

RSC 2024/26

Robert Schuman Centre for Advanced Studies
Florence School of Banking and Finance

Banking Supervision Policy Working Paper Series
In the context of the SSM-EUI partnership on SSM Banking
Supervision Learning Services

WORKING PAPER

**The Effects of SSM Adoption on Bank's
Profitability: a Long-Term Effects
Difference-in-Difference Analysis**

Tommaso Perniola and Pietro Chiarelli

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RSC Working Paper 2024/26

Banking Supervision Policy Research Working Paper 2024/02

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ISSN 1028-3625

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Published in July 2024 by the European University Institute.
Badia Fiesolana, via dei Roccettini 9
I – 50014 San Domenico di Fiesole (FI)

Italy

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Abstract

This paper analyses the impact of the introduction of the Single Supervisory Mechanism on the profitability of banks. While this topic has not been extensively covered in the literature, it is worthy of attention as it allows to reflect on the impact of the SSM on directly supervised banks, namely focusing on its indirect effects. Indeed, its policies and measures are primarily oriented towards ensuring the resilience and soundness of the banking system, yet they might present potential spillover effects on banks' profits. By using a difference-in-difference approach, we find a positive effect of the direct banking supervision by the ECB on banks profitability protracted over time. We use indeed a long-term effects difference-in-difference model which accounts for leads and lags, in order to analyze whether the treatment effect changes over time. Finally, we discuss the conclusions that the supervisor could draw from our empirical results, as well as how it interprets its role and looks at the performance of supervised entities.

Keywords

SSM, Banking supervision, Bank profitability, Difference-in-difference estimation

The Effects of SSM Adoption on Bank's Profitability: a Long-Term Effects Difference-in-Difference Analysis

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Abstract

This paper analyses the impact of the introduction of the Single Supervisory Mechanism on the profitability of banks. While this topic has not been extensively covered in the literature, it is worthy of attention as it allows to reflect on the impact of the SSM on directly supervised banks, namely focusing on its indirect effects. Indeed, its policies and measures are primarily oriented towards ensuring the resilience and soundness of the banking system, yet they might present potential spillover effects on banks' profits. By using a difference-in-difference approach, we find a positive effect of the direct banking supervision by the ECB on banks profitability protracted over time. We use indeed a long-term effects difference-in-difference model which accounts for leads and lags, in order to analyze whether the treatment effect changes over time. Finally, we discuss the conclusions that the supervisor could draw from our empirical results, as well as how it interprets its role and looks at the performance of supervised entities.

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JEL classification: C23 · C51 · Q50 · G21

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1 Introduction

Over the course of December 2012, the heads of state or government of the EU Member States took a decision of historical significance for the fate of the European economy. In fact, in response to the most impactful economic and financial crisis in decades, they collectively agreed on a road-map aimed at achieving the long-awaited completion of the Economic and Monetary Union¹.

Amidst a crisis that was ravaging the economic fabric of the Union, the answer was found in the enhancement of the European integration, and notably in the achievement of a more integrated financial framework. It was thus bet that in this way normal lending would have been restored, competitiveness would have been enhanced and the necessary adjustments to European economies would have been more easily refined.

Among the vast array of consequential choices made during this crucial period, one emerged as particularly monumental: the adoption of the Single Supervisory Mechanism (SSM).

Together with the establishment of the Single Resolution Mechanism, the inception of the SSM marked a structural revolution of the EU Banking Union, serving as one of its essential pillars. With this stated objective, the European Central Bank (ECB), along with the national supervisory authorities of the participating countries, was entrusted with the daunting task of ensuring banking supervision in the Eurozone and the closely cooperating countries.

Nevertheless, in establishing the mandate to supervise banks, the European Council in December 2012 was prompted by the compelling objective of restoring financial stability and the safety and soundness of the European banking sector. Back in those gloomy days, trust in European banks was at an all-time low, and the EU banking system as a whole was far from being resilient and robust. The SSM was called upon to address these urges, which so closely concerned the lives of European citizens, and it is against this background that its adoption was presented as a major qualitative step towards a more integrated financial framework. It was thus in the wake of this strong political will, grounded on solid and high-reaching objectives, that the European co-legislators approved in 2013 the Commission's proposal for the Regulation creating the SSM².

¹ European Council, Conclusions of 13/14 December 2012, EUCO 205/12

² Council Regulation (EU) No 1024/2013 of 15 October 2013 conferring specific tasks on the European Central Bank concerning policies relating to the prudential supervision of credit institutions

The regulatory framework introduced provided that some banks fell under the direct supervision of the ECB, while others would only be indirectly supervised by it, respectively naming them significant institutions (SIs) and less significant institutions (LSI). According to the SSM Framework Regulation³, banks are classified as SIs if they meet specific and alternative criteria concerning size, economic importance for the specific country or the EU economy as a whole, cross-border activities, or if the bank has requested or received funding from the European Stability Mechanism or the European Financial Stability Facility. Additionally, a supervised bank can be deemed significant also if it is one of the three most significant banks in a particular country. On these grounds, the ECB currently directly supervises 113 banks holding almost 82% of banking assets in these countries⁴.

Hence, ten years have now passed since the establishment of the SSM, ten years marked by pandemics, geopolitical upheavals, and vastly different monetary policies, to name but a few of the many factors that influenced the life of banks across the Eurozone. It is thus time to pause for a moment, look back, and assess to what extent the European supervisor, alongside the national ones, have been able to fulfill their mandate.

