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Abhandlungen

Banks in Disadvantaged Areas

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I. Introduction

Empirical studies of cross-sections in banking can be broadly divided into two categories with respect to the scope of the considered entities. On the one hand, much literature applies information taken from commercial databases such as BankScope and, in most cases, has a cross-country perspective. Typical samples, however, do not cover the full population of banks of the regarded countries, are biased towards large banks (as e. g. argued for Italy by *Gambacorta* (2005)) and not corrected for mergers and acquisitions. On the other hand, a large deal of research – mostly on single countries – makes use of more complete data gathered by central banks. Admittedly, the conclusions from such studies with a limited geographical focus are, by nature, not generally applicable. Alongside the fact, however, that the problems mentioned above can be more easily resolved with national but complete samples, the latter have additional advantages. First, a proper calculation of some indicators (such as concentration indices) requires data for the full population of banks. Second, there is no need to be concerned with different accounting standards, regulatory regimes and other aspects of banking systems across countries. Third, data for banks' financial statements obtained by national banks may be more detailed.

Another issue is the discrimination of banks with different characteristics. Heterogeneity related to size, capitalization, earnings diversification, and so on, can be easily examined with both kinds of datasets. Nevertheless, using samples from single or a few countries with comparable banking system features appears to facilitate the examination of different types of banks. One example is the consideration of bank networks in the literature on the bank lending channel of monetary policy transmission.[1] This paper is focused on another dissimilarity of institutions within national banking industries. It is examined whether banks

[1] See, for example, *Ehrmann/Worms* (2004) and *Gambacorta* (2005).

operating in "disadvantaged" regions are special with respect to their characteristics and behavior. At the outset, it can be presumed that such institutions are rather small on average and therefore underrepresented in commercial databases.

The performance and the behavior of banks in structurally weak areas are of interest with respect to several presently relevant topics. One of these, for example, is competition in local markets and its welfare implications. Poorer, less populated and less industrialized regions are served by fewer banks which therefore operate in relative isolation from competitors. However, rivalry may also be reduced by structural features of the banking system. Recently, the European Commission raised concerns that the market segregation typical for savings banks and credit cooperatives in several countries gives rise to bank-level market power (*Commission of the European Communities* (2007)). In contrast, there is an ongoing discussion of the advantageous effects that may be generated by relatively isolated regional banks. It is often argued that the proximity to and the associated exploration of "soft information" (*Berger/Udell* (2002); *Stein* (2002)) on customers supports the access to financial services by local firms and households (*Alessandrini* et al. (2009)).[2] In Austria, as well as in other countries, mainly savings banks and credit cooperatives operate in rural markets with a large share of small, informationally opaque borrowers. *Conrad* et al. (2009) observe that private banks are not present in and retreat from relatively unprofitable and poorly populated areas in Germany. Credit availability in peripheral areas is also connected to the literature on asymmetric regional impacts of monetary policy (see, for instance, *Rodríguez-Fuentes/Dow* (2003) and *Rodríguez-Fuentes* (2006)). The banks themselves would argue (and large parts of the public would agree) that their presence in rural markets is of an immense importance for local investment, growth, employment and stability. Such positive growth and welfare effects associated with (certain types of) regionally operating banks are discussed and confirmed by, for example, *Fernández de Guevara/Maudos* (2009), *Gärtner* (2009), *Hasan* et al. (2009), *Hakenes* et al. (2009) and *Hakenes/Schnabel* (2010).

The aims of this study and its contributions are the following. For the Austrian example, it is examined first whether banks in regions termed and to be defined as "disadvantaged" have particular characteristics that distinguish them from institutions in other locations. Then, we discuss

[2] The European Commission recently addressed the issue of financial exclusion as well (*Commission of the European Communities* (2008)).

the role of the local markets' characteristics for the observed distinctions in bank performance and behavior in more detail. Finally, some regression models commonly applied in the empirical research on banking are examined, with the variables to be explained comprising net interest margins, bank efficiency, competitive behavior, and the reactions of loan supply to changes in the monetary policy stance. By evaluating whether the obtained results are affected by the (non)consideration of the banks under study, evidence is collected on how generalizable the results from different samples of banks are. Substantial differences might indicate that research based on non-complete bank samples is prone to yield misleading results, as it does not fully account for the diversity of financial institutions (also in the intra-national context). At last, the discussion points to possibly important conclusions for competition, monetary and regional policies, as well as for local development and welfare.

The remainder of the paper is structured as follows. Section II describes the data and the procedure applied to identify the banks that are affected by low regional development. The differences between the institutions selected in this manner and the remaining ones are examined in Section III. Subsequently, Section IV provides evidence on how sensitive standard results generated in the empirical banking literature are to the exclusion of such a special group of banks. Section V summarizes and concludes.

II. Data and Sample Division

The main dataset used is made up by the (yearly, non-consolidated) financial statements of all Austrian banks for the 1998–2006 period, obtained from the Austrian National Bank (Oesterreichische Nationalbank, OeNB). Financial figures are in million real 2005 euro and have been added for merging banks also for the pre-merger period. In the subsequent analysis, we exclude four banks that drop away for non-merger reasons, and the complete history of 36 banks for which, at least for one time during the sample period, there is no dataset entry for either assets, interest income or expenses, personnel expenditures, fixed assets, capital requirements, loans or deposits. Moreover, special purpose banks, building and loan associations, wealth managers and European Member State credit institutions are removed from the dataset. The estimation sample comprises a balanced panel of 691 banks: 9 joint-stock banks, 54 savings banks, 562 Raiffeisen and 58 Volksbank credit cooperatives, as well as 8 state mortgage banks. Additionally applied is data on the location of

banks and of their branches in 2006 (also provided by the OeNB), information on territorial classifications and data for regional income, population and area of land (from Statistics Austria), growth rates of real GDP (from the Austrian Institute of Economic Research, WIFO), distances between municipalities (provided by the Geomarketing GmbH), and time series data on overnight interbank interest rates (the EONIA, obtained from the European Central Bank).[3]

Analyzing Austrian banks by territiorial means is facilitated by the fact that many of them, though being part of a network, are legally independent (thus, the respective data are available). Both groups of credit cooperatives and the savings banks have a multi-layer organizational structure with head institutions that provide certain services to the primary banks. Internal capital markets, mutual assistance arrangements, and market segregation practices are special features of these network structures. Especially compared to commercial banks, further distinct characteristics of these bank types relate to ownership structures and business objectives. While savings banks are founded by municipalities or associations, cooperative banks are owned by their members. The pursuance of profit-maximizing objectives is partly obscured by public missions and, in case of credit cooperatives, the aim to support the business of their members.

