*Article*

# The Impact of Changes in Financial Supervision on the Profitability of the Hungarian Banking Sector

Tibor Bareith [1] , Tibor Tatay [2,*] and József Varga [1,3,4]

1  Department of Investment, Finance and Accounting, Hungarian University of Agriculture and Life Sciences, Kaposvár Campus, HU7400 Kaposvár, Hungary; bareith.tibor@uni-mate.hu (T.B.); varga.jozsef@uni-mate.hu (J.V.)
2  Department of Economic Analyses, Széchenyi István University, HU9026 Győr, Hungary
3  Department of Finance, Corvinus University of Budapest, HU1093 Budapest, Hungary
4  Faculty of Economics, Socio-Human Sciences and Engineering, Sapientia Hungarian University of Transylvania, RO530104 Miercurea Ciuc, Romania
*  Correspondence: tatay@sze.hu

**Abstract:** Since 2013, the central bank has been responsible for supervision in Hungary. In addition to the regulatory change, a law was published in the same year that started the process of abolishing the savings co-operative system. This paper investigates the impact of these two significant changes on the profitability of the Hungarian banking sector between 2003 and 2019 using dynamic panel model estimates. The supervisory change has reduced the profitability of credit institutions and tighter supervision has been implemented. The transformation of the savings co-operative system was in fact an integration that led to the disappearance of savings co-operatives by 2019. Competition in the market has been weakened, which has increased the profitability of the remaining financial institutions. The results were robust in terms of the multiple specifications and profitability ratio.

**Keywords:** supervision change; profitability; structural change; profit persistence

**JEL Classification:** D47; E58; G21; G28

## 1. Introduction

In the aftermath of the 2008 crisis, a serious debate emerged on the role of central banks, including financial stability and these banks' relationship with financial supervision (Pesuth 2016). According to the Hungarian National Bank (MNB), which is also a leading authority in the Hungarian economic literature, there were three main reasons for the 2008 international financial crisis from a supervisory perspective: "On the one hand, the authorities were late in recognizing the systemic risks, on the other hand, the degree of the problems was significantly underestimated by decision-makers, and finally, the problems that did arise were not always properly managed" (MNB n.d.).

In the view of the Hungarian National Bank, Hungary's high vulnerability has been caused by the build-up of foreign currency—and especially foreign currency-based lending to households and corporates—the emergence of high public debt and the resulting high external indebtedness. Although some people thought at the time that Hungary would not be affected by the crisis at all (Király 2008), in reality the global economic crisis deeply affected Hungary, causing a significant drop in GDP. Hungary's GDP continued to decline in 2012 after the 2008 crisis and did not reach the 2008 level for almost a decade, only surpassing it in 2018.

Another significant change in the period under investigation was the disappearance of the savings co-operative system, which vanished from Hungary in just over 15 years. Numerically, there were 181 savings co-operatives in 2003, but the number fell down to one in 2019 (Figure 1). The market structure was significantly affected by the disappearance of

the savings co-operatives, which damaged competition in the market. It is important to note that, in addition to financial institutions, the financial sector also includes financial corporations and other financial actors, the establishment and operating rules of which are also regulated by the supervisory system (Baranyi 2019).
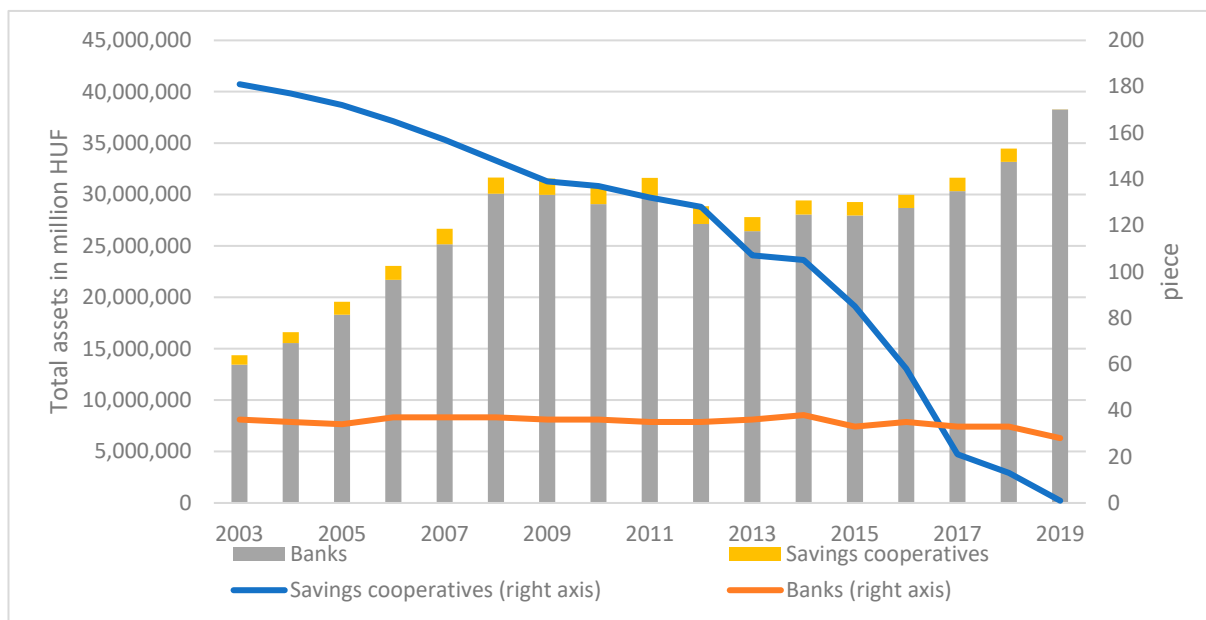


**Figure 1.** Structural change in the Hungarian banking system. Source: authors' editing based on MNB Golden Books.

This paper aims to examine the impact of changes in financial supervision on the profitability of financial institutions. Our hypothesis is that the national bank will be able to implement supervision and control more efficiently because it will concentrate all relevant data in one place. Stricter rules and more effective controls are expected to reduce the profits of the banks. In the period under examination (2003–2019), besides the supervisory change (2013), macroeconomic (global economic crisis) and market structural (savings co-operative integration) changes also affected the profitability of the Hungarian banking system. The authors estimate the impact of the change in financial supervision, taking these effects into account.

There are abundant studies in the economic literature dealing with the question of the profitability of the banking sector. Following the publication of Cull et al.'s (2011, p. 961) study about microfinance institutions (MFIs)—"To date, there has been relatively little discussion, at least within academic circles, and almost no empirical analysis of the effects that prudential supervision is likely to have on MFI profitability and outreach"—the situation has not really changed.

There are also abundant studies on organizational transformation issues. On the other hand, a less researched area—and this is the research gap our publication aims at—is how a special organizational change, namely the merger of banking supervision into the central bank, affects, as a result of more efficient control, the profitability of the banking system. Another special feature of our study is that nearly a decade has passed since the merger with the central bank, thus opening up the possibility of a comparative analysis of a longer period before and after the merger.

The stability of the banking system as a whole, the regulation of bank risk-taking, the maintenance of profitability and the maintenance of healthy competition must always maintain a delicate balance. After the 2008 crisis, regulatory changes have put macro-stability at the forefront. To this end, not only have the regulatory parameters changed but also the institutional framework of the regulator. The merging of monetary and supervisory

authorities has also taken place in Hungary. Macro- and micro-prudential supervision have thus been merged. On the practical side, however, it is also important that banks' profitability remains at the expected level in this renewed regulatory environment. The practical relevance of our study is to examine the evolution of the relationship between these institutional changes and bank profitability in the light of empirical evidence.

