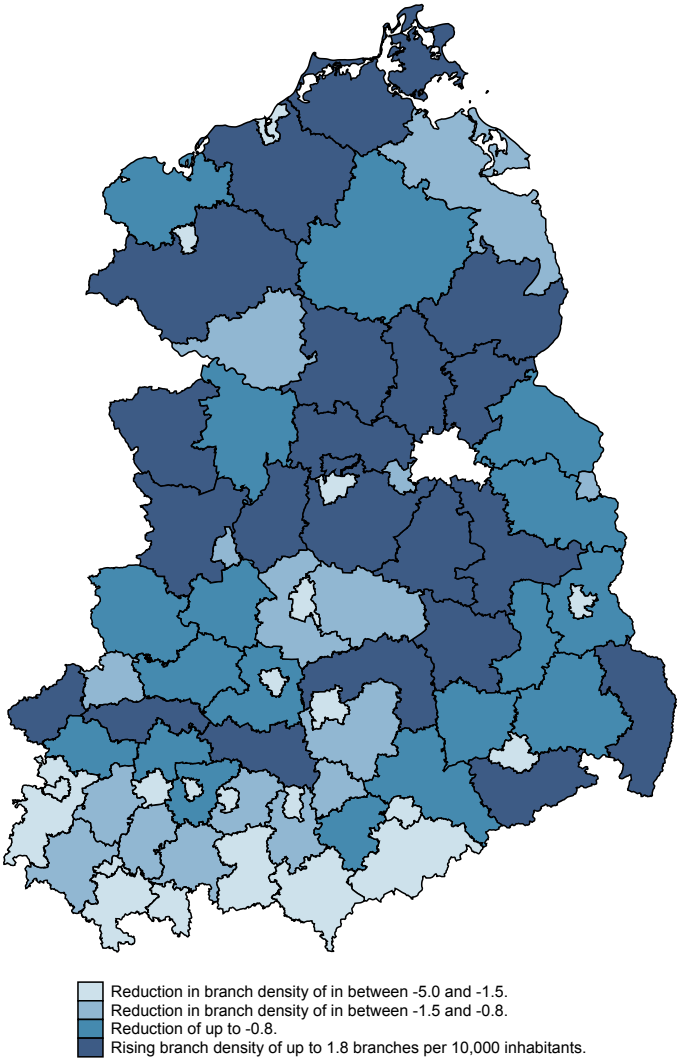


Figure 9 illustrates the change in the number of bank branches per capita in East Germany from 1990 to 2013. Considered are 76 Nuts3 regions, including 18 city districts *kreisfreie Städte* and 58 country districts *Landkreise*. The city of Berlin was not considered, due to its separation during GDR times. It is evident that the density of the banking market was heterogeneous in 1990, while in 2013 this density decreased nearly everywhere.

Figure 10: Change in average regional branch distance from 1990 to 2013

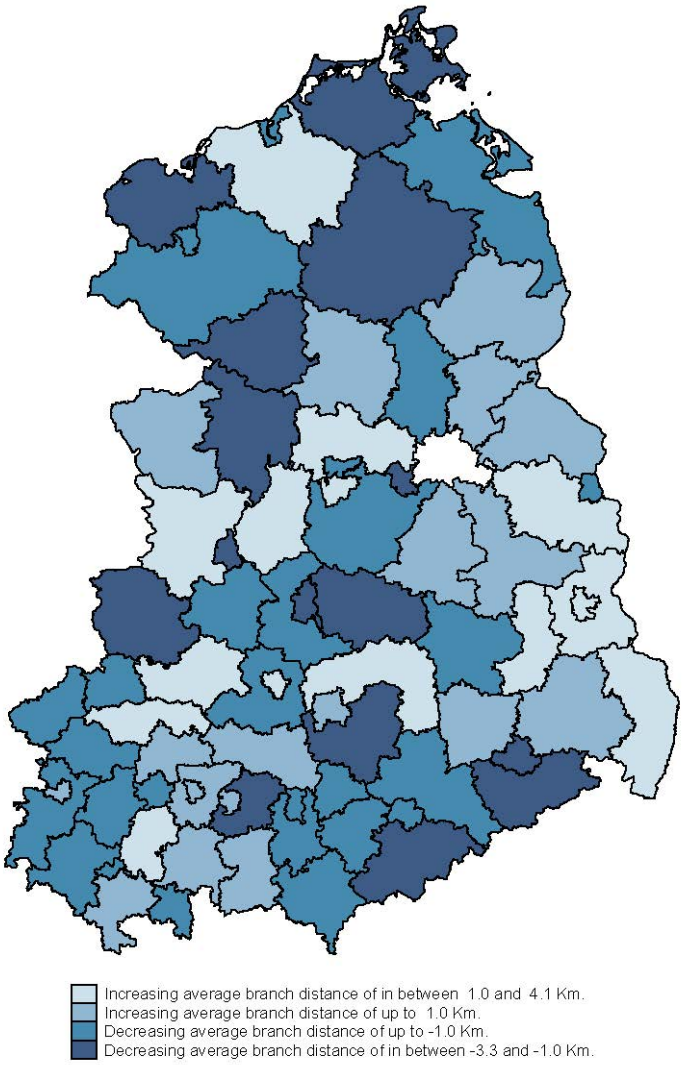


Figure 10 illustrates the change in the average regional branch distance from 1990 to 2013. Bright colours indicate a reduction in travelling distance, whereas darker colours show an increase in regional branch distance. While on average there was no significant change in distance from 1990, this regional approach displays significant regional heterogeneity concerning branch distance development.

Figure 11: Banking market concentration

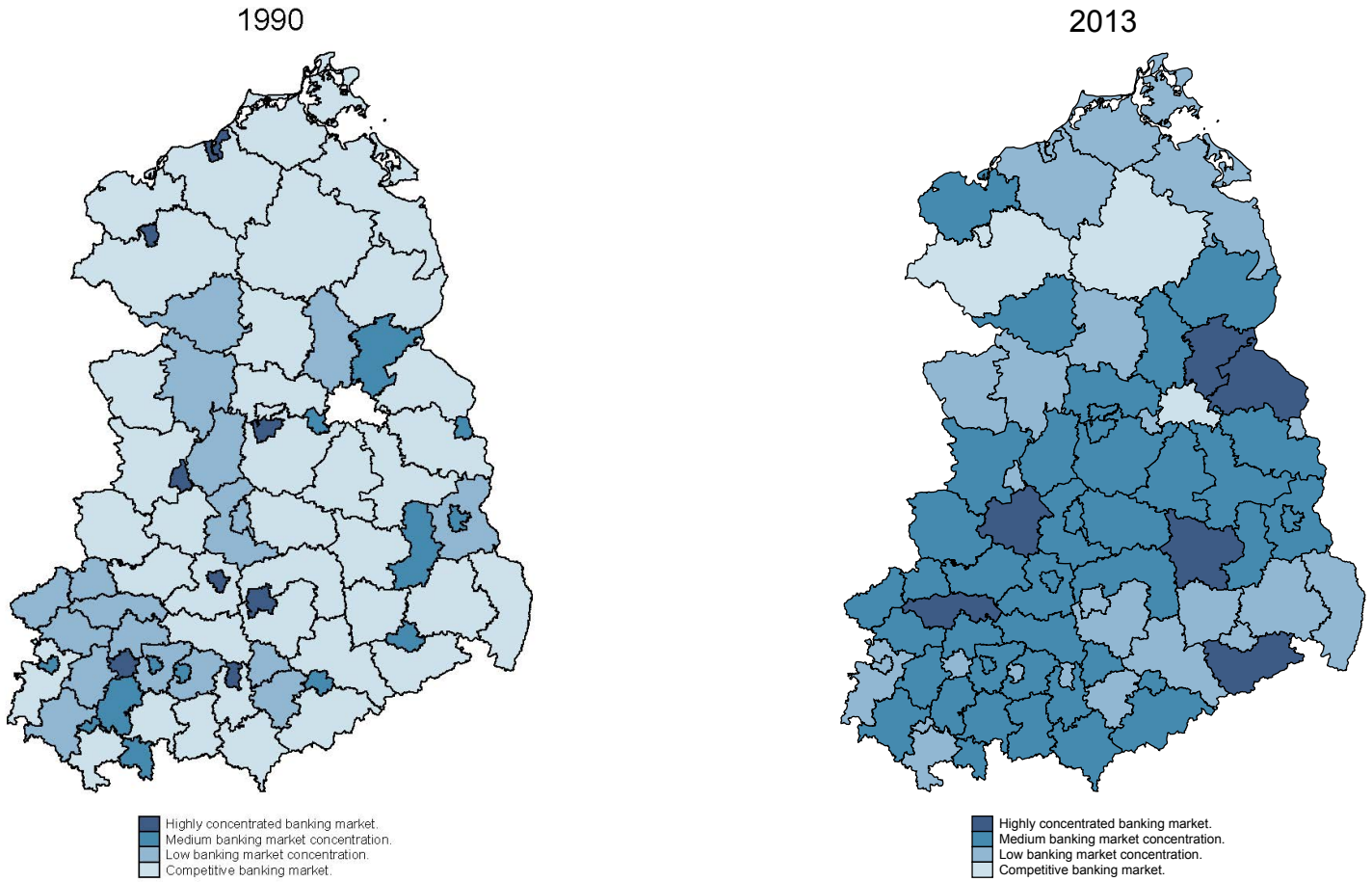


Figure 11 illustrates the distribution of the banking market concentration index for each Nuts3 region in East Germany in 1990 and 2013. Brighter colours indicate a lower concentration. The concentration index is calculated on behalf of the Herfindahl-Hirschmann Index on branches, ranging from 1 (monopolist market) to 0 (competitive market). Considered are 76 Nuts3 regions, including 18 city districts *kreisfreie Städte* and 58 country districts *Landkreise*. The city of Berlin was not considered, due to its separation during GDR times.

5.3 Regional banking development in Germany overall

Parts of the following section are taken from Bernhardt and Schwartz (2014).

Not only is the banking landscape in the former GDR area changing constantly, but the European banking scene is also developing. The European Central Bank (ECB) recently announced that the banking landscape is thinning out in the Eurozone: 269 banks either closed down or were merged in 2013 (-4 per cent according to European Central Bank, Press Release (2014)). The overall banking sector in Germany is likewise changing, the ECB reports that the number of financial institutions is declining by 31 year-on-year. This movement is mirrored by the overall decrease in the number of bank branches. One out of every ten bank branches in Germany closed down between 2003 and 2013, and the country's network of bank branches markedly contracted in size: over 12 per cent – more than 4,500 branches – were closed down. In 2013, around 30,100 branches remained.[21]

For the most part, cost-cutting and profitability considerations (particularly the fixed costs of real estate and personnel) are named to be causing this development. Increasing professionalism and the elimination of surplus capacities are other important causes. Mergers between banks (e.g. Commerzbank and Dresdner Bank in 2009, and Deutsche Bank AG overtaking Postbank AG in 2012) likewise lead to branches being shut down, to avoid duplications among local structures. The 'Digital Revolution' in banking has also played a significant role, both in terms of increased competition, due to the rise of online banks, and the fact that (private) banking clients are increasingly turning to digital distribution channels for increasingly more financing and investment products (see du Toit and Burns (2013)).

Besides the overall trend toward reducing branches, it is not clear as to whether this reduction concerns all regional districts to the same degree or whether – contrary to the general trend – local branch networks have actually expanded in some cases. Up until the first publications on behalf of the compiled panel data (see Bernhardt and Schwartz (2014) and Bernhardt and Schwartz (2015)), this question could not be answered.

As we see in East Germany, branch closures are not evenly distributed across all German

[21] By way of comparison, France has over 38,450 branches and Spain over 38,200, with the numbers in a downward trend (-17 per cent between 2008 and 2012).

regions. While diminishing branch networks can be observed in four out of five of the 402 German districts, in 17 of them the number of bank branches has not changed (e.g. the cities of Kaiserslautern, Kassel or Darmstadt) at all. Moreover, the banking market is actually growing in 48 regions. The district of Augsburg and the city of Heilbronn are ahead of the pack here, with the number of bank branches increasing by about 67 per cent in both regions. This analysis shows that rural districts are more often affected by a trend towards scarcity than their city counterparts. In the district Südliche Weinstraße, for example, the number of branches dwindled from 70 to 42 – a 40 per cent decline. Nonetheless, there are cities affected by cutbacks as well. The city of Hamm, for instance, registered a 33 per cent decline in the number of bank branches. Overall, it seems as if particularly rural regions experience a decline in bank branches. While in 2013, there were 15 per cent fewer bank branches in rural regions than 10 years ago, the number in urban districts went down by around 9 per cent during the same period. Apparently the more urban (rural) a German region, the fewer (more) branches shut down. Figure 13 illustrates this development graphically.

Anticipating a question to be answered by the empirical estimations later on, a simple correlation analysis between economic strength and the number of bank branches in a district is shown in Figure 12. According to the results, regions with relatively weaker economic strength are likewise affected more markedly by cutbacks in the number of bank branches. Economically weaker regions are characterised by twice as many branch closures per capita than regions with comparatively strong economies (minus 11.6 versus minus 5.8 per cent). This finding is in line with current scholarly debates on the significance of the development of a region's financial sector and the success of that region in economic terms, as discussed in Chapter 2 of this work.

Inherent in the decline in the number of bank branches is a change in the structure of regional banking markets. At first, a decline in absolute numbers of bank branches leads to lower branch density (branches per capita, see Figure 14). In contrast to the observed development in East Germany, in Germany overall branches decreased more rapidly than the population. Another effect of decreasing local branch density is increasing concentration

Figure 12: Relative change 2012 (GDP per capita) and 2013 (number of branches), in percentage terms, with respect to 2003

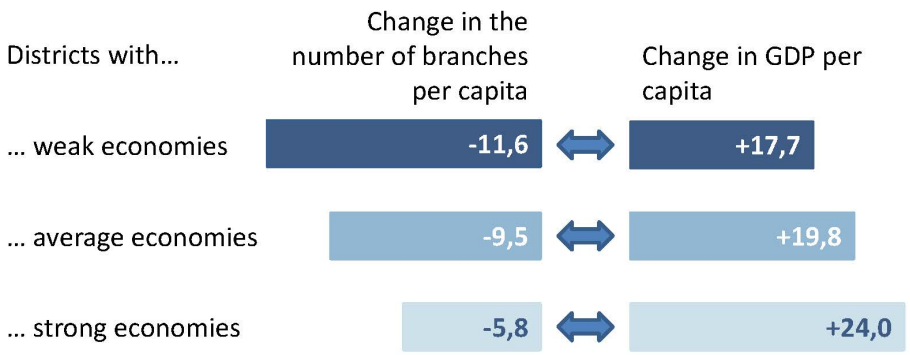


Figure 12 illustrates the percentage change in the number of bank branches per 10,000 inhabitants and GDP per capita from 2003 to 2013 for three different clusters of economic strength. Values are expressed on a per capita basis, so as to exclude the impact of migration trends. Regions' initial classification by 2003 GDP per capita: 'Low economic strength': Regions in the lower 10 per cent (less than EUR 20,000 per capita) of distribution. 'High economic strength': Regions in the upper 10 per cent (above EUR 45,000 per capita) of distribution. This figure is taken from Bernhardt and Schwartz (2014).

in the regional banking market. In some regions the variety in banking supply went through a sharp decline, as evident in Figure 15. This extends to the point where, in 2013, there are 13 districts across Germany without even a single bank branch in the private banking sector.[22] Competition decreases and the regional banking market becomes more monopolist in nature, as indicated by rising HHI index values. A severe example is given by the Harz district, where between 2003 and 2013 concentration increased by 20 percentage points.