201 of the 691 banks in the sample are single-branch institutions or operate only within one municipality. While most of these are Raiffeisen credit cooperatives, the typical savings bank or "Volksbank" has more subsidiaries and a wider geographical focus. Although financial figures are not available at the branch level, administrative districts form a suitable market delineation (see also *Hahn* (2008)) as three quarters of all banks in our sample do not entertain subsidiaries outside the district in which the main office is located.[4]

To identify banks in less developed regions (or, more generally, disadvantaged banks), the regional classification of *Palme* (1995) is used at the outset. He differentiates the Austrian districts according to the prevailing economic structure and allocates them into 9 groups – from metropolitan areas to industrial and touristic periphery. In general, one would presume that the less industrialized and the peripheral districts (Palme groups 6, 8 and 9) are the less prosperous ones. By matching the

[3] For 1998, the Vienna Interbank Offered Rate (VIBOR) is utilized.

[4] Of those that do, several may be operating near district borders. Much of the recent consolidation in Austrian banking took place within districts as well.

classification of *Palme* (1995) with regional product per capita in 2006 (which but is available at the NUTS 3 level only), it can be observed that several suburban and medium-sized town districts, but also some districts in intensive industrial and touristic regions, are located in NUTS 3 regions with a relatively low income level. Hence, regional product is used as the decisive factor, but urban districts (Palme groups 0, 1 and 3) are not considered to be structurally weak. The threshold applied is an income level of 25,000 euro per capita (the Austrian average in 2006 was 31,100).

However, credit institutions may fare differently also within less developed regions as to, for example, economic peculiarities at the municipality level. As an additional discriminant at the bank level, the relation between the amounts of loans and deposits is applied. From our data it can be observed that especially small banks from the geographical boundaries of the country often exhibit a severe incongruity between deposits and loans, probably due to structural factors and low regional prosperity. A low intermediation ratio – a comparatively low level of credit granted relative to the received deposits (below the Austrian median, inferred from bank-wise averages over the sample period), is therefore used as an additional indicator for banks operating in a structurally weak environment.

By applying the described criteria (regional classification and income, low intermediation ratio), 111 banks can be separated from the remaining ones. In the following, we will sometimes refer to the former as the "selected" banks for the sake of brevity. In relation to the 580 "non-selected" banks, it could be expected that banks in structurally weak regions are rather small and more inefficient, less profitable and less capitalized. Additionally, one would presume their loan portfolios to be more risk-afflicted, and their margins (markups) to be higher. The latter could relate to a suspected need to recover high costs, to the mentioned risk concentration or to the exploitation of market power due to isolation. The subsequent section investigates the actual features of the banks of both groups.

III. Characteristics and Heterogeneity

For both subgroups of banks, several bank-level and market-related characteristics shall be examined. Table 1 presents the respective figures. Although many of these attributes follow standard definitions or are self-explanatory, some supplementary remarks seem necessary. Cash in-

cludes central bank balances, the liquid assets comprise cash, federal funds, securities and interbank claims. Contingent liabilities (related to bills, guarantees and loan collatoral) and claims afflicted with credit risks are off-balance-sheet items. "Provisions" is used short hand for net expenses from allowances on bad debt losses and provisions for contingent liabilities and credit risks. Average ex-post interest rates are calculated by dividing the interest income (expenses) by all interest-afflicted assets (liabilities). The interest spread is the difference between these two rates. The cost-income ratio is calculated from gross expenses and income positions except for the net profit from financial operations. Inefficiency scores are 1 for the "best-practice" banks and larger for relatively inefficient institutions. Smaller *H*-statistics and higher Lerner indices point to less competitive behavior.[5] Section IV provides the details about the calculation of inefficiency scores, *H*-statistics and Lerner indices. As a measure of the proximity to rivals, the average distance to the next three competing bank branches is applied. Banks' market shares relate to the number of branches within the district, and these shares enter the calculation of the Herfindahl-Hirschman (HHI) concentration index. Municipalities without a bank office underlie the "bankless" population share, regional income is measured per capita (p. c.). Intermediation ratios and interest rates on the district level are asset-weighted averages of bank-level figures. The average interest rate on earning assets is referred to as a proxy for the district's average loan rate. If applicable, the measures in Table 1 are in percent or percentage points.

To infer whether and how "disadvantaged" banks differ with respect to the listed characteristics, a simple mean comparison procedure is carried out. That is, the particular attribute is, by applying the pooled data, regressed on a dummy which takes on the value 1 for banks presumed to be affected by low economic development. This group of banks is subsample II in Table 1, subsample I is made up by the 580 remaining institutions. It turns out that the difference between the two subsamples is not statistically significant at conventional levels only for three criteria: the balance sheet equity ratio, the operating expenses ratio and the

[5] Lerner indices measure competitive conduct via the ability of banks to set markups over marginal costs. Alternatively, the competitive conditions under which banks operate may be inferred through an estimate of how strongly changes in input prices are reflected in revenues. The sum of the respective elasticities makes up the so-called *H*-statistic. A value of 1 is compatible with perfect competition, while the *H*-statistic is zero or negative in case of a monopoly. Section IV provides more details in this regard.

Table 1

Sample Means and Subsample Comparisons

This table presents the means for bank-level and market-related characteristics, calculated from the pooled data for the 1998–2006 period. The full sample consists of 691 banks, subsample II is made up by the 111 institutions presumed to be affected by low regional development. Regarding the test on no differences in the mean, one asterisk is for statistical significance at the 10 % level, two (three) of them indicate significance at the 5 % (1 %) level.

