Did the COVID-19 Pandemic Affect Banks' Ownership Structure? Evidence from Europe

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Abstract

This paper examines the impact of the COVID-19 pandemic on ownership concentration in the banking industry. In particular, we look at the institutions comprised under the Refinitiv category "Banks". Once retrieved the data on shareholders (i.e., their identities and stakes held), we end up with a sample of 221 European listed banks over a 13-quarter time horizon — spanning between 2018-Q3 and 2021-Q3 — for a total amount of 2,873 observations on ownership concentration. For each bank-quarter observation, we compute the Herfindahl-Hirschman Index (HHI) of the ownership structure, the cumulative stake held by the 5 largest shareholders, and the floating capital (i.e., the sum of all stakes that are too small to be displayed). After preliminarily regressing these variables on the bank financials (from Moody's BankFocus) that could theoretically affect the degree of concentration, we construct a panel data model to test whether the latter may be explained by COVID-related country-quarter variables (from the Our World in Data database), and whether financials play a different effect based on the pandemic trend. We find that the positivity rate and the number of deaths each million people have contributed to reducing concentration, potentially suggesting that the largest shareholders have fled banks as the contagion advanced, whereas the degree of stringency of anti-COVID public policies has seemingly exerted no influence on investors' behaviour.

JEL: E58, F30, G01, G14, G21, G28

Keywords: Banks, ownership, concentration, COVID-19

1. Introduction

The year before the collapse of Lehman Brothers and the subsequent global recession, the economist Nassim Nicholas Taleb published a philosophical literary essay that become famous entitled "The Black Swan" (2007). The economist Taleb developed the interesting idea that mankind, despite all possible expedients, remains blind to randomness. "*Rara avis in terris nigroque simillima cygno*" (a rare bird in the lands and very much like a black swan) is the phrase of the latin poet Juvenal from which Taleb drew inspiration to allude to improbable if not impossible events. The black swan of which the author tells is indeed an adverse event that occurs unexpectedly, with an enormous potential

for damage. It is widely believed that a new black swan has been appeared at the gates 2020: corona virus disease (COVID-19). But is this really the case? Is the image of the black swan really the exact representation of this crisis? Certainly nowadays, the media provoke a rapid and massive dissemination of information with multiple theories about the health emergency and the resulting crisis (Biddlestone, Green & Douglas, 2020; Pummerer et al., 2022; Romer & Jamieson, 2020). It should come as no surprise that, the idea of looking at this event as a black swan, has received much credence (Antipova, 2020; Mazzoleni, Turchetti & Ambrosino, 2020; Yarovaya, Matkovskyy & Jalan, 2022). It probably appeals many to exempt themselves from blame, such as a failure to foresee, by deeming this crisis to be an unforeseeable event.

But if the COVID-19 pandemic wave was in a sense already expected by many, can the same be said for the collapse of the markets and the resulting financial shock? Today's financial system is the result of a recent consolidation process that took place after the 2007 crisis. Although in recent years the financial markets have seen a series of rallies and are now completely different from those of the latest crisis, we are faced with a financial system that is still carrying the burdens of a deep crisis and has many fragilities to heal (Atkinson et al., 2013; DeMenno, 2020; Lucas, 2019). Such a devastating impact of the pandemic on the financial system was inevitable. Moreover, since 2007 we have witnessed a process of reduction and consolidation of banks. They have gradually reduced their presence (from around 880 banks in 2007 to 539 today) and at the same time, while businesses have remained quite small, banks have consolidated their position by becoming much larger and strengthening their assets (Claessens & Van Horen, 2015; Uhde & Heimeshoff, 2009). However, the financial system is responding more effectively than it might have done at other times.

In Europe, the perspective adopted has always been of a bank-centric system due to the strong connection between companies and the banking sector, considered by the former as the main source of financing. Indeed, in the Italian context the pandemic crisis materialised in different way with respect to the Americans one, mainly because of the almost different role played by the banking sector in the two contexts. Therefore, banks in Italy have not been directly affected by the problems that have afflicted the American credit sector, but rather have only taken on board the crisis when it hit the real economy. Given the economic shock, Italian companies found it difficult to maintain a healthy relationship with the credit sector, transferring its problems to the latter. In particular, what allowed the Italian banking sector to handle the initial collapse of the financial markets was the lack of ownership of particular securities. Indeed, while the Anglo-Saxon banks and those of other countries, which are more involved in securities brokerage operations, held a large quantity of these so-called "toxic" securities, Italian banks were less affected from this point of view as they held very

few of these financial instruments. The strong dependence of companies on the banking channel is therefore not a positive element for any financial system.

Indeed, while major banks with significant levels of unused corporate loan commitments undergone the greatest increases in lending, these banks managed to fulfil liquidity demands due to the enormous increase in deposits (Acharya et al., 2021; Chodorow-Reich et al., 2021; Li et al., 2020).

The nascent literature on COVID-19 and the financial sectors mainly focuses on banking performance during the COVID-19 crisis (Beck and Keil, 2021; Hassan et al., 2021) or on stock market reactions detecting a substantial reaction of share prices to Covid-19 updates and a rise in market volatility (Alfaro et al., 2020; Baker et al., 2020; Ramelli & Wagner, 2020). Moreover, as is typically of research on the financial sector especially in the banking industry, the existing scientific debated on COVID-19 is mainly centred on the United States (Berger et al., 2021b, Chodorow-Reich et al., 2021; Acharya et al., 2021).

However, to the best of our knowledge no study has investigated the effect that COVID-19 has had on banking concentration. Therefore, in this research, we empirically investigate the impact of COVID-19 pandemic on banking concentration measured using three main different variables, namely Herfindahl-Hirschman Index (HHI), the top 5 stake (%) held in a bank by its 5 largest shareholders and the floating capital. Moreover, we focus on whether concentration index of banks has been influenced by the pandemic comparing banks different business models.

The paper is structured as follows. In Section 2 we present the literature review. In Section 3, we describe data. In Section 4, we lay out the methodology. In Section 5, we analyse our research findings. Finally, Section 6 concludes.

2. Literature Review

The Covid-19 pandemic has highlighted the need to accelerate digital transformation towards new and more resilient business models, both in the public and private sector. Containment of contagions and living with the virus have changed the priorities of companies, leading them to adopt new ways of competing based on speed of reaction, flexibility and innovation in order to adapt to the new normal.

Having regard to the financial sector, banks faced the constraints of low interest rates, the legacy of the global crisis with high NPLs, new rivals and digitalization, and a significantly larger regulatory load prior to Covid-19 (Cukierman, 2013; Dermine, 2013; Manz, 2019; Broeders & Khanna, 2015; Vasiljeva & Lukanova, 2016). These issues exacerbate in the post-Covid-19 environment, with only a limited reduction in regulatory burden owing to the looming crisis. The Covid-19 crisis has demonstrated that low interest rates are here to stay for a significantly longer period of time than was

anticipated prior to the crisis. The possibility of negative economic growth and more debt will result in even lower nominal and real interest rates (Bismut & Ramajo, 2021).

This will put more pressure on bank profits and, as a result, cost-cutting measures which is the reason why the recent scientific and academic debate is mainly focused on banks faced extreme pandemic crisis in terms of profitability, risk-taking, and capital decomposition. Our study is related to a very recent, yet growing, literature which analyses the impact of the pandemic in the context of the financial sector (Borio, 2020; Feyen et al., 2021; Gormsen & Koijen, 2020; Landier & Thesmar, 2020). However, given the crisis's immense scope and unique character, it is difficult to select a specific stream of research to identify the shock's impact on the financial system.

Indeed, if on the one hand scholars analyse the relationship between credit management and Covid-19 (Beck and Keil, 2021; Çolak & Öztekin, 2021; Greenwald et al., 2020; Li et al., 2020), on the other hand it was investigated how Covid-19 influenced volatility and market risk along with bank liquidity, central bank funding and negative rates (Acharya et al., 2021; Chodorow-Reich, et al., 2021; Kapan and Minoiu, 2021).

In a very recent study on the impact of the pandemic on the banking sector, Demirgüç-Kunt et al., (2021) investigate whether the shock generated a differential impact on banks against corporates, other than banks with different characteristics in a sample of 53 countries. Employing a comprehensive database of financial sector policy responses, the findings confirm the different effects. Indeed, they prove that the negative impact of the pandemic on banks was far more acute and long-lasting than companies and other non-bank financial institutions since banks are expected to absorb at least a portion of the shock to the business sector (Acharya & Steffen, 2020; Borio, 2020). Moreover, larger banks were mostly affected by the pandemic in terms of stock returns as well as public ones and those banks that have been revealed lower liquidity before the pandemic event.

