Financial sector restructuring in Greece: The impact on activities, financial health and employment

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Developments in the financial sector of the economy has attracted the interest of research community, especially after the crisis of 2008, both in Greece and worldwide. Policy makers in the European Union and elsewhere have played a more active role in shaping the regulatory framework for financial institutions' operation. In this conjuncture, the Greek financial sector, given its major Non-Performing Loans (NPLs) problem, which has been the outcome of the protracted economic crisis (2009-2016), is passing through a period of restructuring and reconsideration of its business model. This paper reviews the developments concerning key indicators of Greek financial institutions about their activities, employment and financial soundness. Our findings indicate that the economic crisis had a significant impact on the current banking landscape and the business model of financial intermediaries which has been characterized by the deep scars of economic recession.

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1. *Introduction*

THE OUTBREAK of the financial crisis in the USA in early 2008 and the subsequent developments in financial intermediation both worldwide and in Greece, have spurred the interest of researchers and scholars around the globe.[1] European Union institutions and think tanks have published policy papers[2] shaping a framework of financial operation that would secure orderly financing of the economy and would enhance confidence in financial stability. Besides, the latter is the main reason why systemic banks are subject to thorough supervision on behalf of the European Central Bank (ECB), so as for the regulatory authority to monitor and assess possible risks attached to their portfolios. European Union-wide stress tests have been conducted as of 2011 in order to assess the resilience of European banking sector in systemic risks given different macroeconomic scenarios. In this context, the Greek banking sector, given its major Non-Performing Loans (NPLs) problem[3] which has been the outcome of the protracted economic crisis (2009-2016), is passing through a period of restructuring and reconsideration of its business model.[4]

The importance of the financial sector is reflected in the texts of structural adjustment programmes that have been applied in the Greek economy from 2010 onwards.[5] Banks' recapitalizations aimed at confidence of the public. At the same time, there were various institutional developments at play, such as takeovers and mergers, which resulted in reshuffling

1. See among others Adrian & Shin (2010) and IMF (2019).
2. See EBA (2019).
3. Loizos (2019).
4. See Speech of the Governor of the Bank of Greece 'A systemic approach towards improving asset quality of Greek banks'. Tackling NPLs within the Greek banking system, Hellenic Bank Association and PwC, January 24, 2019.
5. See section 3 in European Commission (2012).

and restructuring the banking sector. The operation cost has been at the centre of the efforts towards recovery. The need to take heed of operating cost issues has been conceived as the main lesson to learn from the recent crisis[6] in combination with the various indicators of financial soundness of these institutions. In the rest of this paper, we study how the volumes of activities and various financial indices of the banking sector in Greece evolved during the crisis years and thereafter along with the impact on the level and composition of employment in the financial sector. Our findings indicate that the economic crisis had a significant effect in shaping the current banking landscape and the business model of financial intermediaries entered a new phase which has been characterized by the deep scars of economic recession.

2. *Periodization of the Greek crisis*

Without disregarding the complexity of institutional and political aspects of the Greek crisis which have been extensively studied in the literature (Maris & Flouros, 2011; Maris, Sklias & Maravegias, 2021; Liargovas, 2020; Missos et al., 2021; Vaitsos & Missos, 2018; Provopoulos, 2014; Sklias & Maris, 2013, Argitis, 2012), and in order to delineate the macroeconomic environment for Greek banks during the last thirteen years of their operation, we present in Figure 1 the evolution of GDP growth rate from the third quarter of 2008 to the second quarter of 2021 as the main criterion of periodization. Consequently, in Tables 1a and 1b, we present the results by distinguishing among three chosen sub-periods.

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6. See Speech of the Governor of the Bank of Greece, 'Lessons from the financial crisis and challenges from the Greek banking sector', November 14, 2018, at a lecture organized by the International Center for Monetary and Banking Studies, Geneva.