To this end, it could be envisaged to focus on a topic that is closely related to the primary objectives of the supervisor's mandate, such as the resilience of banks in the face of systemic and individual risks. However, it is particularly compelling to delve into a domain that has been relatively underexplored in the literature, yet is no less relevant or useful for understanding the effects of the SSM, whether they be positive or negative.

Indeed, in 2018, the ECB stated that it falls within the realm of market forces to prompt banks to increase their profitability and that it is not its role to take stances on the various coexisting business models, as the focus of supervision is the viability and sustainability of banks' business models over the cycle (ECB, 2018). Thus, while the core focus for supervisors is the strategic steering and risk management capabilities, the ECB still looked at the data on the profitability of banks in the euro area and came to the conclusion that this was under pressure, despite the improved economic situation of banks.

³ Article 39 of the Regulation (EU) No 468/2014 of the European Central Bank of 16 April 2014 establishing the framework for cooperation within the Single Supervisory Mechanism between the European Central Bank and national competent authorities and with national designated authorities (SSM Framework Regulation)

⁴ <https://www.bankingsupervision.europa.eu/about/thessm/html/index.en.html>

Therefore, building on the interest shown by the supervisor for this variable, it is valuable to ascertain whether over time profitability indicators of European banks have changed, namely whether the SSM had a positive effect on the profitability of directly supervised banks.

2 Data

We use an unbalanced panel dataset with annual measurements from 2011 to 2019, covering 2815 banks in 18 European countries. Among these, our treated group is composed of the SIs, a classification that applied to 76 banks in our dataset in 2014. However, the ECB periodically updates the list of SIs, which entails that it is not infrequent that a bank directly supervised is then reclassified as less significant and thus supervised by the national supervisory authority. We will return to the implications of this for our econometric analysis in Section 5. The remaining banks are the control group, and they are under the supervision of the national competent authorities (NCAs) since they have been classified as LSIs.

The descriptive statistics are displayed in Table 1 and 2 based on the participation to the SSM in 2014. The data on SSM participation are taken from the publicly available list provided on the ECB website⁵. Financial data on the single banks are from BankFocus database provided by Bureau van Dijk. These include the Return on Equity (ROE) using profit (loss) before tax and the ROE using net income, which we use as alternative indicators of profitability, and other bank-specific control variables that may contribute to determining banks' profits. We also control for different structural macro variables, which are from the World Development Indicators (WDI) of the World Bank⁶.

Table 1: Descriptive statistics: Significant Institutions

Statistic	N	Mean	St. Dev.	Min	Max
ROE using profit (loss) before tax	586	-1.809	51.164	-806.454	39.220
ROE using net income	586	-1.533	40.084	-648.066	39.973
Total assets	628	152,367,945.000	255,655,524.000	18,050.000	1,520,459,000.000
Common equity as percentage total assets	247	9.303	8.974	-4.872	59.460
Cost-to-income ratio	585	67.771	117.680	-1,809.926	1,595.435
Loan loss reserves to gross customer loans ratio	393	6.223	7.043	0.034	31.955
Tier 1 ratio	339	19.202	15.503	-7.300	196.880
Government effectiveness	666	1.258	0.448	0.125	2.235
Inflation (CPI)	666	1.286	1.127	-2.097	4.982
GDP growth	666	1.642	2.886	-10.149	24.475
Profit tax	666	14.939	7.025	-0.200	23.300

⁵ <https://www.bankingsupervision.europa.eu/press/publications/html/index.en.html?key=entities>

⁶ <https://databank.worldbank.org/source/world-development-indicators>, downloaded in January 2024

Table 2: Descriptive statistics: Less Significant Institutions

Statistic	N	Mean	St. Dev.	Min	Max
ROE using profit (loss) before tax	20,491	5.479	14.122	-548.000	417.450
ROE using net income	20,491	3.300	13.140	-655.932	176.370
Total assets	20,600	5,493,366.000	29,123,132.000	37.000	870,641,000.000
Common equity as percentage total assets	12,146	10.005	6.996	-0.788	116.083
Cost-to-income ratio	20,474	75.728	411.875	-9,849.098	52,561.540
Loan loss reserves to gross customer loans ratio	15,099	3.089	6.292	0.000	97.326
Tier 1 ratio	13,913	19.666	29.767	-2.500	1,320.000
Government effectiveness	24,552	1.394	0.402	0.125	2.235
Inflation (CPI)	24,552	1.363	0.839	-2.097	4.982
GDP growth	24,552	1.410	1.557	-10.149	24.475
Profit tax	24,552	17.664	6.598	-0.200	23.300

Figure 1 reports the pairwise correlations for all the variables included in the regression models, including total asset for which we consider the natural logarithm.

