

Adams, Robert M.; Röller, Lars-Hendrik; Sickles, Robin C.

Working Paper

Market power in outputs and inputs: an empirical application to banking

WZB Discussion Paper, No. FS IV 02-33

Provided in Cooperation with:

WZB Berlin Social Science Center

Suggested Citation: Adams, Robert M.; Röller, Lars-Hendrik; Sickles, Robin C. (2002) : Market power in outputs and inputs: an empirical application to banking, WZB Discussion Paper, No. FS IV 02-33, Wissenschaftszentrum Berlin für Sozialforschung (WZB), Berlin

This Version is available at:

<https://hdl.handle.net/10419/51046>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

discussion papers

FS IV 02 – 33

**Market Power in Outputs and Inputs: An
Empirical Application to Banking**

Robert M. Adams *
Lars-Hendrik Röller **
Robin C. Sickles ***

* Board of Governors Federal Reserve System
** WZB - Wissenschaftszentrum Berlin
*** Rice University

December 2002

ISSN Nr. 0722 - 6748

**Forschungsschwerpunkt
Markt und politische Ökonomie**

**Research Area
Markets and Political Economy**

Zitierweise/Citation:

Robert M. Adams, Lars-Hendrik Röller, and Robin C. Sickles, **Market Power in Outputs and Inputs: An Empirical Application to Banking**, Discussion Paper FS IV 02-33, Wissenschaftszentrum Berlin, 2002.

Wissenschaftszentrum Berlin für Sozialforschung gGmbH,
Reichpietschufer 50, 10785 Berlin, Germany, Tel. (030) 2 54 91 – 0
Internet: www.wz-berlin.de

ABSTRACT

Market Power in Outputs and Inputs: An Empirical Application to Banking

by Robert M. Adams*, Lars-Hendrik Röller, and Robin C. Sickles

This paper provides evidence on the empirical separability of input and output market imperfections. We specify a model of banking competition and simultaneously estimate bank conduct in output (loan) and input (deposit) markets. Our results suggest that firms display some degree of noncompetitive behavior in both the loan and the deposit markets. Moreover, we find that the input side and the output side are empirically separable, that is the measurement of market power on one side of the market is not affected by assuming that the other side of the market is perfectly competitive. Our results suggest that empirical studies of market power that concentrate on either the input side or the output side, are not subject to significant misspecification error.

Keywords: Measuring Market Power, Banking

JEL Classification: G2, L1, C3

* The views expressed are those of the authors and do not necessarily reflect the position of the Federal Reserve System, the Board of Governors, or its staff. We wish to thank Charles Taragin for his excellent research assistance and Alex Raskovich, Beth Kiser, Robin Prager, Ken Brevoort, Ron Borzekowski, and Dean Amel for their comments. We are grateful to the German Science Foundation (DFG) for financial support.

ZUSAMMENFASSUNG

Marktmacht auf Input- und Outputmärkten: Eine Empirische Anwendung auf den Bankensektor

Der Aufsatz untersucht den Zusammenhang von Unvollkommenheiten auf Input- und auf Outputmärkten. Im Rahmen eines Wettbewerbsmodells für den Bankensektor wird die Wechselwirkung zwischen Outputmarkt, d.h. bei der Kreditvergabe, und Inputmarkt (Geldanlage) empirisch untersucht.

Die Ergebnisse zeigen, dass Banken auf beiden Seiten des Marktes eine gewisse Marktmacht ausüben können. Allerdings ist die Wechselwirkung begrenzt, sodass eine separate Betrachtungsweise von Input- und Outputmärkten möglich ist. Dies bedeutet wiederum, dass empirische Untersuchungen, die jeweils nur eine Seite des Marktes analysieren, keinen signifikanten Verzerrungen unterliegen.

1 Introduction

Most empirical studies on the measurement of market power in output markets assume that input markets are perfectly competitive. However, there are many industries where this assumption may not be valid. In fact, it has been argued that firms with market power are able to extract considerable rents from both input and output markets. In this context, it is important to understand to what extent the measurement of market power in output markets is affected by the assumption of perfectly competitive input markets. This paper provides evidence on the empirical separability of input and output markets.

In order to investigate the relationship between input and output market imperfections, one needs a model and an industry where input and output markets are prominent. The industry that we investigate in this paper is banking. Banking competition has been a topic of considerable interest, especially since the early 1980s, when deposit rates were deregulated and banks were permitted to pay interest on demand deposits. The banking industry clearly is going through substantial changes in structure and competition. Mergers, failures and entry have resulted in a net decline in the number of banks from some 14,500 in 1980 to around 8,200 in 2000. These changes in the banking industry's structure and competitive environment have fueled a large literature on banking competition.

We specify a model of banking competition, where banks have market power in loan markets (the output market), as well as in deposit markets (i.e. the input market). More specifically, we differentiate between three different loan categories: commercial and industrial loans, installment loans, and real estate loans. Given that consumers are typically not able to substitute one loan type for another it is likely that each of these loan types constitutes a separate output market.¹

We implement our model with quarterly state level data from the U.S. commercial banking industry from 1987 through 1996. We find that firms display some degree of non-competitive behavior in both the loan and deposit markets. In particular, there is evidence that, in both markets, prices are higher than a non-cooperative Nash outcome would predict.

Given that our empirical model accounts for market imperfections on both the input side (deposit) as well as the output side (loan) we then compare our results to a situation where either the input or the output side

¹Of course, common cost elements exist between the markets such as the costs of federal funds and discount funds, but it is the demand side and risk that differ dramatically in these markets.

is assumed to be perfectly competitive. In other words, we provide some evidence on whether it matters for the measurement of product market imperfections that the input market is assumed to be perfectly competitive. Our main result is as follows. We find that the input side and the output side are *empirically separable*; that is, the measurement of market power on one side of the market is not affected by the assuming that the other side of the market is perfectly competitive. This is true independent of whether the output market is aggregated or not. Our results suggest that empirical studies of market power that concentrate on either the input side or the output side are not subject to a significant misspecification error.

The remainder of the paper is structured in the following manner. Section 2 provides background information. In section 3, we introduce our model of banking competition and discuss the empirical implementation in section 4. The data are described in section 5 and the results in section 6. We conclude in section 7.

2 Background

Quantifying market behavior and productivity in the banking industry is still an elusive topic primarily because the appropriate data are not available. In addition, difficulties exist in defining inputs and outputs and in measuring prices. Because of these difficulties, a substantial part of bank competition research has centered on the structure-conduct-performance (SCP) relationship and, until recently, the efficient-structure (ES) hypothesis.² The structure-conduct-performance hypothesis posits higher profits in more concentrated markets from the exercise of market power. Conversely, the efficient-structure hypothesis³ gives a different explanation by attributing higher profits and market concentration to greater firm efficiency. Authors typically consider the effect of market concentration on prices or profitability. Market concentration in banking is typically measured in terms of total deposits.⁴ Most studies use a measure of price such as deposit interest rates or a measure of profitability such as return on assets or return on equity in their analysis.

Numerous studies of banking competition use the market concentration methodology. Gilbert (1984) surveys the previous literature on banking

²See Berger and Hannan (1989) for SCP and Berger and Hannan (1995, 1998) for ES.

³See Demsetz (1973).

⁴The Federal Reserve and Department of Justice Antitrust Division use market concentration measured by deposits using FDIC data.

competition spanning two decades and finds a positive relationship between market share and performance.⁵ Berger and Hannan (1989) examine the relationship between concentration and deposit interest rates after deregulation in the 1980s. They find lower deposit rates in higher concentrated markets. In a subsequent study, Hannan and Berger (1991) find asymmetric adjustment of deposit rates to Treasury Bill rates in concentrated markets, where banks in more concentrated markets decrease deposit rates in periods of declining overall rates more quickly than they increase them during periods of increasing interest rates. Hannan (1991, 1997) links local market concentration to higher rates on different classes of small commercial loans. Furthermore, other studies support the hypothesis that concentration leads to less efficient firms, which implies that firms with market power are not profit maximizing. Berger and Hannan (1997, 1998) test both the market power and efficiency hypotheses in U.S. banking. These studies find support for the hypothesis that market concentration is associated with lower bank efficiency, a contradiction of the efficient-structure hypothesis.