Characteristic	Subsample I (580 banks)	Subsample II (111 banks)	Gap
Cash ratio (to total assets)	1.37	1.48	0.12***
Liquidity ratio (to total assets)	29.11	43.80	14.69***
Loans ratio (to total assets)	60.00	43.69	–16.32***
Deposits ratio (to interest-bearing liabilities)	66.96	81.83	14.69***
Equity ratio (to total liabilities)	7.39	7.38	0.01
Regulatory capital (% of required)	151.56	128.21	–23.35***
Intermediation ratio	87.92	50.07	–37.85***
Contingent liabilities ratio (to loans)	8.11	7.47	–0.64***
Credit risks ratio (to total loans)	11.96	13.32	1.35***
Provisions ratio (to total loans)	0.82	0.90	0.08**
Net interest margin	2.36	2.42	0.06***
Average interest rate (assets)	4.86	4.93	0.07**
Average interest rate (liabilities)	2.16	2.07	-0.09***
Interest spread	2.70	2.86	0.16***
ROA	1.11	1.04	–0.07***
ROE	16.54	15.53	–1.01***
Cost-income ratio	80.47	81.25	0.78***
Operating expenses ratio (to total assets)	2.51	2.46	–0.05
Total costs ratio (to total assets)	4.57	4.45	–0.12***
Interest income share (% of gross income)	76.87	78.44	1.58***
DEA inefficiency score	1.08	1.07	–0.01***
Growth rate of loans (year-to-year)	5.52	4.08	–1.44***

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(Table 1: Continued)

Characteristic	Subsample I (580 banks)	Subsample II (111 banks)	Gap
Bank-level *H*-statistic	34.87	34.83	–0.04
Lerner index	30.38	31.65	1.27***
Avg. distance to next three rivals (km)	2.46	4.38	1.93***
Market share (branches, district)	9.64	5.91	–3.73***
HHI (branches, district)	0.08	0.10	0.01***
Population density (1,000/km^2, district)	0.36	0.07	–0.30***
Bank offices per 1,000 inhabitants (district)	0.70	0.76	0.06***
Bank offices per km^2 (district)	0.34	0.05	–0.29***
Population share without bank (district)	10.34	13.40	3.05***
Regional product p. c. (1000 euro, NUTS 3)	29.02	20.97	–8.05***
Real growth of regional product (1998–2006)	13.27	13.92	0.65***
Intermediation ratio (district)	96.91	66.36	–30.55***
Average interest rate (assets, district)	4.83	5.02	0.20***
Size (log of total assets)	4.76	3.53	–1.23***

bank-level *H*-statistic. In consequence of the selection procedure, the banks in subsample II have relatively lower intermediation ratios, which is also reflected in higher holdings of cash and liquid assets. The share of loans (deposits) is lower (higher), and these banks are less capitalized with respect to regulatory rules. While contingent liabilities are relatively lower, credit risks as well as bad debt and risk provisioning are more pronounced.

With respect to margins, efficiency and profitability, the following picture emerges. Net interest margins of banks from less developed regions are rather high in comparison. One reason for this is the lower average rate paid on interest-bearing liabilities, which may be due to the fact that this group of banks does not emit (rather expensive) debt securities. Whereas the share of loans in the banks' portfolios is lower, the average rate on interest-earning assets is higher. This might be, as also indicated by the differences in credit risks and provisions, a reflection of the weak

economic environment leading to higher risks in the loan portfolio.[6] It is not the case that the selected banks have higher operating expenses (and total costs) per unit of total assets. The higher cost-income ratios and the lower profitability are therefore due to the higher share of assets with low returns and to a less pronounced aquisition of revenues through fees and trading activities. Consequently, it does not appear that the maintenance of regional banks is rather costly, but that the banks operating in far reaches pursue less profitable business strategies. Inefficiency scores from Data Envelopment Analysis (DEA) attest the selected banks to be more efficient, the relatively higher markups (Lerner indices) indicate a less competitive behavior. Banks in structurally weak areas experience lower loan growth and are located significantly more distant to potential rivals. Their market shares (with respect to the number of branches in the district) are lower, but the respective concentration is higher in these markets. The selected banks operate in less densely populated and poorer districts, and also bank density is relatively lower, but only if measured relative to the district's size (per 1,000 inhabitants it is higher). However, regional product grew by a higher rate in the respective districts over the sample period. Compared to the district level of the intermediation ratio and the loan rate, the banks to be examined are below and, respectively, above the average.

In Section IV, the determinants of certain bank characteristics shall be studied with respect to sample choice sensitivity. Therefore, the differences with respect to the involved attributes – net interest margins, inefficiency scores, loan growth and competitive behavior – shall be investigated in more detail in the following. More precisely, it is asked whether the observed distinctions can be ascribed to other bank-specific or market-related factors (loosely following *Coccorese* (2008), who uses some of these measures to explain regional bank competition in Italy). By the latter, we control for the influences of the district-level heterogeneity in the demand for banking services, the structure and profitability of the market, and the economic development of the region. As some of these variables are time-invariant, we apply between-effects regressions with robust standard errors.[7]

[6] Other explanations could comprise a higher bankruptcy risk (as indicated by the lower capitalization), an increased engagement in relationship lending or the exploitation of market power.

[7] Instead of taking averages for each bank over the sample period (in the context of between estimation), the entire available information could have been used with estimating by pooled OLS just as well. While the detailed results would

The applied control variables are more or less equal across the estimated models and comprise the following market-related factors: the average distance to the next three rival bank offices in km (more precisely, 1 plus the logarithm of distance), population and size of the district (in logarithms), the log of regional income, the real growth rate of regional product from 1998 to 2006, the share of the district's population that lives in municipalities without a bank branch, the Herfindahl-Hirschman concentration index, and the average intermediation ratio and loan rate of the district. At the bank level, it is controlled for the market share, loans and deposits ratios, regulatory capital, the ROA, the interest income share, the cost-income ratio, bank size, contingent liabilities, credit risks, provisions, market power, and for a dummy that marks multi-branch banks.

The results from these exercises (not all the results are presented in tabular form) reveal that the differences in the Lerner index can be explained by the market's attributes, whereas this is not the case for the gaps in inefficiency and loan growth. Taking the district's characteristics into account leads to the emergence of a (statistically significant) differential in *H*-statistics, and the discrepance in net interest margins changes its sign. After the additional consideration of bank-level features, only the gap in the inefficiency scores remains.

Due to the results just mentioned, details from the regressions for the net interest margin and the *H*-statistic are reported in Table 2. Regression I accounts for the market-related factors, regression II for all variables that are applicable.[8] In general (see regression I), the net interest margin is higher for banks that are more distant to rivals, and in districts with low intermediation ratios and a higher interest rate level. As the selected banks fulfill these three criteria, their positive discrepance to other banks (as apparent from Table 1) with respect to margins vanishes.[9] After controlling for the market-related factors, the margins are even significantly lower in comparison. This gap disappears when adding further bank-level factors to the model, which is then due to be-

(naturally) differ somewhat from those reported below, the main relationships are qualitatively unaffected by the choice between pooled OLS and between-effects estimation.