Against this background, the study by Hassan et al., (2021) on the Federal Deposit Insurance Corporation (FDIC) financial institutions data for the three quarters before and the first three quarters during COVID-19, examine the performance of community and non-community banks. In their experimental design, the authors define a community bank as one with less than $1 billion in total assets and a large community bank as having assets between $1 billion and $10 billion. In order to analyse the influence of the pandemic on bank performance they use three bank performance proxies namely return on assets (ROA), return on equity (ROE), and net interest margin (NIM). Findings show that, on the first three-quarters of COVID-19, non-community banks underperformed with respect to community banks critical indicators. This because, community banks can benefit from strong customer connections providing a better understanding of local firms which is crucial during times of high externalities (Berger & Udell, 1995; Elsas, 2005; Haynes et al., 1999; Petersen and Rajan, 1995;

Scott, 2004).n line with these findings, when comparing the performance of community banks in rural against urban locations, authors discover that community banks in urban areas outperform rural community banks over the first three quarters of the epidemic. Besides, community banks in metropolitan areas enforce greater client ties, separating themselves from major banks. Moreover, by introducing in their empirical model an index of quality of healthcare facilities, the authors prove that the level of performance reached by banks varies with respect to the better or worse quality of healthcare services. Indeed, performance inequalities are less significant in states with a higher health index.

In order to explain the entire impact of the pandemic on the economy and financial system several studies have been conducted. Barua (2020) offers a thorough knowledge of the pandemic's anticipated macroeconomic repercussions. Investigating on the implications of several scenarios on macroeconomic outcomes and financial markets, McKibbin and Fernando (2020) confirm historical data that pandemics are a real threat for economic recessions, which are likely to have a significant impact on the banking sector's stability. Moreover, according to Fernandes (2020), COVID-19 lowered worldwide supply and demand.

Several more research investigate the competition-stability perspectives on bank risk-taking during the Covid-19 (Duan et al., 2021; Elnahass, Trinh & Li, 2021; Li et al., 2021; Rizwan, Ahmad & Ashraf, 2020). In light of the above, the study by Duan et al., (2021) on 1,584 listed banks from 64 countries during the COVID-19 pandemic is the first which perform the first broad-based worldwide analysis of the influence of the COVID-19 pandemic on bank systemic risk. Findings show that the pandemic has elevated systemic risk across nations and that the main influence is due to networks of government policy reaction and bank failure risk. Moreover, it has been found that big, highly leveraged, riskier, high loan-to-asset, undercapitalized, and low network centrality banks have a more negative impact on systemic stability during the Covid-19 pandemic.

Since the literature on the aforementioned topic is to be considered an active research agenda, with number of research publications forthcoming, the objective of the study is to determine whether COVID-19 pandemic played a role on ownership concentration in the European banking industry, raising the following question: *Did the COVID-19 Pandemic Affect Banks' Ownership Structure?*

Therefore, the current research responds to the call to deepen previous studies on banking research in the time of COVID-19 on whether and how the COVID-19 crisis will impact banking market structure and whether the crisis has impacted bank operations and business models (Berger & Demirgüç-Kunt, 2021).

3. Data and methodology

Our study employs data comprised between 2018 3rd quarter, ending on 30 September 2018, and 2021 3rd quarter, ending on 30 September 2021. It focuses on listed European banks (i.e., incorporated in a listed European country), whose population is retrieved from the Refinitiv category Banks, which comprised 374 institutions upon launching our query. Although some of them are actually private institutions (for instance, they were listed in the past but are not publicly traded anymore), the unlisted status would arise once we check for data availability. Still from Refinitiv, we collected a wide array of information on these banks' shareholders, whereof we kept just the name and the stake held (in percentage terms, as reported by Refinitiv). We excluded a bank-quarter observation in case it was either based on too narrow data (i.e., a <5% sum of displayed stakes) or marred by self-evident errors (e.g., a >100% sum of displayed stakes). By doing so, we ended up with an entity set made of 221 banks, for a total amount of 2,873 observations on the variables describing ownership concentration.

Also, we collected banks' financials from Moody's BankFocus, where we selected entities based on the 1:1 correspondence between an entity's Refinitiv Identification Code (RIC) and the associated International Securities Identification Number (ISIN) on equity markets, as the latter is acknowledged as a search criterion on BankFocus. However, since for a given ISIN multiple results are displayed, associated with different levels of consolidation of financial data, we systematically chose the most consolidated as possible.

In addition to bank-level variables, we downloaded country-level COVID-19 variables from the Our World in Data (OWiD) database, stored on GitHub (link). The data cover the period of 2018q to 2020q, and includes countries belonging to the EU and non-EU as well as Eurozone and non-Eurozone countries. The panel data set was built using also quarterly financial variables from Bankfocus to capture the time-varying dimension of banks' ownership structure with respect different banks financial characteristics. In the development of the identification of banks with respect ownership characteristics, three ownership metrics have been considered: (1) Herfindal Hershman index computed for a bank's ownership distribution (HHI); (2) The sum of the stakes held in a bank by its 5 largest shareholders (Top 5 stake) , (3)The floating capital as inverse measure of bank's HHI.

Table 1 reports the variable definitions. The dependent variable are Herfindahl-Hirschman Index (HHI), Top 5 Stake and Floating capital and the main independent variables as proxies of the effects of COVID-19 are the stringency index, the positivity rate and the deaths per millions of people associated with a COVID-19 infection. Table 2 presents some general descriptive statistics for both our data set and the corresponding full sample of banks. It shows descriptive statistics for the variables used in the regression analysis. By constructing the correlation matrix, we also confirm that there are no multicollinearity issues (Table 3).

Table 1 Variable definitions

Dependent variables	
Herfindahl-Hirschman Index	The sum of all the squared ownership stakes held in a bank. Given that stakes are expressed in percentage points, the index ranges between 0 and 10,000.
Top 5 stake (%)	The sum of the stakes held in a bank by its 5 largest shareholders, in percentage points.
Floating capital (%)	The sum of all the stakes in a bank that are too small to be displayed by Refinitiv, in percentage points. The figure is computed residually, as the complement to 100 of the sum of all displayed stakes.
COVID-19 variables	
Stringency Index	The degree of stringency of public policy measures (e.g., lockdowns) adopted by a country's government as a response to the COVID-19 pandemic, as computed by the Oxford Coronavirus Government Response Tracker (OxCGRT). It ranges between 0 and 100. Each country-quarter figure is computed as the average of all the daily observations related to that country throughout that quarter.
Positivity rate, quarterly	The ratio between the COVID-19 tests with a "positive" outcome and the total number of tests undergone in a country during a quarter.
Deaths per 1M people, quarterly flow	The number of people whose death has been associated with a COVID-19 infection, per million people, in a country during a quarter.
Financial control variables	
Net loans on total assets (%)	The ratio between a bank's total performing loans (i.e., net of delinquencies) and total assets, in percentage points.
Return on average assets (%)	The ratio between a bank's net profit and average total assets (i.e., the mean of the beginning and end-period figures).
CET1 ratio (%)	The Common Equity Tier 1 ratio, as reported by a bank, in percentage points.
NPL ratio (%)	The ratio between a bank's non-performing loans and total loans, in percentage points.
Other dummy controls	
Bank holding company	Dichotomic variable that takes value 1 if a bank is classified as "bank holding company" by Moody's BankFocus.
Commercial bank	Dichotomic variable that takes value 1 if a bank is classified as "commercial bank" by Moody's BankFocus, and 0 otherwise.
Cooperative bank	Dichotomic variable that takes value 1 if a bank is classified as "cooperative bank" by Moody's BankFocus, and 0 otherwise.
Savings bank	Dichotomic variable that takes value 1 if a bank is classified as "savings bank" by Moody's BankFocus, and 0 otherwise.
Government bank	Dichotomic variable that takes value 1 if a bank is classified as "specialized governmental credit institution" by Moody's BankFocus, and 0 otherwise.