Banking market concentration studies lend themselves to competition analysis for several reasons. First, deposit data (by branch on a yearly basis) are readily available and can be used easily to determine market share for a relatively small geographic market. Second, Federal Reserve (Fed) and Department of Justice (DOJ) antitrust merger analysis uses Herfindahl–Hirschman Index (HHI) market concentration measures⁶ derived from deposit shares as an initial screen to determine the possible effects of a bank merger.⁷ Threshold values of the HHI that warrant competitive concern include a HHI level of 1800 and a change in HHI of 200. Once both of these bounds are exceeded, the Fed and DOJ consider other factors such as potential entry and market growth to determine if action is necessary. Because merger analysis relies on HHI measures of concentration, it is important to understand the relationship between prices and concentration in order to draw inferences about competition. Hence, studies that examine this rela-

⁵Not all studies listed in this survey reach this conclusion.

⁶The HHI is defined as the sum of squared market shares. Market shares are typically derived from deposits, because it is assumed that the level of a bank’s deposits in a market is an indication of the level of its other banking services in that same market.

⁷There are some differences between the Federal Reserve and DOJ methods. First, DOJ only includes thrifts in its market share calculations under certain conditions, while the Fed typically includes them at 50%. Second, geographic market definitions differ. The Federal Reserve tends to use economically integrated areas such as MSAs or RMAs to determine geographic markets, while the DOJ defines markets on other criteria such as small business service areas. Third, the Fed considers the product market to be a bundle of banking services, while the DOJ analyzes individual products.

tionship are directly relevant to competition policy. Furthermore, deposit shares are essentially used as a proxy for other types of banking services such as loans, cash management, underwriting, etc. Since loan data are not readily available at a branch level, both agencies rely on deposit data for their competitive analysis.⁸

Past studies⁹ on market structure in the banking industry attempted to determine the relationship between market concentration and prices. However, this methodology is unable to estimate the degree of competition in the industry. Other authors have introduced structural models of banking competition using the methods outlined in Bresnahan (1989) that can determine the degree of competition in an industry. These methods have been applied to the banking industry by Shaffer (1989, 1993), Shaffer and DiSalvo (1994), Suominen (1994), and Neven and Röller (1999). Most studies, particularly those using U.S. data, have found little evidence of market power. Suominen (1994) estimates the competitive behavior for two separate markets, aggregated loan and deposit markets. His study finds mixed results on the market behavior of Finnish banks, where banks behave competitively before regulation in 1984 and less after deregulation. Shaffer (1993) considers competition in the Canadian banking industry using total assets as an output index and finds an equilibrium consistent with perfect competition. Neven and Röller (1999) find significant monopoly collusive behavior in European banking markets, where they consider corporate and household loan markets. Finally, Shaffer (1989) estimates a model with aggregated loans and finds firm behavior in the U.S. banking industry is more consistent with a competitive equilibrium than non-cooperative Nash behavior. Shaffer and DiSalvo (1994) find imperfectly competitive behavior in a highly concentrated duopoly banking market.¹⁰ Almost all of these studies aggregate loan outputs into a single index. Since loan markets are very heterogeneous in nature, this aggregation could complicate any inference on competition in the banking industry.

Aggregation is also important because of its implications for merger policy. Two distinct methods of analysis in banking markets are applied by the Fed and the DOJ. On the one hand, the Fed uses a cluster market approach,

⁸The Community Reinvestment Act (CRA) data contain detailed loan information. One significant shortcoming of these data is their complete lack of price information. Also, they do not cover all banks - only large or metropolitan banks are included.

⁹See Gilbert (1984), Berger and Hannan (1989), Hannan (1991, 1997).

¹⁰Their measure of market behavior lies between perfect competition and non-cooperative Nash equilibria.

where banking services are considered jointly as a cluster of products.¹¹ Under this methodology, all retail banking products are bundled together, since consumers are alleged to purchase several services, such as loans, deposits, and other retail services, from a single bank. Furthermore, banking markets are defined to be geographically large, and often include other financial institutions such as thrifts because of their provision of many bank services. On the other hand, the DOJ applies the smallest-market principle detailed in the Merger Guidelines promulgated by the DOJ and Federal Trade Commission (FTC). In the smallest-market principle, a product market is defined as the set of products for which a hypothetical monopolist (i.e. all the firms which produce a specific product in a specific area would hypothetically act as a single monopolist) could impose a “small but significant and non-transitory” price increase.¹² The resulting analysis centers on separate loan and deposit markets. Small business and middle market lending are typically individual markets of concern in DOJ analyses. Other financial institutions are included in the analysis only if they represent a significant competitor in the individual markets. Our model allows us to consider competition in separate markets following the single market principle of the DOJ.

3 Model

We use a static Cournot game to develop a structural model of oligopoly behavior.¹³ We assume profit maximization, where banks sell loans to consumers and borrow loanable funds from depositors. It is well known that deposits could also represent other banking retail services (an output) to customers. However, our aim is to determine whether banks are paying competitive rates for deposits. In order to measure monopsony power, we model savings deposits as inputs.

¹¹The Federal Reserve often cites a 1963 Supreme Court decision, which defines the cluster of banking services as the product market in banking. See *United States v. Philadelphia National Bank*, 374 U.S. 321, 357 (1963).

¹²See Merger Guidelines (1997) pg. 4.

¹³A Bertrand equilibrium may be a more appropriate model in the banking industry. However, the theoretical value of the market parameter in a non-cooperative Nash outcome tends to be lower in a Bertrand equilibrium than in a Cournot equilibrium. This means that Bertrand competitors act as though there were fewer firms in the market than Cournot competitors. Hence, estimates using Cournot equilibrium are still indicative of overall market behavior and tend to understate the level of collusion in a market. Also, the reader should note that this study does not consider any dynamics in competition, but only considers average firm behavior over the entire sample.

We start our formulation of the model by specifying the aggregate demand equation for loan type j :

$$r_j^l = P_j^l(L_j, Z_l) \quad (1)$$

where r_j^l is the interest rate charged on loan j , L_j is the market level quantity of loan j , and Z_l represents exogenous demand determinants. Customers also supply loanable funds to banks:

$$r_i^d = P_i^d(D_i, Z_d) \quad (2)$$

where r_i^d is the price of deposit i , D_i is the market level quantity of deposits, and Z_d represents exogenous demand determinants. Given loan demand and deposit supply, we consider a representative bank n that produces loan types $j = 1, 2, 3$ and demands deposits $i = 1, 2$ to maximize profits, where loan types are real estate loans, commercial and industrial loans, and installment loans and deposit types are savings deposits and purchased funds:¹⁴

$$\begin{aligned} \max_{d_i, l_j} \Pi &= \sum_{j=1}^3 r_j^l l_j - \sum_{i=1}^2 r_i^d d_i - C(\{l_j\}_{j=1}^3, \{d_i\}_{i=1}^2), \\ \text{s.t. } r_j^l &= P_j^l(L_j, Z_l), \\ r^d &= P_i^d(D_i, Z_d) \text{ and} \\ \sum_{j=1}^3 l_j &\leq \sum_{i=1}^2 d_i \end{aligned}$$

where r_j^l is the price for loan type j , l_j is the dollar value of loans for loan type j for bank n , d_i is the dollar value of deposits for deposit type i for bank b , r_i^d is the price of deposit type i , and $C(\cdot)$ is the management cost function, where costs are a function of the loan and deposit quantities. Given loan demand, deposit supply, and cost specifications, we can write the first order conditions for the Cournot solution, where banks are offering loans on the one hand and demanding deposits on the other and banks have possible market power in deposit market i , assuming competitive market behavior in other deposit markets. We use purchased funds (d_1) as the