[8] Dummies for capital intensive and rural regions according to *Hahn* (2008) and based on *Palme* (1995), as well as state and bank-type dummies are additionally considered, but their coefficients are not shown. The same applies for the estimation results presented in Table 6.

[9] Such lines of argumentation refer to what is called "omitted variable bias" in standard regression analysis.

low-average values for the selected banks with respect to several positively significant determinants, such as market shares, loans ratios and returns.

With respect to the *H*-statistic we observe a less competitive behavior of the selected banks after controlling for market-related factors (regression I in the right part of Table 2). The fact that this difference did not appear before has to be related with determinants that indicate more competition, which are also attributes of banks affected by low regional development. For example, a higher interest rate level (measured by the average rate on earning assets) indicates markets with higher competition levels. By controlling for this factor – which is one characteristic of the selected banks as well – previously hidden differences become evi-

Table 2

Subsample Differentials in Margins and *H*-Statistics

This table presents results on subsample differences in the net interest margin (NIM) and the bank-level *H*-statistics after bank-specific and market-related variables are controlled for. The divergence between banks presumed to be affected by low regional development and the other institutions in the sample are inferred from the coefficient of a dummy for the selected banks. Both models are estimated by between-effects regressions using data for all 691 banks over the 1998–2006 period. All coefficients from the NIM equation were multiplied by 100, the effects are therefore measured in basis points. Regression I includes market-related control variables, regression II includes market-related and bank-level controls. Asterisks indicate statistical significance at the 1% (***), 5% (**), and 10% (*) level.

	Net interest margin		*H*-statistic	
	I	II	I	II
Selected banks dummy	–14.06***	3.25	–1.12***	0.06
Distance to rivals (log)	10.71***	1.03	-0.41***	–0.31**
Population (district, log)	–1.23	1.55	0.88**	0.78***
Area (district, log)	0.75	1.44	–0.66***	–0.56***
Regional income (NUTS 3, log)	0.41	1.87	–0.55**	–0.41***
Regional income growth (98-06)	0.005	–0.05	0.04*	0.02
Population share without bank office	0.26	0.20***	–0.01	0.005
HHI (branches)	–23.57	–9.41	0.93	–1.83

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(Table 2: Continued)

	Net interest margin		*H*-statistic	
	I	II	I	II
Intermediation ratio (district)	–0.17*	0.03	–0.01**	–0.004
Interest rate (assets, district)	53.48***	–5.36	3.01***	0.01
Market share (branches)		0.35***		0.05***
Loans ratio		0.48***		0.05***
Deposits ratio		0.34***		0.06***
Regulatory capital		0.03		–0.01***
Interest income share		4.31***		–0.02
Cost-income ratio		–2.39		0.53***
Size (log of total assets)		–34.20***		0.06
Contingent liabilities		–0.18		–0.04
Credit risks		0.16		0.003
Provisions		–1.40		0.74***
ROA		221.10***		9.89***
Multi-branch bank		1.66		0.88***
Bank-level H-statistic		–1.94*		
Lerner index		–16.05***		
R^2	0.46	0.92	0.44	0.70

dent. As with net interest margins, bank-level features (see the corresponding regression II) explain the observed gap in *H*-statistics. Several attributes that are connected to low competitiveness are typical for the selected banks: being a single-branch bank, being small and unprofitable, having a low market share and a low loans ratio, respectively.

IV. Determinants of Bank Performance and Behavior

As the final exercise, this section examines some regression models commonly estimated in the empirical banking literature. Thereby, the question is whether the conclusions to be drawn are affected by the consideration or non-consideration of banks with special features. Four topics are studied in the following: net interest margins, efficiency, the reaction of the growth rate of loans to changes in short-term interest rates,

and the relation between competitive behavior and the bank's distance to rivals. The specifications of the estimated models are largely adopted from the respective literature. In case of dynamic panel data regressions being used, it is not possible to employ variables that are time-invariant at the bank level, such as bank type, regional income, proximity to rivals, and so on. Only a small set of reference papers is selected for each topic with the focus on panel data studies for European countries. Additionally, we list previous reseach on Austrian banks without explicitly comparing the results.

1. Net Interest Margins

The banking literature interprets net interest margins as measures of intermediation costs or efficiency, as well as of market power. Prominent studies of their determinants include *Goddard* et al. (2004), *Maudos/Fernández de Guevara* (2004), *Carbó Valverde/Rodríguez Fernández* (2007) and *Pasiouras/Kosmidou* (2007). *Liebeg/Schwaiger* (2006) is an application using data on Austrian banks. From the list of influental factors, we apply the following (as described in Section III): cash, loans and deposits ratios, capitalization, contingent liabilities, credit risks, provisions, the interest income share, the operating expenses ratio, inefficiency scores, size and implicit interest payments (as defined in *Angbazo* (1997)).

As applied in *Liebeg/Schwaiger* (2006) and *Carbó Valverde/Rodríguez Fernández* (2007), we estimate a dynamic panel data regression, though by use of one-step System GMM (*Blundell/Bond* (1998)).[10] Time dummies are assumed to capture (structural and macroeconomic) factors that affect all banks similarly. The results for both the full population and the "non-selected" subsample of banks can be found in Table 3. In general, these are very much in line with the evidence from the empirical literature. One of the influences affected by sample choice is the effect of bank size. In the full sample, a negative coefficient on the log of total assets emerges, indicating that larger Austrian banks have smaller margins. It

[10] The test on instrument validity indicates that the corresponding models are not well specified if Difference GMM (*Arellano/Bond* (1991)) is employed. The lagged margin, which is correlated with the error term, is instrumented by its second and third lag as well as by the first differences of the other explanatory variables with the instrument set being collapsed (see *Roodman* (2009)). Tests on serial correlation of orders one and two (*Arellano/Bond* (1991)) are used to ensure that the model is not misspecified. Instrument validity is evaluated by use of the *Hansen* (1982) *J*-test from the two-step model, which is robust to heteroscedasticity but may be weakened with many instruments (*Roodman* (2009)).