Figure 1: Real GDP growth rate (percentage changes with respect
to the corresponding quarter of the previous year) 2008Q3-2021Q2
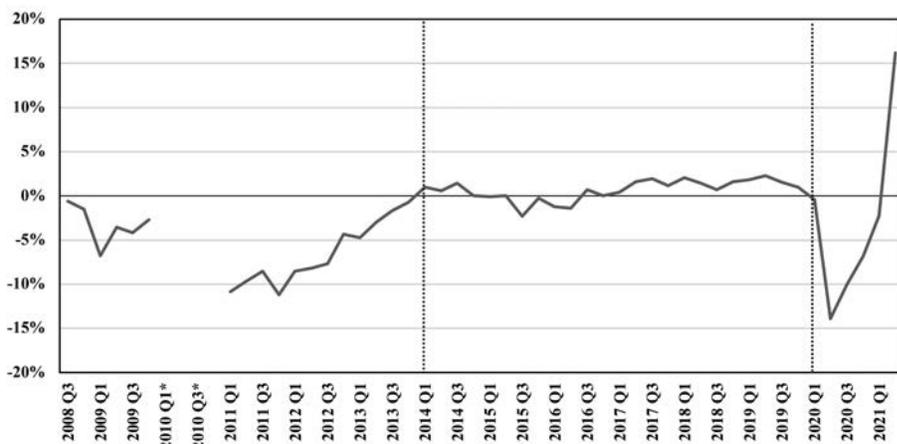
Source: ELSTAT (data processing by the authors).

Table 1a: Real GDP growth rate: Summary statistics
(percentage changes with respect to the corresponding quarter
of the previous year) 2008Q3-2021Q2

Period	Mean	Median	Standard Deviation	Min	Max
2008Q3 – 2013Q4	-5.5	-4.5	3.50	-11.2	-0.6
2014Q1 – 2019Q4	0.7	0.8	1.16	-2.3	2.3
2020Q1 – 2021Q2	-2.9	-4.6	10.57	-13.9	16.2

Source: ELSTAT (data processing by the authors).

Table 1b: Real GDP growth rate: Summary statistics
(annual percentage changes) 2008-2020

Period	Mean	Median	Standard Deviation	Min	Max
2008-2013	-5.01	-4.89	3.42	-10.15	-0.34
2014-2019	0.75	0.99	1.01	-0.49	1.86
2020	-8.25	-8.25	-	-	-

Source: World Bank, World Development Indicators
(data processing by the authors)

We can discern three subperiods which describe how the Greek crisis unfolded from mid-2008 until the end of 2021. The first subperiod begins in the third quarter of 2008 in which the financial crisis manifested in late summer of 2007 had deteriorated (Bank of Greece, 2014, p. 27) and extends up to the end of 2013. This time period is characterized by a great recession which inflicted the Greek economy, as it is depicted in Figure 1 and the related Tables. Specifically, between the third quarter of 2008 and the last quarter of 2013 there was a negative average GDP growth rate which was equal to -5.5%.[7] This mean value is also corroborated by the mean value calculated using the annual data for the same time interval, which is -5.01%. Conversely, since the beginning of 2014 and until the end of 2019 we observe a milder fluctuation of GDP growth rates with positive and negative values succeeding each other. However, GDP growth rate assumes on average a small positive value equal to 0.7% in terms of quarterly data or 0.75% in annual data. While the first two subperiods are related to the financial crisis of 2008 and the Greek sovereign debt crisis of 2010 (Bank of Greece, 2014, pp. 61), the last subperiod is marked by the outbreak of the Covid-19 pandemic and its impact on the Greek economy and it extends from the first quarter of 2020 until the second quarter of 2021 (according to the availability of our data). Nonetheless, this short period showed wide fluctuations in GDP growth rates. Indeed, the average GDP growth rate during this latter period was -2.9% namely, lower than mean value of GDP growth rate during the first period of recession which followed the financial crisis, but the median GDP growth rate was -4.6% which was higher than the median value during the recession between 2008 and 2013, in terms of quarterly data.

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7. This value has been calculated without taking into account the data for 2010 since the time series provided by ELSTAT does not report values for the interval 2010Q1-2010Q4 due to data revision. This is the reason why we also cite the time series of GDP annual growth rates which is complete up to 2020.

Having set as a benchmark context the three subperiods of the protracted Greek crisis, we now proceed to present the developments in key banking data during the corresponding intervals.

