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ENJOYING THE QUIET LIFE UNDER DEREGULATION? EVIDENCE FROM ADJUSTED LERNER INDICES FOR U.S. BANKS

Michael Koetter, James W. Kolari, and Laura Spierdijk*

Abstract—The quiet life hypothesis posits that firms with market power incur inefficiencies rather than reap monopolistic rents. We propose a simple adjustment to Lerner indices to account for the possibility of forgone rents to test this hypothesis. For a large sample of U.S. commercial banks, we find that adjusted Lerner indices are significantly larger than conventional Lerner indices and trending upward over time. Instrumental variable regressions reject the quiet life hypothesis for cost inefficiencies. However, Lerner indices adjusted for profit inefficiencies reveal a quiet life among U.S. banks.

I. Introduction

THE quiet life hypothesis proposes that firms with market power prefer to operate inefficiently rather than reap all potential rents. As Hicks (1935) aptly noted, "The best of all monopoly profits is the quiet life." This potential negative relation between efficiency and market power has motivated deregulatory changes in many sectors of both industrialized and developing economies in recent decades (Bertrand & Mullainathan, 2003).[1] Theoretically, the deregulation of market access reduces competitive distortions, thereby increasing the efficient allocation of factors and, ultimately, welfare (Anderson, de Palma, & Thisse, 1997; Poitras & Sutter, 2000).[2] Empirical studies confirm that deregulation tends to improve firm, industry, and aggregate performance.[3] However, few studies investigate the simultaneous relation between market power and efficiency inherent in this trade-off. Also, previous work does not consider the implications of deregulation for the quiet life. In this study, we propose a simple adjustment to Lerner indices based on a unified reduced-form model that disentangles quiet life inefficiency from markups reflecting market power. By avoiding the implicit assumption of full efficiency in the estimation of conventional Lerner indices of competitive behavior, this adjustment allows more explicit tests of the quiet life hypothesis.

Canonical examples of the relation between cost inefficiency and a quiet life are excessive expenditures, such as corporate jets and other management perks (Yermack, 2006). Profit inefficiency arises when firms do not fully exploit their pricing opportunity set. For example, a profit-inefficient bank may require too little collateral and charge too low interest rates when lending, thereby forgoing potential profits and incurring inordinate risk for shareholders in exchange for less managerial effort to identify potential borrowers' reservation interest rates and adequate levels and quality of collateral pledged.[4]

Like Jayaratne and Strahan (1996), Berger and Hannan (1998), and Kroszner and Strahan (1999), we consider the U.S. banking industry a natural laboratory for investigating the relationship between market power and efficiency. First, banks are relatively homogeneous firms that are undiversified for the most part (Rhoades & Rutz, 1982), which permits performance comparisons. Second, the existence of market power may be particularly harmful by enabling banks to exert influence on the profits of borrowing firms once projects have started. Rajan (1992) shows that such lock-in effects follow from the private information generated during the lending process. Aggravation of lock-in effects due to banks with market power could therefore lead to larger welfare distortions compared to nonfinancial industries. At the same time, deregulation of banks may prove hazardous if the elimination of markup pricing coincides with a deterioration of lending quality in terms of inferior information generation (Hauswald & Marquez, 2003).[5] In this regard, Bertrand, Schoar, and Thesmar (2007) show that deregulation of French banks reduced

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[1] A positive relation between market power and efficiency would be consistent with numerous (but not mutually exclusive) alternative theories, such as the efficient structure hypothesis contending that more efficient firms acquire market shares from less efficient firms (Demsetz, 1973).

[2] Bertrand et al. (2007) note that deregulation occurs in many ways, including the lifting of quotas or price restrictions, the privatization of government-owned enterprises, and loosening market entry requirements.

[3] For instance, Wilson (1994) investigates the deregulation of the U.S. railroad sector and finds that eventually rates on all considered commodities declined significantly. La Porta and López-de-Silanes (1999) examine nonfinancial Mexican firms and attribute two-thirds of profitability increases to productivity gains due to deregulation. Kleit and Terrel (2001) report cost savings on the order of 13% in the U.S. electricity industry following efficiency gains associated with deregulation. Due to improved corporate governance following stock market listing, Gupta (2005) shows that partial privatization increased the profitability, productivity, and investment of state-owned Indian firms. And due to factor reallocation gains after deregulation, Eslava et al. (2010) find both plant-level and aggregate productivity growth in Colombian manufacturing.

[4] Despite being fairly homogeneous products, there is evidence of significant differences in loan prices after controlling for borrower risk and bank traits due to (for example) alternative board composition of banks (see Qian & Strahan, 2007). In addition to differences in loan spreads Wu et al. (2009) show that nonprice components of loans (such as general and financial covenants, performance pricing, and collateral) also differ significantly.

[5] See also Cole (2009) for empirical evidence on the government nationalization of Indian banks, which reduced interest rates but led to inefficient factor allocation and no significant growth impetus in regions.

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their propensity to bail out poorly performing corporate customers. Besides directly improving the performance of firms in a deregulated industry, policies aiming to enhance bank competition facilitated the reallocation of factors to more productive users (see also Angelini & Cetorelli, 2003).[6]

Third, the relation between deregulation, consolidation, and performance is well documented in the banking industry (see Berger, Demsetz, & Strahan, 1999; Berger & Mester, 2003; Evanoff & Ors, 2010). Many studies conclude that deregulation fueled consolidation and increasing concentration but did not lead to efficiency gains. The large number of studies that investigate the competitive structure in U.S. and other banking markets and financial intermediaries' performance often use market concentration as a proxy for the degree of market power.[7] However, Boone (2008) observes that this broad measure fails to assess individual firms' abilities to charge markup prices. Especially in light of the quiet life hypothesis, we need measures that account for heterogeneous bank behavior with respect to forgoing possible rents in exchange for inefficiencies, that is, bank-specific indicators of market power. Moreover, the choice of banks to trade monopolistic rents for slack occurs contemporaneously. With the exception of a few European banking studies (Maudos & Fernández de Guevara, 2007; Koetter & Poghosyan, 2009; Delis & Tsionas, 2009), virtually all studies on market structure and efficiency ignore this simultaneous relation and obtain competition and efficiency measures from separate models. Also, most market-structure and bank efficiency studies fail to assess the relative ability of banks to generate profits, which is at the heart of the quiet life hypothesis. Often-used cost inefficiency measures only indirectly capture preference behavior favoring slack over monopoly rents.[8] Berger and Hannan (1998) explicitly assess the relation between U.S. banking competition and efficiency by regressing cost efficiency estimates on competition proxies. However, their study relies on market structure proxies and does not take into account the role of deregulation.

Fourth, and last, different deregulation patterns in U.S. banking permit further tests on the causal relation between market structure and performance. A number of studies exploit the different timing of changes in the regulation of banks across U.S. states to examine the impact of deregulation on growth (Strahan, 2003), loan pricing (Calem & Nakamura, 1998), bank condition (Stiroh & Strahan, 2003), and small business lending (Rice & Strahan, 2010). While these studies link deregulation to bank performance, the simultaneous relation between operational slack and market power posited by the quiet life hypothesis is not considered.

We seek to extend the literature by testing the quiet life hypothesis more explicitly with efficiency-adjusted Lerner indices. Empirical results are provided for all insured U.S. commercial banks between 1976 and 2007, a period marked by historic deregulation that dramatically changed the competition and structure of the industry. To account for simultaneity, we derive both markups and inefficiency from a unified reduced-form model. Besides conventional cost inefficiencies, we focus in particular on forgone profits. Since adjusted Lerner indices are estimated simultaneously with cost and profit efficiency scores, we take into account the possibility that banks may forgo profits under the quiet life hypothesis due to suboptimal (or nonprofit maximizing) pricing of their output vector. Cost and profit frontiers are estimated, and efficiency-adjusted Lerner indices are compared with conventional Lerner indices that assume fully efficient banks. The effect of market power on efficiency is estimated with instrumental variable techniques to account for possible endogeneity (by construction) between these measures. Additionally, we investigate the causal relation between market power and inefficiency. We utilize the different timing and degree of implementation of bank deregulation across U.S. states to identify the differential impact of banking liberalization on efficiency conditional on adjusted Lerner indices. Following Stiroh and Strahan (2003), we employ a difference-in-difference approach to estimate the marginal effects of market power corrected for deregulation to test the quiet life hypothesis in view of changing regulation.

Our results corroborate the importance of accounting for profit inefficiency in competition analyses. Adjusted Lerner indices are about 30% higher than conventional Lerner indices. Statistical tests confirm significant differences between these two competition measures. Also, trends in these measures yield different inferences about changes in banking industry competition over time. Efficiency-adjusted Lerner indices reveal that despite deregulation over the past two decades that allowed banks to compete more freely with each other, the average market power of banks substantially increased during our sample period. Across a wide variety of models, specifications, and estimation techniques, we show that adjusted Lerner margins positively affected cost efficiency in the U.S. banking industry but reduced profit efficiency. Thus, the evidence rejects the quiet life hypothesis for U.S. banks regarding their ability to allocate input factors at minimal cost but supports Hicks's conjecture about the quiet life that banks with market power forgo some of their potential monopoly profits.

Further analyses of the impact of geographic deregulation in the banking industry on the quiet life tend to support these inferences. The total effect of Lerner indices is significant and negatively related to profit efficiency but positively related to cost efficiency. Regarding the effect of deregulation, marginal effects of intra- and interstate banking liber-

[6] Also note potential negative externalities beyond the banking industry if poorly supervised banks gain market power and take excessive risks (Vives, 1991; Matutes & Vives, 2000).

[7] See, for example, Gilbert (1984), Claessens and Laeven (2004), and Bikker and Spierdijk (2008).

[8] See the surveys in Berger and Humphrey (1997), Berger et al. (1999), Amel et al. (2004), and Bos and Kolari (2005).

alization are associated with increasing profit and cost efficiency of banks. However, the effects of geographic deregulation on bank profit and cost efficiency are often different for adjusted versus unadjusted Lerner indices. Also, while bank efficiency normally improved after geographic deregulation, many banks continued to practice the quiet life, as evidenced by increasing market power over time and decreasing profit efficiency, as well as an overall negative relation between Lerner indices and efficiency.

The remainder of this paper is structured as follows. Section II provides the theory underlying adjusted Lerner indices. Section III discusses the empirical method and data used to estimate adjusted Lerner indices. Section IV describes empirical tests of the quiet life hypothesis. Section V extends these tests to the geographic deregulation of U.S. banking activities. Section VI presents the results. Section VII concludes and discusses policy implications.