The structure of the study is the follow: After the introduction, we describe the main changes in the Hungarian regulatory regime in recent decades. The second section reviews the links between bank profitability and banking regulation, drawing on the literature. In the third section, we examine the profit persistence of Hungarian banks. The basic model used is the Arellano–Bond GMM dynamic panel model. In the fourth section, we report the results of the calculations and compare them with the literature. In the fifth section, the conclusions of our study are presented.

### 1.1. A Brief History of the Hungarian Banking System

During the years of socialism, Hungary had a one-tier banking system. The organization of monetary policy was not based on the logic of a market economy. The first significant step towards a two-tier banking system in Hungary was taken in 1985, when the Hungarian National Bank (MNB) was restructured and the Budapest Credit Bank (Budapest Hitelbank) was established as a subsidiary bank of the Hungarian National Bank. Furthermore, from this date, two sections were created within the MNB. These steps did not imply the introduction of a two-tier banking system, but the restructuring of the banking system was certainly a step towards this goal. On 1 January 1987, the new MNB and the system of commercial banks institutionally separated from it were set up. Based on the Anglo-Saxon model, the Hungarian banking system was organized as a specialized banking system under the Glass–Steagall Act of 1933.

The transition was not smooth, as the banks started operating under outdated laws in an economic environment of collapsing socialist cooperation, declining domestic GDP and high inflation (36% in 1991). "GDP fell by 15 percent between 1988 and 1991, and this was largely due to internal problems, exacerbated by the collapse of Eastern markets that accompanied the regime change" (Várhegyi 2019, p. 40). Another major problem was the under-capitalization of banks. In 1987, the three successor banks had a combined capital stock of less than HUF 20 billion, while the value of their lending amounted to HUF 450 billion (Várhegyi 2019). The Banking, Accounting and Bankruptcy Act, which came into force in 1991–1992, devalued the banks' portfolios by requiring them to set aside reserves for lending losses. Privatization offered a solution but, first, banks needed to be recapitalized and restructured.

This was the purpose of the consolidation of credit and banks. Under the 1992 credit consolidation, banks were allowed to convert their non-performing loans into 20-year government bonds. As this did not produce the expected results, the government had to intervene again. This new intervention was bank consolidation. As a first step, the state provided capital injections to eight banks, bringing their capital adequacy ratio to 0 percent. Since the aim was to reach the statutory capital adequacy ratio of 8 percent by the end of 1994, a further capital increase was necessary, which was carried out by means of a government bond, subordinated debt or a state guarantee. Of course, bank consolidation came at a price: the state's share of ownership in banks increased. The privatization of the domestic banking system took place after the recapitalization. Privatization was a way of eliminating state dominance in the banking sector and recapitalizing banks with foreign capital.

In 1991, parliament adopted the Financial Institutions Act (Act LXIX of 1991), which defined the activities of credit institutions, delimited the scope of activities of certain credit institutions, prescribed measures to ensure the safety of the operation of credit institutions and regulated the activities of the National Banking Supervisory Authority. Rapid economic changes, the demands on the banking system and the drive for convergence

with the European Union banking system required new regulation of the activities of credit institutions.

Act CXII of 1996 on Credit Institutions and Financial Undertakings (Hpt), which replaced the Financial Institutions Act, entered into force in 1997. This law created a legal framework that was completely compatible with the international environment. This act was last significantly amended by Act CCXXXVII of 2013. The Hungarian banking system gradually introduced the Basel I, II and now III regulatory frameworks in parallel with international legislation.

### 1.2. Financial Supervision in Hungary

After the 2008 crisis, there was a major change in the targeting of central banks. A historical perspective on the target prioritization of the triple bottom line, based on the work by Goodhart (2011), is shown in Table 1. The relationship between the three goals is expressed well by Pesuth (2016, p. 36): "However, looking at the history of central banks, we can see that since their foundation—some three centuries ago—the ultimate goal of central banks has been to support sustainable economic growth by pursuing price and financial stability." Table 1 summarizes what the role of the central bank has meant in different periods and what kind of target system central banks have had.

**Table 1.** Banking eras according to the priority of the target system.

| Central Banking Eras | | |
|---|---|---|
| Period | Name of the era | Overall characteristics of the role of the central bank |
| 1840–1914 | Victorian | Creating financial stability<br>Central bank rules generally followed a rule of thumb |
| 1930–1960 | Government intervention and control | Economic policy advice<br>Operation of a supervisory system<br>Managing markets |
| 1980–2007 | Victory of markets | The inflation-targeting system becomes more prominent |

Source: Pesuth (2016).

The background to the organizational change was the transformation of the system of governance following the 2008 crisis, where the framework of central bank policy and the philosophy of the central bank were reconsidered (Shirakawa 2010). On the relationship between central banks' traditional monetary policy, which focuses on price stability, and macro-prudential supervisory control, Jens Weidmann, President of the Bundesbank, has a remarkable view: "In order to facilitate the transition from analysis to action, a clear mandate for macroprudential supervision is needed. And there are good reasons why central banks should be involved as long as their independence and the hierarchy of their objectives, with price stability as the primary goal, are respected. Their extensive knowledge of financial markets and the macro economy is very valuable for macroprudential purposes" (Weidmann 2011). Weidmann discusses the prominent role of central banks in both price stability and macro-prudential supervision, advocating an institutional merger of central banking and supervision.

Three solutions were outlined for the institutional framework:

- In countries where micro-prudential supervision is integrated into the central bank, the central bank tends to take the primary responsibility for macro-prudential policy (UK, Ireland, Belgium, the Netherlands, the Czech Republic). In these countries, the authorities are in principle able to use the full range of tools at their disposal to address systemic risks.
- The other institutional option is a Financial Stability Board (France, Sweden, Poland, Turkey), with representatives of the supervisor, the government and the central bank.

- A third way is to ensure greater stability in the financial system by maintaining the previous institutional structure and strengthening cooperation between the different actors (Norway, Switzerland).

In both the second and third cases, central banks generally play a leading role in coordination, but their macro-prudential powers are not sufficiently broad and their scope for direct macro-prudential intervention is limited. In these cases, the macro-prudential authorities have the power to identify problems and propose interventions in an advisory capacity. The actual decision must therefore be taken by parliament or the regulator (MNB n.d.).

In economic circles, there is a long-standing and stubborn debate about how the institutional structure of supervision should be built. There is no consensus in the literature on whether micro-prudential supervision integrated into the central bank as an "integrated model" or as a separate institution ("separate model") is the more efficient solution. For a compact comparison of the system of arguments and counter-arguments, see Table 2. As it can be seen from the table, there is no a priori better solution, with countless arguments for and against the two models. In the second table, the pros and cons of integrated and independent financial supervision are presented from different aspects.

**Table 2.** Theoretical arguments for and against supervision integrated into the central bank.

| | Arguments for Integrated Supervision by the Central Bank | Arguments against Integration |
|---|---|---|
| Supervision | Eliminating cooperation problems between the central bank and the Supervisory Authority:<br><br>- Clear responsibilities<br>- Coordination of objectives (e.g., micro- and macro-prudential policy)<br>- Information sharing<br><br>Strong central bank independence and market reputation also strengthen the supervisory function<br>The central bank, as an actor in the inter-bank market, has first-hand information on market developments<br>Synergies with the central bank's oversight function<br>Concentration of the limited "knowledge" of the post makes it more efficient in carrying out its tasks | "More eyes see more" principle<br>Positive effects of competition between authorities<br>A financial stability board could in principle provide for effective cooperation |
| "Lender of last resort" | The central bank's lender-of-last-resort function has increased incentives for effective, proactive supervision<br>In the case of lender-of-last-resort loan, direct information on the solvency of the credit institution | The risk of regulatory capture (the supervisor's delay in declaring an institution unsound because of the links between the supervisor and the supervised institution) |
| Bank union | An integrated supervisory model for the euro area will be established in the framework of the banking union, with the ECB as the micro-prudential supervisor | |
| Monetary policy | Direct micro-prudential information facilitates a more effective monetary policy | Supervisory failures can reduce the credibility and thus the effectiveness of monetary policy |
| Social aspects | Cost savings from the elimination of duplicated functions | Supervision integrated into the central bank would mean excessive concentration of responsibility and powers |

Source: MNB (n.d.).