3. *Bank credit and Non-Performing Loans*

Probably the two most indicative yardsticks of the conditions prevailing in the Greek banking sector during the last decade are the evolution of bank credit and Non-Performing Loans (NPLs). Figure 2 and Tables 2a και 2b present these variables in aggregate measures.

Figure 2: Gross loans and Non-Performing Gross Loans
2008Q3-2021Q2 (million Euros)
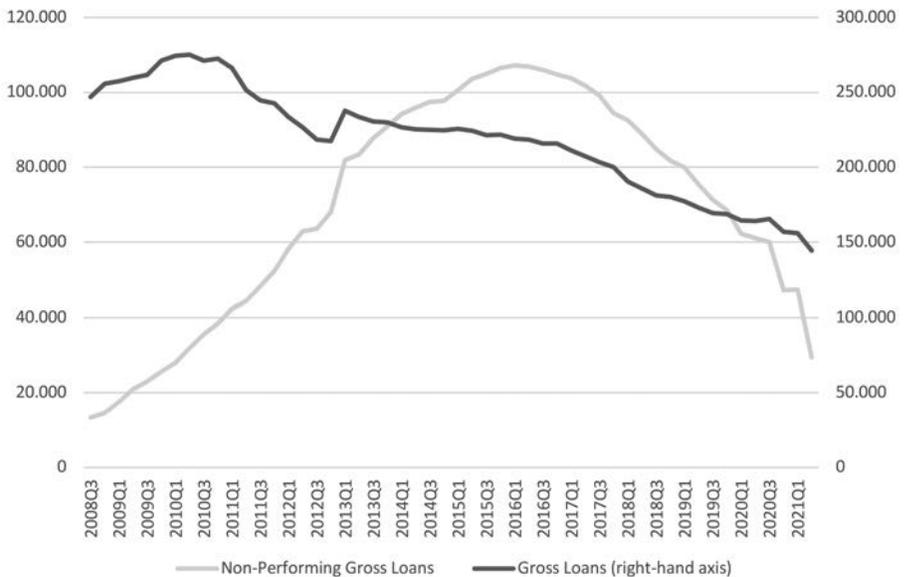
Source: Bank of Greece (data processing by the authors)

Table 2a: Gross Loans (million Euros)

Period	Mean	Median	Standard Deviation	Min	Max
2008Q3 – 2013Q4	249,040	249,182	18,684	217,474	275,083
2014Q1 – 2019Q4	204,656	213,521	20,689	168,707	226,621
2020Q1 – 2021Q2	158,525	160,514	8,015	144,400	165,349

Source: Bank of Greece (data processing by the authors)

Table 2b: Non-Performing Gross Loans (million Euros)

Period	Mean	Median	Standard Deviation	Min	Max
2008Q3 – 2013Q4	46,943	43,336	24,740	13,355	90,867
2014Q1 – 2019Q4	94,490	97,577	11,790	68,525	107,196
2020Q1 – 2021Q2	51,188	53,659	12,683	29,369	62,233

Source: Bank of Greece (data processing by the authors)

According to Figure 2, the volume of bank credit shows a continuous falling trend from the end of 2010 and afterwards, while during the period before that, and at least until the second quarter of 2010, it manifested a clear rising trend. Consequently, it seems that the evolution of bank credit does not keep up with the developments in GDP since the former is not affected by GDP growth rate rise as of 2014 or by its fluctuations during the pandemic. Indeed, inspecting the data in different subperiods we observe a continuous decline in average bank credit measured in million Euros from 249,040 before 2014 to 204,656 between 2014 and 2019 and finally, to 158,525

during the interval 2020Q1 – 2021Q2. The same holds true for the medians of gross loans concerning the three subperiods, despite a less steep fall of the relevant variable in this case.