II. Theoretical Motives for Adjusting Lerner Indices

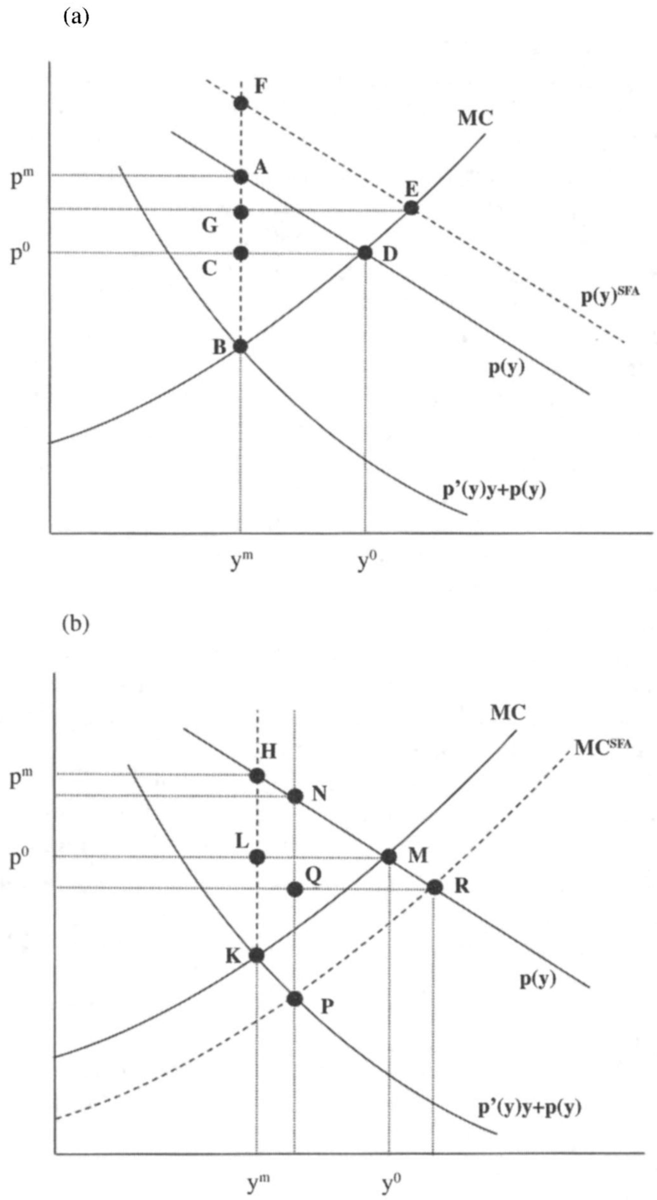
Consider a monopoly in which one firm is the only producer of a good. The demand for this good at price p is given by the function $x(p)$, which we assume to be continuous and strictly decreasing at all p for which $x(p) > 0$. We assume that the monopolist knows the demand function for his product and can produce output level y at a cost of $c(y)$. The monopolist's decision problem consists of choosing the price p that maximizes his profits. Equivalently, the monopolist's optimization problem can be formulated in terms of the level of output he wants to sell, with the price at which he can sell his output given by the inverse demand function $p(y) = x^{-1}(y)$. This approach eases the comparison to perfect competition below. The monopolist's maximization problem is

$$\max p(y)y - c(y) \text{ subject } y \geq 0. \qquad (1)$$

Optimal monopoly output y^m satisfies $p(y^m) = c'(y^m) - p'(y^m)y^m$. For the typical case that $p'(y) < 0$ for all $y \geq 0$, we have $p(y^m) > c'(y^m)$, so that the price under monopoly exceeds marginal costs. Moreover, the monopolist's optimal output y^m must be below the competitive output level (say, y^0). This quantity reduction allows the monopolist to increase the price of his remaining sales. The term $-p'(y^m)y^m$ reflects the markup of the monopoly price above the perfect competition price at the monopoly output level y^m and thus represents the economic profit earned by the monopolist. Figure 1a depicts the optimal price and quantity in the cases of perfect competition (p^0 and y^0) and monopoly (p^m and y^m).

To measure the degree of monopoly power, Lerner (1934) considers the economic profit of the monopolist scaled by the price at the monopoly output level. Hence, the Lerner index of monopoly power is defined as

FIGURE 1.—ILLUSTRATION OF EFFICIENCY-ADJUSTED LERNER INDICES



$$L = (p(y^m) - c'(y^m))/p(y^m) = -p'(y^m)y^m/p(y^m). \qquad (2)$$

In figure 1a, the distance AB reflects the economic profit of the monopolist—the difference between the price at the monopoly output level and the corresponding marginal costs. Under monopoly, marginal revenues are given by $p'(y^m)y^m + p(y^m)$. By contrast, average revenues equal $p(y^m)$. Alternatively, we could therefore write the Lerner index as

$$L = \{AR(y^m) - MC(y^m)\}/AR(y^m), \qquad (3)$$

that is, as the difference between average revenues and marginal costs divided by average revenues.

Thus, the Lerner index contains two components, which are usually estimated separately: prices (or, equivalently, average revenues) and marginal costs. If either of the two components is not measured correctly, the Lerner index will be biased. The existing literature generally obtains prices and marginal costs as observed mean output prices and estimated marginal costs, respectively. The implicit assumption is that banks are fully efficient. Figure 1a illustrates why the Lerner index is biased when profit inefficiencies are ignored. Ceteris paribus, taking into account profit inefficiency, the true price function is the dashed curve $p(y)^{SFA}$. The observed price-cost margin equals AB, but the true margin is given by BF. Ignoring inefficiencies biases welfare implications also. The area ACD reflects the observed consumer welfare loss, but the true loss is given by FGE. The observed producer surplus loss is represented by the area BCD, whereas the observed loss is BGE. Figure 1b illustrates the consequences of ignoring cost inefficiencies. Taking into account cost inefficiency, the true marginal cost function is the dashed curve MC^{SFA}. Although the observed cost-price margin is the distance HK, the true margin equals NP. In figure 1b, the observed consumer welfare loss is equal to HLM, but the true loss is NQR. The observed forgone producer surplus due to unrealized monopoly rents equals KLM, but the true loss is the area PQR. Ignoring both cost and profit inefficiencies would lead to an even larger bias in price-cost margin, as well as in consumer and producer welfare losses.

III. Estimating Adjusted Lerner Indices

A. Empirical Method

Consistent with conventional bank efficiency studies, we use stochastic frontier analysis (SFA) to estimate marginal cost and average revenues.[9] We specify inputs and outputs according to the intermediation model (Sealey & Lindley, 1977). A bank's production function uses labor and physical capital to attract deposits. The deposits are used to fund loans and other earning assets. Similar to previous studies estimating Lerner indices in banking (Angelini & Cetorelli, 2003; Carbó et al., 2009), we specify a production technology with three inputs (borrowed funds, labor, and capital) and two outputs (securities and loans). Following Mester (1996, 1997), we also include equity because it can be used to fund loans and reflects different risk attitudes of banks. We assume that factor markets are complete and the bank chooses factor quantities at given factor prices in order to supply a desired output. To estimate marginal costs, we employ a translog total cost function for bank $j = 1,\ldots, m$ at time $t = 1,\ldots, T$ as

$$\begin{aligned}\log\ TOC_{jt} &= \alpha + \sum_{i=1}^{3}\beta_i \log\ w_{ijt} \\ &+ \sum_{p=1}^{2}\gamma_p \log\ y_{pjt} + \delta \log\ (z_{jt}) + \sum_{i=1}^{3}(\varsigma_i/2)(\log\ w_{ijt})^2 \\ &+ \sum\sum_{i<k}\eta_{ik}\log\ w_{ijt}\log\ w_{kjt} + \sum_{p=1}^{2}(\theta_p/2)(\log\ y_{pjt})^2 \\ &+ (\kappa_{12}/2)\log\ y_{1jt}\log\ y_{2jt} \\ &+ \sum_{i=1}^{3}\sum_{p=1}^{2}\lambda_{pi}\log\ w_{ijt}\log\ y_{pjt} + \sum_{k=1}^{2}\nu_k trend^k \\ &+ \sum_{i=1}^{3}\xi_i \log\ w_{ijt} trend + \sum_{p=1}^{2}\omega_p \log\ y_{pjt} trend + \varepsilon_{jt}, \qquad (4)\end{aligned}$$

where TOC denotes total operating costs, w_{ijt} input factors $i = 1,2,3$ of bank j at time t, y_{1jt} is total securities of bank j in year t, y_{2jt} is total loans of bank j at time t, z_{jt} is total equity of bank j at time t, and $trend$ is a time trend to capture technical change. We impose homogeneity of degree 1 on input prices by dividing all factor prices and TOC by w_3. Marginal costs follow directly from equation (3) by taking the sum of the derivatives with respect to total securities (y_{1jt}) and total loans (y_{2jt}), which yields

$$\begin{aligned}MC_{jt} = \frac{TOC_{jt}}{y_{1jt}}&\Big[\gamma_1 + \theta_1 \log\ y_{1jt} + (\kappa_{12}/2)\log\ y_{2jt} \\ &+ \sum_{i=1}^{3}\lambda_{1i}\log\ w_{ijt} + \omega_1 trend\Big] \\ &+ \frac{TOC_{jt}}{y_{2jt}}\Big[\gamma_2 + \theta_2 \log\ y_{2jt} + (\kappa_{12}/2)\log\ y_{1jt} + \\ &\sum_{i=1}^{3}\lambda_{2i}\log\ w_{ijt} + \omega_2 trend\Big]. \qquad (5)\end{aligned}$$

We estimate equation (4) using an SFA approach based on standard assumptions in the literature (Kumbhakar & Lovell, 2000). Given the output level of the bank, cost (in)efficiency measures the difference between minimum and observed costs. We assume that $\varepsilon_j = v_j + u_j$, where random error v_j is assumed to be i.i.d. normally distributed with mean zero and variance σ_V^2. The u_j terms denote systematic deviations from optimal cost due to inefficiency and are assumed to be i.i.d. with a half-normal distribution and variance σ_u^2 independent of the v_j's. We estimate the coefficients of equation (3) with MLE and measure the cost efficiency of bank j as $\exp(-u_j)$. Alternatively, we employ pooled OLS, which relies on the assumption that banks are fully cost efficient.