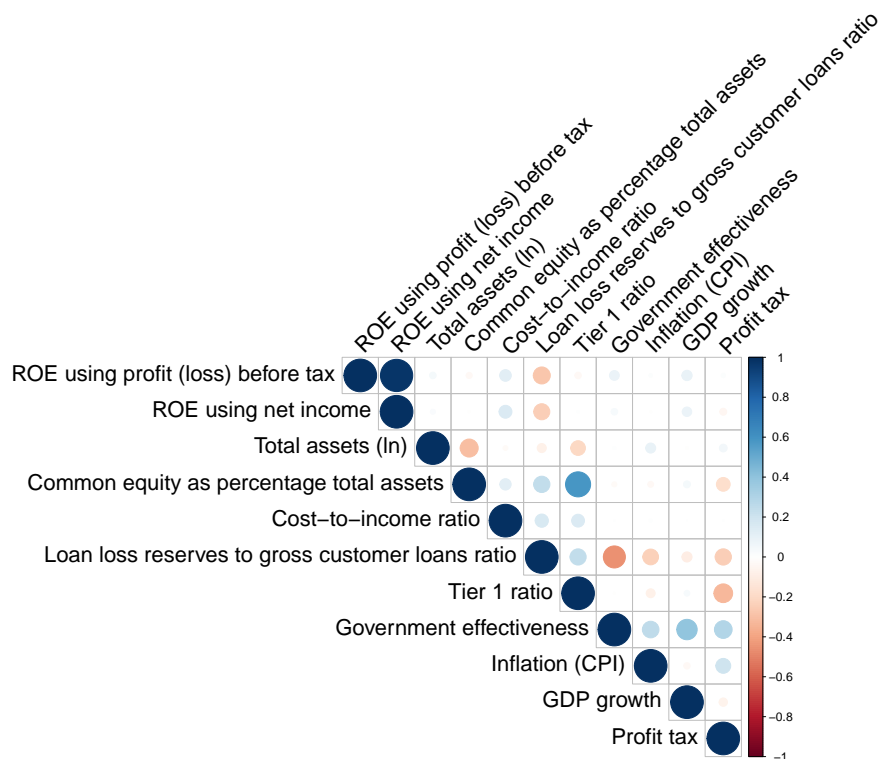


Figure 1: Correlation matrix

3 Econometric Model

In order to identify the causal effect of the adoption of the SSM on the profitability of banks, i.e. the causal effect of being directly supervised by the ECB instead of the NCAs, we use a difference-in-difference approach. This method has been initially developed by the seminal work of [Card and Krueger \(1993\)](#) and has become increasingly popular over the years as a useful tool for estimating the causal effect of a binary treatment which is usually a governmental policy (e.g., a reform of the healthcare system or an adjustment of the minimum wage).

Firstly we only consider observations in 2013 and 2014 and we esteem the basic difference-in-difference model that can be written as follows:

$$p_{it} = \beta_0 + \beta_1 SSM_i + \beta_2 Post_t + \beta_3 (SSM * Post)_{it} + \gamma X_{it} + \eta_c + \tau_e + u_{it} \quad (1)$$

For bank i at time t let p_{it} be a profitability measure (ROE using profit (loss) before tax or ROE using net income in our analysis). The variable SSM_i is a dummy and it is equal to 1 if a bank is directly supervised by the SSM in 2014 and 0 otherwise. It captures the differences between the two groups (treated and non-treated banks, i.e. respectively banks directly and indirectly supervised by the ECB). The time period dummy variable $Post_t$ takes the value 1 in the year of introduction of the SSM (2014) and 0 before that (2013). It captures all the factors that could affect the profitability over time, regardless of the treatment. The variable $(SSM * Post)_{it}$ then is equal to 1 for treated banks (i.e. directly supervised by the SSM in 2014) in the year of introduction of the SSM (2014) and 0 otherwise. Its coefficient, β_3 , measures the effect of the SSM and is the subject of our interest. Additional bank specific and structural control variables are collected in vector X_{it} . The parameters η_c represents the country-specific fixed effects that control for cross-country differences, while τ_e represents the type of entity fixed effects (credit institution, financial holding company or mixed financial holding company). Finally, u_{it} is the error term.

Parallel trend assumption The key identifying assumption for the difference-in-difference approach is the so-called parallel trend assumption. The idea is that for the model to be valid the outcome in treatment and control group should follow the same time trend if there were no treatment. The

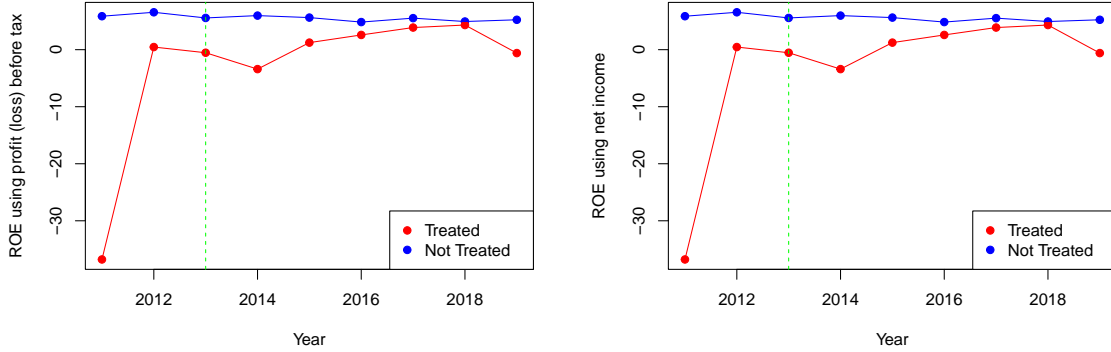


Figure 2: Parallel trend assumption, graphical check. 2013 is the last year before the SSM introduction

parallel trends assumption is obviously impossible to verify but it is possible to use pre-treatment data to show that the trends are the same at least up to the pre-treatment period. In our case the trends in profitability should be parallel for both treated (directly supervised by the ECB) and not treated (supervised by NCAs) banks.