On the other hand, a completely different pattern characterizes the evolution of Non-Performing Gross Loans (NPLs). The magnitude of NPLs in banks' balance sheets is affected by a multitude of factors, macroeconomic and microeconomic, including indicators of banks' financial soundness (Naili & Lahrichi, 2020; Nikolopoulos & Tsalas, 2017). Indeed, we observe a consistent rise of NPLs and credit risk assumed by Greek banks from mid-2008 to the first quarter of 2016. Thereafter, the volume of NPLs falls gradually and steadily. Both, partial – though interrupted – recovery of the economy from 2014 and then from 2017 onwards, and plans to reduce NPLs put forward by the banks themselves, the government and the Bank of Greece, contributed to this hopeful result (Loizos, 2020; Mouzoulas, Panagopoulos & Peletidis, 2020; Stournaras, 2019; Bank of Greece, 2018). Looking at the evolution of NPLs in the context of the three subperiods we notice a rise in the mean value of NPLs in million Euros from 46,943 during the first subperiod 2008Q3-2013Q4 to 94,490 in the following one 2014Q1-2019Q4 but a decisive fall during the last subperiod 2020Q1-2021Q2 to 51,188 million Euros. Moreover, in the last quarter of our sample, 2021Q2, the volume of NPLs reached the value of 29,369 million Euros thus, approaching the value of this variable in the first quarter of 2010 (27,946 million Euros). It is also interesting to track down the evolution of the composition both of gross loans and of NPLs which is described in Figures 3 and 4 and the respective Tables.

Figure 3: Gross Loans, total and by category (million Euros)
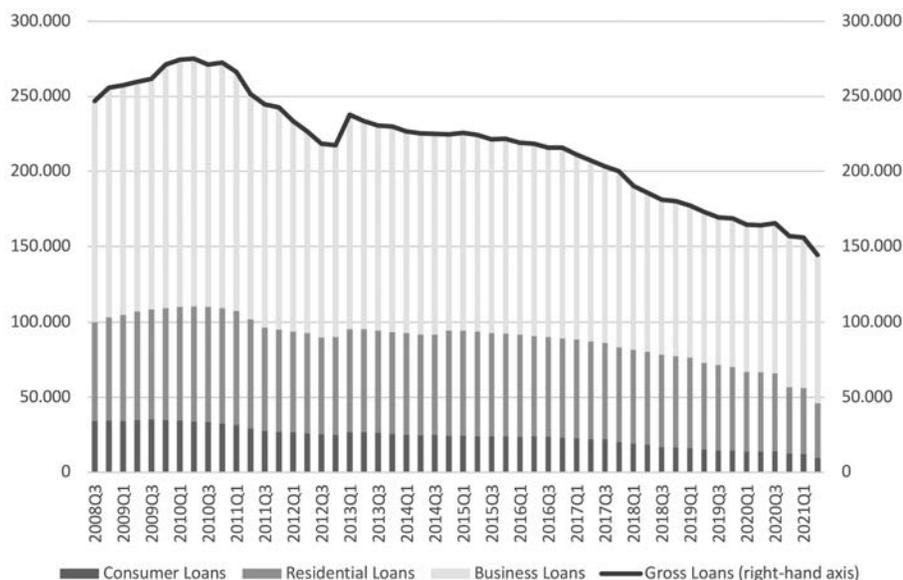
Table 3: Average contribution of each category
of Gross Loans to their total volume (percentages)

Subperiod	Consumer loans to total gross loans %	Residential loans to total Gross Loans %	Business loans to total Gross Loans %
2008Q3 – 2013Q4	12.1	28.4	59.5
2014Q1 – 2019Q4	10.3	31.7	58.0
2020Q1 – 2021Q2	8.0	29.6	62.4

The volume of business loans predominates, as a share of gross loans, over the other categories in all periods. In fact, despite the fall in the aggregate magnitude of gross loans, business loans remain at high levels as a percentage of total bank credit (above 50%) and even reach the level of 62% of

total loans during the last subperiod. Residential loans' average shares of total loans take values between 28% and 32%, while the respective figures for consumer loans are between 12% and 8%, showing a falling trend, probably because would-be borrowers lack collateral assets of sufficient value.