To perform an exploratory analysis of the possible causal effects of the COVID-19 spreading on European banks' ownership structure, we run the following panel data regression:

$$\text{OWNERSHIP}_{ijt} = \alpha + \beta\ \text{COVID-19}_{j(t-1)} + \mathbf{FINANCIALS}_{ij(t-1)}\boldsymbol{\gamma} + \mathbf{D\_BUSINESS}_{ij}\boldsymbol{\delta} + (\mathbf{COVID\text{-}19} \times \mathbf{FINANCIALS})_{ij(t-1)}\boldsymbol{\eta} + \tau_t + \kappa_j + \varepsilon_{ijt}$$

where i indexes banks, j countries, and t quarters; α is the constant term; τ denotes quarter-fixed effects, and κ country-fixed ones; ε is the error term. Standard errors are clustered by bank.

- **OWNERSHIP** is alternatively one of the following:
  - *Herfindahl-Hirschman Index*
  - *Top 5 stake*
  - *Floating capital*
- **COVID-19**, associated with the β coefficient, is alternatively one of the following:
  - *Stringency Index*
  - *Positivity rate, quarterly*
  - *Deaths per 1M, quarterly flow*

- **FINANCIALS** is a $[1 \times 4]$ row vector, associated with a $[4 \times 1]$ vector of coefficients ($\boldsymbol{\gamma}$), made of the following:
  - *Net loans on total assets*
  - *Return on average assets*
  - *CET1 ratio*
  - *NPL ratio*
- **D_BUSINESS** is a $[1 \times 5]$ row vector, associated with a $[5 \times 1]$ vector of coefficients ($\boldsymbol{\delta}$), made of the following:
  - *Bank holding company*
  - *Commercial bank*
  - *Cooperative bank*
  - *Government bank*
  - *Savings bank*
- **COVID-19 × FINANCIALS** is a row vector, associated with a column vector of coefficients ($\boldsymbol{\eta}$) made of interaction terms between (some of the) variables encompassed by those two vectors.

Table 2 Descriptive statistics

	N	Mean	SD	Min	p25	p50	p75	Max	Skewness	Kurtosis
Herfindahl-Hirschman Index	2,871	1,736.70	2,101.67	0.00	177.92	713.18	2,803.54	10,000.00	1.50	4.77
Top 5 stake	2,871	46.94	26.36	0.00	24.02	45.06	69.91	100.00	0.12	1.84
Floating capital	2,871	41.17	25.43	0.00	21.19	36.31	56.36	100.00	0.57	2.53
Stringency Index	2,825	29.81	29.55	0.00	0.00	34.35	58.48	86.16	0.20	1.39
Positivity rate, quarterly	2,544	2.75	5.19	0.00	0.00	0.00	3.13	32.14	2.93	12.66
Deaths per 1M people, quarterly flow	2,832	104.49	201.38	0.00	0.00	4.76	80.00	1,388.28	2.42	9.12
NLTA	2,182	61.25	16.66	0.03	51.08	63.00	74.16	91.33	-0.81	3.85
ROA	2,225	0.84	1.51	-17.87	0.37	0.67	1.11	36.82	5.98	169.96
CET1	1,910	16.91	36.81	1.00	13.60	15.90	17.92	1,615.00	42.88	1,861.87
NPL	1,783	3.85	5.87	0.00	0.84	1.83	4.10	71.17	4.08	27.02
Bank holding company	2,871	0.09	0.28	0	0	0	0	1	2.95	9.72
Commercial bank	2,871	0.49	0.50	0	0	0	1	1	0.03	1.00
Cooperative bank	2,871	0.08	0.27	0	0	0	0	1	3.17	11.07
Government bank	2,871	0.05	0.22	0	0	0	0	1	4.14	18.13
Savings bank	2,871	0.14	0.35	0	0	0	0	1	2.07	5.29

Table 3 Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Herfindahl-Hirschman Index	1.00													
Top 5 stake	0.86	1.00												
Floating capital	-0.68	-0.87	1.00											
Stringency Index	-0.01	0.00	-0.01	1.00										
Positivity rate, quarterly	0.07	0.05	-0.02	0.53	1.00									
Deaths per 1M people, quarterly flow	0.10	0.09	-0.05	0.62	0.76	1.00								
NLTA	-0.08	-0.05	-0.01	-0.13	-0.11	-0.17	1.00							
ROA	-0.04	0.02	-0.07	-0.12	-0.15	-0.13	0.17	1.00						
CET1	-0.12	-0.10	0.13	0.06	0.02	0.00	0.10	0.08	1.00					
NPL	0.02	0.03	0.07	-0.02	-0.02	-0.02	-0.06	-0.07	-0.08	1.00				
Bank holding company	-0.13	-0.14	-0.01	0.07	0.04	0.06	-0.27	-0.08	-0.14	-0.06	1.00			
Commercial bank	0.11	0.15	-0.06	0.02	0.06	0.07	-0.24	-0.01	-0.15	0.26	-0.39	1.00		
Cooperative bank	0.07	-0.04	0.16	-0.07	-0.03	-0.02	0.07	-0.05	0.03	-0.01	-0.09	-0.28	1.00	
Government bank	0.12	0.05	0.05	-0.05	0.08	0.10	0.11	-0.05	0.07	-0.07	-0.05	-0.18	-0.04	1.00

Table 4 The impact of Covid-19 on bank's concentration in Eurozone and Non-Eurozone

	Pre-COV	**Post-COV**	**Shift**
HHI			
Total	1,709.72	1,759.79	*+2.93%*
Eurozone	1,592.42	1,633.83	*+2.60%*
Non-Euro	1,778.63	1,834.10	*+3.12%*
Δ	*-186.22*	*-200.28*	*+7.55%*
TOP 5 STAKE			
Total	47.06	46.84	*-0.46%*
Eurozone	43.31	42.80	*-1.19%*
Non-Euro	49.26	49.23	*-0.06%*
Δ	*-5.95*	*-6.44*	*+8.21%*
FLOATING CAPITAL			
Total	40.77	41.50	*+1.79%*
Eurozone	46.13	46.70	*+1.24%*
Non-Euro	37.63	38.43	*+2.15%*
Δ	*+8.50*	*+8.27*	*-2.74%*

Table 5 Banks by country

Country	Banks (N)	Obs (N)	Total assets, avg by obs (EUR bn)	Total assets, total (EUR bn)	Total assets, total (% of Sample)
United Kingdom	15	127	682.79	86,714.83	721957.54%
France	17	175	431.18	75,456.33	628223.17%
Spain	6	78	514.30	40,115.15	333984.82%
Italy	17	199	156.64	31,172.20	259528.88%
Germany	7	75	348.45	26,133.90	217581.78%
Switzerland	22	143	164.99	23,593.67	196432.71%
Netherlands	2	24	692.46	16,619.09	138364.76%
Sweden	5	52	216.39	11,252.12	93681.24%
Russia	14	107	83.77	8,963.84	74629.81%
Denmark	17	208	41.66	8,664.72	72139.44%
Finland	3	26	295.44	7,681.48	63953.31%
Austria	7	84	80.60	6,770.26	56366.85%
Norway	31	375	14.35	5,381.82	44807.17%
Greece	6	65	82.65	5,372.41	44728.79%
Belgium	2	16	297.92	4,766.76	39686.39%
Poland	12	155	29.42	4,560.08	37965.67%
Ireland	3	18	85.76	1,543.61	12851.57%
Portugal	2	13	83.20	1,081.59	9004.94%
Hungary	2	16	48.24	771.89	6426.46%
Czech Republic	2	26	28.27	734.89	6118.48%
Romania	3	26	16.13	419.48	3492.47%
Cyprus	2	26	15.01	390.29	3249.41%
Croatia	6	74	4.31	318.86	2654.72%
Liechtenstein	2	12	16.82	201.86	1680.61%
Slovakia	2	12	16.75	201.06	1673.94%
Malta	4	24	5.48	131.45	1094.41%
Iceland	1	13	8.34	108.45	902.94%
Bulgaria	4	36	2.95	106.07	883.11%
Estonia	1	13	3.67	47.77	397.69%
Lithuania	1	13	2.74	35.67	296.95%
Faroe Islands	1	13	2.14	27.83	231.66%
Macedonia	1	13	2.04	26.47	220.36%
Serbia	1	3	4.00	12.01	100.00%
Total	221	2,260	4,478.88	12.01	100.00%

Table 6 Banking concentration by quarter (Mean)