To approximate average revenues (or the price p) in the Lerner index, equation (2), we use two approaches. First, we follow earlier banking studies and define p as the

[9] See Berger and Humphrey (1997) for an excellent overview of efficiency analysis in banking. Discussion of econometric specification choices in SFA can be found in Kumbhakar and Lovell (2000) and Greene (2005).

ratio of total revenues to total assets. But inefficient bank management is not confined to the allocation and employment of input factors. Bank efficiency studies (Berger & Humphrey, 1997) document that forgone profits due to suboptimal production plans are substantially larger compared to cost inefficiencies. Therefore, we also take into account potential profit inefficiencies in the measurement of average revenues. Second, we take advantage of the fact that average revenues are equal to average profits plus average costs. Since we are interested in assessing banking competition in relation to efficiency, it would be unrealistic to assume a priori that the banking market is competitive with output prices being given. In this regard, Humphrey and Pulley (1997) propose an alternative profit efficiency model as a more adequate framework when the standard assumptions of a perfectly competitive market do not hold. Bank output prices and input factors are endogenous variables in their model. Alternative profit efficiency measures to what extent a bank generates maximum profits given its output levels. To measure this efficiency, we use profits before taxes (*PBT*) as the dependent variable in the translog equation (4). To obtain the Lerner index from the cost and profit function, note that the Lerner index can be expressed in terms of average revenues and marginal costs as in equation (3). Using predicted total operating cost (*TOC*), corresponding marginal costs (*MC*), and predicted profits (*PBT*) relative to total output (*TO* = total loans + total securities), an efficiency-adjusted Lerner index is

$$L = \frac{\frac{PBT}{TO} + \frac{TOC}{TO} - MC}{\frac{PBT}{TO} + \frac{TOC}{TO}} = \frac{PBT + TOC - MC \times TO}{PBT + TOC}. \tag{6}$$

The adjusted Lerner index is thus estimated from frontier estimates of *PBT*, *TOC*, and *MC*.

B. *Data to Estimate Adjusted Lerner Indices*

Variable definitions and descriptive statistics are provided in tables 1 and 2, respectively. In table 1 the top panel lists the variables employed to estimate cost and profit functions using both OLS and SFA. Data are gathered for individual commercial banks from the Reports of Condition and Income (or Call Reports) of the Federal Reserve System. We obtain annual year-end data from all U.S. insured banks between 1976 and 2007. There are 394,286 bank-year observations for which gross total assets are available. Following Stiroh and Strahan (2003), we exclude the District of Columbia and South Dakota due to exceptional credit card business legislation in these states. Also, we drop observations with missing or negative data for the three factor prices, two outputs, costs, profits, equity, and total assets. This culling yielded 366,234 bank-year observations. We deflate all monetary volumes to 2005 prices using the consumer price index obtained from Bureau of Economic Analysis. All factor prices are then truncated at the top and bottom percentile, respectively, to control for outliers.[10] This trimming reduces the final sample to 342,856 observations.

In line with the intermediation approach, we assume that banks use savings of consumers and firms to make investments and seek to minimize costs and maximize profits when choosing a production plan. Following convention in both the competition and efficiency literature, we specify three factor prices. First, the price of fixed assets w_1 is calculated as the ratio of expenses for fixed assets and premises to their stock values. Second, the cost of labor w_2 is approximated by salaries and wages relative to full-time equivalent employees. Third, and last, funding costs w_3 are proxied by the ratio of interest expenses to total interest-bearing liabilities. We specify two outputs, securities (y_1) and loans (y_2), and like Mester (1996, 1997) and others, include equity as a netput z. The dependent variables to estimate cost and profit frontiers are total operating costs and operating income less operating costs, respectively.

IV. Testing the Quiet Life Hypothesis

A. *Empirical Method*

To test the quiet life hypothesis, we regress cost and profit inefficiencies on Lerner indices. Since both inefficiencies and markups are obtained from the same model, we take into account endogeneity arising from simultaneity by estimating the following instrumental variable specification (hereafter, IV regression model):

$$\begin{aligned} L_{jt} &= a_0 + b_1 IV_{jt} + b_2 X_{jt} + \eta_{jt}, \\ Eff_{jt} &= c_0 + d_1 \hat{L}_{jt} + d_2 X_{jt} + \xi_i + \nu_t + \varepsilon_{jt}, \end{aligned} \tag{7}$$

where Eff_{jt} is the cost or profit efficiency of bank j at time t, L_{jt} is either the adjusted or unadjusted Lerner index, X_{jt} represent further bank-specific controls, b and d capture state- and year-specific fixed effects, IV are instrumental variables used to predict Lerner indices, and the remaining terms are estimated parameters and error terms. We use Wooldridge's (1995) overidentification and exogeneity tests as well as the explanatory power of the first-stage regression to select suited instruments.

B. *Instruments*

Consistent with the dynamic panel literature (Blundell & Bond, 1998), an initial set of instruments is based on lagged values of endogenous covariates. Another set of instruments is motivated by sociological research on the existence of significantly different occupational accomplishments across different ethnicity groups (Rosen, 1956, 1959; Duncan & Duncan, 1968). In this respect, Hirschman and Wong (1981, 1984) provide evidence that Asian immigrants are more

[10] The results remained qualitatively the same using alternative outlier treatments and deflators.

TABLE 1.—VARIABLE DEFINITIONS AND SOURCES

Name and Acronym		Description	Source
Frontier arguments			
Cost of fixed assets	w_1	Expenditures on fixed assets (riad 4217) divided by premises and fixed assets (rcfd 2145)	Report of Condition and Income, December reporting, Federal Reserve Bank of Chicago
Cost of labor	w_2	Salaries (riad 4135) divided by full-time equivalent employees (riad 4150)	
Cost of borrowed funds	w_3	Interest expenses on deposits (riad 4170) and interest expenses on fed funds (riad 4180) divided by the sum of total deposits (rcfd 2200) and fed funds purchased (rcfd 2800)	
Total securities	y_1	Before 1984: Sum of U.S. Treasury securities (rcfd 0400), US government and corporation obligations (rcfd 0600), state and political subdivisions obligations (rcfd 0900), and all other stocks, bonds, securities (rcfd 0380). Between 1983 and 1994: Total investment securities (rcfd 0390) and trading account securities (rcfd 2146). After 1993: Securities held-to-maturity (rcfd 1754) and securities held-for-sale (rcfd 1773).	
Total loans	y_2	Before 1984: Total loans and leases (rcfd 1400) and lease financing receivables (rcfd 2165). After 1983: Total loans and leases (rcfd 1400)	
Equity	Z	Gross total equity (rcfd 3210)	
Operating costs	TOC	Sum of interest expenses on deposits (riad 4170), interest expenses on fed funds (riad 4180), loan-loss provisions (riad 4230), expenditures on fixed assets (riad 4217), and salaries (riad 4135)	
Profits before tax	PBT	Operating income (riad 4000) less TOC	
IV regression model			
Asset market share	MS	Share of each bank's gross total assets (rcfd 2170) with respect to aggregate assets per state in each year	Report of Condition and Income, December reporting, Federal Reserve Bank of Chicago
Indicator if among largest 100 banks	TOP	Indicator equal to 1 (0) if the bank is (not) among the 100 largest banks measured in total assets in the country in a given year	
Security share	SEC	Share of securities (y_2) of total assets	
HHI loan category Index	SCOPE	Hirschman-Herfindahl index of each bank's asset portfolio across real estate loans (rcfd 1410), agricultural loans (rcfd 1590), commercial and industrial loans (rcfd 1600), loans to individuals (rcfd 1975), and other loans as ratios of total loans and leases (rcfd 1400) in each year	
Loan income share	INC	Interest and fee income from loans (riad 4010) divided by operating income (riad 4000)	
Loan-loss provision share	LLP	Loan-loss provisions (riad 4230) divided by total loans	
Loan-loss reserve share	LLR	Loan-loss reserves (rcfd 3123) divided by total loans	
Z-score	ZSCORE	Sum of return on assets, defined as PBT over gross total assets, and the equity ratio, defined as equity over total assets, divided by the standard deviation of ROA in the preceding four years Standard deviation is calculated using a rolling window	
Capital to assets ratio	ER	Equity ratio defined as gross total equity (rcfd 3210) divided by gross total assets (rcfd 2170)	
Instruments			
Lagged Lerner	Lerner_{t-1}	Lerner indices derived from OLS and SFA estimates of marginal cost and average revenues, respectively, lagged by one period	Own calculations
Share Asian	$\text{ETH}_{\text{Asian}}$	Sum of Chinese, Filipino, Japanese, Asian Indian, Korean, Vietnamese, Cambodian, Hmong, Laotian, Thai, and other Asian countries relative to working population	U.S. Census 2000 and historical census data (Appendix D) as described in Gibson and Jung (2002)
Share Pacific	$\text{ETH}_{\text{Pacific}}$	Sum of Hawaiian, Samoan, Guamanian, and other Pacific islands relative to total working population	
Share Hispanic	$\text{ETH}_{\text{Hispanic}}$	Sum of Mexican, Puerto Rican, Cuban, and other Hispanic countries relative to total working population	
Ethnicity HHI index	ETH_{HHI}	Sum of the above squared ethnicity shares	
Gross state product	GSP	Gross state product	Bureau of Economic Analysis (BEA)
Disposable personal income	DPI	Personal income, which is the sum of net earnings by place of residence, rental income of persons, personal dividend income, personal interest income, and personal current transfer receipts less contributions for domestic government social insurance, and personal current taxes	Bureau of Economic Analysis (BEA)
High school degree	HD	Share of population above the age of 25 with a high school diploma or higher	U.S. Census Bureau, Population Division, Education and Social Stratification Branch
Bachelor degree	BD	Share of population above the age of 25 with a bachelor's degree or higher	
Unemployment rate	UR	Total unemployed, as a percentage of the civilian labor force	Bureau of Labor Statistics
Number of mergers per state	MER	Count of all acquisitions conducted by banks residing in a state per year	Federal Reserve System
Indicator of acquiring banks	ACQ	Indicator equal to 1 if acquired by another bank(s) during the period	

TABLE 1. (CONTINUED)

Name and Acronym		Description	Source
Regulation			
Intrastate deregulation	INTRA	Indicator equal to 1 starting in the year that intrastate banking was permitted by means of mergers and acquisitions	Amel (1993); Kroszner and Strahan (1999); Stiroh and Strahan (2003); Demyanyk, Ostergaard, and Sorenson (2007); Beck et al. (2010)
Interstate deregulation	INTER	Indicator equal to 1 starting in the year that the state entered an interstate banking agreement with another state	
Age	BRI_1	Minimum age of institution (bank or branch) for acquisition	Johnson and Rice (2008)
De novo	BRI_2	Opt-in allows de novo interstate branching	
Acquisition	BRI_3	Acquisition of single branches or other portions of an institution	
Deposit cap	BRI_4	Statewide deposit cap on branch acquisitions	
Branch restriction indicator	BRI	Sum of BRI1 through BRI4	