At the beginning of the 1990s, financial supervision in Hungary was not unified, but there were three separate professional supervisors. This fragmentation changed in 2000, with the State Financial Supervisory Authority (Pénzügyi Szervezetek Állami Felügyelete, PSZÁF) operating between 2000 and 2013. The PSZÁF was created as the successor of the State Financial and Capital Market Supervisory Authority, the State Insurance Supervisory Authority and the State Pension Fund Supervisory Authority. The PSZÁF was headed

by a chairman, appointed by the President of the Republic for a term of six years on a proposal from the Prime Minister. In this system of governance, the State Financial Supervisory Authority and the Hungarian National Bank functioned as separate entities, but the Financial Stability Committee, which assisted the work of the Financial Stability Authority, and, after the crisis, the Financial Stability Council served as the interface. In addition to the Minister of National Economy, the President of the National Bank of Hungary was also a member of this council, as was, of course, the President of the Supervisory Authority.

The unification of the three supervisors in 2000 did not end the professional debate. At the center of the problem is the question of the extent to which the shared responsibilities of the PSZÁF, the NGM (Ministry of National Economy) and the MNB (Hungarian National Bank) ensure that systemic problems can be solved. In the MNB's view, "the crisis has shown that the current tripartite financial stability institutional structure has significant shortcomings. In Hungary, three institutions—the PSZÁF, the MNB and the Ministry of National Economy (formerly the Ministry of Finance)—are responsible for maintaining financial stability. The cooperation between the three institutions is key for the early identification and management of risks" (MNB n.d.).

In the period leading up to the 2008 crisis, weaknesses in the regulation and supervision of the financial system also played a role in household over-indebtedness and the spread of foreign currency lending. In the view of the MNB, prior to the merger of financial supervision into the central bank on 1 October 2013, the current institutional structure and supervisory powers in Hungary did not adequately ensure the timely identification of systemic problems and the possibility of intervening quickly and effectively.

The MNB proposes to strengthen the macro-prudential framework and to integrate supervision and the central bank in order to create a more efficient supervisory structure. Based on international practice and domestic experience, the MNB should have primary responsibility for macro-prudential policy. As a consequence, the central bank responsible for financial stability, macro-prudential and micro-prudential supervision and monetary policy will have a broader information base and a broader set of tools at its disposal to prevent individual or systemic financial crises or to adequately manage crisis situations that have already occurred. The main objective of the new consolidated supervision, as defined by law, is to safeguard the stability of the financial system and to ensure the contribution of the financial intermediary system to economic growth without compromising this main objective.

The direction of cooperation between institutions changed after the 2008 crisis: professional opinion shifted towards institutional mergers. In Pesuth's view, "the dominant regulatory logic of the past period was to separate the regulation of individual market players from the market as a whole. This approach failed and was replaced by a desire to link the two. But this did not only mean a merger of the two regulators, it also resulted in an institutional change to communicate more directly to financial market participants the impact of their decisions on the overall risk at the market level" (Pesuth 2016, p. 38).

This view is also reflected in the MNB's pre-merger position, which stated that "the consumer protection, market supervision, capital and insurance supervision functions of the PSZÁF could be integrated into the central bank. As regards timing, the MNB recommends an earlier introduction of macro-prudential regulation. The MNB proposes that the partial or full integration of the PSZÁF could be achieved with the adoption of the new central bank law in the spring legislative session of the Parliament, with entry into force on 1 January 2014" (MNB n.d.).

There are three supervisory authorities in the European Union at the time of this study: the European Banking Authority (EBA), the European Insurance and Occupational Pensions Authority (EIOPA) and the European Securities and Markets Authority (ESMA). These authorities are therefore independent of the European Central Bank. Each authority is headed by a chairman who represents the whole organization. Operational decisions are taken by the Boards of Supervisors, which are composed of representatives of the super-

visory authorities of the Member States. The European System of Financial Supervisors is a network organized around the three European supervisory authorities, the European Systemic Risk Board and the national supervisors. Its main task is to ensure consistent and appropriate supervision of the financial system in the European Union. The European Central Bank, as the European banking supervisor, works closely with the three supervisory authorities; in particular, the European Banking Authority. The European System of Financial Supervisors carries out both macro-prudential and micro-prudential supervision.

Based on the above, Act CXXXIX of 2013 on the Hungarian National Bank (MNB), states that it is a member of the European System of Central Banks and the European System of Financial Supervisors, pursuant to Article 1(1) of Act CXXXIX of 2013 on the Hungarian National Bank. Paragraph (3) of the same Act stipulates that the MNB, in view of its membership of the European System of Financial Supervisors, shall perform the tasks arising from the competences of the European Banking Authority, the European Insurance and Occupational Pensions Authority, the European Securities and Markets Authority and the European Systemic Risk Board that fall within the MNB's competence.

With the merger of financial supervision into the central bank, an integrated system of objectives was created in Hungary, where the central bank and the merged supervisor set financial stability and sustainable growth as the new objectives, in addition to the traditional monetary policy objective of achieving and maintaining price stability.

Finally, the Financial Supervisory Authority (PSZÁF) was terminated on 1 October 2013. Its former powers were taken over by the National Bank of Hungary. At the same time, the Financial Stability Board was established on 1 October 2013, and it currently has nine members, including the Governor, three Vice Governors and five other staff members.

The change of the political system, the reorganization of the two-tier banking system (1987) and the entry into force of Act LXIX of 1991 on "Financial Institutions and Financial Institutional Activities" posed fundamentally new challenges for savings co-operatives. At the time of the entry into force of Act I of 1992, 260 savings co-operatives with a total market share of 5% were providing an increasingly wide range of services through 1752 branches, with a total membership of 1,780,000 (Moizs 2019).

As a result of the selection and polarization and the transformation into banks, the number of co-operative institutions (savings co-operative and credit co-operative) was reduced to 124 by Act CXXXV of 2013 on the Integration of Cooperative Credit Institutions and on the Amendment of Certain Legislative Acts on Economic Matters. In the process of transformation, the aims of the restructuring of the credit institution sector with the involvement of the state were:

- The modernization of savings co-operative institutions;
- Institutional guarantees of their long-term prudent operation;
- Ensuring the solvency of savings co-operative institutions.

In contrast, the renewed strategy for 2019–2023 was no longer the strategic goal of making the sector competitive but that of creating a competitive commercial bank, so the amendment only created an intermediate state. The integration of the credit institutions sector in 2019 started with the cooperation of 16 privately owned co-operative credit institutions—savings co-operatives, credit co-operatives and smaller banks—and then, following the mergers carried out in 2019, the number of co-operative credit institutions was reduced to two banks.

With the completion of the integration process, "On 31 October 2019, the fifth largest credit institution in the country entered the market following the national merger of Savings and Savings Commercial Bank (Takarékbank). As a result of the mergers, the number of Takarékbank's customers has increased to more than 1.1 million, and it operates the largest nationwide branch network with 750 branches and 15 Takarék mobile branches". "On 15 December 2020 Magyar Bankholding Zrt. started its effective operation, after the major shareholders of Budapest Bank Zrt., MKB Bank Nyrt. and MTB Zrt. transferred their bank shares to the joint holding company, having obtained the approval of the Hungarian

National Bank. This created the second largest banking group in Hungary" (Takarékbank 2021).