Table 3

Heterogeneity in Net Interest Margins

This table presents results on the determinants of net interest margins. The estimation is conducted for two samples of banks by use of System GMM. The full sample consists of data for 691 banks over the 1998–2006 period, the subsample neglects the institutions presumed to be affected by low regional development. All coefficients were multiplied by 100 so that the effects are measured in basis points. The *p*-values for the *t*-test on non-significance are given in parentheses. Asterisks indicate statistical significance at the 1 % (***), 5 % (**), and 10 % (*) level.

	Full sample		Subsample	
Net interest margin (lag)	88.03***	(0.00)	91.28***	(0.00)
Cash ratio	0.40	(0.52)	0.29	(0.69)
Loans ratio	0.26***	(0.00)	0.25***	(0.00)
Deposits ratio	0.05	(0.55)	–0.004	(0.96)
Regulatory capital	0.03**	(0.02)	0.02*	(0.10)
Contingent liabilities	0.02	(0.72)	0.03	(0.69)
Credit risks	0.003	(0.90)	–0.005	(0.85)
Provisions	3.15***	(0.00)	3.02***	(0.00)
Interest income share	0.66**	(0.01)	0.52*	(0.05)
Operating expenses ratio	5.76**	(0.02)	4.62**	(0.04)
DEA inefficiency score	–81.60***	(0.00)	–76.91***	(0.00)
Implicit interest payments	1.87	(0.57)	2.74	(0.45)
Size (log of total assets)	–1.30***	(0.01)	–0.70	(0.18)
Constant	12.65	(0.68)	13.24	(0.68)
Number of banks	691		580	
Number of observations	5528		4640	
Number of instruments	23		23	
AR(1) test (*p*-value)	0.00		0.00	
AR(2) test (*p*-value)	0.93		0.28	
Hansen test (*p*-value)	0.19		0.16	

turns out that, by neglecting the banks in disadvantaged areas, the bank size effect dissolves. Furthermore, for two of the other determinants of net interest margins, the statistical significance level increases from 5 to 10 %. The positive effect of both increased capitalization and a higher share of interest income is smaller and less significant in this respect. Auxiliary tests reveal that the coefficients of the interest income share and bank size differ between the two models (the former at the 5 % level only). Thus, the negative relationships of both income diversification and size with the margin are significantly underestimated in the reduced sample.

2. *Technical Efficiency*

Data Envelopment Analysis (DEA) is one of the frontier techniques frequently applied to examine banks' efficiency.[11] Its main advantage over other frontier methods is the possibility to conjointly consider multiple outputs. DEA is a linear programming technique to estimate the production frontier that is formed by the "best-practice" entities. With technical efficiency considered, the individual (in)efficiency levels from an evaluation against this benchmark are mostly expressed as the necessary proportional reduction in input utilization to reach comparable efficient banks. The corresponding measures are called radial inefficiency scores from a model with input orientation. Such indicators of relative technical inefficiency are applied in the following, using a model with variable returns to scale (*Banker* et al. (1984)). The outcomes are expressed by use of *Shephard* (1970) distance functions, which implies that the score for banks on the frontier is 1 and higher than 1 for inefficient banks. After calculating the inefficiency scores, their determinants are investigated by use of the methods proposed by *Simar/Wilson* (2007). These are based on truncated regressions and suitably bootstrapped standard errors. Algorithm #2 of *Simar/Wilson* (2007) is employed, which includes a bias correction procedure.

Our main empirical references for this section are *Casu/Molyneux* (2003), *Casu/Girardone* (2006), *Fiorentino* et al. (2006) and *Pasiouras* (2008), Austrian banks are analyzed by *Hahn* (2007). The selection of in-

[11] Frontier approaches are to be preferred over accounting-based cost ratios as the latter may provoke misleading conclusions if the banks considered are dissimilar with respect to their characteristics (*DeYoung* (1997)). Additionally, cost-income ratios are affected by both cost management abilities and competitive pressures on output markets at the same time (*Bikker/Bos* (2004)).

Table 4

Heterogeneity in DEA Inefficiency Scores

This table presents results on the determinants of DEA inefficiency scores, obtained by the application of Algorithm #2 of *Simar/Wilson* (2007). The estimation is conducted for the full sample consisting of data for 691 banks over the 1998–2006 period, as well as for a subsample that neglects the institutions presumed to be affected by low regional development. All coefficients were multiplied by 100. Asterisks indicate statistical significance at the 1% (***), 5% (**), and 10% (*) level.

	Full sample	Subsample
Loans ratio	0.057***	0.053***
Deposits ratio	0.086***	0.085***
Regulatory capital	0.002	0.003
ROE	–0.256***	–0.278***
Size (log of total assets)	0.467***	0.439***
Constant	99.756***	100.410***

puts and outputs is oriented on the financial intermediation approach of bank production (*Sealey/Lindley* (1977)). The inputs considered are total funds, fixed assets and total costs. Outputs produced comprise total loans, other earning assets and non-interest income (as a proxy for off-balance sheet activities, see *Pasiouras* (2008)). Year-wise calculations of the frontier and the relative positions of the individual banks are conducted. As explanatory factors for the second estimation stage we apply bank size (the logarithm of total assets), capitalization, the return on equity, the deposits ratio as a measure of the funding structure, and the loans ratio.

From Section III we know that the "disadvantaged banks" are more efficient, and that this could not be explained by several market-related and bank-level factors. However, from the construction of the inefficiency scores it seems clear that their efficiency advantage results from the lower cost level per unit of assets (see Section III as well). Despite these differences, Table 4 shows that the results from the second-stage regression are rather unaffected by the pursued sample reduction. A noticeable result is that larger banks appear to be more inefficient, which is not in line with the presumption that larger banks are managed more professionally.

3. The Bank Lending Channel of Monetary Policy Transmission

The theory of the bank lending channel argues that bank behavior leads to an amplification of "traditional" interest rate effects (which are driven by loan demand) after monetary policy actions. In case of a monetary tightening, for example, some (types of) banks reduce their supply of credit, either because they are not able or willing to counteract the policy-induced drain of funds by raising additional ones, or due to a refusal to retain the prior level of lending through sales of liquid assets. If firms and households are bank-dependent, the real effects of monetary policy are aggravated by the impact of reduced credit on the spending of bank customers.