	HHI Total	Top 5 Stake	Floating Capital
2018-Q3	100.00	100.00	100.00
2018-Q4	99.93	100.41	98.43
2019-Q1	105.23	101.78	97.43
2019-Q2	105.58	101.66	97.41
2019-Q3	105.31	101.34	97.63
2019-Q4	106.60	100.69	97.41
2020-Q1	106.10	100.11	98.75
2020-Q2	106.36	100.09	99.85
2020-Q3	104.43	99.70	100.85
2020-Q4	105.98	101.15	99.35
2021-Q1	105.56	100.70	99.83
2021-Q2	109.16	100.66	100.29
2021-Q3	110.14	101.22	99.68

Fig. 1 Average concentration of banks Herfindahl-Hirschman Index, over time

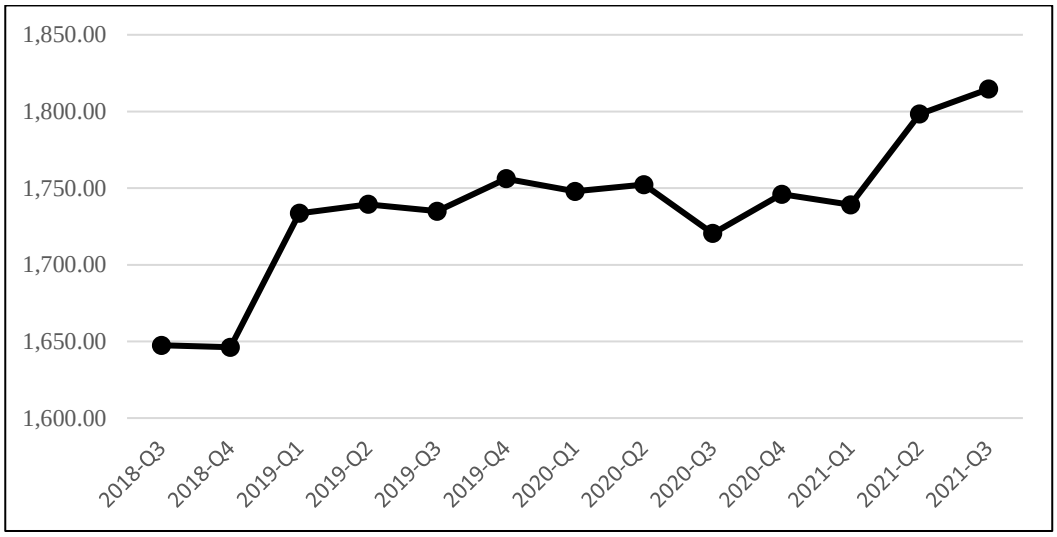


Fig. 2 Average Top 5 Stake (%), over time

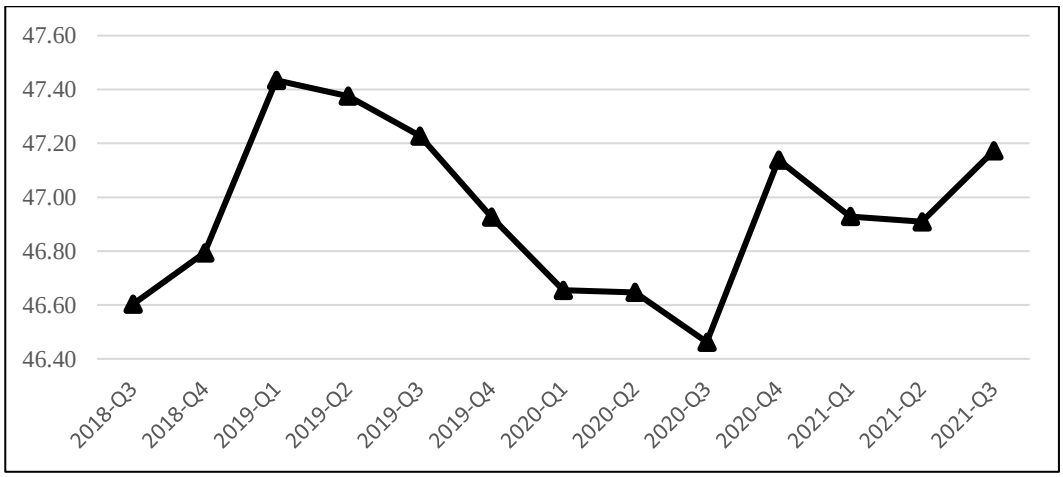
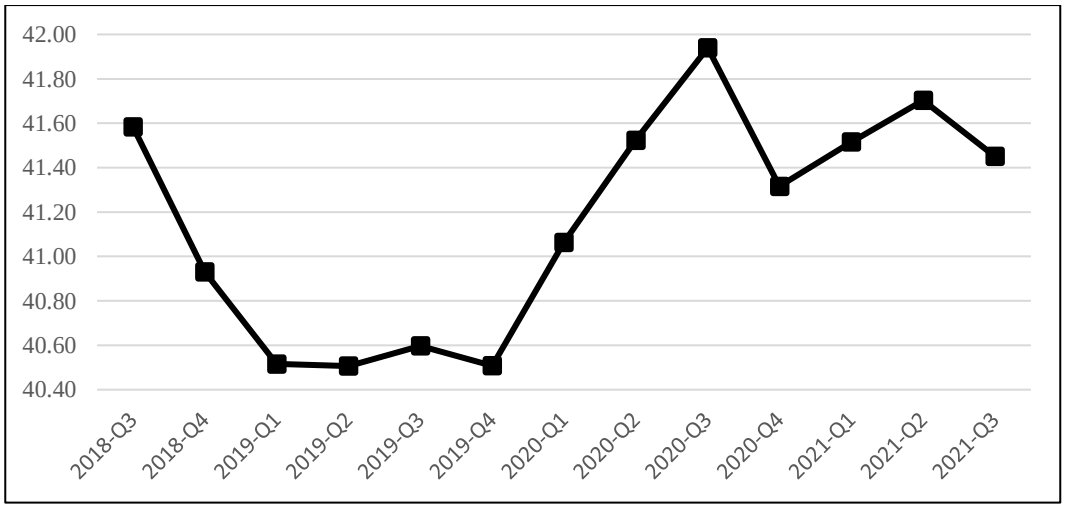


Fig. 3 Average Floating Capital (%), over time



Figures 1 to 3 plot average values of ownership concentration. Over the considered period, the lowest value for HHI was registered on the fourth quarter of 2018. After March 2020, lower values were recorded on the third quarter of 2020 for HHI during the covid pandemic.