The assessment of this study is in line with Moizs (2019) in terms of an aggregate characterization of the process. Instead of the original objectives of the law—the modernization of savings co-operative institutions and the institutional guarantee of their long-term prudent operation—the systematic dismantling of the co-operative sector was achieved, with legislation as the main instrument. It can be stated that co-operative credit institutions (savings and credit co-operatives) operating in the form of co-operatives based on co-operative values and principles (customer ownership; democratic member control; personal member participation; one member, one vote; etc.) have disappeared from the Hungarian financial market after more than a century and a half of operation, and so have hundreds of thousands of small owners as well, who once embodied collective ownership. The weights of the co-operative credit institutions in the Hungarian credit institution system and its disappearance are shown in Figure 1.

The chart shows the sizes of banks, savings and savings co-operatives in Hungary by balance sheet total and the number of institutions. On the left axis is the balance sheet total, with the columns corresponding to it. On the right axis is the number of financial institutions; the values are shown in the bar chart. It can be seen that the number of savings co-operatives has steadily decreased, while the balance sheet total of the financial institutions system has more than doubled.

## 2. Literature Review

Bank profitability has been the subject of numerous studies in different regions of the world. Several of them concern the relationship between bank profitability and the regulatory environment. Petria et al. (2015) investigated the factors affecting bank profitability in the EU27 countries. Their analysis found that bank profitability is affected by credit risk, liquidity risk and management efficiency. ROA and ROE are affected by the level of market concentration and competition. From a policy perspective, supervisors are advised to monitor credit risk and liquidity risk effectively and to encourage competition. Cull et al. (2011), in their empirical study, found that when microfinance institutions under supervision change, their profits did not change; however they narrowed their client scope. The high-cost client base was reduced. However, the profits of commercial banks serving the general public have fallen, as these institutions focus on the general public, which is costly to reach.

Bouheni et al. (2014) investigated the impact of supervisory and regulatory policies on the profitability and risk-taking of large European banks for the period 2005–2011 using a panel regression approach. The authors found that strengthening supervision can improve banks' profitability and reduce their risk taking. In another study, Bouheni (2013) assessed the impact of supervisory activity on the profitability of the largest banks in France, Germany, the UK and Greece over the period 2005–2011. He found that the impact of supervisory activity on bank profitability varies depending on the institutional and regulatory environment.

In countries where deposit insurance and financial supervision have been combined, profitability in the financial sector has fallen. In contrast, in countries where the supervisor has the right to hold the audit firm accountable and where supervision is provided by the central bank, profitability is higher (Abdennour and Khediri 2010).

## 3. Material, Methods and Model Specification

The most appropriate estimation procedure to estimate the profit persistence ($ROE_{t-1}$) is the Arellano and Bond (1991) GMM dynamic panel model (Hirsch and Gschwandtner 2013). Hirsch (2018) concluded that GMM is the appropriate technique for estimating profit persistence; OLS estimation is biased upwards. The estimator is well-suited when

the period under study is short but there are many observed firms (small T, large N type sample).

$$\pi_{i,t} = \sum_j \alpha_j \left( X_{j,i,t} \right) + \lambda \pi_{i,t-1} + \varepsilon_{i,t} \tag{1}$$

where:

$\lambda$ is the profit persistence coefficient.
$\pi_{i,t}$ is the profitability measure (see Table 3);
$X_{j,i,t}$ are the bank, industry and macroeconomic variables;

$$\varepsilon_{i,t} = \eta_i + \nu_{i,t} \tag{2}$$

**Table 3.** Summary of variables.

| | Proxy | Symbols | Descriptions | Unit of Measure * | Source |
|---|---|---|---|---|---|
| Dependent variables | Profitability | ROE | Net profit/equity | % | MNB's Golden Book |
| | | ROA | Net profit/total assets | % | MNB's Golden Book |
| Main variable | Financial supervision | MNB supervision | =1 if MNB is the supervisor | Dummy | - |
| Bank control variables | Size of financial institution | size | Natural logarithm of total assets | Million HUF | MNB's Golden Book |
| | Loan exposure | loan-to-assets | Loans/total assets | % | MNB's Golden Book |
| | Non-banking costs | operational cost-to-assets | Operational costs/total assets | % | MNB's Golden Book |
| | Capital strength | equity-to-assets | Equity/total assets | % | MNB's Golden Book |
| | Market share | market share | Bank's assets/bank sector total assets | % | MNB's Golden Book |
| | Operational form | savings co-operative | =1 is saving co-operative | Dummy | MNB's Golden Book |
| Market variables | Asset size of the financial market | market size | Natural logarithm of bank sector total assets | Million HUF | MNB's Golden Book |
| | Number of co-op financial institutions | no-of-coop | Number of savings co-operative financial institutions | Piece | MNB's Golden Book |
| Macro control variables | Economic cycle | GDP | GDP growth | % | World Bank |
| | Interest rate spread | LD_IR | lending rate−deposit rate | % | World Bank |

\* In the case of logarithms, the unit of measurement before logarithmization is given. Source: authors' editing.

The Arellano–Bond GMM estimation is based on the first difference in the equation, which allows the elimination of time-independent bank-specific ($\eta_i$) effects (Hirsch and Gschwandtner 2013); $\nu_{i,t}$ is a random error term with an expected value of 0 and constant variance. The GMM estimation is considered consistent if there is no second-degree autocorrelation in the error terms, and the Sargan and Hansen test can be performed to test the instruments. The lagged dependent variable is endogenous, and all other variables in the model are exogenous. The Arellano–Bond GMM estimation procedure gives more accurate results than panel OLS estimation but does not perform perfectly.

The variables used in the analysis are summarized in Table 3 and the descriptive statistics of the variables are presented in Table 4. In this study, profitability was measured by ROE. In international non-banking literature, ROA is the standard profitability indicator. Studies on the banking sector use ROA (see Pervan et al. 2015; Gugler and Peev 2018), in some cases ROE (see Goddard et al. 2004, 2013; Amidu and Harvey 2016) and in other cases both ROE and ROA (e.g., Lee and Hsieh 2013a; Turgutlu 2014; Chronopoulos et al. 2015). Most studies that use both ROA and ROE do not explain why both indicators are used, but it is typically in order to increase the sensitivity of the results. Athanasoglou et al. (2008) argue in favor of ROA, despite the fact that ROA is biased by off-balance sheet items;

this is resolved by using leverage as a control variable. Gugler and Peev (2018) favor the ROA indicator over ROE, and the authors argue that ROE can be influenced by simply manipulating leverage. In the authors' opinion, ROE is a better indicator to measure the performance of the banking sector because of the ownership perspective and the specificity of the bank's operations (e.g., the role of equity). Nevertheless, ROA was also included to check the robustness of the results.

**Table 4.** Descriptive statistics of the variables.

| | N | Mean | sd | Min | Max |
|---|---|---|---|---|---|
| ROE | 2520 | 0.040 | 0.293 | −8.089 | 1.860 |
| ROA | 2520 | 0.036 | 0.033 | −1.305 | 0.148 |
| MNB supervision | 2520 | 0.1920 | 0.394 | 0 | 1 |
| size | 2520 | 9.715 | 1.831 | 5.709 | 16.132 |
| loan-to-assets | 2520 | 0.439 | 0.179 | 0.000 | 0.983 |
| operational cost-to-assets | 2520 | 0.044 | 0.034 | 0.001 | 1.212 |
| equity-to-assets | 2520 | 0.095 | 0.084 | 0.006 | 0.998 |
| market share | 2520 | 0.007 | 0.023 | 0.000 | 0.255 |
| savings co-operative | 2520 | 0.764 | 0.425 | 0 | 1 |
| market size | 2520 | 17.067 | 0.274 | 16.488 | 17.497 |
| no-of-coop | 2520 | 135.649 | 41.930 | 1 | 181 |
| GDP | 2520 | 0.020 | 0.030 | −0.067 | 0.054 |
| LD_IR | 2520 | 0.0571 | 0.028 | 0.006 | 0.105 |

Source: authors' calculations.