[22]The respective rural districts are: Elbe-Elster, Cochem-Zell, Eifelkreis Bitburg-Prüm, Vulkaneifel, Schwalm-Eder-Kreis, Kyffhäuserkreis, Kassel, Märkisch-Oderland, Kaiserslautern, Donnersbergkreis, St. Wendel, Straubing-Bogen, Rhein-Hunsrück-Kreis and Alb-Donau-Kreis;

Figure 13: The number of bank branches in Germany 2003 - 2013

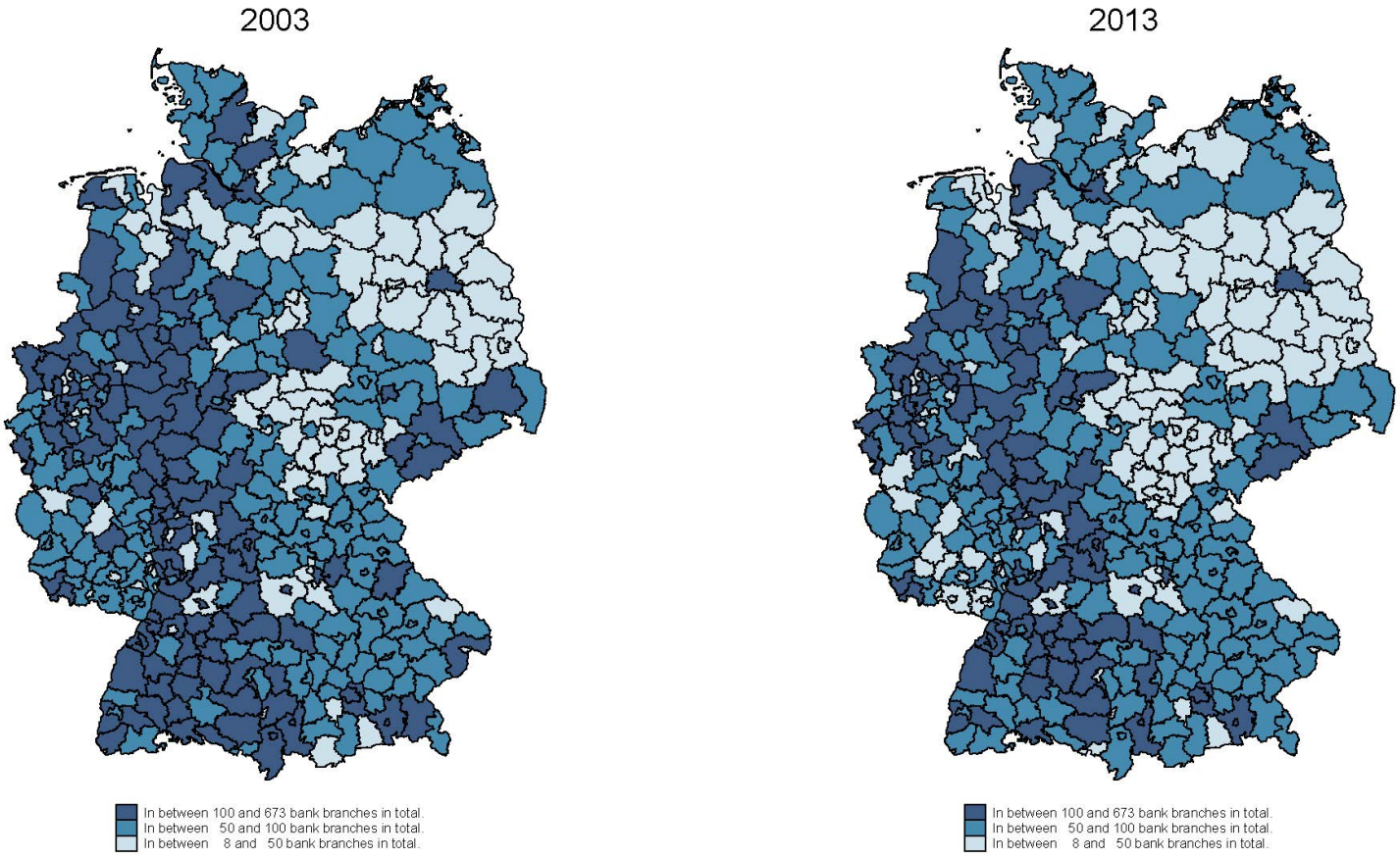


Figure 13 highlights the change in the number of bank branches in Germany between 2003 and 2013. Considered are 402 Nuts3 regions. In this illustration the city of Berlin can be taken into consideration, as consistent data are available for 2003 and 2013. It is evident that the number of bank branches follows a decreasing trend. However, districts located south-west seem to be less affected.

Figure 14: Percentage change in the number of branches per capita 2003 - 2013

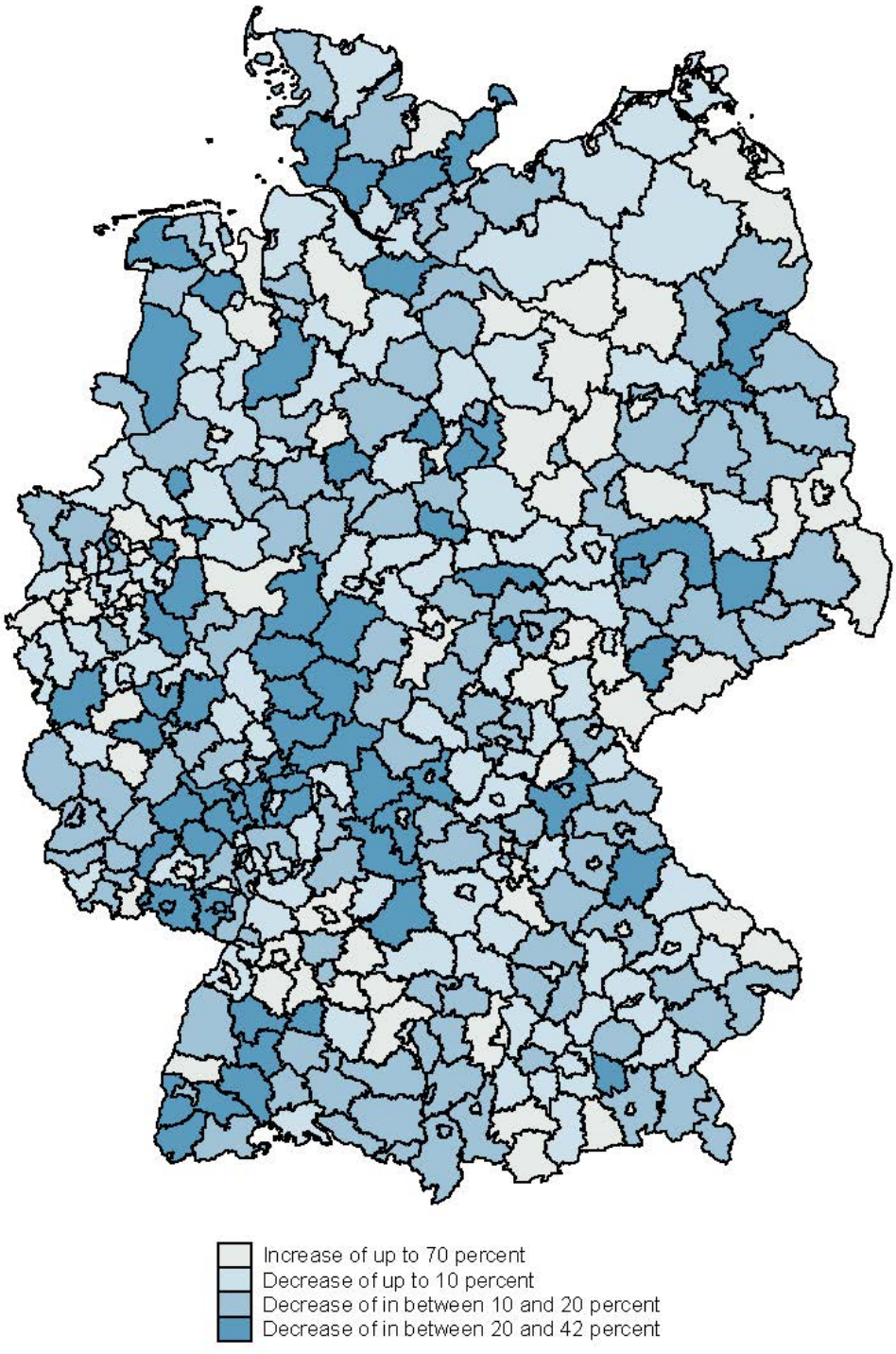


Figure 14 illustrates the percentage change in the number of bank branches per 10,000 inhabitants for all German regions from 2003 to 2013.

Figure 15: Change in banking concentration from 2003 - 2013

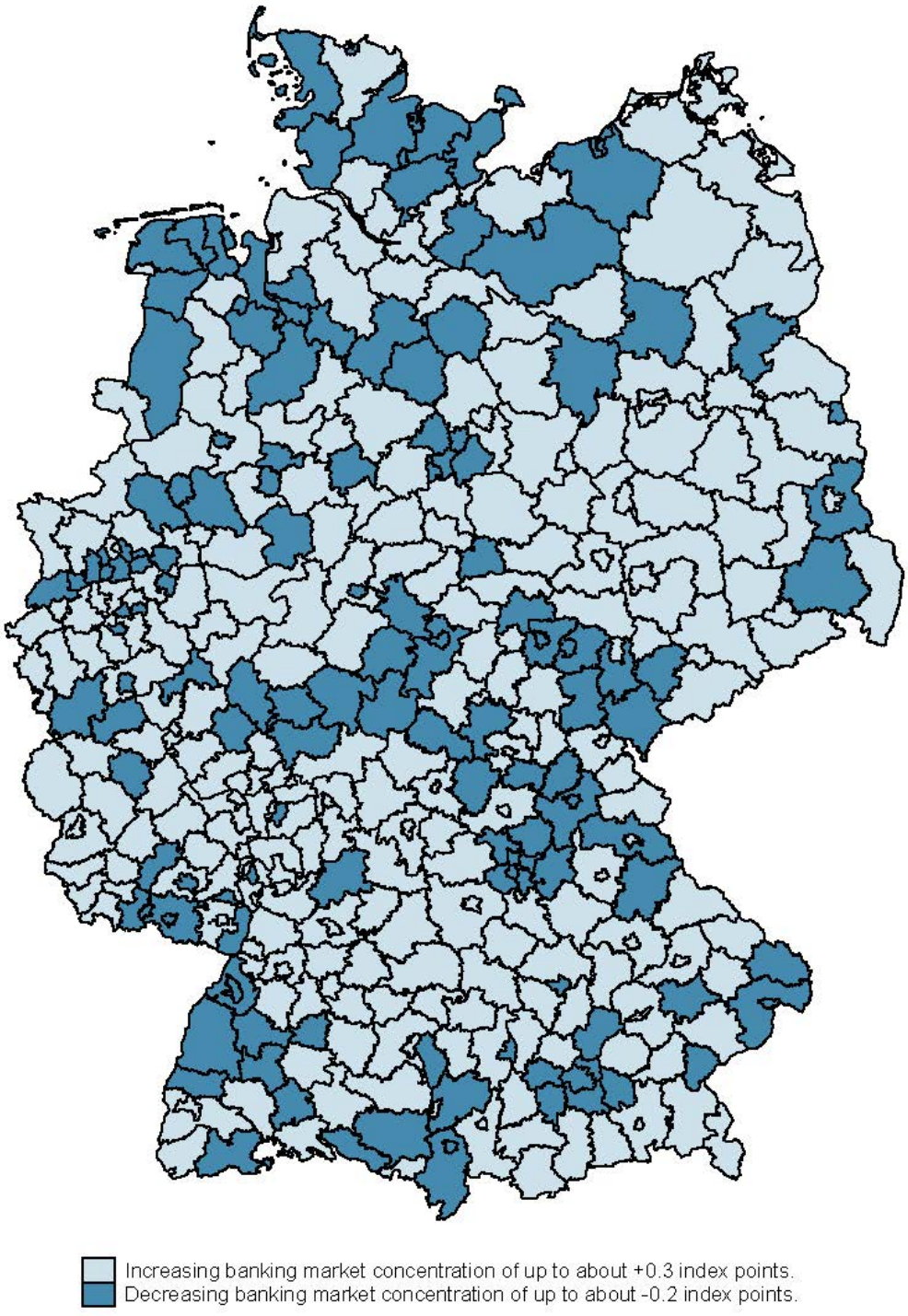


Figure 15 shows the change in banking market concentration between 2003 and 2013. Market concentration is measured by the HHI index ranging from zero, indicating a fully competitive market, to one, indicating a monopolistic market.

5.4 Comparison of banking structures in East and West Germany

As mentioned earlier, the economic and social situations of East and West Germany differ significantly. In this section, it is examined whether current banking market structures also differ. Accordingly, in Table 7, a comparison between the banking structures in East and West Germany is illustrated. Again, the summary statistics are broken down into city and country districts. It is evident that the banking system in the former GDR area still differs a lot from West German banking conditions, regardless of the structural takeover in 1990.

Table 7: Banking structures in Germany 2013

Variable	Area	Mean	Std.Dev.	Min.	Max.	N
branches per capita						
city	West	3.53	1.18	1.48	6.88	88
	East	2.51	0.66	1.73	3.91	18
country	West	4.88	1.56	1.50	9.47	237
	East	3.10	0.93	1.47	5.82	58
distance						
city	West	2.74	1.61	0	6.94	88
	East	3.03	1.70	0	7.21	18
country	West	11.96	3.21	5.72	25.99	237
	East	16.13	5.27	5.27	28.21	58
concentration						
city	West	0.23	0.07	0.04	0.42	88
	East	0.24	0.06	0.15	0.37	18
country	West	0.23	0.08	0.09	0.46	237
	East	0.33	0.10	0.13	0.59	58

Table 7 presents summary statistics for the available banking variables, broken down into whether the respective area is a city or a country district in East or West Germany for 1990 and 2013. Variables are rounded to two decimal places. The branches per capita ratio was calculated as the number of bank branches per 10,000 inhabitants. Distance shows the average regional branch distance in kilometres, while concentration is the banking market concentration measure the Herfindahl-Hirschman Index, indicating a monopolist market if close to one and perfect competition if close to zero. Moreover, the standard deviation, minimum and maximum value and the number of observations are given.

Concerning the branches' per capita ratio, eastern cities do have on average one branch per 10,000 residents less than western ones. In rural regions this situation deepens, with almost two bank branches fewer than in the west. However, a bottom level of about 1.5

branches per capita seems to be the case in east and west, which is evident in the minimum values reported in Table 7. In contrast, the maxima of observed branch per capita values alter a lot, revealing again much lower numbers for East Germany.