TABLE 2.—SUMMARY STATISTICS

Variable	Mean	Standard Deviation	Percentiles 5th	Percentiles 95th	N
Stochastic frontier arguments					
w_1^a	35.23	29.45	10.88	92.31	342,856
w_2^a	28.04	13.59	10.59	54.36	342,856
w_3^a	4.51	1.79	1.71	7.73	342,856
y_1^c	84.86	1,093.85	2.34	181.33	342,856
y_2^c	265.02	3,966.19	6.65	464.80	342,856
Z^c	34.07	551.78	1.29	61.29	342,856
TOC^c	29.69	409.91	1.05	50.18	342,856
PBT^c	12.85	225.72	0.17	19.13	342,856
IV regression arguments					
MS^a	0.457	2.374	0.011	1.225	342,856
TOP^f	0.009	0.096	0.000	0.000	342,856
SEC^a	56.530	14.451	30.701	78.459	342,856
$SCOPE^d$	0.431	0.151	0.267	0.754	342,856
INC^a	62.987	13.805	37.293	82.257	342,856
LLP^a	0.654	1.596	0.000	2.468	342,856
LLR^a	1.376	1.283	0.419	2.990	342,856
$Z\text{-Score}^e$	45.767	50.968	6.200	125.510	283,212
ER^a	9.184	3.442	5.647	14.998	342,856
Instruments					
Lerner SFA_{t-1}	0.411	0.224	0.092	0.680	314,920
Lerner OLS_{t-1}	0.307	0.111	0.169	0.436	314,920
ETH^a_{Asian}	2.539	3.826	0.677	6.043	342,856
$ETH^a_{Pacific}$	0.099	0.871	0.022	0.160	342,856
$ETH^a_{Hispanic}$	11.71	15.389	1.269	48.971	342,856
ETH^d_{HHI}	0.628	0.131	0.488	0.883	342,856
GSP^g	178.0	201.9	19.0	568.4	342,856
PII^g	157.8	172.3	17.4	507.7	341,424
DPI^g	138.6	150.0	15.6	445.8	341,424
HD^a	73.51	8.238	56.400	86.100	342,856
BD^a	19.06	4.518	12.500	27.200	342,856
UR^a	6.055	2.039	3.302	9.638	342,856
MER^h	14.806	27.255	0.000	54.000	342,856
ACQ^f	0.035	0.385	0.000	0.000	342,856
$INTRA^f$	0.577	0.494	0.000	1.000	342,856
$INTER^f$	0.577	0.494	0.000	1.000	342,856
BRI^e	2.970	1.739	0.000	4.000	70,727

Notes: For variable definitions, see table 1.
[a]In percent.
[b]In thousands of deflated U.S. dollars.
[c]In millions of deflated U.S. dollars.
[d]Hirschman-Herfindahl index in points from 0 to 10,000.
[e]Score or ratio in points.
[f]A 0/1 indicator variable.
[g]In billions of U.S. dollars.
[h]Count.

competitive than immigrants from other backgrounds. Therefore, we use decennial census data for each state to calculate different ethnicity shares, as well as Hirschman-Herfindahl indices across shares to instrument banking competition. Other social scientists (Featherman, 1971) emphasize the role of education to achieve economic objectives. Therefore, we specify the share of degrees awarded relative to the total population above 25 years of age from high school (HD) and bachelor programs (BD), respectively.

Bank mergers instigated by deregulation are another feature of the U.S. banking industry that can influence competition by reallocating assets to more productive banks and increasing market shares of survivors (Wheelock & Wilson, 2000; Berger & Mester, 2003; Claessens & Laeven, 2004; Jovanovic & Rousseau, 2008). We obtained the identity of all banks involved in mergers via a Freedom of Information Act request to the Board of Governors of the Federal Reserve System. As additional instrumental variables capturing competitive conditions, we compute the number of transactions per state (MER) as well as an indicator variable equal to 1 for each bank that acquired another bank in a particular year (ACQ).

Chirinko and Fazzari (2000) show that macroeconomic conditions can affect competition too. We therefore use personal disposable income (DPI) and state unemployment rates (UR) obtained from the Bureau of Economic Analysis as instruments.

The third panel in table 1 lists the instrumental variables, their definitions, and data sources. Table 2 provides the descriptive statistics for these variables.

C. *Explanatory Variables*

In the IV regression model, our key variable of interest is the Lerner index. As control variables, we include additional bank-specific characteristics shown in the second panel of table 1. Size as measured by asset market share takes into account the possibility that successful banks remain in the market and gain large market shares (Stiroh & Strahan, 2003). In recent years, a number of U.S. banks have aggressively expanded by acquisitions and mergers and achieved a national market presence. As Boyd and De Nicolo (2005) observed, large, successful survivors might eventually behave uncompetitively. Therefore, we include both asset market share per state (MS) and a dummy indicating whether a bank was among the top 100 largest firms in a given year (TOP). Similar to asset quality controls in the bank distress literature (DeYoung, 2003), we control for the possibility that banks exposed to greater competition are more likely to venture into nontraditional banking activities and operate more lines of business using three control variables: (a) the share of assets in securities (SEC), (b) a Hirschman-Herfindahl Index across five loan categories to account for credit portfolio diversification (SCOPE), and (c) the ratio of noninterest to interest income (INC). It is possible that larger (Lerner) margins may simply reflect risk taking by banks. Since bank capitalization is among the most important determinants of bank distress (Gan, 2004), we include the ratio of equity to total assets (ER). To control for credit risk, both the share of loan-loss reserves (LLR) and loan-loss provisions relative (LLP) to total loans are added. To proxy overall risk of bank failure, we calculate *Z*-scores as suggested in Laeven and Levine (2009). The *Z*-score is defined as the sum of capital ratios and return on assets divided by the standard deviation of return on assets. In contrast to many studies that assume the latter component of *Z*-scores are time invariant, we use a four-year rolling window to calculate the standard deviation of return on assets.[11] Finally, we use dummy variables to account for regional economic and regulatory conditions in the different states.

V. The Influence of Deregulation

A. *Empirical Method*

Despite accounting explicitly for endogenous relations with suited instruments in equation (7), a remaining concern is the identification of causal relations. Here we exploit the fact that banking legislation regarding the geographical scope of banking activities was relaxed to enhance competition at different points in time across U.S. states. Kroszner and Strahan (1999) show that the timing of bank deregulation reflects a political power struggle between lobby groups representing large bank versus small bank interests. Therefore, we initially assess how bank deregulation influenced competition and subsequently examine how the resulting changes in competition affected efficiency. This approach enables us to evaluate how efficiency was affected by competition that changed in response to exogenous deregulation. Consequently, policy implications with respect to deregulation can be inferred.

Jayaratne and Strahan (1996, 1998) systematically collect and analyze the different patterns of deregulation in the U.S. banking industry across states. Strahan (2003) explains that differential geographic deregulation across U.S. states represents an exogenous change in banks' competitive environment, thereby permitting the identification of deregulation effects on real economic and bank performance at the state level. This regulatory setting has been used in numerous studies to identify (for example) the effect of changing legislation on bank performance and consolidation (Stiroh & Strahan, 2003), real economic activity (Strahan, 2003; Huang, 2008), and the availability of credit to small firms (Rice & Strahan, 2010). In line with this literature, we use a difference-in-difference approach to explain the effect of competition on bank efficiency after a

[11] This implies a reduction of observations due to dropping initial years for each bank. We prefer this approach for the following reasons: (a) imputing starting values for this standard error in various ways did not alter our results and (b) the relation between competition and efficiency may be affected by changing risk profiles, thereby rendering a proper time-variant measure of risk more important than sample coverage.

change in bank branching legislation. Like Stiroh and Strahan (2003), we estimate a model of the form

$$\begin{aligned} Eff_{jkt} = a_j + a_k + b_1 INTER_{kt} + b_2 INTRA_{kt} \\ + b_3 L_{jk,t-1} + b_4 (INTER_{kt} \times L_{jk,t-1}) \\ + b_5 (INTRA_{kt} \times L_{jk,t-1}) + \varepsilon_{jkt}, \end{aligned} \tag{8}$$

where Eff_{jkt} is either cost or profit efficiency of bank j in state k at time t. The coefficients a_j and a_k are bank- and state-specific fixed effects, respectively. *INTRA* is an indicator equal to 1 in the year and thereafter when a state allowed branching within state borders by means of mergers and acquisitions.[12] *INTER* is an indicator variable equal to 1 in the year and thereafter when state k enters an interstate agreement permitting the expansion of banking activities (see Kroszner & Strahan, 1999). L_{jkt} is either the adjusted or unadjusted Lerner index estimated for bank j in state k at time t. The impact of a ceteris paribus change in legislation depends on the level of the Lerner index and is captured by the interaction effects b_4 and b_5. Similarly, the impact of a ceteris paribus change in the Lerner index depends on the regulatory environment.

With the passage of the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 (IBBEA), interstate banking became de jure unrestricted. Some bank deregulation studies ignore this effect and estimate relations as in equation (8) for samples during post-IBBEA years (Beck et al., 2010). While technically possible, the absence of different deregulation timing across states limits the ability to identify causal relations between deregulation and dependent variables. Consequently, in addition to the full sample covering the years 1976 to 2007, we utilize subsample periods before and after the implementation of IBBEA.

B. Deregulation Data

Kroszner and Strahan (1999) distinguish between intra- and interstate deregulation. Intrastate deregulation (*INTRA*) relaxed prohibitions on statewide branching. All states removed this limitation gradually by permitting intrastate branching by mergers and acquisitions of existing competitors, as well as de novo branching within the state. Interstate deregulation (*INTER*) under the 1982 Douglas amendment of the 1956 Bank Holding Company Act permitted out-of-state acquisition based on reciprocal agreements among states. Finally, in 1994, the IBBEA leveled the playing field by permitting free interstate branching by 1997.

Prior to 1997, we use deregulation dates of fully free interstate branching provided in Kroszner and Strahan (1999) and supplement with updated information from Stiroh and Strahan (2003), Demyanyk et al. (2007), and Beck et al. (2010). Table 3 provides the years of deregulation for each state. For the period after 1997, we use the four-branch restriction indicators (BRI_i) collected by Johnson and Rice (2008) to measure the different degree and timing of IBEEA implementation across the United States.[13] They show that numerous states used options in the IBEEA to limit interstate branching based on four provisions. As with the *INTRA* and *INTER* indicators, we create a dummy variable equal to 0 in all years until the deregulation and 1 in the year of deregulation and thereafter.[14] With reference to the first provision, IBEEA allowed states to maintain minimum age requirements imposed on (out-of-state) banks that wanted to engage in an interstate bank merger. Most states required a minimum premerger life of five years. Column BRI_1 in table 3 indicates the year by state when this minimum age requirement was reduced or abolished. A second provision on new branches by out-of-state banks required that states explicitly opt in to this de novo branching provision of IBEEA. We label the permission of de novo branching BRI_2 in table 3. A third provision in IBEEA allows out-of-state banks to acquire only branches but not the entire bank for states that explicitly opt in. In table 3 the dates when states accepted this provision are shown in the column labeled BRI_3. The fourth, and last, provision that we consider is the IBEEA prohibition on interstate mergers if they result in (insured) deposit market shares larger than 30%. Also, states were given authority to impose lower (higher) and thus more restrictive (less restrictive) deposit caps on branch acquisitions. We code the indicator BRI_4 equal to 1 if deposit caps were lifted.

VI. Empirical Results

We begin by reporting specification tests and results for the quiet life hypothesis based on the IV regression model in equation (7). We then present deregulation results from the difference-in-difference approach in equation (8).