Figure 4: Non-Performing Gross Loans, aggregate
and by category (million Euros)

Source: Bank of Greece (data processing by the authors)

Table 4: Average contribution of each category
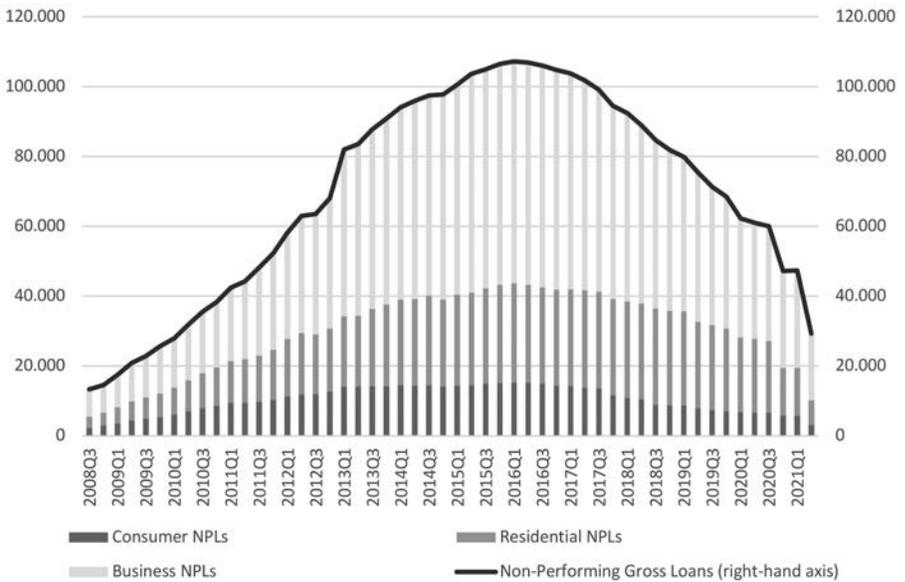of NPLs in their total volume (percentages)

Subperiod	Consumer NPLs to total NPLs %	Residential NPLs to total NPLs %	Business NPLs to total NPLs %
2008Q3 – 2013Q4	19.9	26.7	53.4
2014Q1 – 2019Q4	13.1	28.6	58.4
2020Q1 – 2021Q2	11.4	30.9	57.7

Source: Bank of Greece (data processing by the authors)

As was the case in gross loans, business NPLs predominate, being more than half of total NPLs, while residential and consumer NPLs follow with shares between 11% and 31%. In terms of average percentage contribution, business NPLs rise in the second subperiod 2014Q1 – 2019Q4 but decline slightly thereafter. On the contrary, residential NPLs increase their average share among subperiods thus, indicating the difficulty of banks to reduce this kind of NPLs in the context of a wobbly legal framework. During the period under examination, there were many legislative initiatives concerning overindebted households, including the new bankruptcy law (Loizos, 2020; Zervas & Fasianos, 2018). On the other hand, consumer NPLs decrease over time from about 20% in the first subperiod to 11% in the last one.

Figure 5: NPLs' ratios to the corresponding category
of gross loans 2008Q3-2021Q2
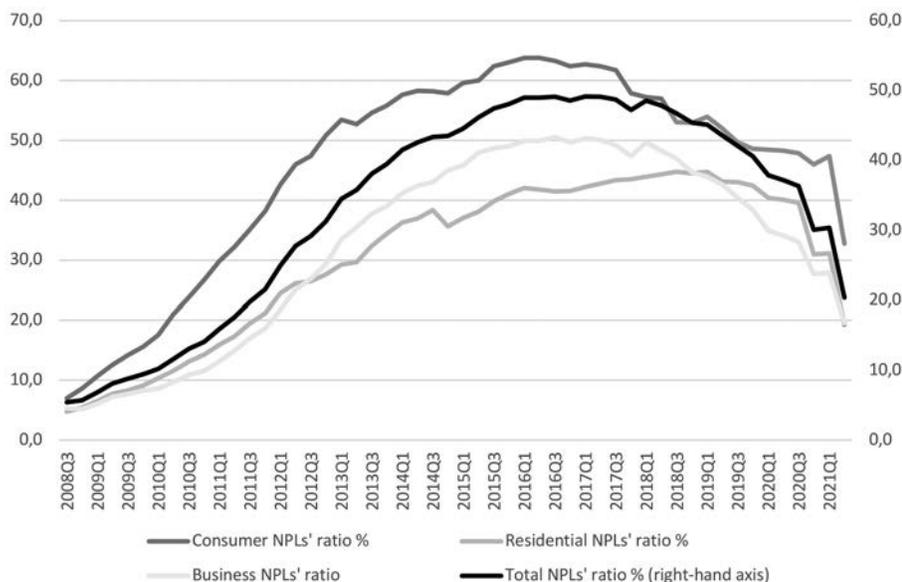
Source: Bank of Greece (data processing by the authors)