¹⁴Purchased funds represent an aggregation of other forms of non-core deposits. We do not include any equity requirements, because they would have no effect on the first order conditions of the model.

competitive deposit market.¹⁵ Purchased funds are described in the data section. Substituting in $d_1 = \sum_{j=1}^3 l_j - d_2$, we get the following first order conditions:

$$r_j^l - r_1^d + \frac{\partial r_j^l}{\partial L_j} l_j \theta_j - MC_{l_j} = 0 \text{ for } j = 1, 2, 3 \quad (3)$$

$$-r_2^d + r_1^d - \frac{\partial r_2^d}{\partial D_2} d_2 \lambda_2 - MC_{d_2} = 0 \quad (4)$$

where MC_{l_j} and MC_{d_i} are marginal management costs with respect to loan j and deposit i , and θ_j and λ_i measure the degree of competition. These parameters measure the degree to which market interest rates are set above marginal costs or above (below) perfectly competitive levels. In output markets at the firm level, if $\theta_j = 0$, price equals marginal cost and the industry is perfectly competitive, while $\theta_j = 1$ is consistent with Cournot Nash behavior. Collusive (or monopoly) behavior occurs when $\theta_j = N$. In factor markets, when $\lambda_i = 0$, factor price equals marginal revenue product (less marginal costs) and the factor market is perfectly competitive. When $\lambda_i = 1$, we observe Cournot Nash behavior. Collusive (or monopsony) behavior is observed when $\lambda_i = N$, indicating that factor prices are less than marginal revenue product.

In a perfectly competitive equilibrium, banks set the intermediation margin (i.e., $r_j^l - r_1^d$) equal to their marginal managerial costs. Since both rates are pegged to the perfectly competitive market and costs are separable, this implies that rates in loan markets are independent from rates in deposit markets (Freixas and Rochet, 1997).¹⁶ It is important to note, however, that even though loan demands are not interrelated, where changes in quantity of one loan type do not affect prices in other loan types, we still consider a multimarket model since markets are connected through the management cost function.

¹⁵In the estimation of the market behavior parameters, we account for interest rate risk by using term equivalent interest rates. For real estate loans, 10 year bond rates are used, and, for commercial and industrial loans and installment loans, we use 5 year bond yields.

¹⁶There has been some discussion in the literature about which market should represent the perfectly competitive market. We do not address that issue in this paper. See Santomero (1984) for a more detail discussion.

4 Empirical Implementation

In order to simplify estimation, we consider an average bank within a state by aggregating the data to the state level¹⁷ (i.e. by summing the first order conditions (equations 3 and 4) over firms) and dividing by N (the number of banks in a state in a given quarter). While this aggregation detracts from any analysis of firm specific behavior, it lends itself to an analysis of over-all industry behavior. Ostensibly, we are estimating average firm behavior across the U.S. Aggregation leads to the following first order conditions:

$$r_j^l - r_1^d + \frac{\partial r_j^l}{\partial L_j} L_j \theta_j - MC(L_j/N) = 0 \text{ for } j = 1, 2, 3 \quad (5)$$

$$-r_2^d + r_1^d - \frac{\partial r_2^d}{\partial D_2} D_2 \lambda - MC(D_2/N) = 0 \quad (6)$$

In this case, the behavioral parameters θ_j and λ have been redefined as a result of the aggregation, where $\theta_j = \frac{\delta_j}{N}$ and $\lambda = \frac{\delta}{N}$, where δ_j and δ are the aggregate estimated parameters. A value of 0 is still consistent with perfect competition, but Cournot behavior is observed when θ_j and $\lambda = \frac{1}{N}$, and perfect collusion is observed when θ_j and $\lambda = 1$.

In order to estimate this system of equations, we make functional form assumptions for marginal management costs and the demand and supply functions. We base our marginal cost functional form on a translog cost function and calculate marginal costs at the state mean.¹⁸ We get the following marginal costs for loans and deposits:

$$\begin{aligned} MC\left(\frac{L_j}{N}\right) &= \frac{C}{L_s} (\bar{\alpha}_j + \alpha_{1j} NBR + \alpha_{2j} \ln Wage + \alpha_{3j} \ln Wcap \\ &+ \sum_{s=1}^3 \gamma_s \ln\left(\frac{L_s}{N}\right)) \text{ for } j, s = 1, 2, 3 \end{aligned} \quad (7)$$

$$\begin{aligned} MC\left(\frac{D_2}{N}\right) &= \frac{C}{D_2} (\bar{\rho}_0 + \rho_1 NBR + \rho_2 \ln Wage + \rho_3 \ln Wcap \\ &+ \rho_4 \ln\left(\frac{D_2}{N}\right)) \end{aligned} \quad (8)$$

where C is total costs, NBR represents the number of branches, Wcap is the average price of capital and WAGE is the average wages rate within

¹⁷We cannot aggregate to the individual market level, because we are unable to infer any price information for individual markets within a state.

¹⁸Our results are robust to other functional form assumptions.

each state. The variables, number of branches, price of capital, and wages, are included in marginal cost equations to account for the costs of branch networks to the different loan types and deposits and for the labor costs in each market. We also assume log-log functional forms for loan demand and deposit supply:

$$\begin{aligned} \ln r_j^l &= d_{j0} + d_{jt} + d_{j1} \ln L_j + d_{j2} \ln Pop + d_{j4} \ln Income + d_{j5} \ln Employment \\ &+ \sum_{t=2}^4 d_{j6t} q_t + d_{j6} \ln TA + d_{j7} TL + d_{j8} NBR/N \\ &+ \sum_{s=1}^{50} st_{js} + \sum_{y=1}^9 yr_{jy} + \epsilon_{1j} \text{ for } j = 1, 2, 3 \end{aligned} \quad (9)$$

$$\begin{aligned} \ln r_2^d &= s_0 + s_1 \ln D_2 + s_2 \ln Pop + s_3 \ln Income + s_4 \ln TA + s_5 \ln TL \\ &+ s_6 NBR/N + \sum_{t=2}^4 s_{4t} q_t + \sum_{s=1}^{50} st_s + \sum_{y=1}^9 yr_y + \epsilon_2 \end{aligned} \quad (10)$$

where Pop is the state population, employment is the number employed in each specific state, income is state level income, q_t is a quarterly dummy variable, TA is total assets, TL is total loans, and st_{js} and yr_{jy} are state and year dummy variables respectively. We include state population, income, employment, total assets, and total loans to account for shifts in loan demand or deposit supply. The quarterly dummies are included to account for seasonal variation and the year dummies are included to account for demand shifts over time. The results section discusses the necessity of including the state dummy variables in the demand equations.

The behavioral questions that follow from the functional form assumptions are:¹⁹

$$\begin{aligned} r_j^l &- r_1^d + r_j^l \delta_j / N - \frac{C}{L_j} (\bar{\alpha}_{ji} + \alpha_{1j} NBR + \alpha_{2j} \ln Wage \\ &+ \alpha_{3j} \ln Wacp + \sum_{s=1}^3 \gamma_{sj} \ln(L_s/N)) + \epsilon_{3j} = 0 \text{ for } j = 1, 2, 3 \\ -r_2^d &+ r_1^d - s_2 r_2^d \delta / N - \frac{C}{D_2} (\bar{\rho}_0 + \rho_1 NBR + \rho_2 \ln Wage \end{aligned} \quad (11)$$

¹⁹While our model does not directly account for risk, the large differences in our marginal cost estimates across loan types are an indication that our marginal costs reflect some of the risk within each loan type.

$$+ \rho_3 \ln Wcap + \rho_4 \ln(D_2/N)) + \epsilon_4 = 0 \quad (12)$$

where γ_j , γ_{sj} , ρ_i , and ρ_{si} are parameters from a translog cost function specification and where ϵ_{3j} and ϵ_4 are additive errors. The parameters in the four behavioral equations are estimated jointly with the loan demand equations and the deposit supply equations.