In Figure 2 we show the mean value of profitability (ROE using profit (loss) before tax and ROE using net income) for the two groups of banks. We can see that the trends are parallel between 2012 and 2013 but not between 2011 and 2012, even though they go in the same direction. The very low level of the profitability in 2011 for treated banks is due to the small number of observations and to the effect of the financial crises which may have had the biggest impact on the big banks (Mirzaei, 2013). Anyway, to better assess this assumption, we perform a statistical test for difference in trends (using only data from 2011 to 2013, i.e. before the treatment period) estimating the following model:

$$p_{it} = \beta_1 SSM_i + \beta_2 Year(SSM_i * Year) + \alpha_i + u_{it} \quad (2)$$

The parameter α_i represents the bank-specific fixed effects. Results are shown in Figure 3 which shows that the values of $\beta_2 Year$ are not significantly different from 0, demonstrating that in the two groups profitability does not follow different trends prior to the time treatment. The large

standard error of the coefficient $\beta_{2,2011}$ is also due to the small number of observations in that year. This regression can also be seen as a placebo test, as we are de facto using a different fake treatment period before the actual treatment period and we do indeed find that these pre-treatment coefficients are not significant.

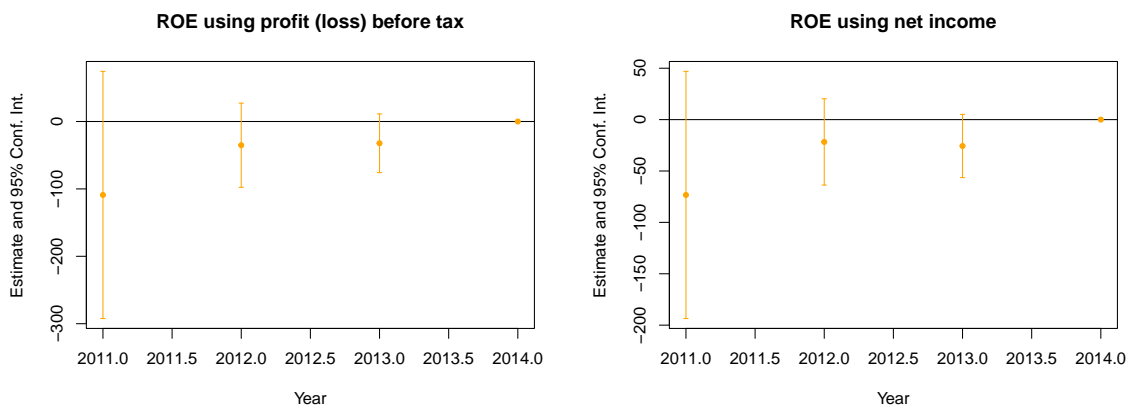


Figure 3: Parallel trend assumption, statistical check. Point estimation and standard errors of coefficient of the interaction between the time trend and the treatment variable (β_{2Year} in Formula 2)

Matching techniques In general, the difference-in-differences design is more plausible when the treated and the untreated groups do not significantly differ with respect to key characteristics or variables that may affect the outcome of interest. This ensures that any observed differences in outcomes over time can be attributed more reliably to the treatment effect rather than pre-existing differences between the groups. To give robustness to our results, we then match the two groups in a very simple way, i.e. we exclude from the control group all observations with a value of total assets less than the minimum value of total assets in the treated group. This is a sort of "size matching", as suggested by [Avgeri, Dendramis and Louri \(2021\)](#). This leads to a large difference in the number of banks in the new dataset, 1031 instead of 2815, but the descriptive statistics and all the econometric results are very similar.

Long-term effects difference-in-difference After the simple difference-in-difference model, we esteem a long-term effects difference-in-difference model proposed by Autor (2003). The idea behind this is to simply include leads and lags in the regression model, which makes it possible to analyse pre-trends and, most importantly, whether the treatment effect changes over time after treatment.

The model can be written as follows:

$$p_{it} = \sum_{r=-q}^{-1} \nu_r * SSM_i + \sum_{r=0}^m \nu_r * SSM_i + \gamma X_{it} + \alpha_i + \lambda_t + \eta_c + \tau_e + u_{it} \quad (3)$$

The parameters α_i represents the bank-specific fixed effects that control for cross-bank differences, while λ_t represents the time fixed effects. As usual, the parameter η_c represents the country-specific fixed effects and τ_e is the type of entity fixed effects. The treatment occurs in year 0 (i.e. 2014). In our case $q = 3$ anticipatory effects (lags) and $m = 5$ post treatment effects are included (see Table 4).

In our models, the inclusion of the fixed effects serves to mitigate omitted variable bias by capturing changes across different dimensions. Additionally, we employ robust clustered standard errors in all regressions to ensure accurate inference.

4 Results

Firstly, we estimate a simple difference-in-difference model, described by Equation 1. We consider only two periods, 2013 and 2014, which are respectively the last year in which all banks were supervised by the NCAs and the first year of SSM activity. The results, shown in Table 3, are inconsistent among the three different specifications and always not significant. In particular, the coefficient of $(SSM * Post)_{it}$, which measures the effect of direct supervision, has different signs but very large standard errors, so we can not consider it to be significantly different from 0. The results are equally not significant considering as alternative dependant variable the Return on Equity using net income (as shown in Appendix in Table 5 and considering the matched sample as described in Section 3).