Table 5: NPLs' ratios to the corresponding category
of gross loans 2008Q3 – 2021Q2 (mean values)

	Total NPLs' ratio %	Consumer NPLs' ratio %	Residential NPLs' ratio %	Business NPLs' ratio %
2008Q3 – 2013Q4	19.5	31.6	18.0	17.9
2014Q1 – 2019Q4	46.1	58.3	41.4	46.5
2020Q1 – 2021Q2	32.0	45.1	33.6	29.5

Source: Bank of Greece (data processing by the authors)

Moreover, Figure 5 and Table 5 portray interesting findings concerning NPLs' ratios with respect to the corresponding category of gross loans. In terms of their aggregate measure, NPLs follow a rising trend from the first to the second subperiod increasing their mean value from 19.5% to 46.1%. However, during the last subperiod the average NPLs' ratio decreases to 32%. Among the different categories of NPLs, in terms of average values per subperiod, business NPLs showed the greater rise from the first to the second subperiod (28.6 percentage points) and at the same time the largest fall from the second to the third subperiod (17%). Residential NPLs rose by 23.4% in the second subperiod and fell by 7.8% in the third one, while the corresponding percentages for consumer NPLs were 26.7% and 13.2%. In addition, the ratio of consumer NPLs to consumer loans prevailed in all subperiods with respect to the other classes of NPLs, indicating the greater risk attached to this kind of loans. On the contrary, residential and business NPLs' ratios, with respect to their corresponding category of gross loans, alternate among subperiods with residential NPLs being the most significant both before 2014 and after 2019. Therefore, despite the fact that business NPLs have been the main category in terms of their share in total NPLs, probably reflecting the corresponding significance of business loans with

respect to total loans, business loans contribution to overall credit risk seems to be smaller than the other categories of loans. This holds true at least for the two in three subperiods under consideration. Moreover, consumer NPLs, notwithstanding their smaller volume, are clearly the riskiest ones since they maintain the largest ratios of NPLs in all three subperiods.

However, it is interesting to comment on summary statistics concerning the ratio of total NPLs of Greek banks (Table 6) as compared to the corresponding ratios of European banks (Table 7).[8] At first, median NPLs' ratios in the Greek case follow the pattern of mean values referred to above since, they rise from 16.8% to 47% in the second subperiod while they fall to 33.3% in the third one. Especially, during the subperiod 2014Q1-2019Q4 where NPLs' ratios assume their maximum average value, variability around this mean value is the lowest among the three subperiods indicating entrenchment of high values for a significant portion of time. On the contrary, standard deviations are much larger both in the first subperiod, due to the significant rise in NPLs, and in the third subperiod, because of their falling trend. In any case, by comparing the Greek experience with the European one, we understand the significant peculiarities of the Greek crisis which manifested themselves with strikingly large deviations between the average NPLs' ratios in Greece in comparison with the rest of European Union. Concerning the latter, the mean NPLs' ratio did not exceed the level of 4.2% in the second subperiod while it has been just 2.4% during the pandemic subperiod, with medians close to mean values (3.8% and 2.5% respectively) and relatively small variability.