Fig. 4 Ownership concentration over time *(Mean)*

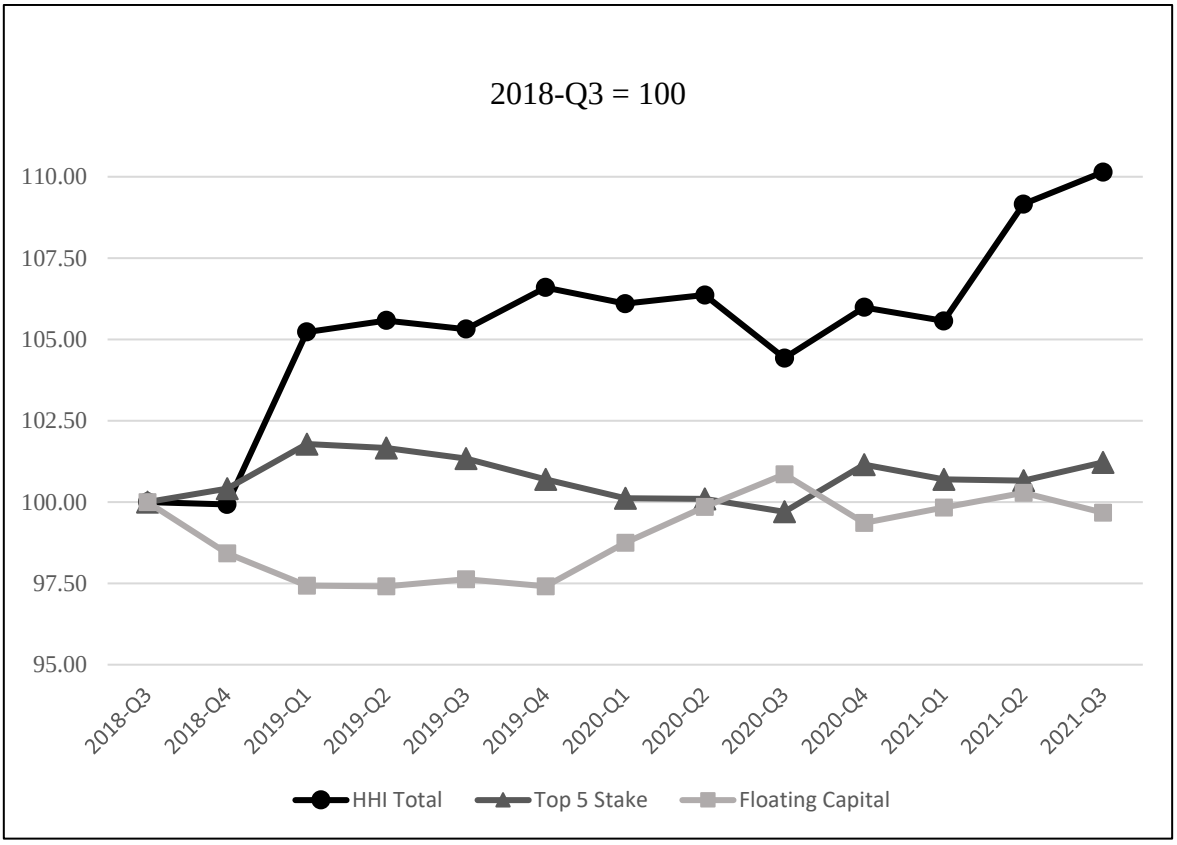


Fig. 4 displays the mean of the three dependent variables employed in this study during the period considered. It shows that higher levels of concentration before Covd-19 shock have been registered in the last quarter of 2018, while the lowest values are displayed in the third quarter of 2020. Average values start to increase, reaching the highest level for HHI, at the third quarter of 2021.

Fig. 5 Herfindahl-Hirschman Index by country (Mean)

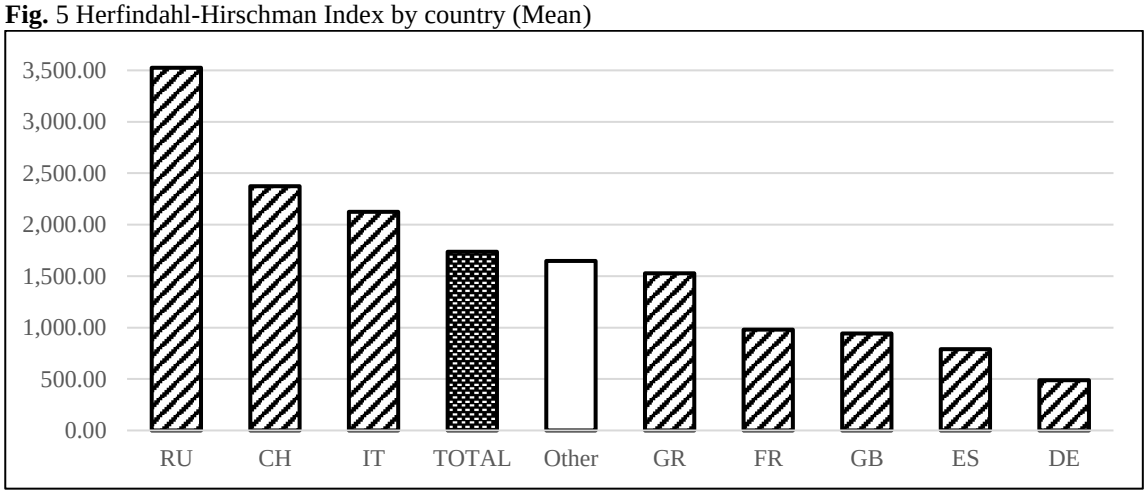


Fig. 6 Top 5 Stake (%) by country (Mean)

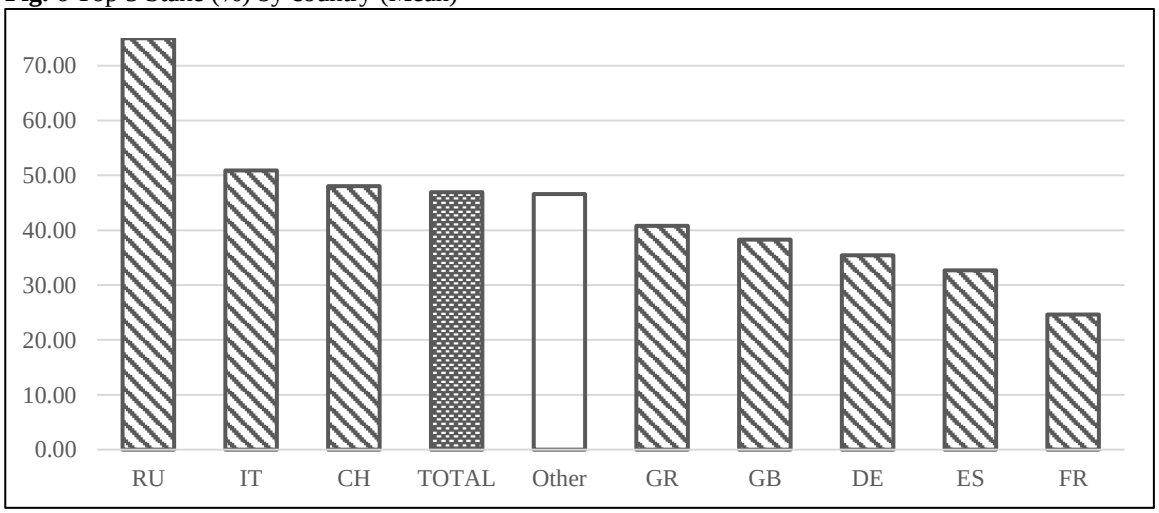


Fig. 7 Floating Capital (%) by country (Mean)

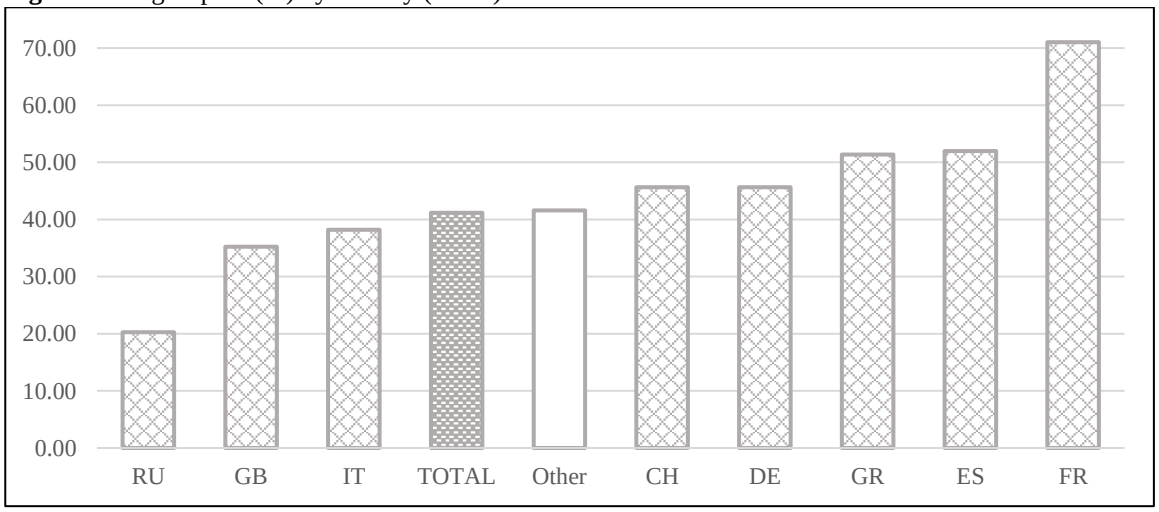


Figure 5 to 7 display ownership concentration of the three dependent variables among the countries of our sample. The bar chart show that the top 3 concentrated countries are Russia, Switzerland and Italy, having a more concentrated ownership structure, where in line with our expectation we find the lower values of floating capital. Conversely, France and Spain show the lowest average values of HHI and Top 5, marked by a relatively dispersed ownership structure, indeed presenting the highest values of floating capital.