The cross-sectional literature identifies banks' supply reactions by the reasoning that the lending reaction is heterogenous with respect to bank characteristics that are connected to the causal chain outlined above. Size and capitalization are proxies for the availability (and costs) of additional funds and the associated information problems. The holdings of liquid assets measure the ability to shield the banks' lending from policy through an assets exchange. Liquidity seems to be the most prominent discriminative factor in European countries (*Ehrmann* et al. (2003)). Further reference studies are *Chatelain* et al. (2003), *Ehrmann/Worms* (2004) and *Gambacorta* (2005). The reactions of Austrian banks are studied by *Kaufmann* (2003), *Frühwirth-Schnatter/Kaufmann* (2006) and *Engler* et al. (2007).

Changes in policy-driven (short-term) interest rates are used to depict the monetary policy stance. Instead of the year-to-year changes in average rates typically applied in the empirical literature, we construct a measure of interest rate developments during the year. The monetary policy change indicator used is the slope from a regression of daily overnight money market (interbank) rates against time (multiplied by the number of days). The estimation equation for the examination of loan supply reactions is

$$\Delta L_{it} = \alpha_i + \varrho \Delta L_{i,t-1} + \sum_{k=0}^{1} \gamma_k MP_{t-k} + \sum_{k=0}^{1} \delta_k MP_{t-k} \cdot X_{i,t-1} + \beta X_{i,t-1} + \sum_{k=0}^{1} \eta_k Y_{t-k} + \sum_{k=0}^{1} \lambda_k Y_{t-k} \cdot X_{i,t-1} + \epsilon_{it}, \quad (1)$$

Table 5

Bank Lending Channel

This table presents results on how the growth rate of loans responds to changes in monetary policy across banks differing with respect to size, liquidity and capitalization. Long-run effects from Equation (1) are reported, which is estimated by Difference GMM. The full sample consists of data for 691 banks over the 1998–2006 period, the subsample neglects the institutions presumed to be affected by low regional development. *MP* denotes the monetary policy change indicator. Coefficients of the lagged bank characteristics as well as differential long-run effects with respect to GDP growth are not shown. The *p*-values for the *t*-test on non-significance are given in parentheses. Asterisks indicate statistical significance at the 1% (***), 5% (**), and 10% (*) level.

	Full sample		Subsample	
MP	–1.11**	(0.01)	–1.27***	(0.01)
MP · Size	1.11***	(0.01)	1.12***	(0.01)
MP · Liquidity	0.10**	(0.04)	0.07	(0.15)
MP · Capitalization	-0.03	(0.20)	-0.04	(0.12)
Growth rate of real GDP	1.29***	(0.00)	1.46***	(0.00)
Number of banks	691		580	
Number of observations	4837		4060	
Number of instruments	21		21	
AR(1) test (*p*-value)	0.00		0.00	
AR(2) test (*p*-value)	0.28		0.24	
Hansen test (*p*-value)	0.54		0.50	

where ΔL denotes the growth rate of loans, *MP* is the monetary policy change indicator, *X* stands for a bank characteristic (in fact, there are three of these, but matrix notation is passed on here) and *Y* is the growth rate of real GDP (which captures demand effects). The bank attributes enter the model with their first lag only which implies that their level at the beginning of the period determines the banks' reaction to monetary policy signals. A normalization with respect to the mean was conducted for the bank features so that these, as well as the respective interaction terms, sum up to zero. The coefficients of *MP* therefore indicate the loan supply reaction of the average bank (average with respect to all attributes). Dynamic GMM (*Arellano/Bond* (1991)) with robust standard er-

rors is applied to estimate Equation (1).[12] Both the monetary policy change indicator and GDP growth appear with current and lagged values, and Table 5 therefore presents long-run effects only. The results reveal that the liquidity effect depends on whether the banks from less developed areas are considered or not. If the selected banks are present in the sample, banks holding relatively more liquid assets are found to reduce their credit growth rate less strongly. The differences in the results in Table 5 can be traced back to the lower liquidity ratios of the "other" banks in the sample. Additionally, the latter also react more strongly to monetary policy signals on average (the long-run effect of *MP* is more negative for this subsample).

4. Competitive Behavior

As argued in Section I, market power in local banking markets has recently appeared on the agenda of the European Commission. To examine competitive behavior, we calculate *H*-statistics and Lerner indices at the individual bank level and connect these to market and bank characteristics. Other than concentration, the mentioned measures gauge the effective degree of competition. The market delineation applied in explaining their heterogeneity across banks is the administrative district (see Section II).

The so-called *H*-statistic was put forward by *Panzar/Rosse* (1987) and has been applied to banking markets oftentimes since then. To calculate *H* at the bank level (which is rather uncommon), *Carbó* et al. (2009) use a translogarithmic specification[13] of the reduced-form revenue equation on which the calculation is generally based. Total revenues are modeled as a function of input prices to determine the market environment that firm

[12] As indicated by the results on the Hansen test on instrument validity, the corresponding models are not well specified if estimated by System GMM. The Hansen test also indicates that using the inflation rate as an additional control variable would result in a severe overidentification of the models.

[13] The translogarithmic function was introduced by *Christensen* et al. (1973) and, since then, applied mainly as a more general and flexible alternative to standard production functions. Both the Cobb-Douglas and the CES production function are special cases of the translogarithmic specification, which involves a local second-order (quadratic) approximation of the production structure via Taylor expansion. In practical applications, including the estimation of bank revenue equations (as in *Carbó* et al. (2009), and others), translogarithmic functions are typically specified by considering the main independent variables (i.e. input prices in logarithms), their squares and their cross-products.

conduct is compatible with. The relevant measure of competition is the extent to which changes in input prices are reflected in equilibrium revenues. In principle, H is the sum of the respective elasticities. With a translog function estimated, it is calculated by the sum of the partial derivatives with respect to the input prices in

$$TR_{it} = \lambda_i + \varrho TR_{i,\,t-1} + \sum_{j=1}^{s} \alpha_j\, p_{jit} + \sum_{j=1}^{s}\sum_{k=1}^{s} \beta_{jk}\, p_{jit}\, p_{kit} + \eta_t + \epsilon_{it}, \tag{2}$$

where TR is total revenue, and where the prices of the s input factors are denoted by p. All variables are in logs and time effects are considered via the year dummies. In case of perfect competition, H is one, for monopoly or collusive oligopoly it is zero or negative. Monopolistic competition is indicated by values between zero and one. For a more detailed description, as well as for other and special cases, see e. g. *Shaffer* (2004).