Regarding average branch distance, there is no compelling regional difference within city areas. Country areas, however, distinguish a great deal; on average, in East Germany, people have to travel about 4 kilometres more to reach a bank branch than in West Germany. Regarding maximum and minimum values, however, no significant difference between East and West German regions is observed. For a more detailed impression see Figure 18 in the Appendix.

The average market concentrations in East and West city districts and West German country districts are fairly low, with 0.24 and 0.23 points. Just East German country districts show a higher market concentration value (0.33 index points). While all minimum values are even, the maximum results are ambiguous. In East Germany urban districts the highest concentration measure is significantly lower than in West Germany (0.37 compared to 0.42 index points), whereas in East Germany country districts a higher concentration than in West Germany (0.59 compared to 0.46 index points) is reported. There is no obvious explanation for these results on market concentration, though development might be driven by the large market share of savings banks in East German country regions and the effective market positioning of private banks in cities.

Summarising the descriptive statistics given in this section, it must be said that there are differences in the banking structures of the eastern and western states of Germany. Although Germany overall reveals a heterogeneous distribution of bank branches, the differences between East and West, even 25 years after the reunification of the two German states, are evident. Yet, the East German banking market can certainly be entitled to be well-developed and as marked-based as its West German counterpart, as the differences do not appear severe.

6 Estimation approach and results

As mentioned earlier the working paper Beck et al. (2016) is based on the data and uses the instrumental variables as presented in Chapter 4 and 3. However, the data is approached slightly differently than just described in Chapter 5. Therefore the following Chapter not only entails the econometric model as approached in Beck et al. (2016) but also some additional information about how the data is used. This chapter is taken fully from the working paper Beck et al. (2016).

6.1 Characterizing local financial development

To capture local financial development in Germany, we follow authors such as Benfratello et al. (2008) or Minetti and Zhu (2011) and rely on information about regional banking markets. The major motivation underlying this choice stems from the fact that the German financial system is strongly bank-based, as documented, e.g., by Langfield and Pagano (2016). This is in particular true for the external financing of SMEs which is still provided mostly by banks as, e.g., the recent survey by European Commission (2013) documents. Thus, our justification for the use of local banking market data to examine the importance of financial development on the economic evolution of German regions basically relies on the same arguments as employed by Benfratello et al. (2008) (and related authors) for the case of Italy: as in this country, the German financial system is strongly bank-based and market-based finance only plays a minor role for firms, particularly SMEs, in obtaining external finance.

To measure the development of local banking markets, we follow Benfratello et al. (2008) and employ the number of branches which banks operate in a given region. This measure is very common in studies on local banking development (see, e.g., also Degryse and Ongena (2005)), amongst others because it enables the construction of long, homogeneous time series. As we will see below, this property will turn out to very useful to devise an instrument which allows us to control for potential endogeneity problems associated with the variable's current observation.

Table 8: Variables and Descriptive Statistics as in Beck et al. (2016)

Variable	**West**	**East**
	(1)	(2)
Financial Development		
Branches per 10,000 inhabitants	4.79	3.04
	[1.68]	[0.85]
Saving banks per 10,000 inhabitants in 1982	2.93	
	[1.46]	
Branches per 10,000 inhabitants in 1990		3.40
		[1.37]
Regional characteristics		
Size in square KM/1000	0.77	1.42
	[0.53]	[1.09]
Independent city	0.28	0.24
	[0.45]	[0.43]
GDP per capita/1000 in 1980	8.61	
	[3.05]	
GDP per capita/1000 in 1992		9.13
		[2.27]
Firm subsidies (1997-2006, p.p.)	50.01	1,285.16
	[94.32]	[688.60]
Regional outcomes		
GDP per capita/1000	28.50	19.64
	[94.32]	[4.14]
Unemployment rate	0.08	0.16
	[0.03]	[0.03]
Firm Insolvencies per 10,000 inhabitants	3.35	2.84
	[1.54]	[0.90]
Business registrations per 10,000 inhabitants	100.97	85.55
	[19.22]	[14.39]
Business de-registrations per 10,000 inhabitants	83.33	75.09
	[15.76]	[11.86]
Manufacturing firms per 10,000 inhabitants	0.77	1.42
	[0.53]	[1.09]
Employment in manufacturing per 10,000 inhabitants	852.78	516.91
	[523.44]	[231.35]
Business volume in manufacturing per capita	19.06	10.66
	[14.64]	[7.34]
Business volume (non-national) in manufacturing per capita	7.80	2.56
	[8.22]	[2.00]
Investment in manufacturing per capita	0.62	0.53
	[0.63]	[0.42]
Regions	326	67

Notes: Means and standard deviations [in squared brackets]. Unless otherwise indicated all variables are measured as averaged values over the years 2002-2006 and 2010-2012. Data sources: Bank branch information is obtained from Bisnode, all other variables are taken from the online database of the German Statistical Office GENESIS.

As the first row of Table 8 show, there exists considerable cross-sectional heterogeneity in bank branch density across German regions. The reported numbers for West Germany are very similar in size to those reported by Benfratello et al. (2008) for Italy, both with

respect to the mean and the regional dispersion. The branch density is pronouncedly higher (by around 50%) in Western German regions than in East German regions. Moreover, the regional dispersion is also considerably smaller in East Germany. On the other hand, the extent of regional dispersion prevailing in East Germany is almost comparable to the value which Benfratello et al. (2008) report for their first sample period, i.e., the period following the deliberalization of banking markets in Italy.

6.2 Characterizing regional economic development

The information on bank branches is complemented by data aimed at capturing the economic development of a given region. For comprehensiveness reasons, we employ four different group of variables to achieve the latter. First, we use variables which capture the **overall regional economic dynamics**. These variables include the growth rate in per-capita output and the unemployment rate. The second group of variables focusses on the **general dynamics of manufacturing firms** comprising the number of firms, number of employees, turnover and the number of firms and employees grouped by size. Our third group of variables captures information on **strongly finance-dependent and growth-enhancing activities** of manufacturing firms such as export activities (total foreign sales) and investment activities. In our last group, we consider variables capturing **founding/closing activities** and comprising the number of new firm registrations and the number of firm deregistrations.

The data is obtained from Eurostat which compiles annual NUTS-3-level information on the variables listed above. The sample period considered differs across the variable groups due to data availability reasons. In all cases, averages across the years 2010 and 2012 are considered. For the case of the macroeconomic variables (first group), additionally averages across 2002 to 2006 are employed. We exclude the immediate pre- and post-crisis period (even if data was available), given that these years were characterized by extraordinary economic dynamics.

The descriptive statistics provided in Table 8 document sizeable heterogeneities across German regions for the considered variables. Moreover, even after more than one (and partly even after two) decade(s) still very sizeable differences exist between West and East

German regions. For the latter, we generally observe somewhat less pronounced heterogeneity, which - amongst others - might be the result of a smaller sample size though. In terms of GDP per capita, the interval covering one-standard deviation of observed values around the mean reaches from 17.3 to 39.7 in West Germany and from 15.5 to 23.78 in East Germany, while the comparable unemployment rates are in the range between 5% and 11% or 13% and 19%, respectively.

Concerning the firm dynamics, the number of manufacturing firms tends to be larger in East Germany, however, their average sizes is considerably smaller. Again, considerable cross-regional heterogeneity prevails. The same is true for major growth-enhancing firm activities. Again, West German firms considerably lead both with respect to their export volume and their investment activities. Concerning founding/closing activities, we find smaller numbers for both categories in East Germany but again, significant heterogeneity exists.

6.3 Econometric model

To examine the role of banking market development on regional economic dynamics we follow Guiso et al. (2004) and run regressions of the following form:

$$EconDevelopment_{jt} = \alpha_{jt} + \beta_1{}^{*} FinDevelopment_{jt} + \beta_2{}^{*} RegControl_{jt} + \varepsilon_{jt}, \qquad (2)$$

where $EconDevelopment_{jt}$ denotes our measurements of the economic development of region j in period t, to be discussed in detail in the next section. The variable $FinDevelopment_{jt}$ aims at capturing the level of financial development of region j for period t.

The expression $RegControl_{jt}$ represents macroeconomic control variables for region j. More specifically, we include a measure of the size of a region (measured in 1,000 square kilometres) and an indicator for whether a region represents a so-called 'independent city' (urban district).[23] Moreover, a measurement of the 'initial' regional log gross domestic

[23] As explained previously, the 402 German counties (denoted as regions in the text) consist of 107 so-called 'independent cities' and 295 'rural' counties. The former group consists of one relatively large city, including its (close) surrounding area, whereas the second group is made up of several towns and numerous villages. Independent cities are normally smaller geographically but (much) more densely populated.

product (measured in 1,000 Euros per inhabitant) is included.

The sample period considered herein differs across the variable groups, due to data availability reasons. In all cases, averages across the years 2010 and 2012 are considered. For the case of the macroeconomic variables, additional averages across 2002 to 2006 are employed. We exclude the immediate pre- and post-crisis periods (even if data were available), given that these years were characterised by extraordinary economic dynamics.

6.4 Estimation results

Following the above expositions, we now turn to our results on the impact of the development of the local banking market on a variety of variables reflecting the economic evolution of a given region. As indicated above, we start by taking a broad macroeconomic perspective and relate our banking variable to economic growth and unemployment in a given region. In so doing, we consider two sub-periods: averages across the years 2002 to 2006 and averages across 2010 and 2012. We exclude the immediate pre- and post-crisis periods.

6.4.1 The role of local banking markets for regional macroeconomic development

Going back to at least Schumpeter (1912), many economists have stressed a positive impact of the level of financial intermediation activities (or more general financial development) and economic growth.[24] The major theoretical considerations underlying this effect are as follows. Financial intermediaries provide services such as evaluating projects, managing risks and monitoring managers, which improve the allocation of capital in an economy, help risk-taking, boost technological innovation and thus contribute to higher economic growth.[25] Early evidence on a positive finance-growth nexus was provided by Goldsmith (1969), who documented only a positive correlation (rather than a causal) relationship between the two variables. Employing data from 80 countries, King and Levine (1993*a*) explicitly showed that financial development helps to forecast economic growth. Based on regional data for Italian provinces, Guiso et al. (2004) show that the development of local

[24] Another very early and influential work on the finance-growth nexus is Goldsmith (1969). There are also some prominent critics, though, such as Robinson (1952) and Lucas (1988).

[25] See Levine (1997),Levine (2005) for a more detailed overview of this literature.

banking markets has a significant positive impact on the growth of a region.

Our results for the interplay between local financial and regional economic development captured by broad measures are mixed though. The first column of Table 9 indicates a statistically highly significant and economically sizeable positive relationship between bank branch density and economic growth for West German regions. According to the obtained estimate, West German regions with a bank branch density being one standard deviation below the country-wide average exhibit a per-capita GDP level which is on average 5.7% (1.68*3.4%) below that of the mean region. However, as argued above, this finding does not allow to draw any conclusions about the direction of causality which is why we instrument for the bank branch density employing the savings banks branch density in 1982 and apply a two-stage least squares approach. The results from the first-stage regression provide strong support for the validity of the instrument's relevance condition: the coefficient on the density of savings banks in 1982 is highly significant, indicating that our instrument is indeed partially correlated with the overall bank branch density in our sample period once the effect of the other exogenous variables is controlled for. The results for the second stage regression confirm a positive effect of bank development which is no longer significant either in a statistical or economic sense though. When only East German regions are considered, the evidence in favor of a positive relationship between financial development and GDP is even weaker: while the first-stage regression provides strong support for the validity of employing the state of the banking system in 1990 as an instrument, both the OLS and the second-stage regression produce insignificant coefficients on the financial development variable.

In light of the partially mixed results obtained for per capita GDP, we tried out additional variables capturing the overall economic development of a region. In Table 10, results for regional unemployment rates are reported.[26] Employing the above outlined reasoning concerning the positive effects of financial intermediaries on economic growth, it is a straightforward undertaking to argue that more intensive banking activities should be

[26]Due to data availability reasons, the choice of potential variables representing the overall economic dynamics of regions is very limited. In addition to GDP per capita and the unemployment rate, we also employed household income. The results for this variable were similar to those for the unemployment rate.

associated with lower unemployment rates, all things being equal. The latter aspect in particular involves labour market regulation, which is compiled at a national level in Germany and thus is homogeneous across regions. For West Germany, the results hint at a strongly negative impact of local banking market development on unemployment. According to the OLS results, regions with a banking density one standard deviation below average have on average an unemployment rate of 1% (-1.68*0.006) above the West German mean region. Taking potential endogeneity into account, the results remain highly significant and still suggest an economically important impact. Again, the first-stage regression results strongly confirm the validity of the relevance condition. Interestingly, the results for the East German regions again turn out to be insignificant. Whereas the validity of our instrument is strongly supported, both the OLS and the second-stage regression do not provide any support for a negative impact of local banking market development on unemployment. On the contrary, the (statistically insignificant) results indicate a positive correlation, if any.

While the impact of external financing conditions on the variables captured by the broad measures of economic activity employed to this point is only indirect, we now turn to variables for which there is a more direct link.

6.4.2 Local financial development and the growth of regional firms

The survey carried out by (European Commission, 2013, Section 2) reveals that external funds remain an important source for financing the economic activities of German companies and that external financing normally relies on bank funding. This is in particular true for SMEs, which comprise 99% of all German firms, produce about one half of German GDP and for which roughly 60% of all German employees work.[27] The strong dependence of SMEs on bank lending has several reasons. For instance, they are usually perceived to have a higher probability of default than larger firms and are normally more informationally opaque. As a result, alternative sources of external finance such as issuing stocks or debt are hardly available to SMEs. Additionally, they are typically too small to make, for example, debt issuance in the financial market an attractive source of finance, given the relatively high

[27] The numbers are taken from Bundesministerium für Wirtschaft und Energie (BMWi) (2013).

fixed costs associated with this process.

Based on this reasoning, we expect – similarly to Guiso et al. (2004) for the case of Italy – to find a positive relationship between the development of local banking markets and the growth of firms. To examine this hypothesis we regress indicators for the economic dynamics of firms in a given region on our variable for the banking sector (controlling for endogeneity) and various control variables. The indicators which we employ to characterise the dynamics of firms include manufacturing employment, manufacturing turnover and the number of manufacturing firms operating in a region. In the latter case, we condition the effects on firm size. Where corresponding data are available, we report results for the sub-periods 2002 to 2006 and 2010 to 2012. Using the number of employees as a measure of firm growth, we find similar results as for the unemployment rate. Given the rationale provided above we would expect that firms which have access to better developed financial markets grow more and thus employ more workers. However, the results provided in the first row of Table 11 show that this is only the case for West German regions: according to the OLS results, around 180 fewer people work in the manufacturing sector of a region characterised by a bank branch density of one standard deviation below average. The corresponding number for the second-stage regression is around 207. Both numbers are statistically highly significant. Concerning East German regions, bank branch density does not seem to have any effect on manufacturing employment. Both the coefficient in the OLS and the IV equation are statistically insignificant, and the latter even turns negative.