From the results obtained so far, there does not seem to be any effect of direct supervision on bank's profitability, at least in the first year of adoption of the SSM. Therefore, in order to test for the presence of long-run effects, we estimate a long-term effects difference-in-difference model (Autor, 2003), as described by Equation 3. The results of are shown in Table 4 for both the Return on Equity using net income and the Return on Equity using profit (loss) before tax and are quite coherent across all the specifications. We find indeed a general evidence of a significant positive effect of direct supervision starting from the second year after the adoption of the SSM. At the same time, pre-treatment coefficients are non-significant, confirming the statistical check of parallel trends assumption described in Section 3. The results are not equally significant in all specifications, but looking only at the third, where we control for all the variables in our dataset, and therefore we consider it to be our baseline specification, we have that from 2015 onwards participation in the SSM in 2014 had a positive and significant effect in all but one case. This can also be seen in Figure 4 where the coefficients of the terms $\nu_r * SSM_i$ are reported with 95% confidence interval. The large standard errors for the $SSM_i * Year = 2011$ coefficient is also due to the low number of observations in that year. As expected, in line with the previous result, we find no significant effect of the SSM during the first year of adoption. These findings are confirmed using the matched sample (described in Section 3), as shown in Table 6 in Appendix.

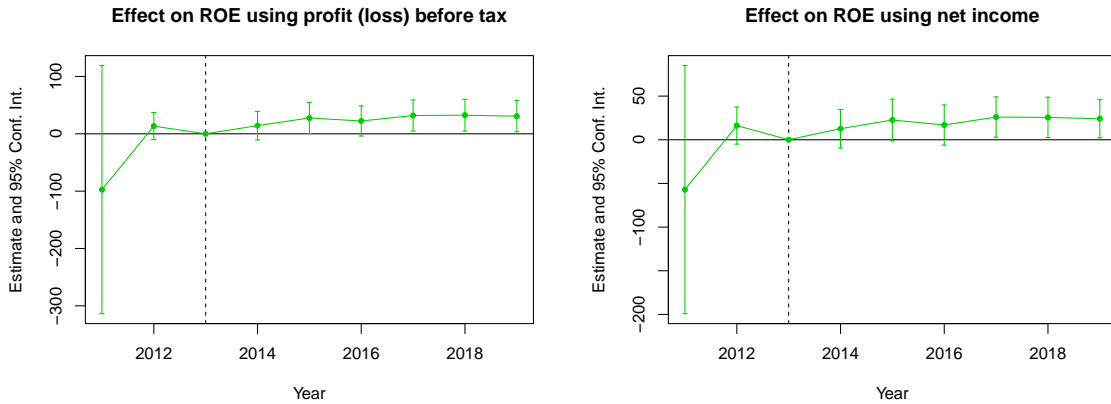


Figure 4: Baseline specification (3). Point estimation and standard errors of the coefficients of the interaction between the year and the treatment variable (ν_r in Formula 3)

The signs of the other significant variables, which we use as controls because they could be co-determinants of bank profitability, are in line with the literature. In particular, the loan loss reserves to gross customer loans ratio has a significant negative effect on profitability, as found by [Kosmidou \(2008\)](#). Common equity as percentage of total assets has instead a significant positive effect, in line with [Pasiouras and Kosmidou \(2007\)](#). The natural logarithm of total asset does not seem to affect profitability, being significant only in the third specification, probably confirming the results of [Athanasoglou, Brissimis and Delis \(2008\)](#). Cost-to-income ratio and Tier 1 are also not significant in our specification. Considering the structural variable, we have that GDP growth has, as expected ([Kosmidou, 2008](#); [Dietrich and Wanzenried, 2011](#)), a strong positive effect. Finally, it appears that government effectiveness, inflation (CPI), and profit tax do not have a clear impact on profitability.

Our findings align with recent research on the subject. In particular, [Avgeri, Dendramis and Louri \(2021\)](#) and [Hirtle, Kovner and Plosser \(2020\)](#) find a positive effect on profitability of direct supervision by the SSM, while [Raunig and Sigmund \(2022\)](#) find that top-ranked U.S. banks that receive more supervisory attention do not have lower growth or profitability. For a discussion on the possible explanations of these results see Section 6.

Table 3: Basic difference-in-difference estimation. 2013-2014

	Dependent variable: ROE using profit (loss) before tax		
	(1)	(2)	(3)
SSM x Post treatment	-6.709 (4.769)	-6.654 (7.452)	3.418 (11.977)
SSM	-2.485 (3.947)	-2.792 (6.559)	-17.708* (10.257)
Post treatment	0.434 (3.042)	0.850 (3.943)	-4.016 (3.064)
Total assets	-0.106 (0.127)	0.027 (0.131)	0.176 (0.203)
Cost-to-income ratio		-0.002 (0.002)	-0.066*** (0.021)
Loan loss reserves to gross customer loans ratio		-0.522*** (0.120)	-0.570*** (0.178)
Common equity as percentage total assets			0.232** (0.099)
Tier 1 ratio			0.071 (0.049)
Government effectiveness	-23.412** (11.670)	-29.692** (14.954)	-10.018 (14.215)
Inflation (CPI)	2.876 (2.958)	3.598 (2.972)	2.774 (2.988)
GDP growth	2.433*** (0.907)	2.794*** (0.988)	4.222* (2.215)
Profit tax	3.828 (4.748)	4.302 (5.289)	-2.283 (1.607)
Constant	-28.570 (70.537)	-27.435 (74.966)	56.097 (35.088)
Country fixed effects	Yes	Yes	Yes
Type of entity fixed effects	Yes	Yes	Yes
Observations	4,934	3,775	1,852
R ²	0.077	0.133	0.263
Adjusted R ²	0.072	0.127	0.251
Residual Std. Error	13.932 (df = 4907)	13.250 (df = 3747)	9.402 (df = 1822)
F Statistic	15.816*** (df = 26; 4907)	21.374*** (df = 27; 3747)	22.407*** (df = 29; 1822)