As described above, since October 2013, the National Bank of Hungary has been supervising financial institutions. The merger caused considerable controversy at the time. If this change brought tightening and more frequent supervision of banks, it should have reduced profitability; if it brought relaxation, it should have had a positive effect.

For the size variable, we expect that larger size is associated with higher profitability. The literature is consistent in that size is measured by the natural logarithm of all assets. A significant amount of research has found a positive relationship between profitability and size (e.g., Pervan et al. 2015; Chronopoulos et al. 2015). Lee and Hsieh (2013a) investigated the moral hazard hypothesis, which states that a bank already in a risky position takes on additional risky positions by reducing its equity.

The credit exposure ratio is measured as credit divided by total assets. The main activity of credit institutions is lending, from which they must derive a significant part of their revenues and profits. For this reason, we expect a positive relationship between profitability and lending volume. Among others, Alhassan et al. (2016) and Jiang (2018) confirmed this positive relationship, but Lee and Hsieh (2013b), in their study of banks in Asian countries, measured a negative relationship between ROE and credit exposure, and even risk was reduced by an increase in credit exposure. Similar research by Lee and Hsieh (2013a) for Chinese banks found a positive relationship between ROE and credit exposure but also found a negative relationship between risk and credit exposure.

Table 3 shows the descriptions, notations, calculation methods and data sources for the variables used for the analysis.

To measure non-direct banking costs, operating costs are compared to total assets. Estimates in similar studies have all come to similar conclusions, with increases in non-direct banking costs reducing profitability. Sarpong-Kumankoma et al. (2018) and Béjaoui and Bouzgarrou (2014) also found a negative relationship, but in these studies costs were compared to revenues. The negative relationship is interpreted by the authors as an efficiency loss (Pervan et al. 2015; Goddard et al. 2013).

The capital strength of credit institutions is measured by the ratio of equity to liabilities. The role of equity capital for banks is different from that of other businesses, due to the different reserves that the bank has to set aside for potential losses. Moreover, due to the

special way banks operate, the leverage is much higher because of the deposits placed with the bank. Lee and Hsieh (2013b) found a negative relationship between profitability (ROE) and equity to total assets for Asian commercial banks and co-operative credit institutions. Chronopoulos et al. (2015) also measured a negative relationship with a sample of US banks between 1984 and 2010. Goddard et al. (2013) measured a negative relationship between ROE and equity ratio in their study of six European countries. In studies where ROA is used as a profitability indicator, there is a positive relationship with the equity ratio. The ROE ratio decreases (with unchanged profits) if the bank increases its equity, so the negative relationship is perfectly understandable.

A bank's market share is the bank's total assets in a given year divided by the total assets of the banking sector in that year. We expect profitability to increase as market share increases. If the relationship is negative or not significant, then there is a loss of efficiency. The literature most commonly uses the Herfindahl–Hirschman index (e.g., Athanasoglou et al. 2008; Goddard et al. 2011) or market concentration index (e.g., Pervan et al. 2015) to measure this effect, but these are market-specific indicators and do not measure market power at the bank level. We also control how financial institutions operate. The transformation process described in the introduction saw the disappearance of co-operative credit institutions from the Hungarian credit institution system over 15 years.

We measure the transformation of the market processes described above with two variables. One is the size of the market, which is determined by the total assets of financial institutions as shown in Figure 1, and it is mainly determined by banks. The second variable is the number of co-operatives, which approximates the market size from the savings co-op side. In our view, changes in both variables are variables that reduce profitability, since a larger market in any respect should also be more competitive.

To measure the effects in the macro environment, we included two variables in our model. For the GDP variable, we used GDP growth. The private sector of a growing economy has a greater propensity to invest, which in most cases requires bank financing. Growing GDP also increases incomes, so that economic agents are more likely to be able to repay on time. Looking at it from all sides, GDP should increase the profitability of the banking sector. The literature confirms this positive effect in a number of cases, either in terms of GDP growth or GDP per capita.

For the loan and deposit spread, we expect a positive relationship with profitability; the higher the spread, the more profitable the banks' core business of collecting and lending is. The interest spread is indirectly affected by inflation. In a rising inflationary environment, not only will new borrowing fall, but interest rates on existing variable-rate loans may also rise, causing payment difficulties. A continuously rising inflationary environment can negatively affect the profitability of banks, but if the rise in inflation does not discourage investment or cause massive payment difficulties, then profitability can be positively affected by rising inflation. This is strongly influenced by the share of private sector credit exposed to interest rate changes. The real value of fixed-rate loans is reduced by the rise in inflation, so under the lender–debtor hypothesis, lenders lose and borrowers gain in inflation redistribution. This effect therefore reduces the profitability of the banking system compared to if it had implemented floating-rate lending. The link between inflation and profitability is not clear from the literature either. We find studies showing a positive association with profitability (e.g., Athanasoglou et al. 2008; Amidu and Harvey 2016) but also a negative association (e.g., Pervan et al. 2015). In a study by Lee and Hsieh (2013b), inflation has a negative relationship with the ROA indicator, while it has a positive relationship with the ROE indicator. Alhassan et al. (2016) also found different results for ROA and ROE, with a positive effect for ROA and no significant relationship with ROE. We expected to measure a positive relationship.

Table 4 shows the descriptive statistics. Appendix A shows the correlation matrix for the variables presented in details in Table 3 for the analysis period 2013–2019.

## 4. Results

Table 5 presents the results for the ROE of the econometric estimations; Table 6 shows the same results for the ROA. To validate the robustness of the results, we ran the models with different specifications through a dynamic panel estimation procedure (Arellano–Bond). The results of the Hansen and Sargan tests of instrument compliance are presented in the results tables. The instruments met both criteria. The third test examined the hypothesis of no second autocorrelation in the error term. Due to the lagged dependent variable ($ROE_{t-1}$), there was no first-order autocorrelation, but it could be second-order autocorrelation. The results of the Arellano–Bond AR(2) tests showed that there were no second-order autocorrelations.

**Table 5.** Dynamic-panel estimations (Arellano–Bond) of bank profitability (ROE).

| ROE | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| $ROE_{t-1}$ | 0.873 (0.735) | 1.114 (0.969) | 0.544 (0.786) | 0.945 (0.865) | 0.483 (0.708) | 0.578 (0.718) | 1.176 (1.071) | 0.585 (0.747) |
| MNB supervision | −0.029 (0.054) | −0.028 (0.058) | −0.105 *** (0.032) | 0.000 (0.034) | −0.106 *** (0.029) | −0.075 *** (0.028) | −0.006 (0.034) | −0.076 *** (0.027) |
| size | | 0.023 * (0.013) | | | 0.040 ** (0.020) | | 0.023 (0.014) | 0.035 * (0.019) |
| loan-to-assets | | −0.004 (0.135) | | | 0.054 (0.095) | | −0.019 (0.122) | 0.029 (0.089) |
| operational cost-to-assets | | −0.558 (0.784) | | | −1.266 * (0.731) | | −0.495 (0.894) | −1.143 (0.759) |
| equity-to-assets | | 0.597 ** (0.302) | | | 0.965 ** (0.437) | | 0.561 (0.348) | 0.857 ** (0.420) |
| market share | | −0.630 (0.550) | | | −0.942 (0.605) | | −0.654 (0.439) | −0.862 (0.573) |
| savings co-operative | | 0.059 (0.082) | | | 0.167 (0.106) | | 0.048 (0.105) | 0.142 (0.108) |
| market size | | | −0.001 *** (0.000) | | −0.001 ** (0.000) | −0.001 *** (0.000) | | −0.001 *** (0.000) |
| no-of-coop | | | −0.215 ** (0.084) | | −0.265 *** (0.094) | −0.214 *** (0.063) | | −0.244 *** (0.078) |
| GDP | | | | −0.201 (0.476) | | −0.276 (0.309) | −0.133 (0.590) | −0.191 (0.310) |
| LD_IR | | | | 0.414 (1.044) | | 0.717 (0.611) | 0.359 (1.251) | 0.781 (0.655) |
| Constant | −0.007 (0.056) | −0.317 ** (0.157) | 3.883 *** (1.452) | −0.038 (0.026) | 4.136 *** (1.417) | 3.837 *** (1.102) | −0.327 (0.250) | 3.841 *** (1.164) |
| Number of observations | | | | 2262 | | | | |
| A-B AR(2) test (*p*-value) | 0.419 | 0.427 | 0.606 | 0.437 | 0.615 | 0.550 | 0.434 | 0.557 |
| Sargan test (*p*-value) | 0.783 | 0.446 | 0.794 | 0.705 | 0.968 | 0.924 | 0.387 | 0.691 |
| Hansen test (*p*-value) | 0.766 | 0.433 | 0.772 | 0.674 | 0.966 | 0.921 | 0.379 | 0.686 |