Fig. 8 COVID-19 pandemic over time *(Mean)*

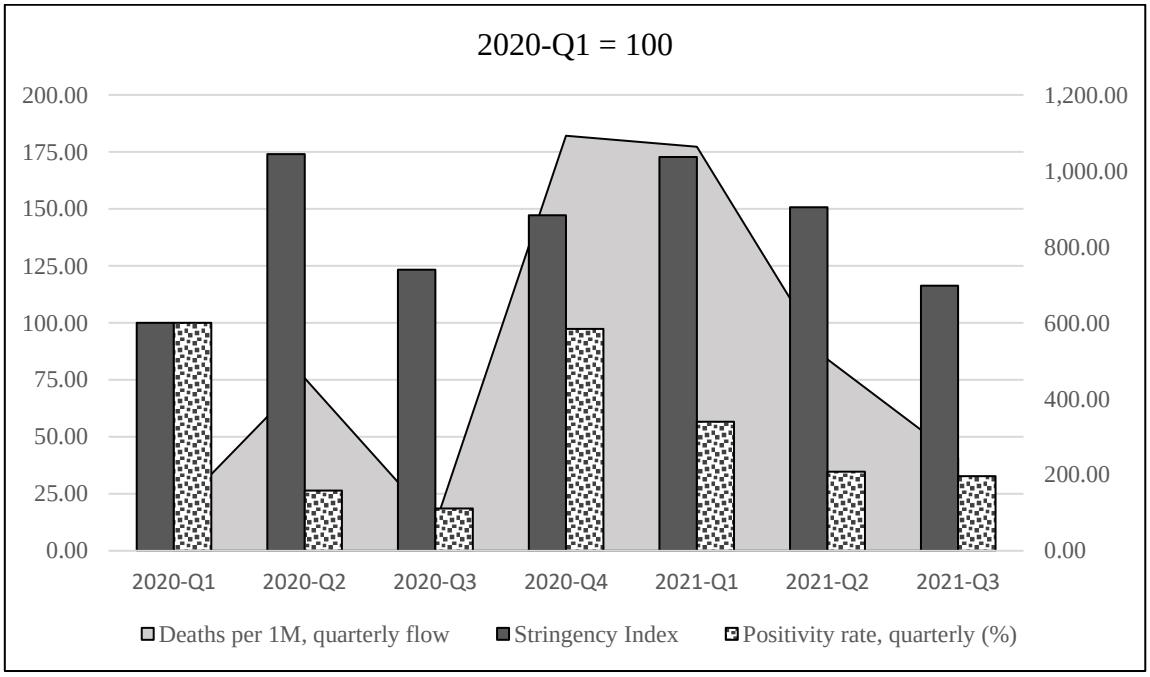


Fig. 8 shows the impact of the Covid-19 pandemic independent variables. The graph illustrates the trend over time of the number of people whose death has been associated with a COVID-19 infection, per million people. The highest value associated to deaths has been registered in the second quartile of 2020, reaching the lowest peak in the third quarter of 2020. The same trend can be observed for the positivity rate. While the stringency index in terms of the degree of stringency of public policy measures (e.g., lockdowns) adopted by a country's government as a response to the COVID-19 pandemic registered high levels form the second quarter of 2020 until the third quarter of 2021, in contrast to the other two independent variables.

Fig. 9 Stringency Index by country

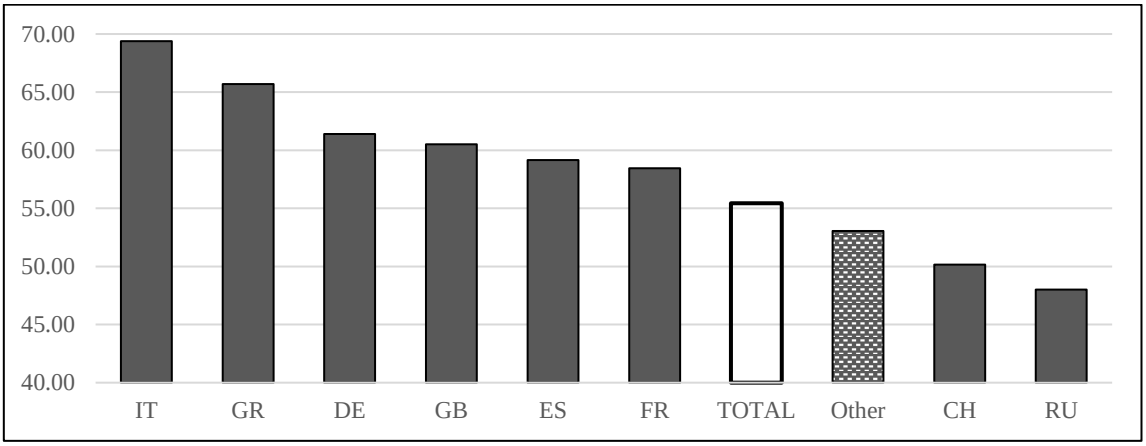


Fig. 10 Positivity rate (quarterly) by country

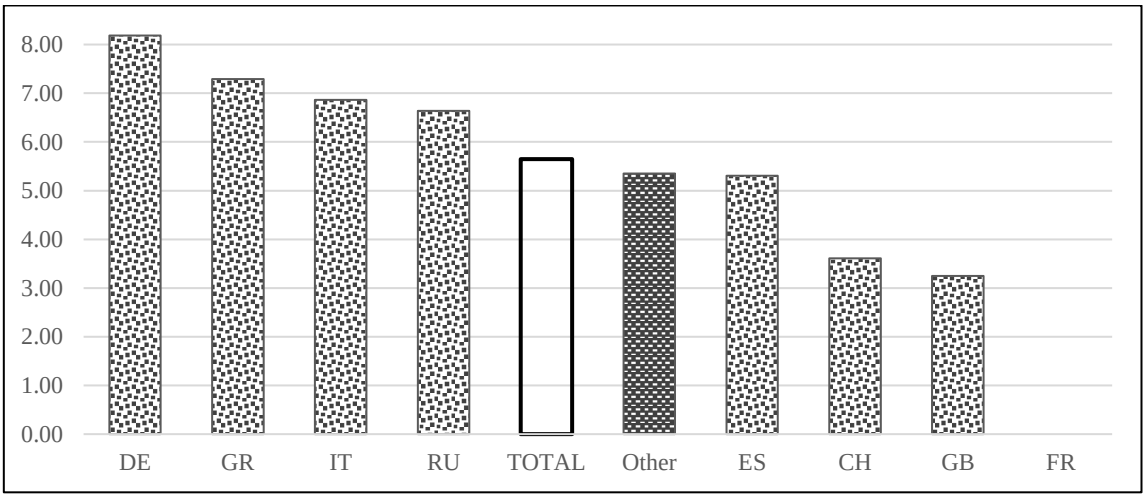


Fig. 11 Deaths per 1M people, quarterly flow, by country

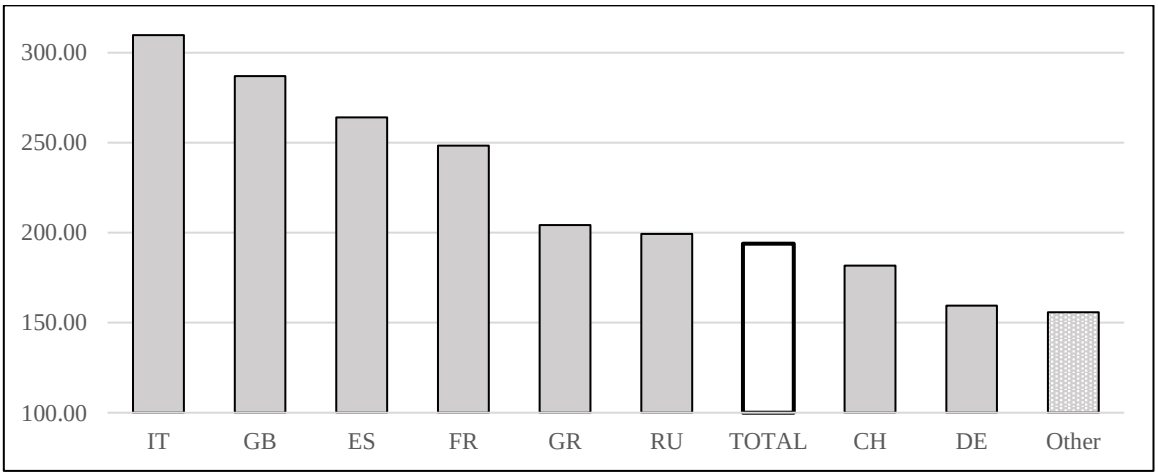


Fig. 9 to **11** show the results of the impact of the chosen independent variables among the sample countries. Italy has registered the highest values for the degree of stringency of public policy measures (e.g., lockdowns) adopted in responding to the COVID-19 pandemic, followed by Greece. In terms

of positivity rate, German and Greece are the country that recorder the highest impact of the ratio between the COVID-19 tests with a "positive" outcome and the total number of tests undergone. Having regard to deaths, Italy and Great Britain have registered the first and the second highest value associated to deaths for Covid-19, followed by Spain and France.