Note: Clustered (Entity) standard-errors in parentheses

*p<0.1; **p<0.05; ***p<0.01

Table 4: Long-term effects difference-in-difference estimation. 2011-2019

Dependent Variables: Model:	ROE using profit (loss) before tax			ROE using net income		
	(1)	(2)	(3)	(1)	(2)	(3)
<i>Variables</i>						
SSM _i × Year = 2011	-33.31 (24.31)	-55.21 (43.81)	-97.33 (110.3)	-24.44 (18.35)	-39.63 (32.99)	-60.82 (74.61)
SSM _i × Year = 2012	0.4778 (3.242)	1.758 (5.215)	13.41 (12.08)	0.1162 (2.920)	1.498 (4.652)	14.97 (10.47)
SSM _i × Year = 2014	-3.621 (3.256)	-1.436 (4.395)	14.28 (12.71)	-2.482 (3.084)	-0.0737 (4.048)	14.13 (10.75)
SSM _i × Year = 2015	1.286 (3.518)	4.829 (5.052)	27.65** (13.82)	0.7288 (3.343)	3.762 (4.666)	22.86** (11.50)
SSM _i × Year = 2016	4.362 (2.775)	4.643 (4.486)	22.36* (13.39)	3.500 (2.630)	3.485 (4.216)	17.92 (11.13)
SSM _i × Year = 2017	5.388** (2.641)	9.377** (4.150)	31.90** (13.84)	4.283* (2.297)	7.158** (3.541)	25.64** (11.13)
SSM _i × Year = 2018	5.758* (3.137)	11.59** (4.654)	32.49** (14.13)	4.348 (2.940)	8.925** (4.254)	25.66** (11.61)
SSM _i × Year = 2019	0.5585 (5.346)	10.24** (4.261)	30.75** (13.82)	-0.7098 (5.191)	7.539** (3.775)	24.35** (11.13)
Total assets	0.1949 (0.8960)	0.0147 (1.218)	3.917** (1.808)	0.2378 (0.9215)	0.0258 (1.174)	4.130** (1.676)
Cost-to-income ratio		0.0067 (0.0053)	0.0108 (0.0069)		0.0068 (0.0056)	0.0110 (0.0072)
Loan loss reserves to gross customer loans ratio		-0.2818* (0.1530)	-0.5677*** (0.1578)		-0.2548* (0.1366)	-0.4796*** (0.1370)
Common equity as percentage total assets			0.5451*** (0.1926)			0.5470*** (0.1799)
Tier 1 ratio			0.0067 (0.0386)			-0.0038 (0.0404)
Government effectiveness	-4.209 (4.034)	-7.856 (6.437)	9.526 (5.853)	-3.781 (3.124)	-8.014 (4.936)	4.477 (4.409)
Inflation (CPI)	-1.693* (0.9930)	-2.660* (1.450)	-1.352 (1.585)	-1.251 (0.7789)	-2.028* (1.140)	-0.9096 (1.159)
GDP growth	1.743*** (0.5795)	1.996*** (0.6958)	1.713*** (0.5792)	1.495*** (0.4781)	1.718*** (0.5770)	1.471*** (0.4981)
Profit tax	0.0862 (0.1635)	0.3119 (0.2167)	0.2939 (0.2477)	0.0551 (0.1394)	0.2422 (0.1811)	0.2038 (0.2176)
<i>Fixed-effects</i>						
Entity	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes	Yes
Type of Entity	Yes	Yes	Yes	Yes	Yes	Yes
<i>Fit statistics</i>						
Observations	20,994	15,299	10,710	20,994	15,299	10,710
R ²	0.37954	0.37740	0.43925	0.40075	0.43114	0.45304
Within R ²	0.03059	0.06037	0.12233	0.02517	0.05618	0.11892

5 Limitations and further research

This analysis has several limitations and should be corroborated by further research, which is needed to explore this issue in more depth. First, other profitability indicators, such as return on assets, should be considered. For instance, [Avgeri, Dendramis and Louri \(2021\)](#) have already done this and have obtained results similar to ours. In addition, in order to strengthen the analysis, it would be necessary to consider a longer time span, where data are available, so as to better assess the parallel trend assumption. More robustness checks would also be needed, in particular further placebo tests. Further research would also benefit from the use of more complex matching techniques, such as propensity score matching.