Source: authors' calculations; corrected standard error in parentheses. ***, ** and * indicate significance at the 1, 5 and 10% levels, respectively.

**Table 6.** Dynamic-panel estimations (Arellano–Bond) of bank profitability (ROA).

| ROA | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| ROA$_{t-1}$ | 0.390 (0.453) | −0.027 (0.265) | 0.364 (0.518) | 0.390 (0.451) | −0.228 (0.299) | 0.368 (0.464) | −0.031 (0.256) | −0.170 (0.279) |
| MNB supervision | −0.005 * (0.003) | −0.009 *** (0.002) | −0.008 ** (0.004) | −0.002 (0.002) | −0.013 *** (0.003) | −0.006 ** (0.003) | −0.002 (0.002) | −0.009 *** (0.002) |
| size | | −0.005 (0.003) | | | −0.003 (0.003) | | −0.004 (0.003) | −0.003 (0.003) |
| loan-to-assets | | 0.020 * (0.012) | | | 0.018 (0.013) | | 0.016 (0.012) | 0.016 (0.013) |
| operational cost-to-assets | | −0.952 *** (0.213) | | | −0.984 *** (0.200) | | −0.957 *** (0.210) | −0.980 *** (0.199) |
| equity-to-assets | | 0.118 ** (0.057) | | | 0.135 ** (0.060) | | 0.124 ** (0.058) | 0.132 ** (0.060) |
| market share | | 0.129 (0.081) | | | 0.099 (0.086) | | 0.091 (0.080) | 0.090 (0.084) |
| savings co-operative | | 0.009 (0.009) | | | 0.014 (0.010) | | 0.011 (0.009) | 0.014 (0.010) |
| market size | | | −0.000 (0.000) | | −0.000 *** (0.000) | −0.000 (0.000) | | −0.000 *** (0.000) |
| no-of-coop | | | −0.014 ** (0.006) | | −0.032 *** (0.005) | −0.012 ** (0.005) | | −0.028 *** (0.006) |
| GDP | | | | 0.012 (0.012) | | 0.001 (0.022) | 0.038 *** (0.010) | −0.001 (0.011) |
| LD_IR | | | | 0.074 * (0.039) | | 0.063 (0.043) | 0.182 *** (0.033) | 0.129 *** (0.025) |
| Constant | 0.003 (0.003) | 0.067 (0.043) | 0.251 ** (0.117) | −0.002 (0.002) | 0.606 *** (0.099) | 0.216 ** (0.096) | 0.042 (0.042) | 0.540 *** (0.097) |
| Observations | | | | 2262 | | | | |
| A-B test for AR(2) (*p*-value) | 0.757 | 0.945 | 0.780 | 0.776 | 0.540 | 0.752 | 0.811 | 0.644 |
| Sargan test (*p*-value) | 0.213 | 0.119 | 0.0494 | 0.210 | 0.448 | 0.0678 | 0.0785 | 0.796 |
| Hansen test (*p*-value) | 0.488 | 0.786 | 0.337 | 0.484 | 0.906 | 0.407 | 0.768 | 0.968 |

Source: authors' calculations; corrected standard error in parentheses. ***, ** and * indicate significance at the 1, 5 and 10% levels, respectively.

Profit persistence is not present (based on ROE and ROA) in the Hungarian banking system, regardless of the model specification and the estimation method. Generally speaking, the ROE estimation has higher profit persistence; i.e., we are further away from perfect competition but coefficients of the lagged variable are not significant. Lee and Hsieh (2013a) measured profit persistence below 0.05 in their study of the Chinese financial market. The larger and more diversified the financial market is, the more difficult it is to achieve above-market profitability. Amidu and Harvey (2016) also measured a profit persistence of around 0.7 for African countries, which supports the inverse relationship between market size and profit persistence. However, Chronopoulos et al. (2015) estimated a profit persistence of around 0.5–0.6 on their database of US banks, which contradicts this. The Hungarian financial market is close to the perfect competition while the European results typically measure the stickiness of profits as being between 0.2 and 0.5.

The first of the bank control variables was the size of the bank (balance sheet total). Bank size increases profitability; the larger the size is, the higher the profit (ROE) is. The economy of scale hypothesis was confirmed. In the changing Hungarian banking system, concentration is increasing, with more and more large players emerging due to mergers, which reduces competition in the market. The Hungarian banking system does not exhibit the moral hazard hypothesis, which Lee and Hsieh (2013a) identified as a negative correlation between size and profitability. Our results are consistent with the results of similar research. The ROA indicator showed no significant relationship with profitability.

Loan exposure was one of the variables where there was no consistent result across the two profit estimation procedures. For ROA, the relationship was positive but not significant (in the case of (2)), the model was significant). The result shows that bank lending is profitable, with profitability growing faster than loan exposure. In similar research, researchers have found both positive (Alhassan et al. 2016; Jiang 2018) and negative (Lee and Hsieh 2013b) relationships. For the Hungarian banking system, the relationship (most of the models) was positive, which also means that the banking system has not yet reached its maximum lending, and there is still space for expansion. This was supported by the loan penetration statistics; while in Hungary the loan-to-GDP ratio is below 40%, in developed European countries, such as Germany, it is 86.6%, in Austria, it is 94.2%, and it is easily above 100% in France or the UK.

In all cases, the increase in operating costs (general administrative costs) reduces profitability. Based on the literature, a negative relationship implies a loss of efficiency, with the profit from productive activity not offsetting the cost of the unproductive activity. This process may be offset by the effects of scale-up and the resulting benefits.

Using return on equity (ROE), we expected a negative relationship based on the literature. The positive relationship may be explained by the fact that profit grew faster than equity in the Hungarian banking sector during the period under study, and the decline in equity was larger when profit declined. Uniquely, Lee and Hsieh (2013a) measured a negative relationship between size and profitability (ROE) in their study on Chinese banking data. In the case of ROA, the results were the same: the coefficients were negative and significant.

Market share showed a positive relationship to ROA for one specification, but this was not a significant relationship with profitability. For market share, an opposite sign is seen for ROE and ROA, but these coefficients are not significant. At the beginning of the period under study, there were more than 200 agents (banks and savings co-operatives) in the market, but by 2019 this had fallen to less than 30, while the market size had more than doubled. Typically, agents with low market shares disappeared during the market consolidation. Market shares have not changed significantly, and the impact of the new giant bank created by the transformation of the savings co-operative will only be felt in the coming years. Savings co-operatives have been at the heart of the changing market and have therefore been identified separately. A positive but not significant relationship with profitability was obtained for all specifications.