As input prices, we employ the cost of funding (the average interest rate paid on interest-bearing liabilities), the ratio of personnel expenditures to total assets, the price of fixed capital (respective value adjustments – losses and depreciation – divided by the value of intangible fixed assets and physical capital), and the price of equity capital (the return on equity, as in *Gischer/Stiele* (2009)). Following to the recommendations of *Goddard/Wilson* (2009), Equation (2) is estimated dynamically (by Difference GMM), without controlling for size or scaling the dependent variable by total assets. Furthermore, no other control variables are applied – these will be used in explaining the H-statistics in the second estimation stage.

Lerner indices are calculated by, for example, *Angelini/Cetorelli* (2003) and also explained in *Fernández de Guevara* et al. (2005) and *Carbó Valverde/Rodríguez Fernández* (2007). The empirical literature typically assumes that the total assets are a suitable measure for the flow of banking goods and services (*Fernández de Guevara* et al. (2007)). The price measure used to calculate the markup of price over marginal costs is therefore the average revenue per unit of assets. We estimate the marginal costs of producing one more unit of output by use of a translogarithmic cost function with one output and s inputs in the form of

$$\begin{aligned} C_{it} = \lambda_i + \varrho C_{i,\,t-1} + \sum_{j=1}^{s} \alpha_j\, p_{jit} + \sum_{j=1}^{s}\sum_{k=1}^{s} \beta_{jk}\, p_{jit}\, p_{kit} + \\ \sum_{j=1}^{s} \gamma_j\, p_{jit}\, TA_{it} + \phi_1 TA_{it} + \phi_2\, TA_{it}^2 + \eta_t + \epsilon_{it}, \end{aligned} \tag{3}$$

where C denotes total costs and TA is total assets. The input prices are defined as with estimating H before. All variables, except for the time dummies, are in logarithms. Equation (3) includes the lagged value of the dependent variable as well to avoid dynamical misspecification. Marginal cost then is calculated (see e. g. *Angelini*/*Cetorelli* (2003)) as

$$MC_{it} = \frac{C_{it}}{TA_{it}} \left(\sum_{j=1}^{s} \gamma_j p_{jit} + \phi_1 + 2\phi_2 TA_{it} \right), \tag{4}$$

and the Lerner index by

$$L_{it} = \frac{P_{it} - MC_{it}}{P_{it}}, \tag{5}$$

with P denoting the price variable – total income divided by total assets. Markups range from zero in case of perfect competition to 1 with monopolies (*Maudos*/*Fernández de Guevara* (2004)).

In the second estimation stage, the heterogeneity in H-statistics and Lerner indices across banks is explained by market-related factors as well as by bank characteristics. As some of the explanatory variables are time-invariant, we again use between-effects estimation with robust standard errors. Table 6 presents the results for both the full and the restricted sample. In all specifications, banks which are more distant from their rivals behave less competitively. Their revenues react less to changes in input prices and markups are relatively higher as well. To pick out one further result, concentration is no explanatory factor for competition in the full sample, which is in line with the findings of *Claessens*/*Laeven* (2004), *Casu*/*Girardone* (2006), *Fernández de Guevara* et al. (2005) and *Carbó Valverde*/*Rodríguez Fernández* (2007). The concentration effect, however, is most responsive to the sample restriction with respect to the equation for H. With the banks from less developed areas not being considered, more concentration is connected with lower competition, supporting the corresponding results of *Bikker*/*Groeneveld* (2000) and *Bikker*/*Haaf* (2002). The impact of increased concentration on bank markups, however, is underestimated unless data on the full population of banks is used, as the coefficients of branch concentration differ between the models at the 5 % level. By ancillary tests for the Lerner index equations, this is also confirmed for e. g. the banks' market share and the distance to rivals. Thus, in case of using the restricted sample, the distance effect on margins would be significantly overestimated.

Table 6

Heterogeneity in Competitive Behavior

This table presents the results on whether bank-level *H*-statistics and Lerner indices (LI) vary with the average distance (in kilometers) to the next three rival bank offices. The regression models include control variables for the demand for bank products and services, market structure as well as bank-level effects and are estimated by between-effects regressions with robust standard errors. The full sample consists of data for 691 banks over the 1998–2006 period, the subsample neglects the institutions presumed to be affected by low regional development. The *p*-values for the *t*-test on non-significance are given in parentheses. Asterisks indicate statistical significance at the 1 % (***), 5 % (**), and 10 % (*) level.

	Full sample		Restricted sample	
	H	LI	*H*	LI
Distance to rivals (log)	–0.37**	0.57**	–0.34**	0.82***
	(0.01)	(0.02)	(0.03)	(0.01)
Population (district, log)	1.26***	–1.23**	1.22***	–0.76*
	(0.00)	(0.01)	(0.00)	(0.10)
Area (district, log)	–0.91***	0.67**	–0.95***	0.43
	(0.00)	(0.03)	(0.00)	(0.17)
Regional income (NUTS 3, log)	–0.49***	0.76**	–0.54***	0.61*
	(0.01)	(0.02)	(0.01)	(0.07)
Regional income growth (98-06)	0.02	–0.02	0.01	–0.01
	(0.29)	(0.44)	(0.57)	(0.72)
Concentration (branches)	–2.98	4.15	–5.28**	1.20
	(0.15)	(0.19)	(0.02)	(0.72)
Intermediation ratio (district)	–0.01**	–0.0002	–0.01**	–0.004
	(0.02)	(0.97)	(0.03)	(0.52)
Interest rate (assets, district)	1.85***	1.05	1.80***	0.99
	(0.00)	(0.12)	(0.00)	(0.14)
Market share (branches)	0.07***	–0.10***	0.08***	–0.08***
	(0.00)	(0.00)	(0.00)	(0.00)
Loans ratio	0.09***	0.02	0.08***	0.02
	(0.00)	(0.35)	(0.00)	(0.29)
Deposits ratio	0.06***	–0.02	0.06***	–0.02
	(0.00)	(0.40)	(0.00)	(0.32)
Regulatory capital	–0.004	0.03***	–0.004	0.03***
	(0.32)	(0.00)	(0.29)	(0.00)

	Full sample		Restricted sample	
	H	LI	*H*	LI
Interest income share	–0.11***	0.14***	–0.12***	0.17***
	(0.00)	(0.00)	(0.00)	(0.00)
Size (log of total assets)	–0.39	–0.84***	–0.50*	–0.88***
	(0.11)	(0.01)	(0.06)	(0.01)
Multi-branch bank	0.94***	–0.66	1.05***	–0.81*
	(0.00)	(0.14)	(0.00)	(0.09)
Constant	22.95***	9.01	25.58***	7.79
	(0.00)	(0.11)	(0.00)	(0.18)
R^2	0.57	0.39	0.60	0.45