5 Data

We construct a panel data set of U.S. commercial banks taken from the Report of Condition and Income (Call Report) and the FDIC Summary of Deposits. All values are aggregated to the state level and the data are quarterly for the 10-year period from 1987 through 1996.

Prices are imputed from loan and deposit revenues, where interest and fee income from loans in each category is divided by total loans²⁰ in each loan type. These imputed prices represent the average revenue of each dollar loaned for each bank. Deposit loan prices represent the average amount paid per dollar of deposit received.²¹ All dollar figures are in thousands of 1982-84 dollars. The resulting data set contains 2017 observations.

The variables in our data include: P^{RE} Price of Real Estate Loans, P^{CI} Price of Commercial and Industrial Loans, P^{IN} Price of Installment Loans, P^{CD} Price of Savings Deposits, P^{PF} Price of Purchased Funds, RELN (real estate loans), CILN (commercial and industrial loans), INLN (installment loans), L (labor), C (capital), Purf (purchased funds),²² CD (retail time and savings deposits) $r_j^l = P^{ci}, P^{re}, P^{in}$; $r_i^d = P^{cd}$.

6 Results

We jointly estimate eight equations (see equations 9 – 12) using generalized method of moments.²³ Tables (2) and (3) show the results for the demand and supply equations and the first order equations (see demand equations 9 and 10 and behavioral equations 11 and 12).

²⁰Net of allowance and reserves.

²¹Gilbert (1984) discusses some of the shortcomings of using this measure of price.

²²Purchased funds include federal funds purchased and securities sold under agreements to repurchase and demand notes issued to the U.S. Treasury and other borrowed money, as well as other borrowed money and deposits which are not demand deposits and retail time and savings deposits.

²³Note that loan demand and supply equations represent 3 equations (one for each loan market) respectively.

Estimation proceeds by setting orthogonality conditions. Let \mathbf{e} be the matrix of additive error terms for the equations, where these error terms are a function of the parameter vector and exogenous variables. Let \mathbf{Z} be the matrix of exogenous variables and instruments.²⁴ The orthogonality conditions are written as:

$$\mathbf{g} = \frac{1}{N * T} \mathbf{Z}' \mathbf{e} \quad (13)$$

Parameter estimates are obtained by minimizing:

$$q = \mathbf{g}' \mathbf{W}^{-1} \mathbf{g} \quad (14)$$

where \mathbf{W} is the covariance matrix of the orthogonality restrictions.²⁵ We control for state specific heterogeneity in the loan demand and deposit supply equations by including state dummy variables. Using a Newey and West (1987) test we reject no state specific intercepts at the 1% level²⁶.

We first turn to the inverse demand estimation results given in Table 2. The own quantity coefficients for all loan types are negative as expected and estimated elasticities, which are derived from these coefficients, are -4.95 , -4.58 , and -7.62 for real estate, commercial and industrial, and installment loans respectively. Even though these values are relatively large, they are smaller than what others have found (see Neven and Rölller (1999)). The reason for this is the way market heterogeneity is treated (i.e. state specific dummy variables). More specifically, we find that the estimated elasticities are much larger when geographic market heterogeneity is not controlled for. To see this, consider parallel inverse demand curves from different geographic markets, where only the intercept varies. If we do not account for the varying intercept, the inverse demand curve would be estimated to be rather flat, which results in large elasticity estimates. Larger elasticity estimates, in turn, raises the estimate of the conduct parameters, since there

²⁴The modeled exogenous variables are population, income, employment, quarterly dummies, wages, number of banks, and number of branches, and the additional instruments include capital, the price of capital, the logarithm of the price of capital, labor, the logarithm of wages, federal funds rate, treasury bill rates, and the price of money market demand accounts.

²⁵The model results in a χ^2 statistic of 0.31, which does not reject the null hypothesis that the over-identifying restrictions are valid at any reasonable significance level.

²⁶The D-statistic suggested by Newey and West (1987) is a χ_s^2 given by $D = T(q_1 - q_0)$, where where s is the number of restrictions, q_1 is the value of the GMM objective function under the restricted model and q_0 is the value under the unrestricted model. Note that the estimated covariance matrix from the unrestricted model is used to estimate the restricted model.

is a one to one relationship between the estimated demand elasticity and the estimated behavioral parameter. In sum, it appears that controlling for market heterogeneity is important to obtain more reasonable demand elasticity estimates.

Elasticities of supply for savings deposits are derived from the quantity coefficient in Table 3. The supply elasticity has the expected sign with a value of 4.99. Amel and Hannan (1999) elasticity of supply estimate for savings deposits is 0.093, where they estimate supply elasticities for local banking markets.²⁷ Amel and Hannan's low elasticity estimate could be attributed to their analysis at the local banking market level. However, Dick (2001), who also estimates demand at the local level, uses a multinomial logit specification and measures the elasticity of supply of 5.95.

The marginal cost parameter estimates are shown in Tables (4) and (5). We estimate average loan marginal costs and find all are positive. Loan marginal costs are 0.0075, 0.036, and 0.021 for real estate loans, commercial and industrial loans, and installment loans at the mean, respectively. Average marginal costs for savings deposits are estimated at 0.012.

We now turn to the behavioral parameters for the loans (θ 's) and deposit markets (λ) (see Table (6)). Our estimates of the θ 's are 0.059 for real estate loans, 0.11 for commercial and industrial loans, and 0.14 for installment loans. These parameters are all significantly different from 0 at the 1% level, rejecting the hypothesis of perfect competition. We also test for collusive behavior ($\theta = 1$) and find that behavioral parameters in all markets are significantly different from 1 at the 1% level. Finally, we test for Nash behavior which is when $\theta_j = 1/N$. Using the average number of banks in our sample $N = 176$, we test whether $\theta = 0.0057$.²⁸ We find that the conduct parameters for all loans are significantly greater than Nash conduct between 176 banks would predict. Putting it differently, our estimated conduct parameter implies Nash behavior amongst 11 banks in the real estate market, 9 banks in the commercial and industrial loan and 7 in installment markets. Given that the average number of competitors in Federal Reserve defined geographic markets is much lower than 176 (in urban markets the average number of competitors (including thrifts) is 26 and in rural markets the average number is 5) our estimated behavioral parameters are more closely in line with Nash conduct.

The larger coefficient estimate of θ for commercial and industrial loans

²⁷They also estimate supply elasticities for MMDA and NOW accounts with results of 0.194 and 0.042 respectively.

²⁸It is important to note that $N=176$ is the mean number of firms, not the actual number of firms in each market.

might warrant a closer analysis. Commercial and industrial loans, especially small business (loans up to \$1,000,000) and middle market loans (loans up to \$10,000,000), are of considerable interest in the antitrust analysis of DOJ (and to some extent the Federal Reserve). This is because small businesses typically do not travel very far to obtain credit.²⁹ They rely on the banks with branches close to them, because of their convenience and also because these banks are able to obtain more information about the small business.³⁰ It is hypothesized that this additional information allows the banks to better judge the risk of the local small business. Hence, the propensity for market power is larger, because competition in small business markets is more localized.³¹ Our results indicate that these antitrust concerns are warranted, since the parameter estimates point to a non-competitive equilibrium.

