



# Assessing market power in the U.S. commercial banking industry under deregulation

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## ABSTRACT

This study attempts to investigate market power in the U.S. commercial banking industry since the U.S. government began to deregulate the banking sector in the early 1990s using the static Bresnahan–Lau model (SBLM) and dynamic Bresnahan–Lau model with error corrections (DBLEC). In particular, panel unit root and panel cointegration techniques are utilized to examine the dynamic model. The empirical results of the SBLM show that the banking industry is highly competitive. The empirical results of DBLEC also suggest that the commercial banking industry is close to being perfectly competitive in the short run. By contrast, the adjustment speeds of the supply and demand sides towards the long-run equilibrium are quite slow in that market, which implies that the U.S. commercial banks enjoy a certain degree of long-run market power.

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## 1. Introduction

The U.S. financial sector has been highly innovative since the 1960s. For example, the widespread issuance of large-value, fixed-term negotiable certificates of deposit, and new types of futures and options contracts met the rapidly growing demand for liquid securities. In the early 1990s, the U.S. government began to relax its stringent regulations by eliminating legal barriers to mergers and acquisitions. The Federal Deposit Insurance Corporation Improvement Act (FDICIA) of 1991 allowed for unrestricted merger and acquisition activity (in compliance with the Bank Merger Act) between national banks and all types of credit institutions.<sup>2</sup> In the late 1990s, 46 state governments permitted out-of-state banks to acquire banks based on their states. In 1999, the Gramm–Leach–Bliley Financial Services Modernization Act repealed Glass–Steagall restrictions on banks that had lasted for over 60 years. While banks continued to grow larger through merger and acquisition activities, new types of financial instruments, such as commercial bills, junk bonds and financial derivatives, came to play an increasingly important role in banks' operations.

In addition to the number of banks and the concentration ratio of the industry (Berger et al., 2004), the government regulations (Canhoto, 2004; Cetorelli, 2004; Demirgüç-Kunt et al., 2004; Ho, 2010), the soundness of the financial system as a whole, the shape taken by banking networks and the level of financial innovation have also had substantial impacts on the degree of competition within the banking industry (Cetorelli, 2004; Northcott, 2004). For instance, Cetorelli's (2004) and Ho's (2010) empirical results showed that the banking industry in the EU and Hong Kong have become more competitive following deregulation.

In this study, we analyze the quarterly panel data of 338 listed U.S. commercial banks over the period from the first quarter of 1990 to the fourth quarter of 2005. The total number of observations is 21,632. We apply the static Bresnahan–Lau model (SBLM) (Bresnahan, 1989) as well as the dynamic Bresnahan–Lau model with error corrections (DBLEC), derived from panel unit root tests and panel cointegration analyses, to examine the degree of short-run and long-run market power in the U.S. commercial banking industry.

The remainder of the paper is organized as follows. Section 2 reviews the literature on the SBLM and DBLEC in regard to market power. Section 3 constructs the empirical models and describes the data. Section 4 analyzes the empirical results, while the final section concludes the paper.

## 2. Literature review

In the past few decades, the SBLM (Bresnahan, 1982, 1989; Lau, 1982) has been used to examine market power in the banking,

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<sup>2</sup> In the early 1990s, the banking industry in the European Union (EU) has also been deregulated to branch freely across borders within EU countries (Cetorelli, 2004).

agriculture and fishery, and power industries around the world.<sup>3</sup> In the area of banking, Shaffer (1989, 1993) examined the U.S. and Canadian banking industries. The market power of both banking markets was found to be insignificant, while the loan, deposit (Bikker and Haaf, 2000) and consumer credit (Toolseman, 2002) markets in the Netherlands exhibited almost perfect competition after 1983. On the basis of Bikker's (2003) study, both the housing loan and corporate lending markets in nine members<sup>4</sup> of the EU were found to be highly competitive during the period 1976–1998. This result is consistent with Nathan and Neave's (1989) findings for the same industry.

However, Shaffer and Disalvo (1994) studied the banking duopoly that existed in Fulton County, Pennsylvania in the U.S. over the period from 1970 to 1986 and from 1976 to 1986, respectively. They concluded that during both periods, the situation in Fulton County was somewhere between that of a duopoly and a competitive market, whereas the degree of market power possessed by the two banks was relatively low. Zardkoohi and Fraser (1998) investigated the impact of regional deregulation on competition in the U.S. banking industry during the period from 1964 to 1993, and found that the impact of deregulation on competition varied significantly from state to state. In some states, the abolition of controls actually led to an increase in the market power of banks operating in that state.

Neven and Röller's (1999) empirical results showed that the loans markets of seven European countries were characterized by collusive behavior between 1981 and 1990, but that the intensity of such behavior declined over time. Suominen (1994) revealed that monopoly power was statistically significant in the deposit and loan markets in Finland from 1986 to 1989. Angelini and Cetorelli (2000) and Canhoto (2004) respectively investigated Italian banking assets from 1983 to 1997 and Portuguese deposit markets in the early 1990s. They found that both markets enjoyed a certain level of market power. Bikker and Haaf (2000) also confirmed that the Portuguese deposit market was oligopolistic during the period from 1983 to 1998, while the loan and deposit markets were highly competitive in another eight European countries. Móri and Nagy (2004) found the Hungarian credit market to be much less competitive than those of the EU member nations during the period 1996–2003.