In a next step, we examine the relationship between local banking markets and manufacturing firms' turnover. Using international cross-country data, Rajan and Zingales (1998) find a positive effect of financial development on firms' sales. Similar conclusions are obtained by Guiso et al. (2004), who document a positive impact on firm sales' growth rates. However, our results, reported in the second row of Table 11, are only partly supportive of these findings when we look at West German regions, and they are not supportive at all for East German regions. More specifically, we find positive impacts of the financing conditions on firms' turnover for both the OLS and the IV regressions for the West German region, where the effect becomes statistically insignificant, albeit after we control for poten-

tial endogeneity problems. For East German regions, the effects are not significant in either case, and in the latter we even obtain a negative coefficient.

Similar to Rajan and Zingales (1998), we also employ the number of manufacturing firms operating in a region as a measure of the sector's growth. Following theoretical arguments which suggest that relatively smaller, informationally more opaque firms should display relatively greater dependence on bank-based external finance, we follow authors such as Guiso et al. (2004) and Cetorelli and Strahan (2006) and split our sample based on the size of firms. As rows 5 to 10 of 11 show, our findings are again mixed. For West German regions, we basically confirm both of these hypotheses, i.e. we not only observe a generally positive impact of financial development on the number of firms, but we also obtain evidence that this effect is negatively related to the firm size. The results are statistically significant for both the OLS and the IV regressions. According to the reported numbers from the IV (OLS) regression, on average 0.7 (0.4) very small firms (< 50 employees) operate less in a region which exhibits a bank density one standard deviation below that of the mean region. For very large firms, the corresponding number is around 10 times smaller. On the other hand, for East German regions, we find positive but nonetheless insignificant numbers for the OLS regressions. When taking endogeneity into account, many of these numbers even turn negative.

Overall, our results provide a mixed picture. For West German regions we confirm previous findings of a positive impact of financial development on firm dynamics, whilst for East German regions this evidence is weak at best. In this sense, the results from this subsection are consistent with findings obtained for the broader macroeconomic variables reported in Chapter 6.1, indicating no or only a very weak impact of local banking markets on regional economic dynamics in East Germany.

6.4.3 Local financial development and major growth-enhancing firm activities

The regional data provided by the German national statistical office allow us to examine the impact of local financial development on investment and exports, i.e. two major activities which are of crucial importance for the growth of firms and economies as a whole and for

whose realisation external financing conditions very often are pivotal. Firms' investments are not only essential for their own successful development, but they also play an eminently important role in the development of a country's GDP in both the neoclassical (see Solow (1956), Swan (1956)) and endogenous growth theory (see Romer (1986) and Lucas (1988)). In light of the strong dependence of German firms on bank lending as a source of external financing, a positive relationship between the development of the banking market and the investments of firms in a given region would therefore be expected.

While a differentiation of conducted investments according to their objectives (investment to replace or extend existing capital, investment in research and development, etc.) would be very useful, the data source only provides a comprehensive measure of firms' investment activities. Row 4 of Table 11 shows that financial development has – as expected – a statistically highly significant and positive impact on firms' investment behaviour in West German regions. The reported figures suggest that investment is on average around 15% (20%) lower in a region where bank branch density is one standard deviation below that of the mean region. On the other hand, for East German regions we find no clear-cut evidence in favour of a positive impact of local financial development on firms' investments. Whilst the coefficient in the OLS regression is positive and statistically significant, we obtain a negative (albeit not significant) coefficient when controlling for potential endogeneity of the banking market variable.

A comparable picture is obtained when we consider firms' exports. Penetrating foreign markets is often seen as an important mechanism for firms to expand their business volume (see, e.g., Minetti and Zhu (2011)).[28] In recent theoretical contributions, Chaney (2016) and Manova (2013) have shown that credit constraints can have a negative impact on firms' decisions to export. Manova (2013) moreover points out that the intensive margins involved in exporting might be adversely affected by firms missing access to bank loans. Employing a rich set of survey data from Italian firms, Minetti and Zhu (2011) show that both the extensive and intensive margins involved in exports are negatively impacted by credit constraints. Given that the ability of firms to obtain lending from banks is positively related to

[28] A recent contribution assessing the empirical evidence on the relationship between exporting and firm performance is provided by Bernard et al. (2014).

the development of the local banking sector, we would expect local financial development to affect beneficially the export volumes of firms located in the considered region.

Our results (Row 3, Table 11) only provide partial support for this hypothesis, though. As for all other variables, there is a clear and highly significant positive relationship between banking development and export volumes in West German regions for the OLS case. After taking into account potential endogeneity this relationship becomes statistically insignificant, though it does remain positive nevertheless. For East German regions, the results mirror those for investment: none of the coefficients is significant, and the IV results even indicate a negative relationship.

6.4.4 The role of local financial markets for founding/closing-down activities

Access to external finance can also affect both the survival of existing firms and the establishment of new companies. Concerning the impact of credit constraints on firm survival, it is argued that inefficiencies in capital markets (and resulting credit constraints) can lead to firms failing, even with positive net present values. Empirical support for such a positive relationship between access to credit and firm survival rates is provided by Mach and Wolken (2011) (and the literature cited therein).

The first measure we employ to examine this hypothesis corresponds to the average number of firm insolvencies in a given region. We would expect the coefficient on this variable to be negative, given that in a financially better developed environment, solvent but liquidity-constrained firms would probably have better chances of obtaining the necessary funds to bridge temporary financial constraints. In line with this intuition, we indeed find that in more financially developed West German regions the number of firm insolvencies is significantly smaller (see Table 12). The numbers imply that regions with a bank branch density of one standard deviation below average experience around 1.14 (IV) or 0.79 (OLS) insolvencies per 10,000 inhabitants more, which amounts to almost one-third of the number in a region with average banking density. As for the other variables considered, we do not find any significant impact for East German regions.

A similar picture is obtained when we employ the number of firm de-registrations. The

data provided by the German statistical office not only contain information about the total number of de-registered firms (denoted by 'Total' in Table 13), but they also allow for differentiating between three major motivations for the de-registration of a firm: closing down, takeover and migration. Closures are split further into those due to a change in the legal form of the company and complete closures. Given the rationale presented above, the latter group (and potentially the group of takeovers) is of most importance for our purpose. Rows 6 to 9 of Table 13 show that financial development is strongly negatively correlated with firm de-registrations in West Germany. For the IV regression this is also the case for the group of complete closures, thereby suggesting that better access to external finance indeed has a positive impact on the survival of existing firms in West German regions. For East Germany, no such relationship exists, though.

In the first five rows of Table 13, results for the link between regional financial development and registrations of new firms are presented. Huyhebaert et al. (2000) and Colombo and Grilli (2007) provide evidence that banks are the most important source of finance to new firms. However, as Hall (2010) argues, start-up firms often face difficulties in raising the required funds to implement their ideas, amongst others because banks are less willing to provide funds to start-ups, as these firms lack collateral and are more opaque. In this context, the development of the local banking market might have a positive impact on access to credit by start-ups. Our results do not confirm this hypothesis, though. Whereas we find no significant impact of local banking development on founding activities for East Germany, the results for West Germany – in most cases – turn out to be significantly negative. This is particularly the case for start-ups. A potential explanation for these negative results is provided by Cestone and White (2003) and Spagnolo (2004). These authors present theoretical frameworks in which existing lending relationships with incumbent borrowers affect the behaviour of lenders relative to potential new borrowers. The less competitive the conditions in the credit market, the lower the incentive for lenders to finance newcomers.

Table 9: Financial development and GDP

	West			East		
	OLS	TSLS		OLS	TSLS	
		1. Stage	2. Stage		1. Stage	2. Stage
Instrument:		Saving banks in 1982			Branches in 1990	
	(1)	(2)	(3)	(4)	(5)	(6)
Branches per 10,000 inhabitants	.034***		.000	.017		.004
	(.005)		(.013)	(.015)		(.023)
Saving banks per 10,000 inhabitants in 1982		.496***				
		(.061)				
Branches per 10,000 inhabitants in 1990					.454***	
					(.135)	
Size in square KM/1000	–.021	–.189	–.020	.015	–.511***	.012
	(.025)	(.205)	(.026)	(.024)	(.175)	(.024)
Independent city	.022	–.870***	–.029	.192**	.257	.193**
	(.046)	(.286)	(.051)	(.081)	(.408)	(.080)
Log GDP per capita/1000 in 1992				.430***	–1.316**	.403***
				(.127)	(.602)	(.132)
Log GDP per capita/1000 in 1980	.904***	–.284	.901***			
	(.051)	(.337)	(.054)			
R^2	.779	.317	.755	.697	.436	.694
F-Stat excl. inst.			66.1			11.2
Observations	326	325	325	67	67	67

* p<0.10, ** p<0.05, *** p<0.01

Notes: Least squares regressions in columns (1), (2), (4) and (5); Two-stage least squares estimations in columns (3) and (6); Excluded instruments are number of saving banks per 10,000 inhabitants in 1982 in column (3) and number of bank branches per 10,000 inhabitants in 1990 in column (6). Dependent variable: average log gross domestic product in years 2002-2006 and 2010-2012 (measured in 1,000 Euros per inhabitant). Branches per capita are measured per 10,000 inhabitants averaged over the years 2002-2006 and 2010-2012. Further covariates include the size of a region ('*Verwaltungsgebiete*') measured in 1,000 square kilometres, an indicator for independent cities ('*kreisfreie Staedte*') and regional log gross domestic product in 1982 [1990] measured in 1,000 Euros per inhabitant in columns (1)-(3) [(4)-(6)]. Sample: West German regions in columns (1)-(3); Regions in former East Germany in columns (4)-(6). Robust standard errors in parentheses. Data sources: bank branch information is obtained from Bisnode, while all other variables are taken from the online database of the German Statistical Office GENESIS.

Table 10: Financial development and unemployment

	West			East		
	OLS	TSLS		OLS	TSLS	
		1. Stage	2. Stage		1. Stage	2. Stage
Instrument:		Saving banks in 1982			Branches in 1990	
	(1)	(2)	(3)	(4)	(5)	(6)
Branches per 10,000 inhabitants	–.006***		–.004***	–.009**		–.012
	(.001)		(.002)	(.004)		(.008)
Saving banks per 10,000 inhabitants in 1982		.496***				
		(.061)				
Branches per 10,000 inhabitants in 1990					.454***	
					(.135)	
Size in square KM/1000	.005*	–.189	.005*	.010	–.511***	.010
	(.003)	(.205)	(.003)	(.007)	(.175)	(.007)
Independent city	.037***	–.870***	.039***	.018	.257	.018
	(.005)	(.286)	(.005)	(.018)	(.408)	(.018)
Log GDP per capita/1000 in 1992				–.027	–1.316**	–.032
				(.029)	(.602)	(.034)
Log GDP per capita/1000 in 1980	–.013**	–.284	–.013**			
	(.006)	(.337)	(.006)			
R^2	.444	.317	.439	.117	.436	.111
F-Stat excl. inst.			66.1			11.2
Observations	326	325	325	67	67	67

* p<0.10, ** p<0.05, *** p<0.01

Notes: Least squares regressions in columns (1), (2), (4) and (5); Two-stage least squares estimations in columns (3) and (6); Excluded instruments are number of saving banks per 10,000 inhabitants in 1982 in column (3) and number of bank branches per 10,000 inhabitants in 1990 in column (6). Dependent variable: average unemployment rates in years 2002-2006 and 2010-2012. Branches per capita are measured per 10,000 inhabitants averaged over the years 2002-2006 and 2010-2012. Further covariates include the size of a region ('*Verwaltungsgebiete*') measured in 1,000 square kilometres, an indicator for independent cities ('*kreisfreie Staedte*') and regional log gross domestic product in 1982 [1990] measured in 1,000 Euros per inhabitant in columns (1)-(3) [(4)-(6)]. Sample: West German regions in columns (1)-(3); Regions in former East Germany in columns (4)-(6). Robust standard errors in parentheses. Data sources: bank branch information is obtained from Bisnode, while all other variables are taken from the online database of the German Statistical Office GENESIS.

Table 11: Financial development and regional firm dynamics

	West		East	
	OLS	IV	OLS	IV
Dependent Variable	(1)	(2)	(3)	(4)
Employment	101.11***	119.52***	94.76***	35.15
	(13.38)	(30.92)	(27.36)	(44.47)
Log business volume	.06***	.05	.11	–.04
	(.02)	(.03)	(.07)	(.14)
Log non-national business volume	.05***	.02	.12	–.10
	(.02)	(.05)	(.10)	(.21)
Log investment	.10***	.09**	.14**	–.05
	(.02)	(.04)	(.07)	(.16)
Firms per 10,000 inhabitants				
all firms	.59***	.80***	1.17***	.49
	(.08)	(.17)	(.31)	(.47)
firms with less than 50 emp.	.26***	.42***	.59***	.18
	(.04)	(.09)	(.17)	(.24)
firms with between 50 and 99 emp.	.16***	.22***	.24***	.05
	(.02)	(.05)	(.07)	(.11)
firms with between 100 and 249 emp.	.13***	.14***	.29***	.22
	(.02)	(.04)	(.09)	(.16)
firms with between 250 and 499 emp.	.12**	.34**	.06*	.01
	(.05)	(.14)	(.03)	(.04)
firms with between 500 and 999 emp.	.02***	.01	.01	–.01
	(.01)	(.01)	(.01)	(.01)
firms with more than 1000 emp.	.01***	.04***	–.00	.00
	(.00)	(.01)	(.00)	(.01)

Notes: Least squares regressions in columns (1) and (3); Two-stage least squares estimations in columns (2) and (4); Excluded instruments are number of saving banks per 10,000 inhabitants in 1982 in column (2) and number of bank branches per 10,000 inhabitants in 1990 in column (4). Dependent variables for each model are reported in the first column. All dependent variables are averages of the years 2002-2006 and 2010-2012. Only estimates of the coefficient on the number of bank branches per capita per 10,000 inhabitants averaged over the years 2002-2006 and 2010-2012 are reported. Coefficients on further covariates are not reported. Further covariates include the size of a region ('*Verwaltungsgebiete*') measured in 1,000 square kilometres, an indicator for independent cities ('*kreisfreie Staedte*') and regional log gross domestic product in 1982 [1990] measured in 1,000 Euros per inhabitant in columns (1)-(2) [(3)-(4)]. Sample: West German regions in columns (1)-(2); Regions in former East Germany in columns (3)-(4). Robust standard errors in parentheses. Data sources: bank branch information is obtained from Bisnode, and all other variables are taken from the online database of the German Statistical Office GENESIS.