The savings deposits conduct parameter (λ) is estimated at 0.032, which is significantly different from perfect competition ($\lambda = 0$) and is also significantly larger than non-cooperative Nash behavior ($\lambda = 1/N$). In other words, banks compete less than non-cooperative Nash behavior would suggest. This is surprising since a number of financial institutions offer a variety of similar products with varying levels of return and liquidity that compete directly with savings deposits. More importantly, many types of financial institutions such as savings and loan associations and credit unions exist that offer the same product as commercial banks. While these financial institutions are not included in our data, they do not seem to exert competitive restraints on banks to raise deposit rates to competitive levels.³² This could be an indication that banks are providing other (unmeasured) services to retail banking consumers, who end up “paying” for these services with reduced savings deposit rates. Another possible explanation is the existence of switching costs. Switching costs lower the amount of consumer mobility that would occur for a given price change. Sharpe (1997) finds that greater population migration into a market positively affects deposit rates. He attributes this result to the existence of switching costs, since migrating customers have no existing deposit relationship in the market.

The estimated markups and markdowns can be calculated from equations (3) and (4) as $r_j^l - r_1^d - MC(L_j/N) = \theta_j / \left(\frac{\partial r_j^l}{\partial L_j} \frac{L_j}{r_j^l} \right)$ and $-r_2^d + r_1^d -$

²⁹Kwast, Starr-McCluer, and Wolken (1997) find that important financial services consumed by small businesses are primarily provided by local institutions.

³⁰The importance of lending relationships between banks and firms has been investigated in several studies. See Petersen and Rajan (1994) and Berger and Udell (1995)

³¹See Rhoades (1996) for a discussion of small business loans in antitrust analysis.

³²Our results are consistent with those in Amel and Hannan (1999).

$MC(D_2/N) = \lambda / \left(\frac{\partial r_2^d}{\partial D_2} \frac{D_2}{r_2^d} \right)$, respectively. As can be seen, the markups (markdown) are a function of the elasticities and the conduct parameter. We find markups of some 10, 29, and 18 basis points for real estate loans, commercial and industrial loans, and installment loans, respectively (or 1.1%, 2.4%, and 1.8%, respectively). Estimated markdown in retail time and savings markets is 4 basis points (or 0.7%). It is important to emphasize that these margins are kept low by the relatively large demand elasticities in each of the markets.

Overall, we therefore find that both the deposit and the loan market display some degree of non-competitive behavior. In particular, there is evidence that in both markets prices are higher than a non-cooperative Nash outcome would predict.

Given that our empirical model accounts for market imperfections on both the input side (deposit) as well as the output side (loan) it is interesting to compare our results to a situation where either the input or the output side is assumed to be perfectly competitive. In other words, we like to provide some evidence on whether it matters for the measurement of product market imperfections that the input market is assumed to be perfect.

To do this we re-estimate our model setting $\lambda = 0$, i.e. we assume that the input market is perfectly competitive. The results for the conduct parameters are in Table (6). As can be seen, the estimated θ^i s are virtually unchanged, yielding 0.059, 0.11, and 0.14 for real estate loans, commercial and industrial loans, and installment loans, respectively. Moreover, the estimated markups are 1.4%, 2.7% and 2.1%, respectively, which is very close to the markups implied by the results in table 6. We therefore find no evidence that ignoring the input side matters in terms of estimating market power in the output market. In this sense to two sides of the market are separable.

In addition, we have re-estimated our model setting $\theta_i = 0$ for all i , i.e. we assume that the output market is perfectly competitive. The resulting estimate of λ is 0.032 which is virtually unchanged from the estimate reported for the full model in Table 6. Moreover, the implied markdown is 0.7% which is also unchanged. Consequently, we find no evidence that assuming that the output market is perfectly competitive has any effect on the measurement of monopsony power. In this sense to two sides of the market are separable.

Finally, we test whether aggregation potentially affects these findings. We re-estimate our model aggregating into single loan and deposit variables. The estimated behavioral parameters are reported in Table 6. As can be

seen, the estimate of θ increases to 0.22 which is significantly larger than under the disaggregate model. In other words, aggregation matters for the estimated conduct. On the other hand, the estimate for λ is unchanged and the markdown is 0.66%. Moreover, setting either $\theta = 0$ or $\lambda = 0$ and re-estimating does not affect the conduct parameter estimates either. This implies that the separability of the input and output markets holds even under aggregation.

Overall, we find that the input side and the output side are *empirically separable*, that is the measurement of market power on one side of the market is not affected by the assuming that the other side of the market is perfectly competitive. This is true independent of whether the output market is aggregated or not. Our results suggest that empirical studies of market power that concentrate on either the input side or the output side, may not be subject to a significant misspecification error.

7 Conclusion

This paper provides evidence on the empirical separability of input and output market imperfections. We specify model of banking competition and simultaneously estimate banks conduct in output (loan) and input (deposit) markets. We find that firms display some degree of non-competitive behavior in both the loan and the deposit markets. In particular, there is evidence that in both markets prices are higher than a non-cooperative Nash would predict.

Given that our empirical model accounts for market imperfections on both the input side (deposit) as well as the output side (loan) we then compare our results to a situation where either the input or the output side is assumed to be perfectly competitive. Our main result is as that the input side and the output side are *empirically separable*, that is the measurement of market power on one side of the market is not affected by the assuming that the other side of the market is perfectly competitive. This is true independent of whether the output market is aggregated or not. Our results suggest that empirical studies of market power that concentrate on either the input side or the output side, are not subject to a significant misspecification error.

References

1. Akhavein, Jalal D., Berger, Allen N. and Humphrey, David B. (1997) “The Effects of Megamergers on Efficiency and Prices: Evidence from a Bank Profit Function,” *Review of Industrial Organization* 12, 95–139.
2. Altunbas, Yener and Molyneux, Philip (1996) “Cost Economies in EU Banking Systems” *Journal of Economics and Business* 48, 217–230.
3. Amel, Dean F. and Hannan, Timothy H. (1999) “Establishing Banking Market Definitions Through Estimation of Residual Deposit Supply Equations,” *Journal of Banking and Finance* 23, 1667–1690.
4. Berger, Allen N. (1995) “The Profit–Structure Relationship in Banking—Tests of Market–Power and Efficient–Structure Hypotheses,” *Journal of Money, Credit, and Banking* 27, 404–431.
5. Berger, Allen N. and Hannan, Timothy H. (1989) “The Price–Concentration Relationship in Banking,” *The Review of Economics and Statistics* 71, 291–99.
6. Berger, Allen N. and Hannan, Timothy H. (1997) “Using Efficiency Measures to Distinguish Among Alternative Explanations of the Structure–Performance Relationship in Banking,” *Managerial Finance* 23, 6–31.
7. Berger, Allen N. and Hannan, Timothy H. (1998) “The Efficiency Cost of Market Power in the Banking Industry: A Test of the ‘Quiet Life’ and Related Hypotheses,” *Review of Economics and Statistics*, 80, 454–65;
8. Berger, Allen N., Saunders, Anthony, Scalise, Joseph, and Udell, Gregory F. (1998) “The Effects of Bank Mergers and Acquisitions on Small Business Lending,” Board of Governors of the Federal Reserve Working Paper 1998–15.
9. Berger, Allen N. and Udell, Gregory F. (1995) “Relationship Lending and Lines of Credit in Small Firm Finance,” *Journal of Business* 68, 351–81.
10. Bresnahan, T.F. (1989) “Empirical Studies in Industries with Market Power,” *Handbook of Industrial Organization, Vol. II*, (edited by R. Schmalensee and R. Willig), 1011–1058.