4. Empirical results

4.1 OLS Results

Table 7 shows the main results using Herfindahl-Hirschman index (HHI) as a proxy for bank concentration. In column (1), we test the regression model with just the financial control variables with bank, time and country fixed effect. Standard errors are clustered at bank level. Preliminary results show that out of the four control variables, two have significant effects on the dependent variable, namely ROA and NPLs. These lagged variables exhibit positive and negative statistically significant coefficients related with HHI, respectively. In columns 2 and 3, we regress the model with the two independent variables, i.e. Stringency Index and Positivity Rate which show no significant impact on HHI. In column (4) we add interaction terms between our Covid-19 Stringency index and the financial control variables but result on banking concentration do not seem to be influenced by the mediation effect of Covid-19 on bank's characteristics. In column 5, we regress the COVID19 Positivity Rate and its interaction with financial control variables, showing no significant impact on HHI. In column 6 we include the COVID19 Death dummy variable representing the second quantile if the contagion and Death have been resulting over the median which shows no effects on HHI. While in column 7, we introduce the interaction between Death over the second quantiles of the median of Death for coronavirus and banks financial controls. The results of the interaction term between Death and ROA negatively affect banks' HHI, proving a change in the sign of the coefficient of ROA. Thus, Death for Covid impact on banking concentration, by reducing banks profitability as well. Table 8 displays the results using Top 5 Stake as main dependent variable. Outcomes are quite similar to the ones on HHI. Indeed, column 7 presents a significant coefficient of Death which positively impacts on the independent variable. Moreover, when interacting the Death with NLTA, the coefficient is negative at 5% level of significance with respect bank's top5 stake (Table 8, column 7). Table 9 analyse our main regression model by using floating capital as dependent variable, which expresses an inverse index of concentration. The results of column 7 (Table 9) show that the interaction term between the dummy equal the second quantile over the median of the positivity rate and banks' ROA, is negatively related to the dependent variable, showing the adverse effects of the pandemic on bank's floating capital. Note that, for the sake of brevity, we do not report the results of the additional dummies.

Then, we examine several additional factors that could also have an impact on the banking concentration and perform a range of further robustness checks. First, we consider the log of all the Covid19 variables, and we include other features of pandemic such as the number of cases quarterly flow per 1M people, the percentage of tests, quarterly flow per 1k people, the mortality Rate, quarterly flow and the vaccinated and fully share. Secondly, we create different subsamples in order to check the validity of our results. Indeed, since our sample is composed for a larger part of Commercial banks, we re-run the main model excluding commercial banks from the sample. The findings confirm previous results providing evidence of the significant negative effect of the interaction terms of COVID19_Death and ROA on HHI and of COVID19_Deaths and NLTA on Top 5 stake. Our third robustness test is to split our sample into Eurozone and non-Eurozone banks. Results do not seem to be affected when splitting the sample. Note that, for the sake of brevity, we do not report the results of these additional robustness check.

Table 7 Main evidence on bank's concentration index (HHI)

	HHI						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
L.Stringency Index		1.161		120.3			
		(1.916)		(106.0)			
L.Positivity Rate			0.878		-21.72		
			(2.525)		(116.8)		
L.Deaths						0.0131	109.7
						(0.0805)	(106.4)
L.NLTA	-12.19	-12.16	-13.53	-9.754	-17.64	-12.10	-16.01
	(9.260)	(9.217)	(9.751)	(9.494)	(14.73)	(9.254)	(10.53)
L.ROA	65.79**	66.27**	68.62**	59.26	43.94	65.95**	129.3**
	(31.43)	(30.51)	(30.93)	(40.81)	(45.24)	(30.99)	(56.80)
L.CET1	-0.0196	-0.0233	4.342	23.40	-28.62	-0.0189	0.0340
	(0.0141)	(0.0184)	(10.05)	(22.41)	(19.27)	(0.0151)	(0.0293)
L.NPLs	-11.74**	-11.44**	-12.29**	-10.82*	0.549	-11.72**	9.015
	(5.347)	(5.309)	(5.249)	(5.581)	(13.22)	(5.349)	(10.50)
Stringency Index ==1*NLTA				-0.125			
				(1.462)			
Stringency Index ==2*NLTA				0.973			
				(2.102)			
Stringency Index ==1*ROA				-35.93			
				(39.07)			
Stringency Index ==2*ROA				24.93			
				(23.91)			
Stringency Index ==1*CET1				-8.728			
				(9.518)			
Stringency Index ==2*CET1				-23.38			
				(22.38)			
Stringency Index ==1*NPLs				-1.595			
				(6.177)			
Stringency Index ==2*NPLs				5.750			
				(3.663)			

Positivity Rate ==2*NLTA					0.599		
					(2.681)		
Positivity Rate ==2*ROA					-45.61		
					(35.49)		
Positivity Rate ==2*CET1					-1.182		
					(5.590)		
Positivity Rate ==2*NPLs					0.221		
					(4.604)		
Deaths ==2*NLTA							-2.920
							(2.496)
Deaths ==2*ROA							-195.6**
							(85.16)
Deaths ==2*CET1							7.221
							(7.299)
Deaths ==2*NPLs							-1.189
							(8.209)
Bank Holding Companies	-1,176*	-1,177*	-1,170*	-1,125*	-1,332*	-1,175*	-1,135*
	(654.0)	(653.2)	(653.0)	(634.8)	(705.7)	(654.1)	(640.1)
Commercial Banks	-894.1*	-894.7*	-879.6*	-887.8*	-941.8*	-894.3*	-799.9*
	(527.0)	(526.9)	(521.0)	(519.6)	(519.8)	(527.1)	(483.5)
Cooperative Banks	266.2	265.0	317.1	241.8	-97.87	265.3	229.3
	(816.0)	(816.1)	(810.8)	(819.0)	(1,302)	(816.6)	(821.8)
Savings Banks	-704.7	-703.9	-690.1	-704.6	-684.9	-705.1	-547.9
	(561.7)	(562.3)	(555.4)	(557.6)	(598.6)	(562.1)	(528.0)
Government Banks	1,173	1,171	1,193	1,155	1,140	1,172	1,257
	(1,051)	(1,051)	(1,052)	(1,055)	(1,052)	(1,051)	(1,042)
Constant	2,904***	2,899***	2,908***	2,523***	3,786**	2,897***	2,923***
	(920.8)	(921.2)	(945.8)	(759.4)	(1,514)	(922.2)	(960.9)
R_squared	0.4689	0.4676	0.4698	0.4656	0.4742	0.4679	0.4639
Observations	1,535	1,519	1,379	1,524	749	1,520	933
Number of banks	187	185	185	187	162	185	184

Table 8 Main evidence on bank's stakes held by its 5 largest shareholders (Top 5 Stake)

	TOP 5 STAKE						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
L.Stringency Index		-0.0113	1.414				
		(0.0266)	(1.494)				
L.Positivity Rate				0.0239	-0.452		
				(0.0395)	(1.878)		
L.Deaths						0.000793	3.198**
						(0.00142)	(1.485)
L.NLTA	-0.0962	-0.0894	-0.0685	-0.117	-0.168	-0.0909	-0.158*
	(0.101)	(0.100)	(0.101)	(0.105)	(0.130)	(0.100)	(0.0952)
L.ROA	0.523	0.516	0.508	0.563*	-0.247	0.530	0.867
	(0.371)	(0.369)	(0.463)	(0.310)	(0.440)	(0.359)	(0.781)
L.CET1	-9.58e-05	-8.69e-05	0.236	0.240	0.111	-4.99e-05	-5.23e-05
	(0.000)	(0.000)	(0.235)	(0.158)	(0.221)	(0.000)	(0.000)
L.NPLs	-0.268**	-0.272***	-0.261***	-0.289***	-0.0569	-0.267**	0.0350
	(0.105)	(0.104)	(0.0964)	(0.106)	(0.149)	(0.105)	(0.148)
Stringency Index ==1*NLTA			-0.0176				
			(0.0324)				