As for other industries, Hjalmarsson (2000) applied the DBLEC to an analysis of the electric power market in Norway and Sweden. In the agriculture and fishery industries, Buschena and Perloff (1991) showed that legal and institutional changes after 1973 significantly strengthened the market power of coconut oil refining and exporting firms in the Philippines. On the other hand, Deodhar and Sheldon (1997) found the world market for soymeal exports to be perfectly competitive, while Hatirli et al. (2003) faced the same consequence in regard to banana imports by Turkey. By employing the SBLM, Frank and Steen (2006) suggested that the Salmon Agreement in 1997 enhanced the Norwegian salmon's market power in the French market. By contrast, Steen and Salvanes (1999) found that the French salmon market was more or less fully competitive using the SBLM and DBLEC.

To date, relatively few studies have employed the SBLM and DBLEC to examine market power, particularly in the banking industry. The current study aims to fill this gap in the literature by exploring both short-run and long-run competition in the U.S. commercial banking industry over the period 1990–2005.

### 3. Data and methodology

#### 3.1. Definition of variables

Financial institutions produce a variety of outputs, whose characteristics differ significantly from those of manufacturing firms. The prices of a bank's inputs and outputs are difficult to measure. In addition, distinguishing between inputs and outputs is a challenging task.

Favero and Papi (1995) proposed five methods to measure bank inputs and outputs, based on the role played by a bank.<sup>5</sup> The intermediation approach has been extensively employed in the literature, due partially to the availability of financial data. This approach treats a bank as a financial intermediary that hires labor, capital and various funds to produce financial services, such as loans, investments and non-traditional activities. An ordinary U.S. commercial bank appears to operate in this manner. With this approach, the emphasis is on the process of transferring funds from companies and households that have surplus funds to those that are lacking in funds. We therefore adopt the intermediation approach to define banks' inputs and outputs.<sup>6</sup>

Following Shaffer (1989), Shaffer and Disalvo (1994), Zardkoohi and Fraser (1998) and Móri and Nagy (2004), a bank's balance sheet entry "total loans & leases, gross" is selected as the output quantity ( $Q$ ). Its price ( $P$ ) is calculated as the ratio of the interest and fee income from loans to total loans and leases. A higher price of the output is anticipated to be negatively associated with the quantity demanded for bank loans.

We use the real GDP as an income level ( $Y$ ) indicator, as did Shaffer (1989) and Móri and Nagy (2004). Any one of the interest rate on the U.S. three-month Treasury Bills, the interest rate on commercial paper, or the interest rate on informal loans is most often chosen as the exogenous variable affecting the demand for bank loans. Because of the unavailability of the rate on comprehensive commercial paper and the difficulty in acquiring informal loan interest rates during the sample period, we use the interest rate on three-month Treasury Bills to act as the exogenous variable ( $Z$ ).<sup>7</sup> Shaffer (1993) adopted the same indicator to examine the impact of the indicator's fluctuations on lending in the Canadian banking industry.

Two bank-specific input prices are identified to explain the variations in output prices. One of them is the average wages ( $W^1$ ) and the other is the interest rate on total deposits, calculated as the ratio of interest on deposits to total deposits ( $W^2$ ). This definition is consistent with that in Zardkoohi and Fraser (1998). The higher are the input prices, the higher are the bank's output prices. The data required to compute the aforementioned variables are taken from the Bureau of Labor Statistics (BLS) and the Federal Reserve Banks of Chicago and St. Louis, respectively. They comprise quarterly data for 338 listed commercial banks in the U.S. stock market over the period 1990Q1–2005Q4. Table 1 describes the data sources and variable definitions.<sup>8</sup>

#### 3.2. The Static Bresnahan–Lau Model (SBLM)

In the following, we begin by describing a simple algebraic demonstration and general theoretical structure of the Bresnahan–Lau Model.

<sup>5</sup> The five methods are: (1) the production approach; (2) the user cost approach; (3) the value-added approach; (4) the intermediation approach; (5) the asset approach.

<sup>6</sup> Shaffer (1989), Favero and Papi (1995) and Noulas (1997) all used the intermediation approach to measure bank inputs and outputs.

<sup>7</sup> Zardkoohi and Fraser (1998) adopted the interest rate on six-month commercial paper to investigate the U.S. banking industry, while the three-month data fit our quarterly time span.

<sup>8</sup> Appendix A shows that the pairwise collinearity hypotheses of the correlation matrix of the independent variables are rejected. The highest variance inflation factor (VIF) is that of the price ( $P$ ), whose VIF equals 7.79. The second highest VIF is that of  $Z$  equaling 5.56, followed by income ( $Y$ ) (1.52), the price of labor ( $W^1$ ) (1.22), and the price of funds ( $W^2$ ) (1.21), respectively. This implies that these variables are appropriate and can be employed in the regression analysis.

<sup>3</sup> Studies using the PR (Panzar and Rosse, 1987) model also focus on individual banks and their competitive strategies (Bikker and Haaf, 2002). However, the scaled variable acting as a dependent variable often leads to distorted parameter estimates. On the contrary, the BL (Bresnahan, 1982, 1989; Lau, 1982) model is much accurate and refined in the examination of market power (Bikker, 2003). Gunalp and Celik (2006) employed the PR model to assess the competitive environment and industrial characteristics of the Turkish banking industry especially during the financial liberalization era from 1980 to 2000.

<sup>4</sup> They are Belgium, the UK, France, the Netherlands, Germany, Italy, Portugal, Spain and Sweden.

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