The transformation of the banking system was measured by two control variables. The market size variable was negative and significant for all models. Market expansion reduced profits, which can be explained by increased competition. The market share variable was not significant, implying that market share did not shift enough for any of the players to have a significant impact on profitability. The variable for savings co-operatives was significant and ad a negative sign. This was the result we expected for market competition, with an increase in the number of operators reducing profitability. In the case of the Hungarian banking system, the number of market participants decreased, and therefore the profitability of the "surviving" financial institutions improved as the savings co-operatives disappear. However, it is important to note that this effect does not decrease profits much.

The change in the macroeconomic environment is measured by the change in GDP on the one hand, and by the interest rate differential on loans and deposits on the other. As economic growth accelerates, the profitability of financial institutions also improves. In the ROE estimations, GDP and profitability were independent. A stronger effect than GDP was the interest spread. We estimated a significant and positive relationship with profitability for all specifications of ROA. An increase in the interest spread clearly increased profitability over the period under study, with an average spread of 5.7% (see Table 4). In the preventive period, a low-interest-rate environment certainly had a negative impact, but in a low-interest-rate environment, the "GDP leg" helps bank profitability. Another important finding is that the core banking activity was profitable; i.e., deposit taking and lending were profitable activities over the last 15 years.

## 5. Discussion and Conclusions

Our hypothesis is that the central bank can carry out supervision and control more effectively than other alternatives. Tighter controls reduce the profitability of financial institutions. Our results confirm this hypothesis: with almost every specification, the central bank as a variable measuring the institution providing supervision (MNB supervision) was significant. Stricter supervisory control has been implemented, which was one of the motivations for the merger. Particular attention has been paid to changes in the macroeconomic environment and to the elimination of the savings co-operative system. The MNB as a supervisor has reduced profitability, but the reduction in the number of savings co-operatives has also reduced competition in the market, so the losses "suffered" from stricter supervision have been partly compensated for by this process.

The focus of our investigation was on surveillance change. Since 1 October 2013, the Hungarian National Bank has been responsible for the supervision and control of the financial intermediary system. Our hypothesis is that the central bank will be able to carry out supervision and control more efficiently because it will centralize all relevant data in one place. The authors hypothesize that stricter rules and more effective supervision will reduce the banks' profits. The results confirm the hypothesis that the change in supervision has reduced the profitability of the Hungarian banking system. Under all control variables, the rate of profit decline (ROE) was considerably higher than the ROA estimate ($-0.076$ vs. $-0.009$).

We found several similarities between the empirical analyses and the findings in the literature cited above. Petria et al. (2015) investigated the factors affecting bank profitability. From a policy perspective, supervisors are recommended to monitor credit and liquidity risk effectively and to promote competition. In Hungary the regulatory changes have strengthened the monitoring of lending and bank liquidity.

Bouheni et al. (2014) investigated the impact of supervisory and regulatory policies on the profitability and risk-taking of large European banks for the period 2005–2011. The authors found that strengthening supervision can improve banks' profitability and reduce their risk. In another study, Bouheni (2013) assessed the impact of supervisory activity on the profitability of the largest banks in France, Germany, the UK and Greece over the period 2005–2011. He found that the impact of supervisory activity on bank profitability varies depending on the institutional and regulatory environment. Abdennour and Khediri (2010) concluded in their study that, in countries where deposit insurance and financial supervision have been combined, profitability in the financial sector has fallen. In contrast, in countries where the supervisor has the right to hold the audit firm accountable and where supervision is provided by the central bank, profitability is higher. Analysis of the Hungarian data showed that the tightening of supervision has reduced bank profitability.

When interpreting the results, it is important to point out in the spirit of scientific humility that it is difficult to judge the real effectiveness of the supervisory change. On the one hand, there may have been synergies that increased supervisory efficiency and reduced profits. On the other hand, in an integrated supervisory system, the central bank and supervisory functions merge. For this reason, the elimination of the savings co-operative system may reduce confidence in the central bank. Finally, the empirical analysis of the real effectiveness of the supervisory change is further complicated by the fact that, in the period under investigation (2003–2019), besides the supervisory change (2013), macroeconomic (the 2008 global economic crisis) and market structural (the integration of savings co-operatives) changes also affected the profitability of the Hungarian banking system. We have tried to take these effects fully into account in the analysis.

In spite of the difficulties encountered, the hypothesis is well-supported by the study, and the effect of the merger of the Supervisory Authority into the MNB on the decline in profits of the banking system can be considered as proven.

## 6. Limitations

The authors were unable to obtain data from the former supervisory body (PSZÁF) on the number and amount of financial penalties imposed. For this reason, it was not possible to measure the stringency of the new supervision with interaction terms, and the study instead measured the change in supervision using only dummy variables. However, the model can be considered complex, including both endogenous and exogenous variables to ensure the most accurate estimation, and the results were robust, with the two estimation procedures having almost the same results.

## Appendix A

**Table A1.** Correlation matrix of the variables included in the analysis.

| | .3 ROE | ROA | MNB Su-pervision | Size | Loan-to-Assets | Operational Cost-to-Assets | Equity-to-Assets | Market Share | Market Size | No-of-Coop | Savings co-Operative | GDP | LD_IR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ROE | 1.000 | | | | | | | | | | | | |
| ROA | 0.412 | 1.000 | | | | | | | | | | | |
| | (0.000) | | | | | | | | | | | | |
| MNB supervision | −0.168 | −0.119 | 1.000 | | | | | | | | | | |
| | (0.000) | (0.000) | | | | | | | | | | | |
| size | −0.010 | 0.053 | 0.276 | 1.000 | | | | | | | | | |
| | (0.620) | (0.008) | (0.000) | | | | | | | | | | |
| loan-to-assets | 0.064 | 0.096 | −0.103 | 0.447 | 1.000 | | | | | | | | |
| | (0.001) | (0.000) | (0.000) | (0.000) | | | | | | | | | |
| operational cost-to-assets | −0.105 | −0.686 | −0.115 | −0.388 | −0.162 | 1.000 | | | | | | | |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | | | | | | | | |
| equity-to-assets | −0.005 | −0.267 | 0.033 | −0.091 | −0.110 | 0.474 | 1.000 | | | | | | |
| | (0.802) | (0.000) | (0.102) | (0.000) | (0.000) | (0.000) | | | | | | | |
| market share | −0.003 | 0.029 | 0.104 | 0.687 | 0.221 | −0.173 | 0.003 | 1.000 | | | | | |
| | (0.893) | (0.148) | (0.000) | (0.000) | (0.000) | (0.000) | (0.878) | | | | | | |
| market size | −0.178 | −0.120 | 0.382 | 0.280 | −0.070 | −0.131 | 0.065 | 0.074 | 1.000 | | | | |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.001) | (0.000) | | | | | |
| no-of-coop | 0.160 | 0.127 | −0.820 | −0.390 | 0.033 | 0.134 | −0.055 | −0.148 | −0.689 | 1.000 | | | |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.099) | (0.000) | (0.006) | (0.000) | (0.000) | | | | |
| savings co-operative | 0.032 | 0.033 | −0.191 | −0.766 | −0.471 | 0.152 | −0.283 | −0.477 | −0.137 | 0.262 | 1.000 | | |
| | (0.105) | (0.097) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | | | |
| GDP | 0.025 | 0.011 | 0.266 | 0.001 | 0.017 | 0.015 | −0.044 | 0.030 | −0.472 | −0.003 | −0.048 | 1.000 | |
| | (0.214) | (0.568) | (0.000) | (0.960) | (0.404) | (0.458) | (0.029) | (0.138) | (0.000) | (0.863) | (0.017) | | |
| LD_IR | 0.185 | 0.126 | −0.847 | −0.310 | 0.093 | 0.135 | −0.036 | −0.113 | −0.516 | 0.854 | 0.205 | −0.243 | 1.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.071) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |

Source: authors' calculation, *p*-values in parentheses.