Table 12: Financial development and firm insolvencies

	West			East		
	OLS	TSLS		OLS	TSLS	
		1. Stage	2. Stage		1. Stage	2. Stage
Instrument:		Saving banks in 1982			Branches in 1990	
	(1)	(2)	(3)	(4)	(5)	(6)
Branches per 10,000 inhabitants	–.472***		–.678***	.061		–.026
	(.045)		(.094)	(.099)		(.214)
Saving banks per 10,000 inhabitants in 1982		.496***				
		(.061)				
Branches per 10,000 inhabitants in 1990					.454***	
					(.135)	
Size in square KM/1000	–.007	–.189	–.018	.176	–.511***	.161
	(.172)	(.205)	(.184)	(.170)	(.175)	(.170)
Independent city	.552*	–.870***	.248	.927	.257	.932
	(.313)	(.286)	(.321)	(.560)	(.408)	(.566)
Log GDP per capita/1000 in 1992				.386	–1.316**	.212
				(.742)	(.602)	(.840)
Log GDP per capita/1000 in 1980	–.179	–.284	–.200			
	(.341)	(.337)	(.352)			
R^2	.340	.317	.297	.159	.436	.153
F-Stat excl. inst.			66.1			11.2
Observations	326	325	325	67	67	67

* p<0.10, ** p<0.05, *** p<0.01

Notes: Least squares regressions in columns (1), (2), (4) and (5); Two-stage least squares estimations in columns (3) and (6); Excluded instruments are number of saving banks per 10,000 inhabitants in 1982 in column (3) and number of bank branches per 10,000 inhabitants in 1990 in column (6). Dependent variable: average number of insolvencies per 10,000 inhabitants in years 2002-2006 and 2010-2012. Branches per capita are measured per 10,000 inhabitants averaged over the years 2002-2006 and 2010-2012. Further covariates include the size of a region ('*Verwaltungsgebiete*') measured in 1,000 square kilometres, an indicator for independent cities ('*kreisfreie Staedte*') and regional log gross domestic product in 1982 [1990] measured in 1,000 Euros per inhabitant in columns (1)-(3) [(4)-(6)]. Sample: West German regions in columns (1)-(3); Regions in former East Germany in columns (4)-(6). Robust standard errors in parentheses. Data sources: bank branch information is obtained from Bisnode, whilst all other variables are taken from the online database of the German Statistical Office GENESIS.

Table 13: Financial development and business registration/closure activities

	West		East	
	OLS	IV	OLS	IV
Dependent Variable	(1)	(2)	(3)	(4)
Business registrations per 10,000 inhabitants				
Total	–1.57***	–5.09***	–3.66**	–2.89
	(.56)	(1.35)	(1.71)	(3.07)
by foundation or transformation	–1.29***	–3.79***	–2.82*	–2.13
	(.46)	(1.11)	(1.44)	(2.39)
as corporate body	.11	–.61*	–.55	–.09
	(.15)	(.37)	(.34)	(.57)
by relocation	–.40***	–1.27***	–1.03***	–.95
	(.15)	(.35)	(.29)	(.62)
by takeover	.12	–.03	.19	.18
	(.10)	(.20)	(.17)	(.43)
Business deregistrations per 10,000 inhabitants				
Total	–1.74***	–3.77***	–1.44	–1.58
	(.43)	(.96)	(1.12)	(1.96)
closures	–1.79***	–2.60***	–.98	–1.12
	(.33)	(.70)	(.87)	(1.45)
as corporate body	–.16	–.47*	.06	–.28
	(.10)	(.24)	(.28)	(.56)
takeovers	.24**	–.08	.29	.31
	(.10)	(.19)	(.18)	(.44)

Notes: Least squares regressions in columns (1) and (3); Two-stage least squares estimations in columns (2) and (4); Excluded instruments are number of saving banks per 10,000 inhabitants in 1982 in column (2) and number of bank branches per 10,000 inhabitants in 1990 in column (4). Dependent variables for each model are reported in the first column. All dependent variables are averages of the years 2002-2006 and 2010-2012. Only estimates of the coefficient on the number of bank branches per capita per 10,000 inhabitants averaged over the years 2002-2006 and 2010-2012 are reported. Coefficients on further covariates are not reported. Further covariates include the size of a region ('*Verwaltungsgebiete*') measured in 1,000 square kilometres, an indicator for independent cities ('*kreisfreie Staedte*') and regional log gross domestic product in 1982 [1990] measured in 1,000 Euros per inhabitant in columns (1)-(2) [(3)-(4)]. Sample: West German regions in columns (1)-(2); Regions in former East Germany in columns (3)-(4). Robust standard errors in parentheses. Data sources: bank branch information is obtained from Bisnode, and all other variables are taken from the online database of the German Statistical Office GENESIS.

7 Summary

Parts of the following chapter are taken from the working paper Beck et al. (2016).

The objective of the current paper was to examine the role of the development of local financial markets for regional economic dynamics in Germany. Several previous studies had shown that financial development affects economic growth very positively. However, no evidence had been provided for Germany to date.

As stressed, Germany is an interesting backdrop against which to study this relationship. First, small- and medium-sized enterprises play a central role in the German economy. These firms are not only fairly dispersed in a geographical sense, but they are also known to have long-running relationships with their local bank, also denoted by *Hausbank*, in many cases. Moreover, in Germany, like in Japan and other continental European countries, firm financing is highly bank-based, which is in contrast to rather market-based countries like the UK or the United States. In other words, the development of the local banking market can be expected to play an important role in the economic dynamics of firms, and thus the overall economy, in a given region.

Secondly, despite centralised legislation and a high degree of economic integration, local banking markets exhibit a significant amount of heterogeneity with respect to their development. This is shown in detail in Chapter 5 of this work. German regions are highly different in terms of numbers of banks, numbers of branches, branch density and several other financial market characteristics. Put differently, the sizeable cross-regional variations in local banking market developments enables research into the potential effects of this heterogeneity on regional economic dynamics.

Thirdly, East German regions have undergone a dramatic transformation from a command economy, where banks have not played any major role, to a market economy with a privately organised banking system. This unique historical event makes East Germany an interesting object of enquiry. Surprisingly, there is only rare non-national research on the economic development of the former GDR area, and empirical research is quasi-non-existent. This might be due to the fact that reliable data on the GDR are hard to find. Compiling the bank branch database on the late GDR is therefore one of the crucial contributions

of this work.

Fourthly, certain particularities in the history of both the West and East German banking systems allow for constructing instruments which control for inherent endogeneity problems associated with examining the relationship between banking markets and economic dynamics. Chapter 3 of this work highlights historic development in a precise manner, and so being able to address the inherent endogeneity problem of empirical finance and growth research is another major contribution of this research.

Initially, several hypotheses were formulated and questions on the relationship between regional banking structure and economic development were asked. To conclude this work, these hypotheses need to be proved and the questions answered. The basic research question at the beginning of this work asked whether local financial structures, such as local banking markets, matter for local economic development. Like most current research on this topic, the results yield ambiguous answers. For West Germany, the Schumpeterian view and most of the hypotheses on the relationship between well-developed financial markets and economic growth can be supported, i.e. a higher number of branches per capita has a positive effect on the regional economy.

However, for East Germany the results are stunning. Either no significant relationship between financial market structure and the regional economy is found, or the outcome refutes the hypotheses. Four attempts are made to explain the East German results. As Robert E. Lucas states, "*In general, I believe that the importance of financial matters is very badly over-stressed [...], as the development of financial institutions is a limiting factor in development ...*" (Lucas (1988)). Thus, the results for East Germany support Lucas's view in finding no significant effect of the local financial market on economic factors.

The second hypothesis to investigate further is the question as to whether in countries where financial and economic markets have not evolved simultaneously, the financial system is relevant at all. Robinson (1952) argues that financial development should follow economic growth. If no significant economic development happens, progressing Robins' thoughts, it will lead to the irrelevance of the financial sector in terms of a positive finance and growth correlation. As for East Germany, if no significant economic growth had been

realised, the well-developed banking market might not have been relevant to economic development at all.

According to the work of Canales and Nanda (2012), a competitive and well-diversified banking market would be advantageous for SMEs – and thus economic development. A banking market, concentrated on local decentralised banks, such as savings banks in East Germany, however, would lead to cherry-picking and thus a restrictive development environment for SMEs. Based on the results presented in Chapter 6, I tend to support the conclusions made by Canales and Nanda (2012). Especially in East Germany, market concentration increased and savings banks nowadays do dominate the local financial sector. Thus, alleged cherry-picking behaviour by the local savings banks might hinder sound regional economic development, driven by SMEs. Of course, the presented empirical analysis does not look at lending decisions or bank-SME interactions, as Canales and Nanda (2012) do in their study, so further efforts to uncover this issue would not only be very interesting, but also possible, based on the data provided within the KfW SME panel.[29]

Another explanation for the contradictory results might be that any positive effects of a sound financial system are crowded out in East German regions. It is a matter of common knowledge that German reunification was very expensive for West Germany, the FRG in general. Massive federal subsidies were paid and public funds were allocated to help put East Germany on an urgently required growth path.[30] The existence of that public financial supply therefore might have crowded-out the relevance of a distinct banking system. This is only a speculative notion, but as data on the public funds are available, further empirical research on this topic is feasible and expedient.

[29]The KfW SME panel is on hand for exploration but has not been used in this stage of the research process.

[30]Besides various private investments, vast public investments were made. One example is the *Fonds Deutsche Einheit*, a special trust set up to secure a financial basis for the five new German Federal states, founded in 1990, supplying about 82.2 billion Euro until 1994 (Gesetz über die Errichtung eines Fonds 'Deutsche Einheit' vom 25. Juni 1990 (BGBl. 1990 II S. 518, 533), das zuletzt durch Artikel 3 Absatz 1 des Gesetzes vom 12. Juli 2006 (BGBl. I S. 1466) geändert worden ist (1990)). By 1995, total transfers constituted 5% of West German GDP and 41% of East German GDP (see f.i. Tofaute (1993) and Gagnon et al. (1996)). The amount of credit for modernisation, restoration and start-ups given by the KfW since 1990 exceeds 194 billion Euros (see the interview given by the KfW president on the 25-year anniversary KfW (2015)).

7.1 Remaining questions and outlook

The results presented in this work are a starting point for further research. The compiled data allow for answering several remaining questions. In developing the existing database, in other words constructing additional variables to examine, it can be tested if the effect of financial development depends on specific regional economic characteristics. The effect of financial development might differ between urban and rural regions or depend on the initial income of a district. Likewise, the sectoral structure of the regional economy (e.g. dependence on the external financing needs of different sectors, as examined in Cetorelli and Strahan (2006)) might force different results on the relevance of a region's banking structure.

Up until now, the regional banking market characteristics as presented in Chapter 5 have not been taken into account, either. Specific structural elements of the respective local banking market include organisational structure, the market concentration (HHI) or a region's 'banking mix' (ratio of public/private banks, regional/global banks). The application of these variables on the empirical estimation of local economic dynamics suggests interesting results.

In applying additional data to hand, such as the KfW SME panel or firm-specific data like Dafne, to the existing database, even more questions can be answered.[31] In so doing, initially the relevance of public funding in East Germany should be tested. Answering the question whether public funding is outgrowing bank lending, is not only interesting from an economic research point of view, but it would also imply interesting conclusions for future political decisions.

Further on, in using the KfW SME panel for example, effects of the financial system on SMEs innovation and export behaviour can be tested. As Germany is one of the world's largest export nations, the results of this approach would probably yield interesting economic and politic conclusions as well. In applying firm-specific data from the KfW SME panel and the Dafne database, questions regarding the quality of credit and alleged cherry-

[31] The Dafne database contains comprehensive information on over one million companies in Germany. It is on of a number of products offered by Bureau van Dijk, such as the more famous Bankscope database.

picking behaviour – as found by Canales and Nanda (2012) – might be addressed.

Concluding, it can be stated that the compilation of the bank database and the invention of the instruments presented herein offer a major contribution to the empirical finance and growth research. The combination of new data on a - for the empirical research - 'new' country enlarges the research by far. By undertaking the just mentioned research questions, it is possible to add some new insights to the finance and growth nexus, especially on local level and for bank-based economies. Additionally, it creates options for several further researches and, as in the Italian case, can be expected to induce a series of empirical work.

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Appendix

A The GDR banking system in detail

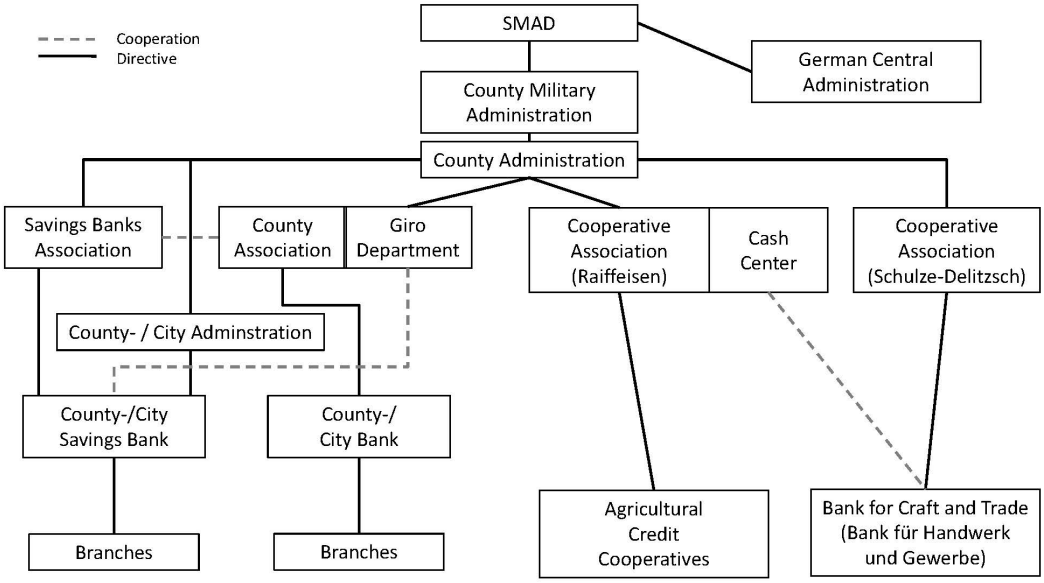
Officially starting with Act 1/45 of the Soviet Military Administration (SMAD) on July 23rd, 1945, the existing banking systems of the occupied territories were transformed into socialist-planned ones. On the occupied German territories however the transformation of the financial system already started in April 1945, when the commander-in-chief of the Red Army ordered all banking activities to be temporarily paused and assets to be fixed. From April to July 1945 some banks were re-opened. After Act 1/45 in July the former savings banks and credit cooperatives then officially re-opened, albeit with different legal statuses and under full control of the SMAD. Large private banks remained closed, whereas small private banks could reopen theoretically, according to the order. Additionally banks controlled by the SMAD were installed in each district, operating branches in every bigger district city but different location.[32]

Banking in a centrally planned socialist state is very important. In such instances, banks and other financial institutions play a major role in the accumulation and distribution of savings and credit. According to the *GDR Handbook for Economy* a central bank's purpose is to help increase the material and cultural standard of living by implementing appropriate credit relations with leading economic institutions. This should be done in line with the five-year plan (and yearly plans) and to promote (i) the highly paced development of socialist production, (ii) increased efficiency, (iii) economic and technical development and finally (iv) the growth of labour productivity. Moreover, banks should enact their financial and controlling projects in a way that all social resources are utilised fully. The socialist process of reproduction should thus be able to perform proportionally and as planned. [33]

[32]Neuorganisation der deutschen Finanz- und Kreditversorgung (SMAD Befehl Nr. 01 vom 23. Juli 1945) (1945) and Befehl Nr.1 des Ersten Stellvertreters des Obersten Chefs der Sowjetischen Militäradministration in Deutschland (SMAD) vom 23. Juli 1945 über die Neuorganisation des Bank- und Kreditwesens in der SBZ (Staatliches Archiv der Russischen Föderation (GARF) R-7317/7/10) (1945). See Schneider (2017) and Deckers (1974) for further information.