Stringency Index ==2*NLTA			-0.000289				
			(0.0261)				
Stringency Index ==1*ROA			-0.515				
			(0.562)				
Stringency Index ==2*ROA			0.116				
			(0.386)				
Stringency Index ==1*CET1			-0.0620				
			(0.148)				
Stringency Index ==2*CET1			-0.236				
			(0.235)				
Stringency Index ==1*NPLs			0.126				
			(0.0843)				
Stringency Index ==2*NPLs			0.0554				
			(0.0824)				
Positivity Rate ==2*NLTA					-0.0278		
					(0.0449)		
Positivity Rate ==2*ROA					0.844		
					(0.521)		
Positivity Rate ==2*CET1					0.0964		
					(0.126)		
Positivity Rate ==2*NPLs					-0.0396		
					(0.0322)		
Deaths ==2*NLTA							-0.0630*
							(0.0323)
Deaths ==2*ROA							-1.765
							(1.301)
Deaths ==2*CET1							0.0403
							(0.0858)
Deaths ==2*NPLs							-0.0430
							(0.0527)
Bank Holding Companies	-15.07*	-15.00*	-14.59*	-14.41	-16.32*	-15.02*	-15.31*
	(8.928)	(8.914)	(8.839)	(8.925)	(9.484)	(8.927)	(9.112)
Commercial Banks	-6.005	-6.021	-5.957	-5.390	-5.885	-6.019	-5.050
	(6.465)	(6.462)	(6.426)	(6.451)	(6.574)	(6.467)	(6.423)
Cooperative Banks	-6.275	-6.360	-6.441	-4.384	-11.70	-6.323	-4.393
	(8.399)	(8.402)	(8.427)	(8.434)	(10.74)	(8.402)	(8.543)
Savings Banks	-8.026	-8.086	-7.853	-7.400	-2.903	-8.050	-5.699
	(7.992)	(7.999)	(7.962)	(7.893)	(8.665)	(7.999)	(8.017)
Government Banks	9.057	9.019	8.843	9.530	8.793	8.983	9.984
	(14.77)	(14.78)	(14.83)	(14.80)	(14.83)	(14.78)	(14.62)
Constant	76.32***	75.91***	72.20***	73.53***	79.02***	75.92***	74.54***
	(10.32)	(10.32)	(9.933)	(11.22)	(14.50)	(10.33)	(10.41)
R_squared	0.4025	0.4009	0.3992	0.3985	0.3916	0.4015	0.3912
Observations	1,535	1,519	1,524	1,379	749	1,520	933
Number of banks	187	185	187	185	162	185	184

Table 9 Main evidence on Refinitiv bank's smallest stakes (Floating capital)

	FLOATING CAPITAL						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
L.Stringency Index		0.0293	-0.819				

		(0.0319)	(1.795)				
L.Positivity Rate				0.103	0.656		
				(0.0639)	(2.317)		
L.Deaths						0.00239	-4.330**
						(0.00161)	(1.701)
L.NLTA	0.112	0.103	0.0720	0.127	0.101	0.102	0.115
	(0.107)	(0.107)	(0.108)	(0.114)	(0.136)	(0.107)	(0.104)
L.ROA	-0.942**	-0.928**	-0.710	-0.930***	0.0181	-0.921**	-1.205
	(0.388)	(0.389)	(0.481)	(0.343)	(0.663)	(0.386)	(0.965)
L.CET1	-0.00153***	-0.00159***	-0.228	-0.229	-0.146	-0.00130***	-0.00287***
	(0.000385)	(0.000414)	(0.263)	(0.182)	(0.274)	(0.000351)	(0.000405)
L.NPLs	0.311***	0.320***	0.336***	0.332***	0.189	0.321***	0.0988
	(0.106)	(0.104)	(0.0910)	(0.108)	(0.206)	(0.103)	(0.172)
Stringency Index ==1*NLTA			0.0160				
			(0.0345)				
Stringency Index ==2*NLTA			-0.00336				
			(0.0317)				
Stringency Index ==1*ROA			0.0697				
			(0.699)				
Stringency Index ==2*ROA			-0.558				
			(0.630)				
Stringency Index ==1*CET1			0.0627				
			(0.166)				
Stringency Index ==2*CET1			0.226				
			(0.263)				
Stringency Index ==1*NPLs			-0.109				
			(0.0950)				
Stringency Index ==2*NPLs			0.0178				
			(0.104)				
Positivity Rate ==2*NLTA					0.0399		
					(0.0469)		
Positivity Rate ==2*ROA					-1.293**		
					(0.625)		
Positivity Rate ==2*CET1					-0.124		
					(0.141)		
Positivity Rate ==2*NPLs					0.0180		
					(0.0446)		
Deaths ==2*NLTA							0.0810**
							(0.0360)
Deaths ==2*ROA							1.544
							(1.378)
Deaths ==2*CET1							0.00580
							(0.108)
Deaths ==2*NPLs							0.0637
							(0.0778)
Bank Holding Companies	1.199	1.097	0.704	0.584	1.615	1.143	0.584
	(8.679)	(8.675)	(8.664)	(8.709)	(8.868)	(8.674)	(8.593)
Commercial Banks	0.619	0.634	0.532	0.107	1.134	0.663	-0.366
	(6.691)	(6.692)	(6.696)	(6.695)	(6.888)	(6.690)	(6.734)
Cooperative Banks	10.34	10.44	10.65	8.590	11.10	10.55	8.857
	(8.766)	(8.786)	(8.905)	(8.728)	(9.879)	(8.782)	(9.157)
Savings Banks	5.735	5.826	5.774	5.186	0.0873	5.875	3.688
	(8.819)	(8.829)	(8.846)	(8.737)	(9.587)	(8.826)	(8.920)
Government Banks	-3.036	-3.005	-2.849	-3.514	-2.817	-3.051	-4.390

	(14.71)	(14.72)	(14.80)	(14.75)	(14.87)	(14.71)	(14.57)
Constant	16.21*	16.72*	20.47**	19.04*	18.08	16.71*	21.42**
	(8.988)	(9.002)	(9.488)	(10.07)	(13.23)	(9.015)	(8.548)
R_squared	0.3977	0.3959	0.3911	0.3686	0.3225	0.3976	0.3861
Observations	1,535	1,519	1,524	1,379	749	1,520	933
Number of banks	187	185	187	185	162	185	184

5. Discussion and conclusion

This paper aims to shed light on the recent economic crisis triggered by the Covid-19 at the beginning of the year 2020, a shocking scenario that gradually materialised at international level. The pandemic crisis quite different from previous ones, since the trigger is endogenous to the system and the occurred shock affected both demand and supply (Berger et al., 2021a; Guerrieri et al., 2020; Balleer et al., 2020). And yet, the particularity of the phenomenon is not to be found in its characteristics, but rather, taking a generalised view of the event, the peculiarity of the crisis can be grasped in its ability to have affected all economic subjects without distinction.

Indeed, it was an event that affected everyone indifferently, and it is for the first time in a long time that history has entered our homes, making us active spectators of a great event. Several documents and works of fiction that, based on scientific evidence, have predicted well in advance what we are experiencing, such as "*Spillover*", a narrative essay by David Quammen (2012) on the spread of new pathogens, in which the author talks about the next global pandemic, wondering whether it will come out of "*a market town in southern China*".

Nevertheless, the truth is often not the simplest, and the black swan by Taleb (2007) is probably just a distorted representation of the reality of the facts, born of a common sense now pervaded by fear and dread. As a matter of fact, Taleb himself argues that the coronavirus is not a black swan, explaining that there is an essential connotation missing from both the disease and the market crash: unpredictability.

For what concern the connection between the pandemic and the economic distress for the financial sector, Covid-19 has already accelerated some existing trends in the banking industry, that will temporarily reverse others, and will influence the players in the sector (including the regulators). At the same time, Covid-19 has deepened and lengthened the period of low or negative interest rates, and which accelerate digitisation and increase investment in IT, with operational risk and cyber-attacks on the rise. This resulted in an increase NPLs, hurting profitability, impairing the ability of banks to generate capital and buffers and constraining their capacity to provide loans (Beck & Keil, 2021; OECD, 2021). Banks remain exposed to credit risk in lending to the economy during the crisis, at

least as regards loans outside of or beyond the coverage of government guarantees. Both central banks and regulators have taken measures to enable banks to keep lending during the crisis.

Results show that the positivity rate and the number of deaths each million people have contributed to reducing concentration, potentially suggesting that the largest shareholders have fled banks as the contagion advanced, whereas the degree of stringency of anti-COVID public policies has seemingly exerted no influence on investors' behaviour.

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