A. Quiet Life Regressions

To test the quiet life hypothesis, we use both adjusted and unadjusted Lerner indices obtained from stochastic frontier analyses. Specification tests clearly favor a stochastic frontier specification over average response functions. The estimated cost and alternative profit frontier coefficients are shown in table 4. Mean cost and alternative profit efficiency of 79% and 54%, respectively, are consistent with previous U.S. banking studies (e.g., see Berger & Humphrey, 1997, and Berger et al., 1999) and confirm that slack in generating profits is important to take into account

[12] Stiroh and Strahan (2003) further distinguish completely unrestricted intrastate branching. Consistent with most other banking studies, we focus on intrastate deregulation by means of permitting merger and acquisitions.

[13] We disregard their fifth indicator, defined as required reciprocity between states, as Johnson and Rice (2008) observe that this indicator is ambiguous in terms of (more or less) restrictiveness.

[14] To be consistent with the *INTRA* and *INTER* indicators, we invert the coding of Johnson and Rice (2008) so that BRI_i indicators equal to 1 indicate deregulation rather than stricter regulation.

TABLE 3.—DEREGULATION TIMING ACROSS U.S. STATES

	INTRA	INTER	BRI_1	BRI_2	BRI_3	BRI_4
State	Intrastate	Interstate	Min. Age	De Novo	Branch Acquisition	Deposit Cap
Alabama	1981	1987				
Alaska	1960	1982			1994	
Arizona	1960	1986			2001	
Arkansas	1994	1989				
California	1960	1987				
Colorado	1991	1988				
Connecticut	1980	1983		1995	1995	
Delaware	1960	1988				
Florida	1988	1985				
Georgia	1983	1985				
Hawaii	1986	1997	2001	2001	2001	
Idaho	1960	1985				1995
Illinois	1988	1986	2004	2004		
Indiana	1989	1986	1997	1997	1997	
Iowa	1999	1991				
Kansas	1987	1992				
Kentucky	1990	1984	2000			
Louisiana	1988	1987				
Maine	1975	1978	1997	1997	1997	
Maryland	1960	1985	1995	1995	1995	
Massachusetts	1984	1983		1996	1996	
Michigan	1987	1986	1995	1995	1995	
Minnesota	1993	1986				
Mississippi	1986	1988				
Missouri	1990	1986				
Montana	1990	1993				
Nebraska	1985	1990				
Nevada	1960	1985				
New Hampshire	1987	1987	2002			
New Jersey	1977	1986	1996		1996	
New Mexico	1991	1989				
New York	1976	1982			1997	
North Carolina	1960	1985	1995	1995	1995	
North Dakota	1987	1991	1997	2003	2003	
Ohio	1979	1985	1997	1997	1997	
Oklahoma	1988	1987	2000	2000	2000	
Oregon	1985	1986			1995	
Pennsylvania	1982	1986	1995	1995	1995	
Rhode Island	1960	1984	1995	1995	1995	
South Carolina	1960	1986				
South Dakota	1960	1988				
Tennessee	1985	1985		2001	1998	
Texas	1988	1987	1999	1999	1999	
Utah	1981	1984		2001	1995	
Vermont	1970	1988		2001	1996	
Virginia	1978	1985			1996	
Washington	1985	1987		2005	2005	
Washington, DC	1960	1985	1996	1996	1996	
West Virginia	1987	1988	1997	1997	1997	
Wisconsin	1990	1987				
Wyoming	1988	1987				

The years indicate when a state deregulated its banking industry. Intra- and interstate deregulation is taken from Kroszner and Strahan (1999) and augmented with information from Stiroh and Strahan (2003), Demyanyk et al. (2007), and Beck et al. (2010). The detailed branching restriction indicators are from Johnson and Rice (2008). Variables are defined in table 1.

in assessing market power and the quiet life. Consistent with theory in section II, mean Lerner indices per year in table 5 demonstrate that failure to adjust for inefficiency leads to underestimation of market power. For the entire sample period, adjusted Lerner indices are on average about one-third larger compared to unadjusted indices. Nonparametric rank-order tests, as well as unreported tests based on bootstrapped Lerner indices, prove that differences in Lerner indices are statistically significant. In contrast to unadjusted indices that suggest little change in competition from 1998 to 2007 (from 0.332 to 0.319, respectively), accounting for inefficiency reveals increasing market power of U.S. banks in this period (adjusted indices from 0.449 to 0.583, respectively). Moreover, the downward bias of market power estimates increases in the late 1990s and reaches a maximum of 26 points in 2007.

Declining levels of competition, despite deregulation, are in line with a number of recent empirical studies, including, for example, Bikker and Spierdijk (2008) and Bos, Kolari, and van Lamoen (2010). The intuition of this result is consistent with Stiroh and Strahan (2003), who report rising profits of U.S. banks over time. They argue that deregula-

TABLE 4.—STOCHASTIC COST AND ALTERNATIVE PROFIT FRONTIER RESULTS

	Cost		Profits	
Dependent	Parameter	p-value	Parameter	p-value
Constant	−1.157	0.000	−5.173	0.000
$\ln w_1$	0.137	0.000	0.362	0.000
$\ln w_2$	0.264	0.000	0.232	0.000
$\ln y_1$	−0.010	0.012	0.728	0.000
$\ln y_2$	0.064	0.000	−0.143	0.000
$\ln z$	0.187	0.000	0.429	0.000
$1/2\,(\ln w_1)^2$	0.072	0.000	0.058	0.000
$1/2\,(\ln w_1 \times \ln w_2)$	−0.068	0.000	−0.084	0.000
$1/2\,(\ln w_2)^2$	0.099	0.000	0.105	0.000
$1/2\,(\ln y_1)^2$	−0.040	0.000	−0.142	0.000
$1/2\,(\ln y_1 \times \ln y_2)$	0.079	0.000	0.104	0.000
$1/2\,(\ln y_2)^2$	0.352	0.000	0.481	0.000
$\ln y_1 \times \ln w_1$	0.010	0.000	−0.025	0.000
$\ln y_1 \times \ln w_2$	−0.013	0.000	0.125	0.000
$\ln y_2 \times \ln w_1$	−0.003	0.000	−0.018	0.000
$\ln y_2 \times \ln w_2$	−0.007	0.000	−0.002	0.589
trend	0.011	0.000	−0.069	0.000
trend^2	0.001	0.000	0.005	0.000
$\ln w_1 \times$ *trend*	−0.006	0.000	−0.003	0.000
$\ln w_2 \times$ *trend*	−0.020	0.000	−0.053	0.000
$\ln y_1 \times$ *trend*	0.003	0.000	−0.005	0.000
$\ln y_2 \times$ *trend*	−0.003	0.000	−0.002	0.000
λ	1.485	0.000	2.318	0.000
σ	0.359	0.000	1.010	0.000

There are 20,458 different banks and 342,856 observations included in the sample covering the years 1976 until 2007. Parameters are defined as follows: $\lambda = \sigma_u/\sigma_v$ and $\sigma^2=\sigma_u+\sigma^2_v$. Robust standard errors are used, and symmetry and homogeneity restrictions are imposed. Variable definitions are provided in table 1. The profit frontier includes a negative profit indicator as in Bos and Koetter (2009).

tion caused a reallocation of banking assets from low-profit to high-profit banks, resulting in higher margins and thus increased overall profitability.[15] As Boone (2008) noted, this line of reasoning relates to two different paths through which competition can increase: firms may enter a market due to the removal of entry barriers or due to more competitive behavior of incumbents. Increased contestability in U.S. banking due to deregulation apparently induced out-of-state banks to capture market shares from less efficient competitors by means of takeovers and mergers rather than by de novo banking. In turn, incumbents sought opportunities to tap new income sources, such as by using more off-balance-sheet activities (Bikker & Spierdijk, 2008). Together these dynamics resulted in higher concentration and the formation of larger banks, which continuously differentiated their products and services portfolios. These larger and more diversified banks may then have gained the scope to realize higher Lerner margins. The larger increase of adjusted relative to unadjusted Lerner indices indicates that these "survivor" banks did not use any such potential size and differentiation gains to realize higher profits for shareholders or lower rates for customers but rather to forgo rents, that is, enjoy a quiet life.

We next turn to specification tests on the choice of instrumental variables in the IV regression model. Table 6 shows results for (a) adjusted and unadjusted Lerner indices as explanatory variables, (b) cost and profit efficiency as dependent variables, and (c) three different sample periods (full sample period 1976–2007, pre-IBEEA period before the full implementation of the IBEEA in 1997, and post-IBEEA period for which the Johnson & Rice, 2008, branch restriction indicators are available from 1997 to 2005). For each specification in columns 1 through 12, we consult Wooldridge's (1995) overidentification and exogeneity tests as well as the explanatory power of various combinations of instruments in first-stage regression results. Variables used as instruments in different models are marked for easy reference.

Each of the resulting twelve specifications requires a different combination of instrumental variables for which (a) overidentification can be rejected, (b) the null hypothesis that Lerner indices are exogenous can be rejected, and (c) explanatory power as indicated by (partial) R^2 and F-tests support the choice of instruments.[16] Exogeneity is rejected for most specifications at the 1% level. We reject exogeneity at the 5% level when using unadjusted Lerner indices to estimate profit efficiency between 1976 and 1996 (column 7) and at the 10% level between 1997 and 2005 (column 11). First-stage explanatory power is high overall but weakest for the post-IBEEA period. Even for the latter period, only one specification (column 12) fails to yield an F-test statistic above the conventional critical threshold value of 10. We infer that specification tests support our choices of instrumental variables.

Table 7 gives the estimated parameters for the IV regression model to test the quiet life hypothesis. Using cost efficiency as the dependent variable, the main coefficient of interest for (instrumented) Lerner indices is significantly positive for all three periods. Banks with larger Lerner margins are better at minimizing costs, thus rejecting the quiet life hypothesis. This result contrasts with Berger and Hannan (1998) and Delis and Tsionas (2009), which implies differences in inferences when measuring concentration or competition using bank-specific estimates of markups. The difference of effects between adjusted and unadjusted Lerner margins in columns 2 and 4 is small for the entire sample. The estimated coefficient of 0.3016 in column 2 is equivalent to an elasticity of cost efficiency with respect to market power of approximately sixteen basis points. While generally low in magnitude, it is economically the most important effect compared to other bank-specific covariates.[17] In this regard, considerably larger coefficients for

[15] This conjecture is corroborated by Bos et al. (2010), who find that average price cost margins in the U.S. banking industry rose from about 9% in 1984 to almost 25% in 2004. They note that increased multimarket contact due to interstate banking deregulation may have increased tacit collusion among larger banks. Hauswald and Marquez (2003) propose that advances in information processing technology may give an advantage of larger banks over smaller banks and thereby tend to decrease competition. Also, Cetorelli and Strahan (2006) find that less credit is available to borrowing firms in banking markets that are highly concentrated. On the other hand, according to Vives (2001), deregulation and financial innovations have substantially increased competition in U.S. and European banking markets.