A critical aspect to note is that our main results should be interpreted solely as the long-term impact of direct supervision by the SSM in 2014 on bank profitability. Indeed, in our analysis, we refrain from incorporating any data regarding changes in the list of SIs. This could raise an endogeneity problem, as the long-term effects of participation in the SSM in 2014, which we estimate, could be biased. Notably, the fact of being directly supervised or not in later years could be considered an omitted variable, being potentially correlated with the dependent variables and, according to our hypothesis, a determinant of profitability. Neither a two-way fixed effect (TWFE) model nor a more complex staggered difference-in-difference model would adequately address this issue. The primary reason is that we must consider the dynamic nature of the treatment, whereby banks may be excluded or included again in the list of directly supervised institutions. [Imai and Kim \(2021\)](#) proposed a model to address this issue and we believe that its estimation represents a crucial step for our further research. To the best of our knowledge, there is indeed no such analysis on this topic in the literature.

Furthermore, it would be worthwhile to examine the effects of direct supervision on factors beyond profitability, such as those pertaining to the risk of individual institutions (e.g. risky assets and non-performing loans). Finally, it would also be interesting to assess the effect of establishing the SSM and resulting macroprudential measures on systemic risks in Europe. This could be achieved by performing a network analysis, which can be used to extract information from data on bilateral relationships between banks and generate network statistics that accurately describe even complex systems [Schweitzer et al. \(2009\)](#).

6 Conclusions

Despite the limitations highlighted, the study conducted delivers rather clear results: the effect that the SSM generates on profitability of directly supervised banks is positive. Nonetheless, it would be erroneous to succumb to the facile temptation of merely attributing credit in a generic manner to the SSM as if its innovation vaguely consisted in a mere conferral of competences. Indeed, the SSM has a complex structure and a mandate that stems from the direct supervision of SIs to the granting and withdrawal of banking licenses, among others. Certainly, the fact that banking supervision has been entrusted to a supervisor that is part of the ECB, despite the functional independence between banking supervision and monetary policy, has allowed for a substantial increase in the institutional trust, which the ECB has earned through its response to the Eurozone crisis. However, to limit the analysis to this aspect would be to overlook the true nature of the SSM. In fact, the SSM has been a real revolution in the culture of banking supervision in Europe, enabling the development of policies, the exchange of best practices among European supervisors and increased transparency through the consistent application of common rules and standards. The harmonization of supervision in Europe has indeed increased intelligibility and transparency for all stakeholders involved, who now know that they are interacting with one of the largest supervisory authorities in the world. Banking supervision has thus become the instrument to create a level playing field for banks across participating countries, and new opportunities have arisen for market participants, for whom the SSM has strengthened the freedom of establishment and provision of cross-border services. Therefore, the novelty of the SSM is not simply the transfer of competences, but rather what the ECB, acting closely with national supervisors, has been able to build in the exercise of these competences. And in this respect the SSM represents a successful example of European integration, wherein national states do not hesitate to share a portion of their sovereignty and prerogatives in the pursuit of a greater good and for the benefit of many. It is also an outstanding example of successful European integration, as it is a framework in which national authorities and EU institutions work jointly to fulfil its ambitious mandate, allocating tasks on a daily basis in accordance with the principles of subsidiarity and loyal cooperation.

In light of this, our results can be explained through various channels. Firstly, by the increased transparency and credibility of the directly supervised banks, which leads to lower funding costs

as markets expect lower returns from safer institutions (Feng and Wang, 2018). Moreover, the observed positive effect on profitability can also be attributed to efficient managerial adjustments carried out by banks in response to the expectations of direct supervision by the ECB. Research by Fiordelisi, Ricci and Lopes (2017) suggests that banks anticipating ECB supervision adjusted their lending activities, which subsequently affected their capital ratios. Given the significant relationship between lending behaviour and capitalisation with bank profitability, these management adjustments are likely to have contributed to the observed positive results. Interestingly, these two mechanisms seem to outweigh the possible negative impact on profitability of the increase in operating costs due to the burdensome and resource-intensive implementation of new regulations (KPMG, 2016). However, it is worth noting that further investigation of these mechanisms is warranted, also in light of the persistently low profitability of European banks, as documented by Elekdag, Malik and Mitra (2020); Feng and Wang (2018); ECB (2018).

In light of the above, the perennial policy question of whether low profitability should be considered an element of concern for supervisors remains open for discussion, especially when the sustainability and viability of business models are ensured over the cycle. As much as it would be overly ambitious to encapsulate the issue in a few words, suffice it to say that the resilience demonstrated by the EU banking system in its ten years of existence clearly indicates that it would be disproportionate to consider the low profitability as a supervisory concern. In this perspective, profitability represents an indicator to be closely looked at. In light of our empirical analysis, we can thus infer that the SSM is indirectly but steadily shielding banks from decreases in profitability, while aiming at their resilience and robustness over the last years. In a Europe in the midst of geopolitical upheaval, predicting the future trajectory of banks and their profits over the next ten years would prove quite a challenging task. However, our findings provide some reassurance that the SSM is on the right track to continue its efforts to safeguard the integrity of the European banking sector.