5. Robustness and Policy Relevance

Some remarks on the robustness and limitations of the presented results seem expedient. The first question is whether a simpler selection rule based on only one of the applied criteria (economic structure, regional income and intermediation ratio) would lead to similar results. Thresholds used to separate banks then need to be adapted for the restricted sample to be reasonably large. It turns out that the outcomes would be, qualitatively, comparable to those presented, with the strongest similarities achieved by a restriction to either peripheral districts (Palme codes 8 and 9) or banks with an intermediation ratio of below 55 %. However, an unerring identification of disadvantaged areas, at the outset, could – due to the reasons illustrated in Section II – only be ensured if a combination of the three indicators is applied. Although the Palme classification is not directly decomposable into its constitutive factors, the description of peripheral regions in *Palme* (1995) suggests additional characteristics of the non-favorable environment in which the selected banks operate. These features contain rather small capacities and firm sizes, as well as low wage levels in manufacturing, and a relatively high share of agricultural employment.

A second issue is that the results may be dependent on the dominance of certain bank types in the targeted areas. Nevertheless, it can be supposed that the envrionment is more influental than the business models of the banks organized in multi-layer structures, due to the fact that

only 17 other institutions are in the sample. The main number of savings banks and credit cooperatives is not separated out and thus acts as a control group within the restricted sample.

Finally, some indications on the relevance of the presented results are given. At first, the academic research would be well advised to rely on comprehensive samples and to pay attention to the diversity of financial institutions. Important relationships may be obscured with respect to their detectability and importance in non-randomly selected samples. Subsequently, economic policy is affected if it seeks to apply the results from the concerned studies. For example, a restrictive monetary policy action might be supposed to affect peripheral regions more severely. Our results, however, suggest that the supply of bank lending in disadvantaged areas need not deteriorate more strongly than elsewhere. Though (or because) banks in less developed regions tend to lend less than they borrow (*Rodríguez-Fuentes* (2006)), they are more flexible in adjusting to monetary policy through their rather high share of liquid assets. *Carlino/DeFina* (1998) report such an effect for the USA, while *Arnold/Vrugt* (2004) and *Dow/Montagnoli* (2007) find monetary policy reduces regional disparities also through other channels. Other conclusions can be drawn for competition and regional policy. If banks in non-favorable environments are neglected, for example, the effect of bank concentration on competition measures is affected. Additionally, the rents banks can extract due to their distance to rivals would be overestimated. These and other results may be of importance with respect to policy actions aimed at bank office outreach and local development, as well as for bank management and bank customers.

V. Concluding Remarks

This paper has dealt with three issues concerning banks which are supposed to be affected by low regional economic development. First, these banks differ from their counterparts with respect to almost all of the examined market-related and bank-level characteristics. Besides the expectable disadvantages regarding the volume of loans, capitalization or profitability, it is remarkable that the selected institutions have relatively low costs per unit of assets. Second, we investigated in which way the observed distinctions can be traced back to bank and market attributes. Thereby, it turns out that especially differences in net interest margins and competitive behavior are masked by certain characteristics of the lo-

cal markets in which these banks are engaged. As the third issue, the results from several models on bank performance and behavior which are commonly estimated in the empirical banking literature were tested on their robustness with respect to the exclusion of banks operating in economically disadvantaged regions. For the Austrian sample examined in this paper, three major changes emerge. These concern the effect of bank size on net interest margins, the heterogeneity of loan supply reactions to monetary policy signals which are related to the banks' liquidity position, and the influence of local concentration on competitive behavior. Our findings confirm that key empirical results may be driven by certain groups of banks with special features. Thus, support is provided for the necessity of a more critical view of empirical outcomes for "the average bank", both from national samples and cross-country studies. A division of banks with respect to geography and economic development is only one example for possible pitfalls with the generalization of such results. Further research should also examine whether similar conclusions can be drawn for countries with similar banking market structures.

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Summary

Banks in Disadvantaged Areas

Based on the presumption that the empirical banking literature devotes too little attention to institutions with special features, this paper examines banks that are affected by low regional development. Data on the full population of Austrian banks is applied to identify such banks and to study their particular characteristics. It turns out that banks operating in disadvantaged areas differ from their counterparts with respect to individual as well as market-related attributes. Additionally, several effects commonly estimated in empirical banking models prove to be sensitive to the exclusion of these institutions from the estimation sample. These comprise the effect of bank size on the net interest margin, the heterogeneity of loan supply reactions to monetary policy signals which are related to the banks' liquidity position, and the influence of local concentration on competitive behavior. Our findings confirm that key empirical results may be driven by certain groups of banks with special features. Thus, support is provided for the necessity of a more critical view of empirical outcomes for "the average bank", both from national samples and cross-country studies. (JEL G21, L11, R32)

Zusammenfassung

Banken in strukturschwachen Regionen

Vor dem Hintergrund, dass empirische Literatur oft zu wenig Augenmerk auf die Heterogenität von Finanzinstitutionen legt, untersucht diese Arbeit Banken in strukturschwachen Räumen. Daten für die Gesamtheit der österreichischen Banken werden herangezogen, um solche Institute zu identifizieren und um ihre speziellen Charakteristiken zu beleuchten. Dabei zeigt sich, dass sich Banken, die von einer schwachen Regionalentwicklung betroffen sind, in vielen Attributen signifikant vom Rest der Kreditinstitute unterscheiden. Zusätzlich kann beobachtet werden, dass sich die Resultate für oftmals in der Bankenliteratur bemühte Zusammenhänge verändern, wenn diese Banken aus der Datenbasis entfernt werden. Dies ist im konkreten Fall zutreffend für den Einfluss der Bankengröße auf die Nettozinsmarge, für die Reaktion der Kreditvergabe auf geldpolitische Impulse in Abhängigkeit von der Liquiditätssituation und für den Effekt von Konzentration in lokalen Märkten auf das Wettbewerbsverhalten. Die Ergebnisse dieser Arbeit lassen vermuten, dass manch empirisches Resultat auf gewisse Bankengruppen mit bestimmten Eigenschaften zurückführbar ist. Daher sollten darauf basierende Aussagen, die „die durchschnittliche Bank" betreffen, kritischer unter die Lupe genommen werden.