[16] To conserve space, we do not report first-stage coefficient estimates, which are available on request.

[17] Elasticities are evaluated at the mean of all covariates and available on request. Other economically important factors are the share of loan to total income (7 basis points) and capital ratios (3 basis points).

Table 5.—Adjusted and Unadjusted Lerner Indices: U.S. Banks in the Period 1976–2007

	Lerner Index		Spearman's Rank Correlation			Efficiency	
Year	Unadjusted	Adjusted	*N*	*r*	*p*-value	CE	PE
1976	0.289	0.372	12,609	0.633	0.000	0.781	0.572
1977	0.296	0.368	13,215	0.615	0.000	0.785	0.597
1978	0.308	0.398	13,761	0.575	0.000	0.798	0.592
1979	0.302	0.382	13,562	0.553	0.000	0.793	0.602
1980	0.290	0.376	13,686	0.517	0.000	0.793	0.566
1981	0.277	0.383	12,833	0.498	0.000	0.798	0.514
1982	0.256	0.365	12,036	0.534	0.000	0.788	0.483
1983	0.244	0.358	13,707	0.546	0.000	0.786	0.471
1984	0.276	0.393	13,513	0.491	0.000	0.810	0.452
1985	0.282	0.368	13,563	0.494	0.000	0.799	0.463
1986	0.277	0.327	13,344	0.515	0.000	0.782	0.469
1987	0.284	0.343	12,894	0.505	0.000	0.782	0.508
1988	0.287	0.361	12,300	0.481	0.000	0.789	0.526
1989	0.285	0.372	12,366	0.409	0.000	0.797	0.514
1990	0.280	0.373	12,025	0.444	0.000	0.797	0.505
1991	0.286	0.381	11,718	0.430	0.000	0.790	0.528
1992	0.327	0.403	11,364	0.349	0.000	0.781	0.603
1993	0.344	0.426	10,984	0.316	0.000	0.784	0.631
1994	0.348	0.432	10,513	0.296	0.000	0.789	0.641
1995	0.341	0.447	9,986	0.248	0.000	0.801	0.606
1996	0.343	0.424	9,188	0.263	0.000	0.778	0.626
1997	0.342	0.460	9,111	0.286	0.000	0.808	0.584
1998	0.332	0.449	8,708	0.290	0.000	0.802	0.569
1999	0.325	0.454	8,513	0.309	0.000	0.802	0.564
2000	0.321	0.473	8,220	0.302	0.000	0.808	0.529
2001	0.321	0.484	7,864	0.286	0.000	0.801	0.507
2002	0.359	0.491	7,580	0.300	0.000	0.790	0.567
2003	0.370	0.505	7,140	0.283	0.000	0.786	0.581
2004	0.376	0.523	6,705	0.308	0.000	0.788	0.582
2005	0.364	0.527	6,886	0.283	0.000	0.781	0.552
2006	0.340	0.553	6,622	0.205	0.000	0.787	0.471
2007	0.319	0.583	6,340	0.175	0.000	0.797	0.391
Total	0.306	0.409	342,856			0.792	0.542

Table 6.—Specification Tests for IV Regression Models on the Adequacy of Instruments

Sample	1976–2007				1976–1996				1997–2005			
Adjusted Lerner	Yes		No		Yes		No		Yes		No	
Dependent	(1) PE	(2) CE	(3) PE	(4) CE	(5) PE	(6) CE	(7) PE	(8) CE	(9) PE	(10) CE	(11) PE	(12) CE
Instruments specified												
Lagged Lerner	x	x	x	x	x	x	x				x	
Share Pacific	x	x	x	x	x		x	x				
Share Hispanic									x	x		
Ethnicity HHI											x	x
Merger indicator				x						x	x	x
Acquisition indicator					x	x		x	x			
Branching restriction indicator									x			x
High school diploma					x					x		
Bachelor degree									x			
Disposable personal income	x	x										
Unemployment									x	x		x
Wooldridge (1995) overidentification tests												
Chi square	0.518	2.668	1.906	0.515	0.826	1.497	0.853	0.367	0.706	1.054	1.480	1.545
p-value	0.772	0.263	0.167	0.773	0.843	0.221	0.356	0.545	0.951	0.902	0.477	0.672
Wooldridge (1995) exogeneity tests												
Score	33.800	124.100	5.932	7.116	47.480	244.700	3.505	244.700	30.710	72.590	4.723	7.944
p-value	0.000	0.000	0.015	0.008	0.000	0.000	0.061	0.000	0.000	0.000	0.030	0.005
Robust *F*-statistic	33.770	120.400	6.583	8.504	48.830	279.300	3.710	178.600	30.830	72.740	6.062	7.937
p-value	0.000	0.000	0.010	0.004	0.000	0.000	0.054	0.000	0.000	0.000	0.014	0.005
First-stage diagnostics												
R^2 value	0.670	0.670	0.639	0.639	0.640	0.624	0.609	0.253	0.212	0.212	0.612	0.174
Robust *F*-statistic	487.7	487.7	301.9	297.0	1011.9	2606.4	189.5	30.4	23.8	20.7	100.9	9.0
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

See table 1 for definitions of instrumental variables. PE and CE denote profit efficiency and cost efficiency, respectively. Specifications correspond to those reported in table 7. The null hypothesis of the robust Wooldridge overidentification score test is that instruments are valid. The null hypothesis for the exogeneity test is that the instrumented variable is not endogenous.

TABLE 7.—IV REGRESSION MODEL RESULTS ON THE QUIET LIFE HYPOTHESIS: U.S. BANKS IN THE PERIOD 1980–2007

Sample period	1980–2007				1980–1996				1997–2005			
Adjusted Lerner	Yes		No		Yes		No		Yes		No	
Dependent	(1) PE	(2) CE	(3) PE	(4) CE	(5) PE	(6) CE	(7) PE	(8) CE	(9) PE	(10) CE	(11) PE	(12) CE
Lerner index SFA	−0.3720***	0.3016***	0.9000***	0.3298***	−0.4302***	0.3469***	0.9440***	1.2534***	−0.6525***	0.5162***	0.8981***	0.7644***
	[0.0224]	[0.0176]	[0.0180]	[0.0038]	[0.0124]	[0.0066]	[0.0295]	[0.1591]	[0.0744]	[0.0462]	[0.0146]	[0.1797]
Market share (state)	0.0004***	0.0007***	0.0011***	0.0016***	−0.0003	0.0002***	0.0021***	0.0030***	0.0019***	−0.0001	0.0006*	0.0015***
	[0.0002]	[0.0001]	[0.0002]	[0.0001]	[0.0002]	[0.0001]	[0.0002]	[0.0005]	[0.0003]	[0.0002]	[0.0003]	[0.0002]
Top 100 bank	−0.0651***	0.0305***	−0.0827***	0.0857***	−0.0575***	0.0205***	−0.1021***	0.1379***	−0.0070	0.0110	−0.0663***	0.0967***
	[0.0049]	[0.0033]	[0.0038]	[0.0018]	[0.0044]	[0.0019]	[0.0046]	[0.0078]	[0.0117]	[0.0074]	[0.0076]	[0.0061]
Security share	0.0020***	0.0002***	0.0018***	−0.0004***	0.0021***	0.0006***	0.0017***	−0.0002*	0.0007**	0.0002	0.0019***	−0.0021***
	[0.0001]	[0.0000]	[0.0001]	[0.0000]	[0.0001]	[0.0000]	[0.0001]	[0.0001]	[0.0003]	[0.0002]	[0.0001]	[0.0002]
HHI index loan categories	−0.0552***	−0.0010	−0.0657***	0.0114***	−0.0471***	−0.0391***	−0.0501***	−0.0793***	−0.0505***	0.0105***	−0.0389***	0.0298***
	[0.0029]	[0.0014]	[0.0023]	[0.0011]	[0.0032]	[0.0014]	[0.0031]	[0.0033]	[0.0061]	[0.0039]	[0.0044]	[0.0046]
Loan income share	−0.0018***	0.0009***	−0.0026***	0.0022***	−0.0018***	0.0004***	−0.0026***	0.0017***	0.0006	0.0002	−0.0026***	0.0031***
	[0.0001]	[0.0000]	[0.0001]	[0.0000]	[0.0001]	[0.0000]	[0.0001]	[0.0001]	[0.0005]	[0.0003]	[0.0001]	[0.0001]
Loan-loss provisions	−0.0412***	0.0083***	−0.0171***	−0.0029***	−0.0418***	0.0110***	−0.0155***	0.0083***	−0.0677***	0.0198***	−0.0301***	−0.0073***
	[0.0029]	[0.0010]	[0.0013]	[0.0002]	[0.0030]	[0.0010]	[0.0013]	[0.0017]	[0.0060]	[0.0029]	[0.0034]	[0.0011]
Loan-loss reserves	−0.0138***	0.0007	−0.0005	−0.0043***	−0.0170***	−0.0008	−0.0004	−0.0082***	0.0007	−0.0024	0.0016	−0.0051***
	[0.0031]	[0.0009]	[0.0012]	[0.0003]	[0.0037]	[0.0011]	[0.0013]	[0.0010]	[0.0026]	[0.0016]	[0.0014]	[0.0006]
Z-score	0.0001***	0.0001***	−0.0001***	0.0001***	0.0000***	0.0001***	−0.0001***	0.0001***	0.0002***	−0.0000**	−0.0001***	−0.0000
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Equity ratio	0.0024***	0.0024***	−0.0163***	0.0078***	0.0078***	−0.0000	−0.0184***	−0.0032	−0.0004	0.0006	−0.0146***	0.0032***
	[0.0008]	[0.0006]	[0.0003]	[0.0001]	[0.0005]	[0.0003]	[0.0005]	[0.0020]	[0.0018]	[0.0013]	[0.0003]	[0.0010]
Constant	0.6887***	0.4922***	0.4082***	0.4504***	0.8241***	0.6072***	0.5930***	0.3808***	0.9121***	0.4754***	0.5108***	0.3296***
	[0.0083]	[0.0036]	[0.0069]	[0.0023]	[0.0098]	[0.0017]	[0.0098]	[0.0299]	[0.0165]	[0.0096]	[0.0090]	[0.0571]
Number of observations	276,585	276,585	276,956	276,956	199,708	199,708	199,708	199,708	66,704	66,704	65,214	66,704
R^2 values	0.375	0.704	0.356	0.456	0.372	0.677	0.350	0.413	0.187	0.288	0.332	0.271

Results from instrumental variable regressions. See table 6 for specified instruments and diagnostic statistics. Robust standard errors in parentheses. Bank- and time-specific effects included but not reported. Significance at *10%, **5%, ***1%. Variable definitions are provided in table 1.

unadjusted Lerner indices compared to adjusted indices in the pre-IBEEA period in columns 6 and 8 and (to a lesser extent) post-IBEEA period in columns 10 and 12 indicate a substantial overestimation of the benefits from increasing banks' markups on cost efficiency.