## References

Abdennour, Faouzi, and Karim Ben Khediri. 2010. Bank supervision and bank profitability: The case of MENA countries. *International Journal of Monetary Economics and Finance* 3: 316. [CrossRef]

Alhassan, Abdul Latif, Michael Lawer Tetteh, and Freeman Owusu Brobbey. 2016. Market power, efficiency and bank profitability: Evidence from Ghana. *Economic Change and Restructuring* 49: 71–93. [CrossRef]

Amidu, Mohammed, and Simon K. Harvey. 2016. The persistence of profits of banks in Africa. *Review of Quantitative Finance and Accounting* 47: 83–108. [CrossRef]

Arellano, Manuel, and Stephen Bond. 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies* 58: 277–97. [CrossRef]

Athanasoglou, Anayiotis P., Sophocles N. Brissimis, and Matthaios D. Delis. 2008. Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of International Financial Markets, Institutions and Money* 18: 121–36. [CrossRef]

Baranyi, Aranka. 2019. Egyéb banki műveletek és szereplők. In *Pénzügyi Intézményrendszer Magyarországon 2019*. Edited by Tamás Kovács, Károly Szóka and József Varga. Sopron: Soproni Egyetem Kiadó, pp. 213–38. 554p.

Béjaoui, Raoudha, and Houssam Bouzgarrou. 2014. Determinants of Tunisian bank profitability. *The International Journal of Business and Finance Research* 8: 121–31.

Bouheni, Faten Ben. 2013. The effects of supervision on banking performance: European evidence. Paper presented at International Conference "Governance and Control in Finance and Banking: A New Paradigm for Risk and Performance", Paris, France, April 18–19.

Bouheni, Faten Ben, Hachmi Ben Ameur, Abdoulkarim Idi Cheffou, and Fredj Jawadi. 2014. The effects of regulation and supervision on European banking profitability and risk: A panel data investigation. *Journal of Applied Business Research (JABR)* 30: 1665–70. [CrossRef]

Chronopoulos, Dimitris K., Hong Liu, Fiona J. McMillan, and John O. S. Wilson. 2015. The dynamics of US bank profitability. *The European Journal of Finance* 21: 426–43. [CrossRef]

Cull, Robert, Asli Demirgüç-Kunt, and Jonathan Morduch. 2011. Regulatory Supervision Curtail Microfinance Profitability and Outreach? *World Development* 39: 949–65. [CrossRef]

Goddard, John, Hong Liu, Philip Molyneux, and John O. S. Wilson. 2011. The persistence of bank profit. *Journal of Banking & Finance* 35: 2881–90. [CrossRef]

Goddard, J., H. Liu, P. Molyneux, and J. O. Wilson. 2013. Do bank profits converge? *European Financial Management* 19: 345–65. [CrossRef]

Goddard, John, Phil Molyneux, and John O. S. Wilson. 2004. The profitability of European banks: A cross-sectional and dynamic panel analysis. *The Manchester School* 72: 363–81. [CrossRef]

Goodhart, Charles Albert Eric. 2011. The changing role of central banks. *Financial History Review* 18: 135–54. [CrossRef]

Gugler, Klaus, and Evgeni Peev. 2018. The persistence of profits in banking: An international comparison. *Applied Economics* 50: 5996–6009. [CrossRef]

Hirsch, Stefan. 2018. Successful in the long run: A meta-regression analysis of persistent firm profits. *Journal of Economic Surveys* 32: 23–49. [CrossRef]

Hirsch, Stefan, and Adelina Gschwandtner. 2013. Profit persistence in the food industry: Evidence from five European countries. *European Review of Agricultural Economics* 40: 741–59. [CrossRef]

Jiang, Yuxiang. 2018. Bank Competition, Earnings Management and Profit Persistence. Doctoral dissertation, University of Glasgow, Glasgow, UK. Available online: http://theses.gla.ac.uk/38943/1/2018JiangPhD.pdf (accessed on 25 August 2021).

Király, Júlia. 2008. Likviditás válságban (Lehman előtt–Lehman után). *Hitelintézeti Szemle* 7: 598–611. Available online: https://bankszovetseg.hu/Content/Hitelintezeti/HSZ6_kiraly_julia_598_611.pdf (accessed on 1 September 2021).

Lee, Chien-Chiang, and Meng-Fen Hsieh. 2013a. Beyond bank competition and profitability: Can moral hazard tell us more? *Journal of Financial Services Research* 44: 87–109. [CrossRef]

Lee, Chien-Chiang, and Meng-Fen Hsieh. 2013b. The impact of bank capital on profitability and risk in Asian banking. *Journal of International Money and Finance* 32: 251–81. [CrossRef]

MNB. n.d. Az MNB pénzügyi felügyeleti funkcióinak megerősítése (Új szabályozói eszközök MNB-hez rendelése és a PSZÁF MNB-be integrálása). Available online: https://www.mnb.hu/letoltes/felugyelet-hu.pdf (accessed on 20 August 2021).

Moizs, Attia. 2019. A szövetkezeti hitelintézetek Magyarországon. In *Pénzügyi Intézményrendszer Magyarországon 2019*. Edited by Tamás Kovács, Károly Szóka and József Varga. Sopron: Soproni Egyetem Kiadó, pp. 187–211. 554p.

Pervan, Maja, Iva Pelivan, and Josip Arnerić. 2015. Profit persistence and determinants of bank profitability in Croatia. *Economic Research-Ekonomska istraživanja* 28: 284–98. [CrossRef]

Pesuth, Tamás. 2016. A jegybanki szerepkör újradefiniálása. *Pénzügyi Szemle* 61: 35. Available online: https://www.penzugyiszemle.hu/upload/documents/pesuth-2016-1pdf_20170817110419_17.pdf (accessed on 22 August 2021).

Petria, Nicolae, Bogdan Capraru, and Iulian Ihnatov. 2015. Determinants of banks' profitability: Evidence from EU 27 banking systems. *Procedia Economics and Finance* 20: 518–24. [CrossRef]

Sarpong-Kumankoma, Emmanuel, Joshua Abor, Anthony Q. Aboagye, and Mohammed Amidu. 2018. Differences in bank profit persistence in Sub-Saharan Africa. *African Journal of Economic and Management Studies* 9: 512–22. [CrossRef]

Shirakawa, Masaaki. 2010. Revisiting the Philosophy behind Central Bank Policy, BIS Review 55/2010. Available online: https://www.bis.org/review/r100427b.pdf (accessed on 26 August 2021).

Takarékbank. 2021. Takarékbank Zártkörűen Működő Részvénytársaság 2020. Évről Szóló Beszámolója Kiegészítő Melléklet. Available online: www.takarekbank.hu (accessed on 15 August 2021).

Turgutlu, Evrim. 2014. Dynamics of profitability in the Turkish banking industry. *Ege Akademik Bakış Dergisi* 14: 43–52. Available online: https://dergipark.org.tr/en/download/article-file/560028 (accessed on 10 September 2021). [CrossRef]

Várhegyi, Éva. 2019. A magyar bankrendszer felnőtté válásának története. *Gazdaság és Pénzügy* 6: 39–55. [CrossRef]

Weidmann, Jens. 2011. Managing macroprudential and monetary policy—A challenge for central banks. Paper presented at SUERF/Deutsche Bundesbank Conference 2011, Berlin, Germany, November 8. Available online: https://www.bis.org/review/r111109g.pdf?frames=0 (accessed on 20 July 2021).