7 Appendix

Table 5: Basic difference-in-difference estimation, alternative dependand variable, 2013-2014

	<i>Dependent variable: ROE using net income</i>		
	(1)	(2)	(3)
SSM x Post treatment	-5.066 (4.001)	-4.061 (6.016)	7.280 (10.032)
SSM	-1.917 (3.268)	-2.352 (5.415)	-17.038* (8.970)
Post treatment	-0.486 (2.521)	-0.069 (3.253)	-5.235* (3.076)
Total assets (ln)	-0.017 (0.099)	0.067 (0.099)	0.086 (0.161)
Cost-to-income ratio		-0.003 (0.002)	-0.058*** (0.016)
Loan loss reserves to gross customer loans ratio		-0.436*** (0.113)	-0.457*** (0.140)
Common equity as percentage total assets			0.219*** (0.076)
Tier 1 ratio			0.065* (0.038)
Government effectiveness	-19.197** (9.473)	-24.008** (12.090)	-9.983 (11.809)
Inflation (CPI)	2.108 (2.441)	2.968 (2.490)	2.436 (2.801)
GDP growth	2.431*** (0.808)	2.764*** (0.929)	4.559** (2.156)
Profit tax	2.819 (3.866)	3.078 (4.313)	-2.478* (1.465)
Constant	-18.768 (57.505)	-16.102 (61.218)	59.894* (30.659)
Country fixed effects	Yes	Yes	Yes
Type of entity fixed effects	Yes	Yes	Yes
Observations	4,934	3,775	1,852
R ²	0.078	0.156	0.276
Adjusted R ²	0.073	0.150	0.265
Residual Std. Error	10.829 (df = 4907)	9.586 (df = 3747)	7.560 (df = 1822)
F Statistic	15.991*** (df = 26; 4907)	25.636*** (df = 27; 3747)	23.972*** (df = 29; 1822)

Note: Clustered (Entity) standard-errors in parentheses

*p<0.1; **p<0.05; ***p<0.01

Table 6: Long term effects difference-in-difference estimation, size-matched sample, 2011-2019

Dependent Variables: Model:	ROE using profit (loss) before tax			ROE using net income		
	(1)	(2)	(3)	(1)	(2)	(3)
<i>Variables</i>						
SSM _i × Year = 2011	-32.36 (23.65)	-53.49 (42.64)	-92.31 (106.9)	-23.54 (17.85)	-38.14 (32.08)	-57.09 (72.37)
SSM _i × Year = 2012	0.4170 (3.432)	2.836 (5.417)	14.99 (12.10)	-0.0409 (3.019)	2.247 (4.706)	16.23 (10.80)
SSM _i × Year = 2014	-4.626 (3.486)	-3.589 (4.870)	13.65 (13.61)	-3.600 (3.256)	-2.364 (4.375)	12.69 (11.27)
SSM _i × Year = 2015	1.462 (3.592)	2.660 (5.744)	27.90* (14.78)	1.020 (3.305)	1.738 (5.162)	22.62* (12.17)
SSM _i × Year = 2016	2.687 (3.060)	1.761 (5.021)	22.03 (14.25)	1.970 (2.810)	0.6692 (4.576)	16.92 (11.73)
SSM _i × Year = 2017	4.376 (2.861)	8.002* (4.615)	32.30** (14.70)	3.385 (2.408)	5.897 (3.803)	26.00** (11.72)
SSM _i × Year = 2018	4.273 (3.439)	9.918** (5.040)	31.57** (14.20)	3.281 (3.124)	7.841* (4.472)	25.64** (11.78)
SSM _i × Year = 2019	-0.5935 (5.490)	9.040** (4.385)	30.53** (13.60)	-1.863 (5.292)	6.303 (3.847)	24.05** (11.12)
Total assets (ln)	-0.8878 (1.235)	-4.982* (2.699)	-0.5242 (5.900)	-0.4918 (1.141)	-4.389* (2.597)	0.9014 (4.983)
Cost-to-income ratio		-0.0020 (0.0031)	-0.0080 (0.0089)		-0.0026 (0.0027)	-0.0069 (0.0076)
Loan loss reserves to gross customer loans ratio		-0.3478 (0.2465)	-0.7557*** (0.2055)		-0.2727 (0.2042)	-0.5786*** (0.1634)
Common equity as percentage total assets			0.4589 (0.4560)			0.4868 (0.3804)
Tier 1 ratio			0.0127 (0.0665)			0.0001 (0.0570)
Government effectiveness	-3.793 (8.487)	-16.09 (13.41)	19.66 (21.97)	-4.535 (6.562)	-17.04* (10.27)	9.145 (15.95)
Inflation (CPI)	-2.850 (2.159)	-4.712 (3.046)	-6.556 (4.931)	-2.099 (1.679)	-3.657 (2.371)	-4.952 (3.498)
GDP growth	2.116*** (0.7798)	2.254*** (0.8525)	2.095** (0.8271)	1.814*** (0.6421)	1.944*** (0.7063)	1.829*** (0.6881)
Profit tax	0.2318 (0.2844)	0.5333 (0.3538)	1.343** (0.5999)	0.1647 (0.2418)	0.4143 (0.2924)	1.041** (0.5045)
<i>Fixed-effects</i>						
Entity	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes	Yes
Type of Entity	Yes	Yes	Yes	Yes	Yes	Yes
<i>Fit statistics</i>						
Observations	8,701	6,513	3,850	8,701	6,513	3,850
R ²	0.30126	0.30534	0.38906	0.28133	0.29093	0.39363
Within R ²	0.04700	0.07223	0.12604	0.04044	0.06337	0.11147

Clustered (Entity) standard-errors in parentheses
Signif. Codes: ***: 0.01, **: 0.05, *: 0.1

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