[33]The original citation in Ehlert (1989) is: "Die sozialistischen Banken haben auf der Grundlage von Fünfjahr- und Jahresplänen ihre Geld- und Kreditbeziehungen zur Wirtschaft und zu den wirtschaftsleitenden Organen so zu gestalten, dass sie zur Erhöhung des materiellen und kulturellen Lebensniveaus des Volkes auf der Grundlage eines hohen Entwicklungstempos der sozialistischen Produktion, der Erhöhung der

Figure 16: Banking system under Soviet military administration (SMAD) 1947-1949



The banking system in the former GDR was thus an integral part of the command economy, as evident in Figure 16, with none of the economic activities known in market-based financial systems. In contrast, it represented all structures of the Marxism-Leninism theory of banking[34], adapting to the SED's governmental plan. From Lenin's point of view, a well-defined banking market is the cornerstone of a fully-functioning socialist system.

Within the banking system under SMAD, only a few names and local structures, developed before the Second World War, remained part of the historically grown market-based system. Hence, it entailed two blocks of bank type: first, the state bank and foreign trade bank, directly representing the socialist government, and second, the savings and cooperative sectors, accounting for the historical remains.

At the heart of Lenin's mono-banking-system was a centrally controlled state bank. Three years after Act 1/45, on July 23rd, 1948, the SMAD therefore founded the Deutsche Notenbank, operating as the central bank from that point on. The German Democratic Republic was founded on October 7th, 1949, totally implemented Lenin's socialist banking

Effektivität, des wirtschaftslich-technischen Fortschritts und des Wachstums der Arbeitsproduktivität beitragen..... Sie führen ihre Finanzierungs- und Kontrollaufgaben sowie die Rechnungsführung so durch, dass die gesellschaftlichen Kräfte und Mittel überall mit höchstem Nutzeneffekt eingesetzt werden und der sozialistische Reproduktionsprozess sich planmäßig proportional vollzieht."

[34] See Lenin (1918) for more details.

system (Lenin, 1918). As a result, there was a state monopoly on banks, with all institutions nationalised and controlled by a single central state bank. According to Lenin, banking is an important source of political and economic power within the development process towards a socialist society. Thus, the banking system of the GDR was built to be a solid pillar of the command economy, assigned to enforcing the government's monetary and credit policy in line with the social state plan.

In order to build a socialist banking system, the GDR government enforced the State Bank and several centrally controlled, specialised banks such as the German Trade Bank and the German Foreign Trade Bank. Postal and railway cheque offices served as financial institutions, too, but they were of minor relevance to the system. Again, savings banks and cooperative banks continued to operate, but banking in the GDR was a politically alienated instrument. Figure 16 provides a detailed description of these banking structures, from 1949-1990.

The GDR State Bank dates back to the Banking Act of the SMAD in 1945. In order to set up a socialist banking system, the Russian occupational power ordered the establishment of federal bank offices in each administrative district with branches in every bigger city. On July 23rd, 1948, the SMAD founded the State Bank (*Deutsche Notenbank*) as the financial head directorate of the envisaged mono-bank system. Usually in socialist states, a central bank acts as a credit, money-issuing and clearing centre, which indeed applied to the State Bank. It was renamed (Staatsbank der Deutschen Demokratischen Republik) in 1968 by the GDR government. The guidelines for the State Bank's supervision were given through financial tasks set by the SED party congresses. Also see Ehlert (1989), p. 126-129 for more detailed information. By the end of 1989, the State Bank operated 207 head and district offices.

Within the cooperative banking sector there has usually been some form of separation between agricultural- and commerce-related elements. The agricultural line (known as Raiffeisenbanken dates back to social reformer Friedrich Wilhelm Raiffeisen (1818 – 1888), who founded credit cooperatives to support local farmers looking to finance their cattle and seeds. The commerce line of cooperative banking (known as Volksbanken)

goes back to Hermann Schulze-Delitzsch (1808 − 1883), who founded the Delitzscher Vorschuss-Verein, the precursor for a banking association of small businesses and craftsmen in 1850. Even at that stage, credit cooperatives were administered according to principles still found today: unlimited liability for members, limited geographic area and the allocation of surpluses to an indivisible reserve. The separation within the cooperative banking sector endured in the GDR. Volksbanken were succeeded by the Genossenschaftskassen für Handwerk und Gewerbe, opposing the Bäuerlichen Handelsgenossenschaften (BHG) as a replacement for the Raiffeisenbanken. At the beginning of the military administration the cooperative banking sector experienced hardly any changes in function. Cooperative banks were basically just re-opened a few days after Act 1/45, preceding their banking business. As the cooperative banking sector of the GDR experienced some intense restructuring later on, the development of both cooperative lines in the GDR is explained in more detail below.

Essentially, cooperatives follow a grassroots democratic structure. Socialism and cooperatives are not opposed; rather, they are enmeshed within their principal values (such as the one-member-one-vote rule and their long-term orientation for business objectives). This is why cooperative banks at first fitted quite well into the socialist philosophy of the early GDR. However, as centralisation and command economy structures strengthened over time, the East German cooperatives had to go along with the policy or be humbled. This process was enforced through several structural and political changes ordered by the GDR regime.

The farming trade cooperatives of the GDR were ancillary to the Bank for Agriculture (BLN). Within this function the BLN was not only in charge of the accumulation of free funds, but it also executed the financial supervision of all mandated institutions. Based on this activity, the BLN gained comprehensive knowledge about the GDR's economic situation regarding agriculture. As a result, the BLN was involved in the elaboration of the three- and five-year plans (compare Handwörterbuch der Sparkassen (HWS) (1982), p. 126 et seq). Officially the 'Kreditverordnung der DDR'[35] did not come into force for the BHGs, and so they cannot be seen as credit cooperatives like the Bank for Craft and Trade (Mann (1996), p. 9).

[35]The 'Kreditverordnung der DDR' was the GDR's official banking Act. This is similar to today's 'Kreditwesengesetz' (KWG) in Germany or the EU's Capital Requirements Regulation (CRR).

Cooperatives for craft and trade (short credit cooperatives from now on) – as can be identified by the name – were responsible for private and business clients associated with craft and trade. The existing cooperatives were organised into an association and were subject to the association's instructions. The cooperative association, amongst others, supervised all craft producers' financing, right up until the beginning of the 1980s. Besides providing all necessary financial services, the credit cooperatives should support the work and outcomes of craft and trade businesses. As evident in Figure 16, the cooperative association, in contrast to the BLN, was not a governmental institution and was only partly directed by the State Bank. According to Mann (1996), p. 6, the cooperatives for craft and trade are thus the only institutions that can be compared with the credit cooperatives of West Germany.

As already mentioned, there were several restructuring phases in the cooperative banking sector, and the credit cooperatives in particular, over time. Starting in the 1970s, credit cooperatives lost their business clients from many sources as smaller businesses were nationalised (firms and small businesses were converted into so-called 'Volkseigene Betriebe' (VEB) – nationally owned enterprises). VEBs had to keep their accounts at the respective local savings bank or State Bank branch. Additionally, cooperatives were not allowed to give credit to VEBs or maintain any other business (see Mann (1996) p. 8). As a consequence the cooperative sector went through a huge programme of rationalisation. When, in 1983, finally, another restriction assigned basically all existing cooperative accounts to the local savings bank, about 90 per cent of the cooperative branches and checkout points were shut down.

It may well be assumed that the reconstruction processes in the cooperative sector were based on the wish for more governmental control on behalf of the cooperative activities. There is no evidence, though, but considering the fact that the cooperative sector was quite autonomous within the GDR banking sector up until the beginning of the 1980s, this might be a reasonable assumption. At the end of 1989, the GDR cooperative banking sector had 272 BHGs operating 2,812 branches and checkout points, with a further 95 credit cooperatives operating 120 branches and checkout points, as well as 14 head- and 176 branch

offices of the BLN.[36]

Like credit cooperatives, savings banks were built upon historically grown structures but integrated into the socialist banking system. Legally, the savings banks had to follow savings banks law, determined by the GDR government. Complementary regulations were set and controlled by a special savings bank department within the State Bank. After the implementation of cashless salary payments, each working GDR inhabitant was in need of an account. For the average population the local savings bank branch was the only way of accessing financial services, as far as one could speak of such in a command economy. The main task of the savings banks, however, was to encourage private household savings. Thus, the savings bank sector was far more politically controlled and pervaded than the cooperative sector. According to the East German Savings Banks Association, the savings bank sector was home to 196 savings banks and over 3,000 savings bank branches by the end of 1989.

Besides the banks mentioned above, there were several other financial institutions in the GDR banking system. The German Foreign Trade Bank (GFTB) of the GRD was in charge of all international transactions. Most of this business, however, was concentrated on other socialist countries, e.g. the COMECON states.[37] Additionally, the GFTB supervised and controlled all exporting firms in the planning and financing of their international business. In observing, analysing and evaluating the development of international capital markets, the GFTB was a consultant partner for exporting firms in all strategic aspects (compare Ehlert et al. (1985), p. 94). Like most other directly and centrally controlled institutions, the German Foreign Trade Bank was headquartered in Berlin under the supervision of the State Bank and the GDR Council of Ministers' external sector plans. For strategic reasons relating to international business, the GFTB was founded in 1966 in the form of a joint-stock company, the stocks of which were held by the State Bank and publicly owned exporting GDR firms. The GDR's German Trade Bank (Deutsche Handelsbank AG) was likewise founded as a joint-stock but state-owned company for foreign trade. In contrast to the Ger-

[36]Data source: Document, DY 19/357 (1981/82) and DG Bank (1990).

[37]COMECON - Council for Mutual Economic Assistance founded in 1948, dissolved in 1991. Economic community of East-European nations, headquartered in Moscow. The COMEON was the equivalent of the OECD after the USSR decided not to participate in the Marshall Plan.

man Foreign Trade Bank, the German Trade Bank focused its attention on the acquisition of foreign exchange and transit trade with non-socialist countries (see Ashauer (1990), p. 11.).

The GDR banking sector also entailed some postal and railway banking institutions, as well as some clerical credit cooperatives, as already mentioned in the main text. Each of them operated accounts and supported government-funded cashless transactions, but none of them operated any commercial credit business. The railway banks were limited to employees of the East German Railways and officially incorporated as credit cooperatives. Postal and railway banks operated branches and checkout points in post offices and railway stations throughout the country.

Within the unifying process, the German Foreign Trade Bank and the German Trade Bank were dissolved. During 1990, the railway banking institutions entered into a joint venture with the West German Deutschen Verkehrs-Kreditbank AG Berlin und Frankfurt am Main (Ministerrat der Deutschen Demokratischen Republik, 1990). In line with the German reunification officially enacted October 3rd, 1990 (Einigungsvertrag vom 31. August 1990 (BGBl. 1990 II S. 889), 1990), the GDR's Deutsche Post merged into the West German Deutsche Bundespost. Therefore, remaining postal banking services were merged, too. For further information on the GDR banking system and its transition see, for example, Lenin (1918), Ehlert et al. (1976) and Mann (1996).

B Data and additional descriptives

As explained in the main section previously, there have been several minor and major reforms in Germany on Nuts3 level since 1982. The older reforms (pre-2000) have already been implemented in the data provided by official federal statistics. Other reforms had to be taken into account and needed to be implemented in the data, in order to achieve consistency.

Two minor reforms were (i) the Städteregion Aachen (5334), which is a merger of the previous urban and rural districts Aachen, krfr. Stadt (05334002) and Aachen, Kreis

(05354). In this case the values could be added easily; and (ii) Heidekreis, Landkreis (03358), which was Landkreis Soltau-Fallingbostel until July 31st, 2011. It was renamed without a change in the Destatis-ID number (the numbers in parenthesis) or a change within district boundaries. No adaptation was necessary in this case.

Three major reforms not included in the official data are rural reforms in Sachsen 2006, in Sachsen-Anhalt 2007 and in Mecklenburg-Vorpommern 2011. Unfortunately, in Mecklenburg-Vorpommern and Sachsen-Anhalt, three rural districts were split on the municipal level. A simple addition of the data on the former districts was therefore not possible, which is why the backward calculation of rural districts as effective since 2013 is based on the percentage of socially insured employees that were moved at municipality level. This kind of backward calculation was recommended by the Statistical Office of Sachsen-Anhalt. The calculation on behalf of the socially insured employees is possible because information on them is available at the municipal level via the Federal German Employment Agency. A detailed picture of the segmentation, percentages and exact calculation is given in Tables 14, 15 and 16.

Not affected by this adaptation are all population data, as they are available on the municipal level at the respective federal statistical bureaus. Therefore, the necessary calculations could be done directly, and all missing data were completed. Of course, it is an unfortunate fact that no perfectly consistent panel data are available. Considering the quite long time period, however, the adaptation is a very good approximation.

Table 14: Reform of rural districts in Sachsen 2006

Rural district effective 2013	**Previous**
14521 (DED42) Erzgebirgskreis	14171 (DED14) Annaberg 14191 (DED1B) Aue-Schwarzberg 14188 (DED1A) Stollberg 14181 (DED18) Mittlerer Erzgebirgskreis
14522 (DED43) Landkreis Mittelsachsen	14375 (DED33) Döbeln 14177 (DED16) Freiberg 14182 (DED19) Mittweida
14523 (DED44) Vogtlandkreis	14178 (DED17) Vogtlandkreis 14166 (DED12) Plauen
14524 (DED45) Landkreis Zwickau	14173 (DED15) Chemnitzer Land 14193 (DED1C) Zwickauer Land 14167 (DED13) Zwickau
14625 (DED2C) Landkreis Bautzen	14272 (DED24) Bautzen 14292 (DED2B) Kamenz 14264 (DED23) Hoyerswerda
14626 (DED2D) Landkreis Görlitz	14286 (DED28) Löbbau-Zittau 14263 (DED22) Görlitz 14284 (DED26) Niederschlesischer Oberlausitzkreis
14627 (DED2E) Landkreis Meißen	14280 (DED25) Meißen 14285 (DED27) Riesa-Großenhein
14628 (DED2F) Landkreis Sächsische Schweiz-Osterzgebirge	14287 (DED29) Sächsische Schweiz 14290 (DED2A) Weißeritzkreis
14729 (DED52) Landkreis Leipzig	14379 (DED34) Leipziger Land 14383 (DED35) Muldentalkreis
14730 (DED53) Landkreis Nordsachsen	14374 (DED32) Delitzch 14389 (DED36) Torgau-Oschatz

Table 15: Reform of rural districts in Mecklenburg-Vorpommern 2011

Rural district effective 2013	**Previous**
13076 Landkreis Ludwigslust-Parchim	13054 (DE80A) Ludwigslust 13060 (DE80G) Parchim
13071 Landkreis Mecklenburgische Seenplatte	13002 (DE802) Neubrandenburg 13056 (DE80C) Müritz 13055 (DE80B) Mecklenburg-Strelitz 13052 (DE808) Demmin (87.75%)
13075 Landkreis Vorpommern-Greifswald	13001 (DE801) Greifswald 13059 (DE80F)Ostvorpommern 13062 (DE80I) Uecker-Randow 13052 (DE808) Demmin (12.25%)
13074 Landkreis Nordwestmecklenburg	13006 (DE806) Wismar 13058 (DE80E) Nordwestmecklenburg
13072 Landkreis Rostock	13051 (DE807) Bad Doberan 13053 (DE809) Güstrow
13073 Landkreis Vorpommern-Rügen	13005 (DE805) Stralsund 13057 (DE80D) Nordvorpommern 13061 (DE80H) Rügen