11. Captain, Purvez F. and Sickles, Robin C. (1997) "Competition and Market Power in the European Airline industry: 1976–1990," *Managerial and Decision Economics* 18, 209–225.
12. Cowling, Keith and Waterson, Michael (1976) "Price Cost Margins and Market Structure," *Econometrica* 43, 267–74.
13. Dansby, Robert E. and Willig, Robert D. (1979) "Industry Performance Gradient Indexes," *American Economic Review* 69, 249–60.
14. Delta, Marie–Odile Yanelle (1997) "Banking Competition and Market Efficiency," *Review of Economic Studies* 64, 215–239.
15. Demsetz, H. (1973) "Industry Structure, Market Rivalry, and Public Policy," *Journal of Law and Economics* 16,1-9.
16. Dick, Astrid A. (2001) "Demand Estimation and Market Power in the Banking Industry" MIT mimeo.
17. Farrell, Joseph and Shapiro, Carl (1990) "Horizontal Mergers: An Equilibrium Analysis," *American Economic Review* 80, 107–126.
18. Frame, W. Scott and Kamerschen, David R. (1997) "The Profit–Structure Relationship in Legally Protected Banking markets using Efficiency Measures," *Review of Industrial Organization* 12, 9–22.
19. Freixas, Xavier and Rochet, Jean-Charles (1997) *Microeconomics of Banking*, The MIT Press, Cambridge, Mass.
20. Gilbert, Alton (1984) "Studies of Bank Market Structure and Competition: A Review and Evaluation," *Journal of Money, Credit, and Banking* 16, 617–644.
21. Hannan, Timothy H. (1991) "Bank Commercial Loan Markets and the Role of Market Structure: Evidence from Surveys of Commercial Lending," *Journal of Banking and Finance* 15, 133–149.
22. Hannan, Timothy H. (1997) "Market Share Inequality, the Number of Competitors, and the HHI: An Examination of Bank Pricing," *Review of Industrial Organization* 12, 23–35.
23. Hannan, Timothy H. and Berger, Allen N.(1991) "The Rigidity of Prices: Evidence from the Banking Industry," *American Economic Review* 81, 938–945.

24. Hannan, Timothy H. and Prager, Robin A. (1996) "Do Substantial Horizontal Mergers Generate Significant Price Effects? Evidence from the Banking Industry," Board of Governors of the Federal Reserve Working Paper.
25. Jackson, William E. III (1997) "Market Structure and the Speed of Price Adjustments: Evidence of Non-Monotonicity," *Review of Industrial Organization* 12, 37–57.
26. Kwast, Myron L., Starr-McCluer, Martha, Wolken, John D. (1997) "Market Definition and the Analysis of Antitrust in Banking," *The Antitrust Bulletin* winter, 973–995.
27. Molyneux, Philip, Thornton, John, and D. Michael Lloyd-Williams (1996) "Competition and Market Contestability in Japanese Commercial Banking," *Journal of Economics and Business* 48, 33–45.
28. Neven, Damien J. and Lars-Hendrik Röller (1999) "An Aggregate Structural Model of Competition in the European Banking Industry," *International Journal of Industrial Organization*, Vol 17, No. 7.
29. Newey, W. K. and West, K. (1987) "Hypothesis Testing with Efficient Method of Moments Testing," *International Economic Review*, 28:777–787.
30. Panzar, J. and Rosse, J. (1987) "Testing for 'Monopoly' Equilibrium," *Journal of Industrial Economics* 35, 443–456.
31. Parker, Philip M. and Lars-Hendrik Röller (1997) "Collusive Conduct in Duopolies: Multimarket Contact and Cross-Ownership in the Mobile Telephone Industry," *RAND Journal of Economics* 28, 304–22.
32. Petersen, Mitchell and Rajan, Raghuram (1994) "The Benefits of Lending Relationships: Evidence from Small Business Data," *Journal of Finance* 49, 3–37.
33. Rhoades, Stephen A. (1996) "Competition and Bank Mergers: Directions for Analysis from Available Evidence," *Antitrust Bulletin* 61, 339–364.
34. Ruthenberg, David and Ellis, Ricky (1996) "Cost Economies and Interest Rate Margins in a Unified European Banking Model," *Journal of Economics and Business* 48, 231–249.

35. Röller, Lars–Hendrik and Sickles, Robin C. (2000) “Competition, Market Niches, and Efficiency: A Structural Model of European Airline Industry,” *International Journal of Industrial Organization*, 18, 845–865.
36. Santomero, Anthony M. (1984) “Modeling the Banking Firm: A Survey,” *Journal of Money, Credit, and Banking* 16, 576–602.
37. Shaffer, Sherrill (1985) “Competition, Economies of Scale, and Diversity of Firm Sizes,” *Applied Economics* 17, 467–476.
38. Shaffer, Sherrill (1989) “Competition in the U.S. Banking Industry,” *Economics Letters* 29, 321–323.
39. Shaffer, Sherrill (1993) “A Test of Competition in Canadian Banking,” *Journal of Money, Credit, and Banking* 25, 49–61.
40. Shaffer, Sherrill (1994a) “Evidence of Monopoly Power Among Credit Card Banks,” *Federal Reserve Bank of Philadelphia Working Paper No. 94–16*.
41. Shaffer, Sherrill (1994b) “Structure, Conduct, Performance, and Welfare,” *Review of Industrial Organization* 9, 435–450.
42. Shaffer, Sherrill and DiSalvo, James (1994) “Conduct in a Banking Duopoly,” *Journal of Banking and Finance* 18, 1063–1082.
43. Sharpe, S. (1997) “The Effect of Consumer Switching Costs on Prices: A Theory and its Application to the Bank Deposit Market,” *Review of Industrial Organization* 12, 79–94.
44. Suominen, Matti (1994) “Measuring Competition in banking: A Two–Product Model,” *Scandinavian Journal of Economics* 96, 95–110.

Table 1: **U.S. Banking Summary Statistics**

Variable	State Mean	Std Dev
Real Estate Loans	13076	17184
Commercial and Industrial Loans	6953	10172
Installment Loans	3829	5002
Real Estate Rate	0.090	0.014
Commercial and Industrial Rate	0.12	0.036
Installment Rate	0.10	0.018
Wage Rate	5.84	1.02
Purchased Funds	9197	13673
Savings Deposits	13780	15624
Purchased Fund Rate	0.069	0.023
Savings Deposit Rate	0.057	0.015
Number of Banks	176	174
Number of Branches	1100	1010

All dollar values are in millions of U.S. dollars, except wage rate which is in thousands of U.S. dollars.

Table 2: **Loan Demand Estimates**

Variable	Estimate	Std Err	T Ratio
Real Estate Loans			
Constant	-1.51	0.17	-8.69
Quantity	-0.20	0.0023	-88.26
Population	-0.066	0.014	-4.77
Income	0.0024	0.00081	2.94
Q2	-0.0084	0.0012	-7.00
Q3	-0.0037	0.0010	-3.70
Q4	0.0025	0.00093	2.70
Total Assets	0.00030	0.0059	0.05
NBR/N	0.0013	0.00028	4.67
Total Loans	0.15	0.0054	27.10
Commercial and Industrial Loans			
Constant	-1.15	0.13	-8.63
Quantity	-0.22	0.0019	-116.68
Population	-0.79	0.012	-65.57
Income	-0.0082	0.00078	-10.56
Employment	0.80	0.0085	93.64
Q2	-0.0020	0.0014	-1.43
Q3	0.013	0.0011	12.40
Q4	-0.016	0.0011	-15.41
Total Assets	-0.062	0.0063	-9.85
NBR/N	-0.0071	0.00032	-22.49
Total Loans	0.22	0.0045	49.78
Installment Loans			
Constant	5.39	0.12	46.21
Quantity	-0.13	0.0012	-109.54
Population	-0.34	0.011	-32.32
Income	-0.0092	0.00074	-12.49
Q2	-0.011	0.0012	-9.34
Q3	-0.013	0.0010	-12.53
Q4	-0.0090	0.0011	-8.52
Employment	-0.20	0.0071	-28.13
Total Assets	0.038	0.0060	6.36
NBR/N	-0.006	0.00029	-20.74
Total Loans	-0.019	0.0044	-4.20

21

State and yearly dummy variables are included in each equation, but not reported in this table.