Results on the relation between bank market power and efficiency differ more substantially depending on whether Lerner indices are adjusted for profit inefficiency. While unadjusted Lerner indices again reject the quiet life hypothesis in all three periods, as shown in columns 3, 7, and 11 in table 7, the estimated coefficients for adjusted Lerner indices are significantly negative in support of the quiet life. Thus, explicitly distinguishing forgone rents from markups reveals that U.S. banks trade off some of their market power in exchange for a quiet life. This quiet life pertains to unrealized profits and therefore suggests welfare losses accruing to equity owners. Unreported elasticity estimates of 28 basis points indicate that changing markups are again the most economically important bank-specific determinant of profit efficiency compared to changes in other covariates. A 1% increase in loan income reduces profit efficiency by 21 basis points, and a similar increase in loan-loss provisions reduces it by 5 basis points. The increasing magnitude of the estimated coefficient for instrumented Lerner indices in the post-IBEEA period in column 9 supports earlier descriptive evidence in table 5 of rising market power that the quiet life of U.S. banks increased over time and reached a peak before the recent financial crisis.

It is possible that relations between margins and efficiency could simply be due to poorly specified cost and profit functions. Table 8 shows five of the various robustness checks that we conducted to address concerns about the cost and profit frontier estimation. We employ weighted regression frontier estimation, include state dummies, split our sample between very large banks and the remaining sample, and specify risk controls in the kernel of the cost and profit frontiers. These robustness checks confirm our baseline results above that unadjusted Lerner indices consistently underestimate bank market power.

B. *Deregulation Effects*

Did geographic deregulation alter the relationship between efficiency and competition? To assess the effects of deregulation on the quiet life hypothesis, we extend previous analyses by using the difference-in-difference specification of equation (8). Table 9 reports the results for the two subsample periods. Columns 1 to 4 correspond to the period 1976 to 1996 before IBEEA implementation. As discussed in section V, after the de jure implementation of the IBEEA, states continued to differ along four provisions affecting the degree to which they de facto permitted interstate branching. Columns 5 to 8 in table 9 show the associated parameter estimates using the joint specification of all restriction indicators.

First, we consider the relation between Lerner indices and efficiency. In both pre- and post-IBEEA periods, the

TABLE 8.—ROBUSTNESS TESTS OF ALTERNATIVE FRONTIER SPECIFICATIONS

	Baseline		Weights (Deposits)		State[a]		Top 100		Without Top 100		Risk[b]	
Efficiency	CE	PE	CE	PE	CE	PE	CE	PE	CE	PE	CE	PE
Mean	0.792	0.543	0.792	0.574	0.819	0.544	0.789	0.568	0.797	0.523	0.846	0.563
S.D.	0.080	0.171	0.098	0.191	0.067	0.185	0.111	0.195	0.078	0.191	0.080	0.178
SFA estimation diagnostics												
Lambda	1.485	2.318	1.879	2.519	1.294	3.131	1.889	3.391	1.434	3.625	2.136	2.692
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sigma	0.359	1.010	0.351	0.856	0.324	1.021	0.376	0.839	0.355	1.098	0.247	0.913
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Lerner Index	*OLS*	*SFA*	*OLS*	*SFA*	*OLS*	*SFA*	*OLS*	*SFA*	*OLS*	*SFA*	*OLS*	*SFA*
Mean	0.306	0.409	0.364	0.402	0.293	0.391	0.543	0.612	0.311	0.431	0.443	0.530
S.D.	0.115	0.263	0.110	0.345	0.117	0.261	0.099	0.175	0.114	0.245	0.213	0.087
IV regression (1980–2007 sample)												
Parameter	0.3016***	−0.3720***	0.3333***	−0.3854***	0.2747***	−0.4550***	0.6787***	−1.1398***	0.3083***	−0.4733***	0.3531***	−0.4599***
Robust SE	[0.0176]	[0.0224]	[0.0225]	[0.0264]	[0.0138]	[0.0245]	[0.0631]	[0.1031]	[0.0137]	[0.0224]	[0.0703]	[0.0860]

Cost efficiency (CE) and profit efficiency (PE) estimates as well as key diagnostics for alternative frontier specifications.
[a]Including state dummies, not reported.
[b]Frontier estimations including all explanatory variables used in the IV regression model in both the kernel and inefficiency distribution.

Table 9.—Difference-in-Difference Regression Model Results for Deregulation Effects, 1976–2007

Sample period	1976–1996				1997–2004			
Adjusted Lerner	Yes		No		Yes		No	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable	PE	CE	PE	CE	PE	CE	PE	CE
Lagged Lerner	−0.0491***	0.1187***	0.3772***	0.1046***	−0.0074	0.1070***	0.2247***	0.0442***
	[0.0044]	[0.0023]	[0.0130]	[0.0051]	[0.0092]	[0.0080]	[0.0150]	[0.0051]
INTRA	0.0283***	−0.0032	0.0712***	−0.0051				
	[0.0033]	[0.0021]	[0.0102]	[0.0036]				
INTER	0.0246***	−0.0063***	0.0076	−0.0104***				
	[0.0032]	[0.0019]	[0.0093]	[0.0035]				
INTRA × Lerner	−0.0291***	0.0061	−0.1828***	0.0058				
	[0.0073]	[0.0053]	[0.0342]	[0.0117]				
INTER × Lerner	−0.0095	0.0288***	0.0365	0.0510***				
	[0.0070]	[0.0046]	[0.0312]	[0.0115]				
BRI_1 × Lerner					0.0695***	−0.0161	−0.0101	−0.0173
					[0.0201]	[0.0117]	[0.0279]	[0.0111]
BRI_2 × Lerner					−0.0827***	0.0271*	−0.0745**	−0.0102
					[0.0283]	[0.0158]	[0.0323]	[0.0151]
BRI_3 × Lerner					−0.0025	0.0026	0.0293	0.0348**
					[0.0283]	[0.0155]	[0.0315]	[0.0160]
BRI_4 × Lerner					−0.0047	−0.0313**	0.0819*	−0.0029
					[0.0402]	[0.0158]	[0.0448]	[0.0200]
BRI_1					−0.0435***	0.0064	−0.0049	0.0032
					[0.0103]	[0.0062]	[0.0106]	[0.0045]
BRI_2					0.0406***	−0.0227***	0.0324**	−0.0075
					[0.0137]	[0.0079]	[0.0128]	[0.0062]
BRI_3					0.0084	0.0097	−0.0082	0.0007
					[0.0136]	[0.0076]	[0.0126]	[0.0065]
BRI_4					0.0603	0.0180	0.0358	0.0010
					[0.0674]	[0.0124]	[0.0655]	[0.0159]
Constant	0.6091***	0.7440***	0.4819***	0.7588***	0.5857***	0.7229***	0.4954***	0.7612***
	[0.0020]	[0.0010]	[0.0039]	[0.0016]	[0.0049]	[0.0040]	[0.0060]	[0.0021]
R^2 Values	0.241	0.241	0.266	0.093	0.086	0.231	0.127	0.139
Number of observations	234,822				67,701			
Banks	18,298				10,189			

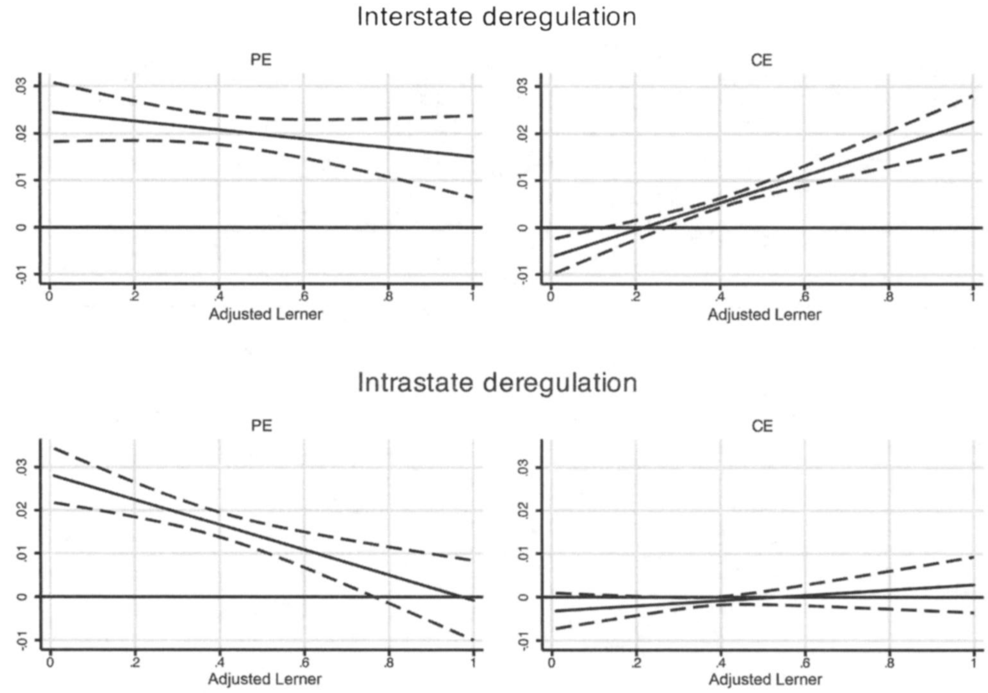
Results are based on difference-in-difference regressions. Robust standard errors are in parentheses. Bank- and time-specific fixed effects are included but not reported. For variable definitions, see table 1.

estimated coefficients on adjusted Lerner indices again have negative signs for profit efficiency (−0.0491 and −0.0074 in columns 1 and 5, respectively). The overall effect taking interaction terms into account is negative too. In line with the results of table 7, we infer that the evidence favors the quiet life hypothesis exists but is weaker after the implementation of the IBEEA (that is, the negative estimated coefficient on the adjusted Lerner index is no longer significant in this period). The estimated coefficients on adjusted Lerner indices have positive signs for cost efficiency (0.1187 and 0.1070 in columns 2 and 6, respectively) in pre- and post-IBEEA periods. These results corroborate the earlier inference from IV estimations to reject the quiet life regarding the cost efficiency of U.S. banks.

Second, we evaluate the direct relation between deregulation and efficiency. In the pre-IBEEA period, intrastate branching (*INTRA*) had a positive and significant direct effect on banks' ability to generate profits independent of whether Lerner indices are adjusted (0.0283 and 0.0712 in columns 1 and 3, respectively). However, the substantially larger *INTRA* coefficient using unadjusted Lerner indices suggests that failure to adjust these indices results in overestimation of the potential benefits of intrastate branching deregulation in terms of slack elimination on the revenue side of the banking industry. Turning to interstate banking (*INTER*) effects on profit efficiency, the case for adjusting Lerner indices is further bolstered by the finding that a significant positive effect is observed only for adjusted indices. The direct cost efficiency results in the pre-IBEEA period indicate an insignificant intrastate branching (*INTRA*) effect but a significant and negative interstate banking (*INTER*) effect. The latter finding suggests that the entry of mostly large out-of-state banks into previously closed regional markets shifted the optimal cost benchmark faced by the majority of regional incumbents down.