Table 16: Reform of rural districts in Sachsen-Anhalt 2007

Rural district effective 2013	**Previous**
15083 (DEE07) Landkreis Börde	15355 Bördekreis 15362 Ohrekreis
15084 (DEE08) Landkreis Burgenland	15256 Burgenlandkreis 15268 Weißenfels
15087 (DEE0A) Mansfeld-Südharz	15260 Mansfelder Land 15266 Sangershausen
15088 (DEE0B) Saalekreis	15261 Merseburg-Querfurt 15265 Saalkreis
15085 (DEE09) Landkreis Harz	15357 Halberstadt 15364 Quedlinburg 15369 Wernigerode 15352 Aschersleben Staßfurt (6.43%)
15089 (DEE0C) Salzlandkreis	15153 Bernburg 15367 Schönbeck 15352 Aschersleben Staßfurt(93.57 %)
15082 (DEE05) Landkreis Anhalt-Bitterfeld	15154 Bitterfeld 15159 Köthen 15151 Anhalt-Zerbst (53.38%)
15091 (DEE0E) Landkreis Wittenberg	15171 Wittenberg 15151 Anhalt-Zerbst (40.76%)
15086 (DEE06) Jerichower Land	15358 Jerichower Land 15151 Anhalt-Zerbst (5.86%)

Table 17: Detailed list of macroeconomic variables used via Destatis

Name of variable	Variable ID	Source	Time	Regions	Frequency	Missing values	Content
General Data							
area	171-01-4	Destatis	all Years	Nuts3	yearly	no	Square kilometre
pop	173-32-4*	Destatis	1995 - 2011	Nuts3	yearly	no	Population, yearly average
educ	trng_lfse_04	Eurostat	2002 - 2012	Nuts2	yearly	N2, N1 $>$ 80%	Participation of adults aged 25-64 in education and training (%)
destatis_t		Destatis	all years	Nuts3	yearly	no	City-Dummy; 1 = city (kreisfreie Stadt), 0 = country (Landkreis)
General Economic Data							
gdp	426-61-4	Destatis	2002 - 2010	Nuts3	yearly	N3, N2, N1 $>$ 80%	GDP, yearly total, Unit: tsd Euro(1000 Euro)
income	666-51-4	Destatis	2000 - 2012	Nuts3	yearly		Income of households, Unit: Euro per inhabitant
landprice	400-51-4	Destatis	1995 - 2011	Nuts3	yearly	$<$ 80%	Average price per sq metre
patent	pat_ep_rtot	Eurostat	2001 - 2009	Nuts2	yearly	no	Number of patent registrations at EPA in priority year
rd_exp	rd_e_gerdreg	Eurostat	1991 - 2009	Nuts2	yearly	N2, N1 $>$ 80%	Total intramural R&D expenditure (GERD, Unit: Euro per in habitant
Internet							
access	iso_r_iacc_h	Eurostat	2006 - 2012	Nuts1	yearly	$>$ 80%	Percentage of households with internet access (%)
broad	isoc_r_broad_h	Eurostat	2006 - 2012	Nuts1	yearly	$>$ 80%	Percentage of households with broadband internet connection (%)
domain	900-32-4	Destatis	2003 - 2012	Nuts3	yearly	no	Number of de-domains, yearly total
Traffic							
road	tran_r_net	Eurostat	2001 - 2011	Nuts2	yearly	N2, N1 $<$ 80%	Total street and highway kilometres
trans	road_go_na7rl3g	Eurostat	1999 - 2007	Nuts3	yearly	N3, N2 $>$ 80%	Annual road freight transport by region of loading,
	road_go_na_rl3g		2008 - 2012				Unit: tsd tonnes (1000t)
vehic	tran_r_vehst	Eurostat	1990 - 2011	Nuts2	yearly	N2, N1 $>$ 80%	Stock of vehicles, yearly total
Labour Market							
emp	xxx**	BAfA**	2002 - 2012	Nuts4	yearly	no	Number of socially insured employees, effective 30.06.
emp_si	254-21-4	Destatis	1999 - 2011	Nuts3	yearly	N3 $>$ 80%	Number of socially insured employees, effective 30.06.
emp_lf	638-61-4	Destatis	2000 - 2011	Nuts3	yearly	no	Number of employees (labour force/Erwerbstätige), yearly average
emp_p	638-52-4	Destatis	2000 - 2011	Nuts3	yearly	no	Number of employed person (Arbeitnehmer), yearly average
unemp	638-71-4	Destatis	2001 - 2012	Nuts3	yearly	N3, N2 $>$ 80%	Number of unemployed, yearly average

*These population data were complemented by data on the municipal level for Mecklenburg-Vorpommern and Sachsen-Anhalt.
**BAfA Bundesagentur für Arbeit. Sozialversicherungspflichtig Beschäftigte nach Wohn- und Arbeitsort mit Pendlerdaten. Deutschland nach Kreisen und Gemeinden. Statistik online, Stand 22.08.2013

Name of variable	Variable ID	Source	Time	Regions	Frequency	Missing values	Content
Firm-Level Data							
firms_all	401-31-4	Destatis	2006 - 2010	Nuts3	yearly	N3 $>$ 80%	Number of firms, total, effective 31.12.
firms09	401-31-4	Destatis	2006 - 2010	Nuts3	yearly	N3 $>$ 80%	Number of firms, 9 or less employees, effective 31.12.
firms1049	401-31-4	Destatis	2006 - 2010	Nuts3	yearly	N3 $>$ 80%	Number of firms, 10 to 49 employees, effective 31.12.
firms50249	401-31-4	Destatis	2006 - 2010	Nuts3	yearly	N3 $>$ 80%	Number of firms, 50 to 249 employees, effective 31.12.
firms250	401-31-4	Destatis	2006 - 2010	Nuts3	yearly	N3 $>$ 80%	Number of firms, 250 and over employees, effective 31.12.
buil_comp	052-41-4	Destatis	1995 - 2012	Nuts3	yearly	N3 $>$ 80 %	Number of firms in building sector, effective 30.09.
buil_emp	052-41-4	Destatis	1995 - 2012	Nuts3	yearly	N3, N2, $>$ 80%	Number of employees in building sector, effective 30.09.
buil_turn	052-41-4	Destatis	1994 - 2011	Nuts3	yearly	N3, N2, $>$ 80%	Yearly total turnover in building sector, Unit: tsd Euro
Business statistics data							
reg	328-61-4	Destatis	1998 - 2013	Nuts3	yearly	no	Business registrations, yearly total
reg_new			2001 - 2013			no	Registration by foundation or transformation
reg_comp			2008 - 2013			no	Registration as corporate body
reg_move			2001 - 2013			no	Registrations by moving
reg_take			2001 - 2013			no	Registrations by takeover
dereg	328-61-4	Destatis	1998 - 2013	Nuts3	yearly	no	Business de-registrations, yearly total
dereg_surr			2001 - 2013			no	De-registration by surrender
dereg_comp			2008 - 2013			no	De-registration as corporate body
dereg_move			2001 - 2013			4 in Nuts2 48 in Nuts3	De-registration by moving
dereg_take			2001 - 2013			4 in Nuts2 48 in Nuts3	De-registration by takeover
insol	325-32-4	Destatis	2007 - 2013	Nuts3	yearly	no	Number of firm insolvency proceedings, yearly total
insol_open							Number of accepted firm insolvencies, yearly total
insol_notopen							Number of rejected firm insolvencies, yearly total
insol_emp							Number of employees affected by firm insolvencies, yearly total
insol_liab							Number of expected liabilities from firm insolvencies, yearly total

Name of variable	Variable ID	Source	Time	Regions	Frequency	Missing values	Content
Manufacturing sector							
manu_comp	001-03-4 001-11-4	Destatis	1995 - 2008 2009 - 2013	Nuts3	yearly		Number of firms in manufacturing sector, effective 30.09.
manu_emp	001-03-4 001-11-4	Destatis	1995 - 2008 2009 - 2013	Nuts3	yearly		Number of employees in manufacturing sector, effective 30.09.
manu_turn	001-44-4 001-34-4	Destatis	1999 - 2008 2009 - 2011	Nuts3	yearly yearly		Yearly total turnover in manufacturing sector (Tsd. Euro)
manu_exturn	001-44-4 001-34-4	Destatis	1999 - 2008 2009 - 2011	Nuts3	yearly yearly		Yearly total foreign sales in manufacturing sector (Tsd. Euro)
manu_invest	011-61-4	Destatis	1995 - 2013	Nuts3	yearly		Investment in manufacturing sector, yearly total (Tsd. Euro)
Manufacturing variables acc. to firms size:	001-42-4 001-52-4 001-62-4	Destatis	1995 - 2002 2003 - 2008 2009 - 2013	Nuts3	yearly		
manu_49			1995-2913				Number of manufacturing firms, fewer than 50 emp.
manu_5099			1995-2913				Number of manufacturing firms, between 50 and 99 emp.
manu_100249			1995-2913				Number of manufacturing firms, between 100 and 249 emp.
manu_250499			1995-2913				Number of manufacturing firms, between 250 and 499 emp.
manu_500999			1995-2913				Number of manufacturing firms, between 500 and 999 emp.
manu_1000			1995-2913				Number of manufacturing firms, more than 1000 emp.
manu_emp_49			1995-2913				Total employees in manufacturing firms with fewer than 50 emp.
manu_emp_5099			1995-2913				Total employees in manufacturing firms, between 50 and 99 emp.
manu_emp_100249			1995-2913				Total employees in manufacturing firms, between 100 and 249 emp.
manu_emp_250499			1995-2913				Total employees in manufacturing firms, between 250 and 499 emp.
manu_emp_500999			1995-2913				Total employees in manufacturing firms, between 500 and 999 emp.
manu_emp_1000			1995-2913				Total employees in manufacturing firms with more than 1000 emp.

C Additional figures and tables

Table 18: Banking sector distribution in Germany 2013

Variable	Area	Mean	Std.Dev.	Min.	Max.	N
branches						
city	West	66.32	79.48	11	510	88
	Ost	37.61	25.67	12	100	18
country	West	85.20	40.78	20	125	295
	Ost	49.38	27.49	12	182	58
savings						
city	West	25.89	29.62	5	236	88
	East	17.94	13.22	4	47	18
country	West	37.08	19.87	8	125	237
	East	27.40	19.55	6	144	58
coop						
city	West	18.01	16.39	2	216	88
	East	8.89	5.88	1	21	18
country	West	40.84	20.07	7	122	237
	Ost	17.43	8.78	4	44	58
private						
city	West	22.42	38.10	2	216	88
	East	10.78	7.48	4	32	18
country	West	7.28	7.49	0	70	237
	East	4.55	3.45	0	19	58

Table 18 displays the summary statistics for the available banking variables, broken down into whether the respective area is a city or a country district in East or West Germany, 2013. Variables are rounded to two decimal places. The variable 'branches' shows the total number of bank branches, while 'savings' and 'coop' refer to the number of savings bank branches and cooperative branches, respectively. Percentage shares are given in parenthesis. Moreover, the standard deviation, minimum and maximum value and the number of observations are given.

Figure 17: Average regional branch distance in East Germany 1990

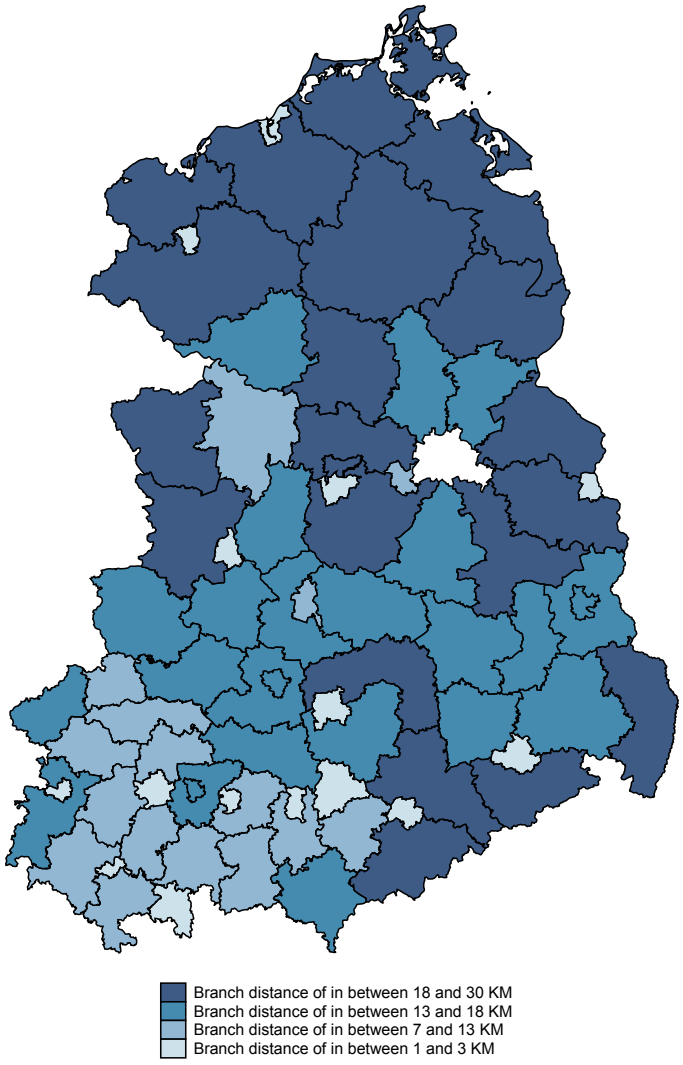


Figure 17 highlights the variable distance for each Nuts3 district in 1990. The variable was calculated as average distance (Km) a person has to travel within a respective district to reach any bank branch. Darker colours indicate a greater average branch distance.