Table 3: **Deposit Supply Estimates**

Variable	Estimate	Std Err	T Ratio
Constant	-3.04	0.025	-121.16
Quantity	0.20	0.0021	93.58
Income	-0.0098	0.00091	-10.73
Q2	-0.010	0.0013	-8.09
Q3	-0.012	0.0011	-11.92
Q4	-0.015	0.0011	-13.53
Total Assets	-0.29	0.0069	-42.74
NBR/N	-0.0065	0.00031	-20.95
Total Loans	0.12	0.0049	24.20

Table 4: Marginal Cost Estimates for Loans

Variable	Estimate	Std Err	T Ratio
Real Estate Loans			
Constant	0.066	0.0076	8.71
$\ln y_1$	0.071	0.00041	172.39
$\ln y_2$	-0.091	0.00068	-134.20
$\ln y_3$	0.004463	0.000690	6.47
NBR	0.000032	3.48E-7	92.85
$\ln W_{lab}$	-0.025	0.0019	-13.00
$\ln W_{cap}$	-0.023	0.0019	-11.89
Commercial and Industrial Loans			
Constant	0.66	0.0062	106.44
$\ln y_1$	-0.037	0.00062	-60.50
$\ln y_2$	-0.12	0.00082	-144.81
$\ln y_3$	-0.046	0.00069	-66.49
NBR	0.000075	3.136E-7	238.02
$\ln W_{lab}$	0.0068	0.0019	3.58
$\ln W_{cap}$	-0.074	0.0016	-44.98
Installment Loans			
Constant	0.248	0.0026	95.40
$\ln y_1$	0.017	0.00020	82.57
$\ln y_3$	0.017	0.00027	62.53
$\ln y_2$	-0.054	0.00033	-165.61
NBR	0.000016	1.17E-7	139.07
$\ln W_{lab}$	-0.0967	0.00092	-104.86
$\ln W_{cap}$	-0.025	0.00059	-42.71

Table 5: **Marginal Cost Estimates for Savings Deposits**

Variable	Estimate	Std Err	T Ratio
Constant	-1.39	0.013	-111.78
$\ln x3$	0.046	0.00093	49.75
NBR	0.000044	4.81E-7	90.60
$\ln Wlab$	0.46	0.0036	128.92
$\ln Wcap$	-0.20	0.0030	-64.34

Table 6: **Market Conduct Measures**

Market Parameter	Parameter	Estimate	Std Err	T Ratio
Disaggregated Model				
Real Estate Loans	$\theta_1 = \delta_1/\bar{N}$	0.059	0.00079	74.21
Commercial and Industrial Loans	$\theta_2 = \delta_2/\bar{N}$	0.11	0.0011	102.11
Installment Loans	$\theta_3 = \delta_3/\bar{N}$	0.14	0.0015	91.98
Savings Deposits	$\lambda = \delta/\bar{N}$	0.032	0.00097	33.15
Disaggregated Model with no deposits				
Real Estate Loans	$\theta_1 = \delta_1/\bar{N}$	0.059	0.0016	37.83
Commercial and Industrial Loans	$\theta_2 = \delta_2/\bar{N}$	0.11	0.0022	50.92
Installment Loans	$\theta_3 = \delta_3/\bar{N}$	0.14	0.0029	48.53
Aggregated Model				
All Loans	$\theta = \delta_1/\bar{N}$	0.22	0.027	8.19
Savings Deposits	$\lambda = \delta/\bar{N}$	0.032	0.0031	10.37

We calculate behavior at mean of N , $\bar{N} = 176$.

Bücher des Forschungsschwerpunkts Markt und politische Ökonomie
Books of the Research Area Markets and Political Economy

- Andreas Stephan
Essays on the Contribution of Public Infrastructure to Private: Production and its Political Economy
2002, dissertation.de
- Hans Mewis
Essays on Herd Behavior and Strategic Delegation
2001, Shaker Verlag
- Andreas Moerke
Organisationslernen über Netzwerke – Die personellen Verflechtungen von Führungsgremien japanischer Aktiengesellschaften
2001, Deutscher Universitäts-Verlag
- Silke Neubauer
Multimarket Contact and Organizational Design
2001, Deutscher Universitäts-Verlag
- Lars-Hendrik Röller, Christian Wey (Eds.)
Die Soziale Marktwirtschaft in der neuen Weltwirtschaft, WZB Jahrbuch 2001
2001, edition sigma
- Michael Tröge
Competition in Credit Markets: A Theoretic Analysis
2001, Deutscher Universitäts-Verlag
- Tobias Miarka
Financial Intermediation and Deregulation: A Critical Analysis of Japanese Bank-Firm-Relationships
2000, Physica-Verlag
- Rita Zobel
Beschäftigungsveränderungen und organisationales Lernen in japanischen Industriegesellschaften
2000, Humboldt-Universität zu Berlin
<http://dochost.rz.hu-berlin.de/dissertationen/zobel-rita-2000-06-19>
- Jos Jansen
Essays on Incentives in Regulation and Innovation
2000, Tilburg University
- Ralph Siebert
Innovation, Research Joint Ventures, and Multiproduct Competition
2000, Humboldt-Universität zu Berlin
<http://dochost.rz.hu-berlin.de/dissertationen/siebert-ralph-2000-03-23/>
- Damien J. Neven, Lars-Hendrik Röller (Eds.)
The Political Economy of Industrial Policy in Europe and the Member States
2000, edition sigma
- Jianping Yang
Bankbeziehungen deutscher Unternehmen: Investitionsverhalten und Risikoanalyse
2000, Deutscher Universitäts-Verlag
- Christoph Schenk
Cooperation between Competitors – Subcontracting and the Influence of Information, Production and Capacity on Market Structure and Competition
1999, Humboldt-Universität zu Berlin
<http://dochost.rz.hu-berlin.de/dissertationen/schenk-christoph-1999-11-16>
- Horst Albach, Ulrike Görtzen, Rita Zobel (Eds.)
Information Processing as a Competitive Advantage of Japanese Firms
1999, edition sigma
- Dieter Köster
Wettbewerb in Netzproduktmärkten
1999, Deutscher Universitäts-Verlag
- Christian Wey
Marktorganisation durch Standardisierung: Ein Beitrag zur Neuen Institutionenökonomik des Marktes
1999, edition sigma
- Horst Albach, Meinolf Dierkes, Ariane Berthoin Antal, Kristina Vaillant (Hg.)
Organisationslernen – institutionelle und kulturelle Dimensionen
WZB-Jahrbuch 1998
1998, edition sigma
- Lars Bergman, Chris Doyle, Jordi Gual, Lars Hultkrantz, Damien Neven, Lars-Hendrik Röller, Leonard Waverman
Europe's Network Industries: Conflicting Priorities - Telecommunications
Monitoring European Deregulation 1
1998, Centre for Economic Policy Research
- Manfred Fleischer
The Inefficiency Trap
Strategy Failure in the German Machine Tool Industry
1997, edition sigma
- Christian Göseke
Information Gathering and Dissemination
The Contribution of JETRO to Japanese Competitiveness
1997, Deutscher Universitäts-Verlag