Third, we assess deregulation effects for efficiency conditional on different levels of competition. Brambor, Clark, and Golder (2006) caution that inference from interaction models should not rely on individual coefficients alone. To estimate the overall effect of deregulation, we assess the total marginal effects of deregulation from both direct and interaction terms on efficiency, conditional on different levels of competition. Based on parameter estimates in the pre-IBEEA 1976 to 1996 period shown in columns 1 and 2 of table 9, we compute the total marginal effects and standard errors (Oehlert, 1992) of deregulation on efficiency scores graphically illustrated in figure 2.

FIGURE 2.—TOTAL MARGINAL EFFECTS OF DEREGULATION ON EFFICIENCY: U.S. BANKS, 1976–1996



Notes: Based on parameters in columns (1) and (2) of Table 9

The upper (lower) two panels of figure 2 show the total effects of interstate (intrastate) deregulation on profit and cost efficiency (denoted PE and CE, respectively). The overall effect of interstate banking on profit efficiency is significantly positive across the range of Lerner indices, with gains of about 2%. However, profit efficiency gains due to interstate banking decrease as Lerner indices increase, which agrees with the quiet life hypothesis. Also, the effect on cost efficiency is statistically different from 0 beyond a threshold Lerner index of around 30 points, with cost efficiency gains of up to 2% at higher market power levels.

Similar to figure 2, figures 3 and 4 illustrate the total marginal effects of deregulation on profit and cost efficiency, respectively. Casual observation of figures 3 and 4 suggests that efficiency was not significantly affected by different aspects of geographic deregulation in the post-IBEEA 1997–2004 period for the most part, with the following exceptions: (a) decreased profit efficiency (figure 3) among banks with low Lerner indices conditional on abolishing minimum age requirements, (b) increased (decreased) profit efficiency (figure 3) and decreased cost efficiency (figure 4) among banks with low (high) Lerner indices with respect to allowing out-of-state banks to set up de novo branches among banks, and (c) increased cost efficiency (figure 4) among banks with mid-range Lerner indices related to permitting out-of-state banks to acquire single branches. Especially the de novo interstate branching profit efficiency results in figure 3 agree with the quiet life hypothesis, as banks with very high indices, larger than approximately 80 points, had about 4% lower profit efficiency in the post-IBEEA period. According to DeYoung (2003), de novo banks have a higher propensity to fail compared to their more tenured peers, which may partially explain lower profits in these states.

VII. Conclusion and Implications

According to Hicks's (1935) quiet life hypothesis, firms possessing market power may forgo monopolistic rents in favor of cost and profit inefficiencies. We proposed theory and evidence for adjusting Lerner indices for potential cost and profit inefficiencies to test this hypothesis. Empirical results are presented for a panel of approximately 350,000 observations containing annual data for all insured U.S. commercial banks from 1976 to 2007, a period of historic geographic deregulation. Because states gradually deregulated interstate banking restrictions to increase competition, we examined the effect of liberalized banking markets on the quiet life relation. Unlike previous empirical studies, we estimated both efficiency and competition measures simultaneously, thereby avoiding the implicit assumption of full efficiency in the estimation of conventional Lerner indices of competitive behavior. This empirical approach enabled us to consider the possibility that banks fail to fully exploit output-pricing opportunities due to market power. Moreover, since competition and efficiency are closely intertwined, we accounted explicitly for bidirectional causality in our estimation strategy.

We found that efficiency-adjusted Lerner indices are on average more than 30% larger compared to conventional

FIGURE 3.—TOTAL MARGINAL EFFECTS OF DIFFERENT STATE-LEVEL INTERSTATE BRANCHING DEREGULATION ON PROFIT EFFICIENCY: U.S. BANKS, 1997–2005

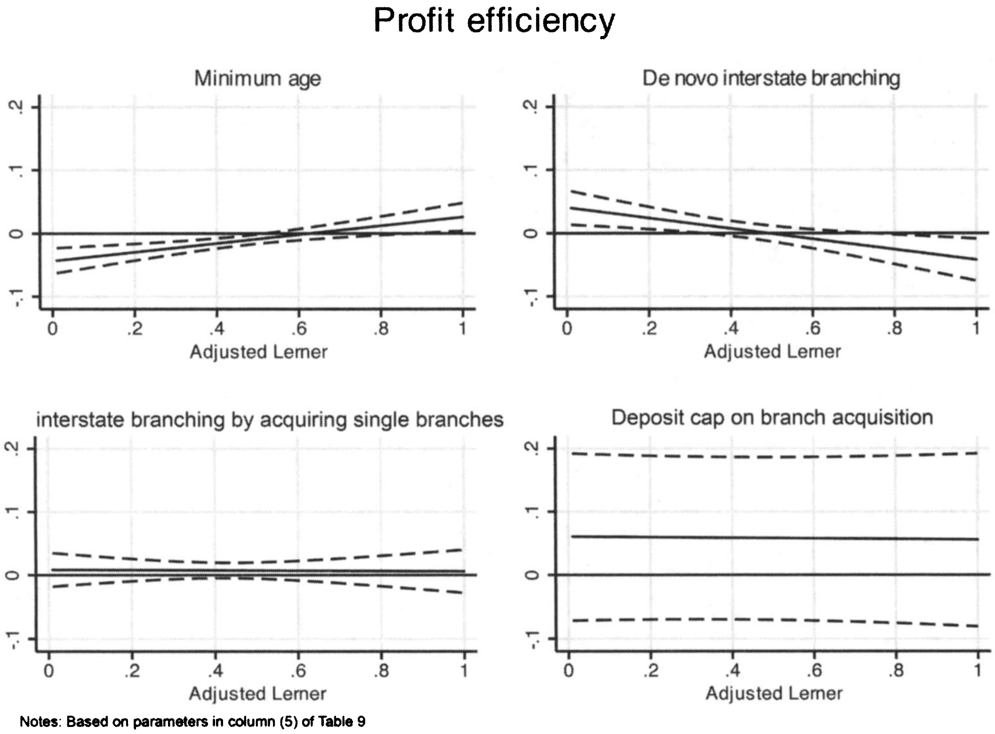
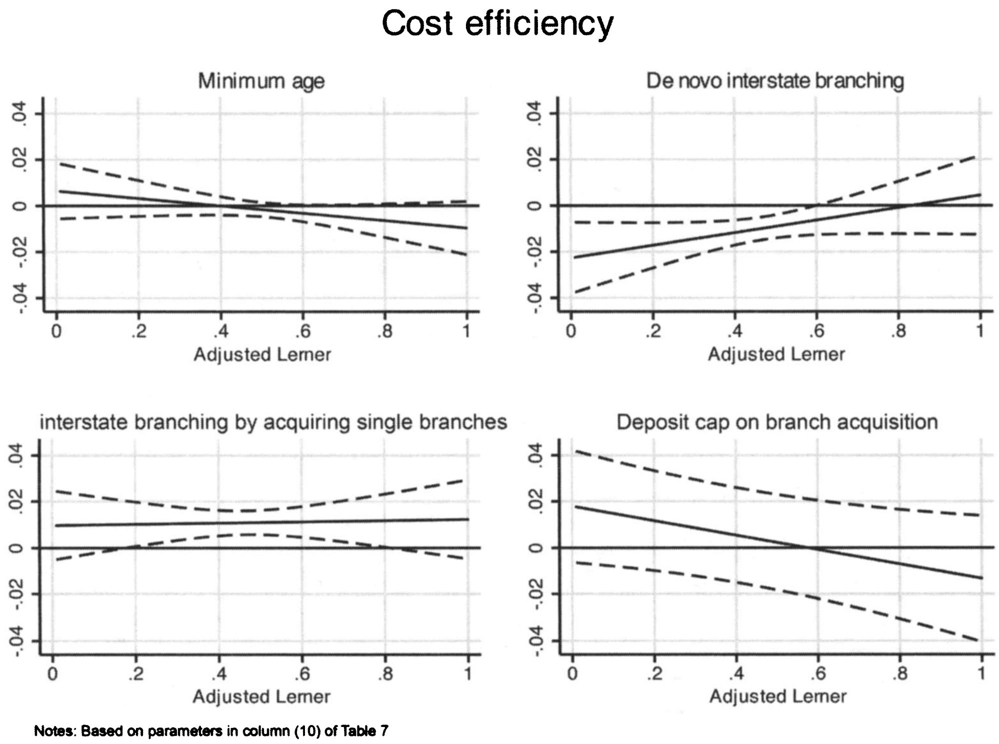


FIGURE 4.—TOTAL MARGINAL EFFECTS OF DIFFERENT STATE-LEVEL INTERSTATE BRANCHING DEREGULATION ON COST EFFICIENCY: U.S. BANKS, 1997–2005



Lerner indices. In contrast to little change in competition from 1998 to 2007 using conventional Lerner indices, adjusted indices reveal increasing market power in the U.S. banking industry. Competition studies should therefore use this simple adjustment to realistically take into account cost and profit inefficiencies that exist in many firms, which are implicitly assumed to be 0 in unadjusted Lerner indices.

The relation between market power and cost efficiency using both unadjusted and adjusted Lerner indices was consistently positive. By contrast, a significant negative relation between profit efficiency and efficiency-adjusted Lerner indices was found. Hence, profit efficiency declined as market power among U.S. banks increased in our sample period, which favors the quiet life hypothesis. Unadjusted Lerner indices were unable to detect this significant profit efficiency to market power relation. Taking into account geographic deregulation of banks over time, we again found evidence that U.S. banks were enjoying the quiet life in terms of profit efficiency. However, this evidence was weaker after full implementation of federal interstate banking legislation. Furthermore, we showed that the effects of geographic deregulation on bank profit and cost efficiency are often different for adjusted versus unadjusted Lerner indices and that deregulation normally did not affect the relationship between competition and efficiency in the banking industry. The effect of deregulation on efficiency is generally positive but fairly weak after federal legislation introduced after 1996. Furthermore, positive deregulation effects on the relative ability of banks to generate profits are reduced if competition is low.

In light of recent regulatory reform legislation that increases supervisory scrutiny and limits the scope of permitted banking activities (according to the so-called Volcker rule to curb proprietary trading activities of banks with federally insured deposits; Volcker & Frenkel, 2009), our deregulation results suggest that only limited efficiency losses can be expected. However, the existence of a quiet life on the profit side of U.S. banks despite past deregulation supports the development of policies that increase the contestability of banking markets. Complementing current efforts to tighten prudential supervision with competition-enhancing policies rather than massive bailouts of distressed banks may thus be warranted.

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