Figure 18: Average branch distance in 2003 and 2013

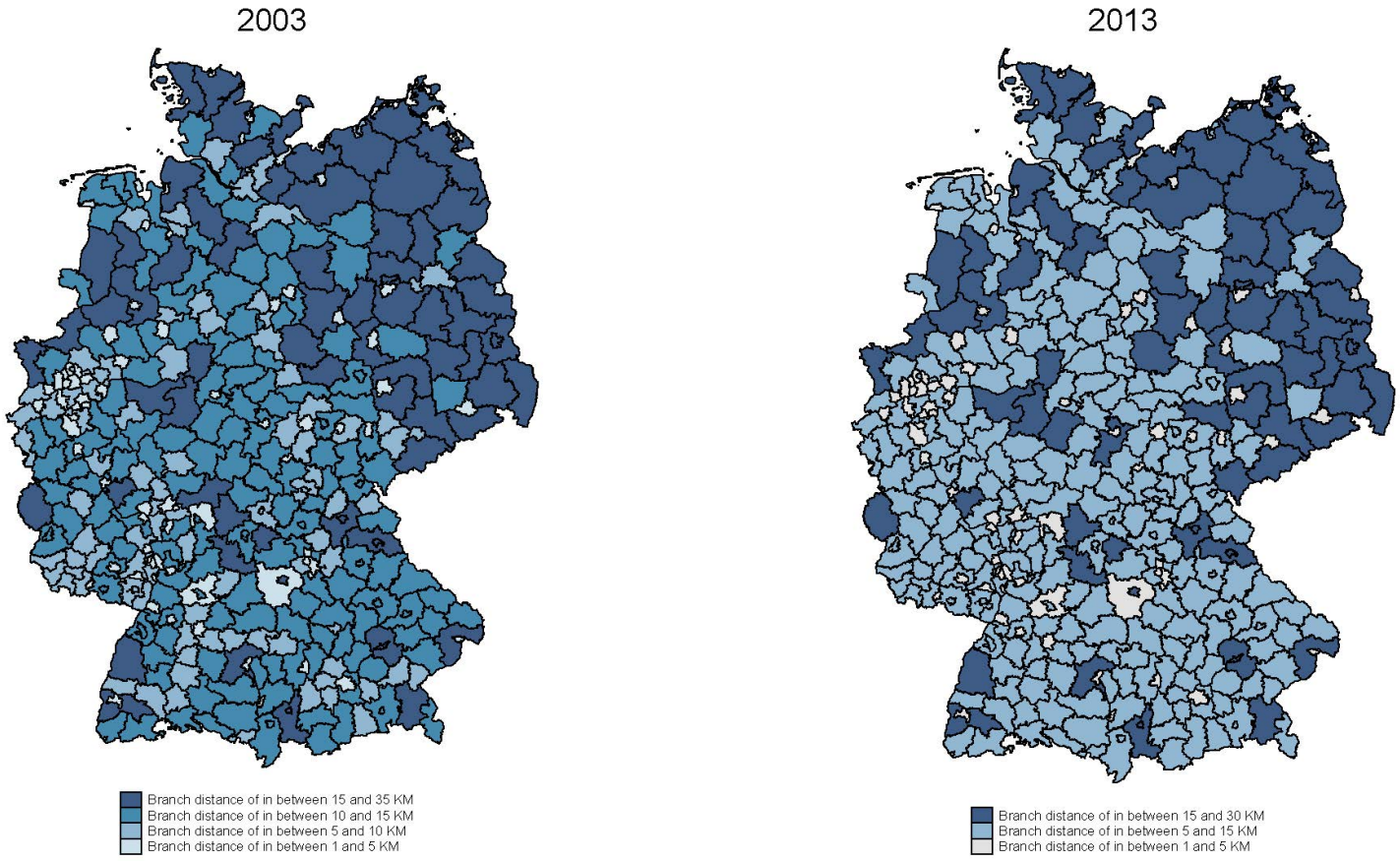


Figure 18 highlights the variable distance for each Nuts3 district in 2003 and 2013 in all 402 German districts. The variable was calculated as average distance (Km) a person has to travel within a respective district to reach any bank branch. Darker colours indicate a greater average branch distance.

Figure 19: Germany: Change of population 1990 to 2013

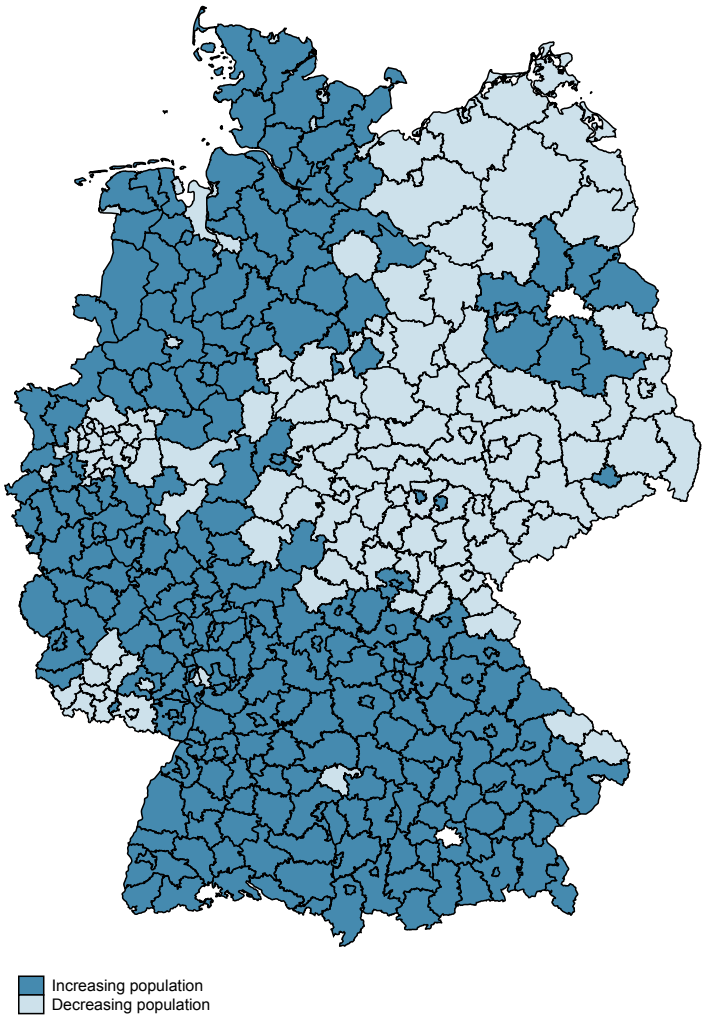


Figure 19 shows whether a region had either decreasing or increasing population development from 1990 to 2013 in Germany overall.

Figure 20: Sectoral distribution of the East German banking market

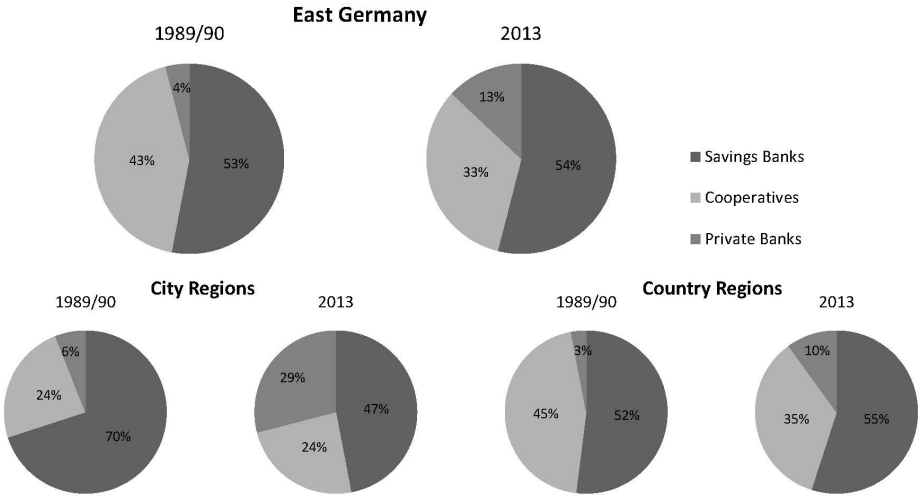


Figure 20 illustrates average banking market segmentation in the three-pillar structure for 1990 and 2013. Considered are 76 Nuts3 regions, including 18 city districts *kreisfreie Städte* and 58 country districts *Landkreise*. The city of Berlin is not considered, due to its separation during GDR times.

Figure 21: GDR banking institutions: from planned to marked economy

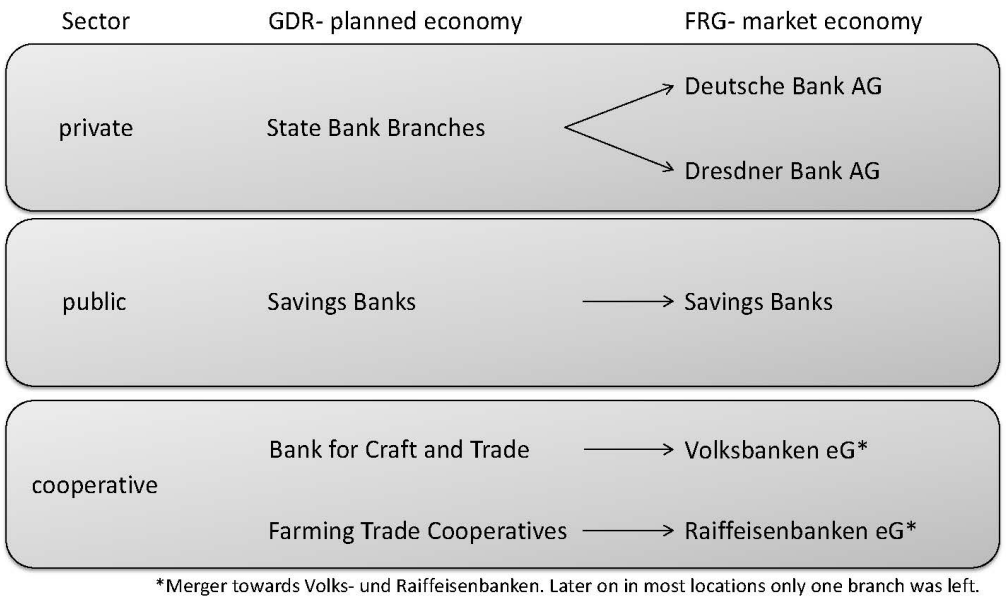


Figure 21 shows how the banking institutions from a former planned economy were changed into or overtaken by a banking model based on a market economy. Although the three-pillar banking system did not remain intact during the GDR area, names and assignments hardly changed and therefore could be carried beyond the planned economy.

Figure 22: The GDR state organs

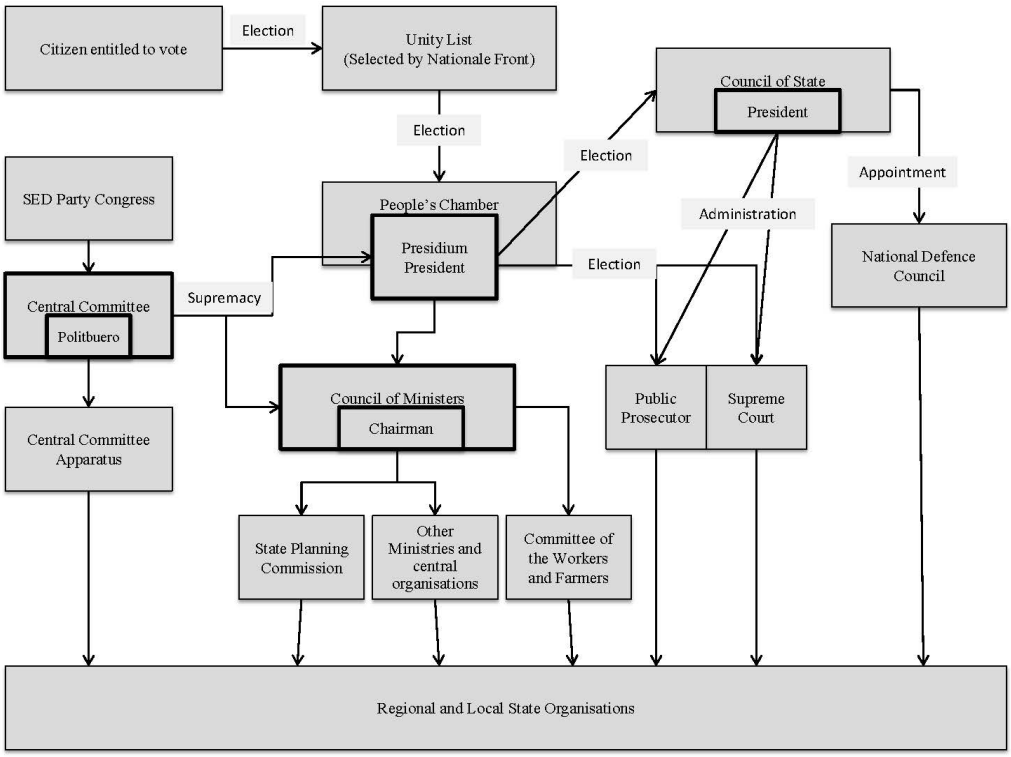


Figure 22 shows the most important political and federal organs of the GDR state and their relations. It highlights the importance of the SED. More detailed information on the political system is given in Schmidt (2013)

Figure 23: Administrative divisions of the GDR until 1989

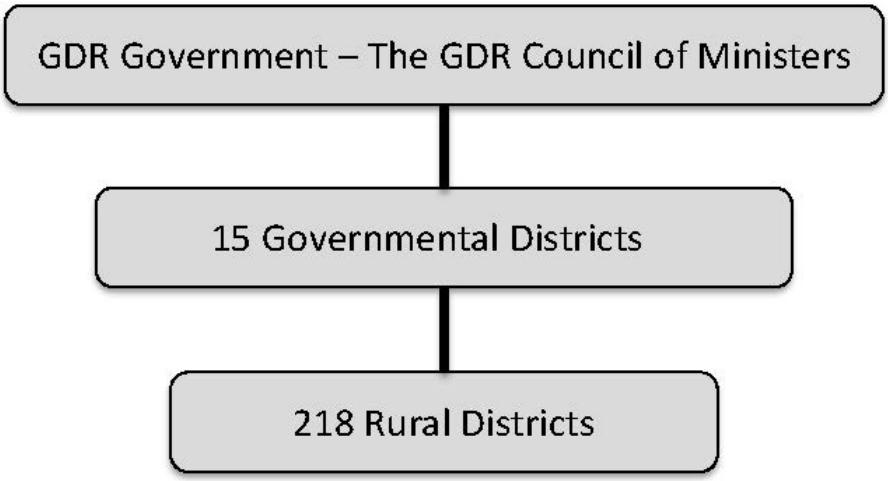


Figure 23 entails information on administrative divisions on political and geographical levels of the GDR up until 1989. Similar to the FRG, there were governmental districts and rural districts. The administrative structures of most of the banks in the GDR banking system are based on this administrative division, as evident in comparison to Figure 1.

Figure 24: The Federal Republic of Germany in Nuts levels

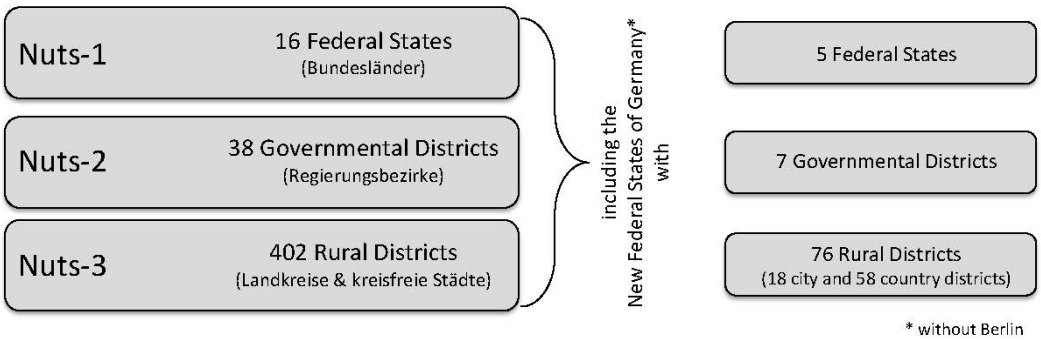


Figure 24 shows information on the administrative divisions of the FRG since German reunification in 1990. The number of rural districts reports the current status, effective since January 2012.