DISCUSSION PAPERS 2001

Fredrik Andersson Kai A. Konrad	Globalization and Human Capital Formation	FS IV 01 – 01
Andreas Stephan	Regional Infrastructure Policy and its Impact on Productivity: A Comparison of Germany and France	FS IV 01 – 02
Tomaso Duso	Lobbying and Regulation in a Political Economy: Evidence from the US Cellular Industry	FS IV 01 – 03
Steffen Huck Kai A. Konrad Wieland Müller	Merger and Collusion in Contest	FS IV 01 – 04
Steffen Huck Kai A. Konrad Wieland Müller	Profitable Horizontal Mergers without Cost Advantages: The Role of Internal Organization, Information, and Market Structure	FS IV 01 – 05
Jos Jansen	Strategic Information Revelation and Revenue Sharing in an R&D Race <i>(A revision of FS IV 99-11)</i>	FS IV 01 – 06
Astrid Jung	Are Product Innovation and Flexible Technology Complements?	FS IV 01 – 07
Jonas Björnerstedt Johan Stennek	Bilateral Oligopoly	FS IV 01 – 08
Manfred Fleischer	Regulierungswettbewerb und Innovation in der chemischen Industrie	FS IV 01 – 09
Karl Wärneryd	Rent, Risk, and Replication – Preference Adaptation in Winner-Take-All Markets	FS IV 01 – 10
Karl Wärneryd	Information in Conflicts	FS IV 01 – 11
Steffen Huck Kai A. Konrad	Merger Profitability and Trade Policy	FS IV 01 – 12
Michal Grajek	Gender Pay Gap in Poland	FS IV 01 – 13
Achim Kemmerling Andreas Stephan	The Contribution of Local Public Infra-structure to Private Productivity and its Political-Economy: Evidence from a Panel of Large German Cities	FS IV 01 – 14
Suchan Chae Paul Heidhues	Nash Bargaining Solution with Coalitions and the Joint Bargaining Paradox	FS IV 01 – 15
Kai A. Konrad Harald Künemund Kjell Erik Lommerud Julio R. Robledo	Geography of the Family	FS IV 01 – 16
Tomaso Duso Lars-Hendrik Röller	Towards a Political Economy of Industrial Organization: Empirical Regularities from Deregulation	FS IV 01 – 17

Kai A. Konrad	Investment in the Absence of Property Rights – The Role of Incumbency Advantages	FS IV 01 – 18
Roman Inderst Christian Wey	Bargaining, Mergers, and Technology Choice in Bilaterally Oligopolistic Industries	FS IV 01 – 19
Kai A. Konrad Helmut Seitz	Fiscal Federalism and Risk Sharing in Germany: The Role of Size Differences	FS IV 01 – 20
Klaus Gugler Dennis C. Mueller B. Burcin Yurtoglu Christine Zulehner	The Effects of Mergers: An International Comparison	FS IV 01 – 21
Kjell Erik Lommerud Odd Rune Straume Lars Sørgaard	Downstream Merger with Oligopolistic Input Suppliers	FS IV 01 – 22
Andreas Blume Paul Heidhues	Tacit Collusion in Repeated Auctions	FS IV 01 – 23
Roman Inders Christian Wey	The Incentives for Takeover in Oligopoly	FS IV 01 – 24
Klaus Gugler Dennis C. Mueller B. Burcin Yurtoglu	Corporate Governance, Capital Market Discipline and the Returns on Investment	FS IV 01 – 25
Sven-Olof Fridolfsson Johan Stennek	Why Mergers Reduce Profits and Raise Share Prices: A Theory of Preemptive Mergers	FS IV 01 – 26

DISCUSSION PAPERS 2002

Fredrik Andersson Kai A. Konrad	Human Capital Investment and Globalization in Extortionary States	FS IV 02 – 01
Lars-Hendrik Röller Christian Wey	Merger Control in the New Economy	FS IV 02 – 02
Talat Mahmood Klaus Schömann	Die Determinanten der Migrationsentscheidung von IT-Hochschulabsolventen aus Pakistan – Empirische Befunde zur Ausgestaltung der deutschen „Green Card“	FS IV 02 – 03
Jos Jansen	The Effects of Disclosure Regulation on Innovative Firms: Common Values	FS IV 02 – 04
Jos Jansen	The Effects of Disclosure Regulation on Innovative Firms: Private Values	FS IV 02 – 05
Günter Franke Harris Schlesinger Richard C. Stapleton	Multiplicative Background Risk	FS IV 02 – 06
Tomaso Duso	On the Politics of the Regulatory Reform: Econometric Evidence from the OECD Countries	FS IV 02 – 07
Johan Lagerlöf Paul Heidhues	On the Desirability of an Efficiency Defense in Merger Control	FS IV 02 – 08
Olivier Cadot Lars-Hendrik Röller Andreas Stephan	Contribution to Productivity or Pork Barrel? The Two Faces of Infrastructure Investment	FS IV 02 – 09
Justus Haucap Christian Wey	Unionization Structures and Firms' Incentives for Productivity Enhancing Investments	FS IV 02 – 10
Heidrun C. Hoppe Emre Ozdenoren	Intermediation in Innovation	FS IV 02 – 11
Rainer Nitsche	On the Effectiveness of Anti-Predation Rules	FS IV 02 – 12
Daniel Krähmer	Entry and Experimentation in Oligopolistic Markets for Experience Goods	FS IV 02 – 13
J. Peter Murmann	The Coevolution of Industries and National Institutions: Theory and Evidence	FS IV 02 – 14
Kai A. Konrad	Terrorism and the State	FS IV 02 – 15
Robert Nuscheler	Physician Reimbursement, Time-Consistency and the Quality of Care	FS IV 02 – 16
Fredrik Andersson Kai A. Konrad	Taxation and Education Investment in the Tertiary Sector	FS IV 02 – 17
Jan Boone	'Be nice, unless it pays to fight': A New Theory of Price Determination with Implications for Competition Policy	FS IV 02 – 18

Kai A. Konrad	Altruism and Envy in Contests: An Evolutionarily Stable Symbiosis	FS IV 02 – 19
Helmut Bester Kai A. Konrad	Delay in Contests	FS IV 02 – 20
Kjell Erik Lommerud Bjørn Sandvik Odd Rune Straume	Good Jobs, Bad Jobs and Redistribution	FS IV 02 – 21
Steffen Huck Vicki Knoblauch Wieland Müller	On the Profitability of Collusion in Location Games	FS IV 02 – 22
Ralph Siebert	Learning by Doing and Multiproduction Effects over the Life Cycle: Evidence from the Semiconductor Industry	FS IV 02 – 23
Jürgen Bracht Saul Lach Eyal Winter	Modeling Oligopolistic Price Adjustment in Micro Level Panel Data	FS IV 02 – 24
Steffen Huck Kai A. Konrad	Strategic Trade Policy and the Home Bias in Firm Ownership Structure	FS IV 02 – 25
Daniel Krähmer	Delegation versus Authority	FS IV 02 – 26
Thomas Knaus Robert Nuscheler	Incomplete Risk Adjustment and Adverse Selection in the German Public Health Insurance System	FS IV 02 – 27
Kurt R. Brekke Robert Nuscheler Odd Rune Straume	Quality and Location Choices under Price Regulation	FS IV 02 – 28
Kai A. Konrad	Inverse Campaigning	FS IV 02 – 29
Sebastian Kessing	A Note on the Determinants of Labour Share Movements	FS IV 02 – 30
Sebastian Kessing	Employment Protection and Product Market Competition	FS IV 02 – 31
Michal Grajek	Identification of Network Externalities in Markets for Non-Durables	FS IV 02 – 32
Robert M. Adams Lars-Hendrik Röller Robin C. Sickles	Market Power in Outputs and Inputs: An Empirical Application to Banking	FS IV 02 – 33

Bei Ihren Bestellungen von WZB-Papers schicken Sie bitte unbedingt einen an Sie adressierten Aufkleber mit sowie je paper eine Briefmarke im Wert von 0,51 Euro oder einen "Coupon Reponse International" (für Besteller aus dem Ausland)

Please send a self addressed label and postage stamps in the amount of 0.51 Euro or a "Coupon-Reponse International" (if you are ordering from outside Germany) for each WZB-paper requested

Bestellschein

Order Form

Absender / Return Address:

Wissenschaftszentrum Berlin
für Sozialforschung
Presse- und informationsreferat
Reichpietschufer 50

D-10785 Berlin-Tiergarten

**Hiermit bestelle ich folgende(s)
Discussion paper(s):**

**Please send me the following
Discussion paper(s):**

Bestell-Nr. / Order no.	Autor/in, Kurztitel /Author(s) / Title(s) in brief