8. Data on European Central Bank Risk Indicators are available for the interval 20014Q3-2021Q2.

Table 6: NPLs ratio to total loans, Greece, summary statistics

Period	Mean	Median	Standard deviation	Min	Max
2008Q3 – 2013Q4	19.5	16.8	11.3	5.4	39.5
2014Q1 – 2019Q4	46.1	47.0	2.8	40.6	49.1
2020Q1 – 2021Q2	32.0	33.3	6.7	20.3	37.8

Source: Bank of Greece (data processing by the authors)

Table 7: NPLs' ratio to total loans, EU 27 (medians),
summary statistics

Period	Mean	Median	Standard deviation	Min	Max
2014Q3– 2019Q4	4.2	3.8	1.3	2.6	6.4
2020Q1– 2021Q2	2.4	2.5	0.2	2.1	2.6

Source: European Central Bank, ESRB Risk Dashboard,
September 9, 2021 (data processing by the authors)

Figures 6a and 6b depict the evolution of loans extended to non-financial corporations along with their allocation by economic activity. Figure 6b shows that bank credit to non-financial enterprises in total, decreases consistently from the third quarter of 2008 until the second quarter of 2021, except its short-lived recovery during the first two quarters of 2010. Looking at bank credit by industry, this pattern seems to repeat itself in the majority of cases (Figure 6a). The significant rise of bank credit channelled to manufacturing and transportation/storage during the first quarters of 2010 is notable, while credit extended to agriculture and other activities decline. It seems that there was an attempt to increase bank credit towards specific activities in the Greek economy at the outset of the

Figure 6a: Evolution of loans to non-financial corporations
by economic activity 2008Q3-2021Q2

(a) ——— Agriculture, forestry and fishing

(b) ——— Mining and quarrying

(c) ——— Manufacturing

(d) ——— Water supply, sewerage, waste management and remediation activities

(e) ——— Construction

(f) ——— Wholesale and retail trade, repair of motor vehicles and motorcycles

(g) ——— Accomodation and food service activities

(h) ——— Transportation and storage

(i) ——— Information and communication

(j) ——— Real estate activities

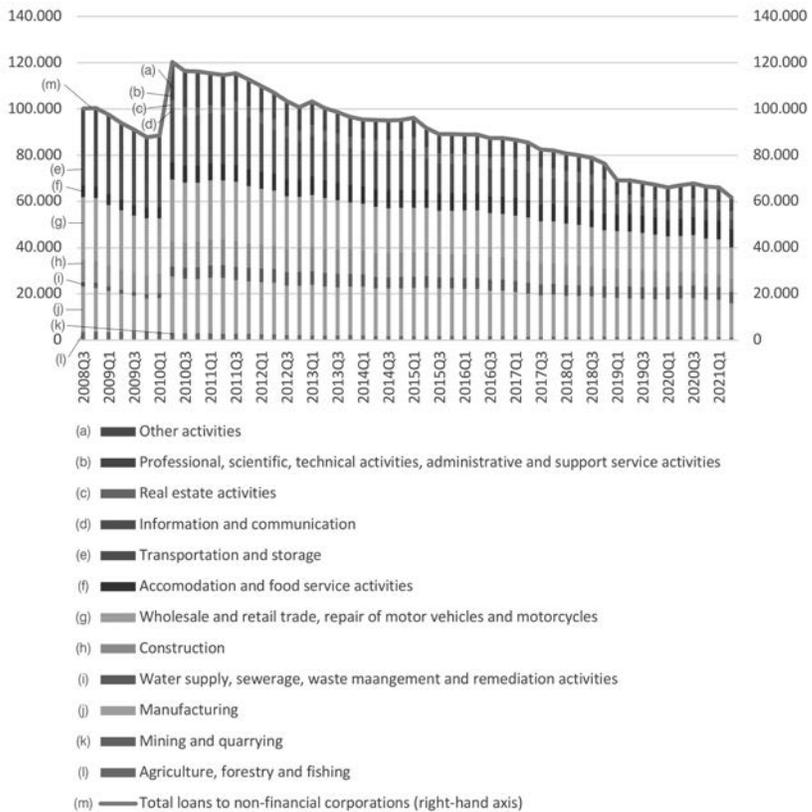(k) ——— Professional, scientific, technical activitie, administrative and support service activities

Source: Bank of Greece (data processing by the authors)

sovereign crisis. However, from the third quarter of 2010 loans
to manufacturing, wholesale and retail trade, transportation and
storage, agriculture and other activities, show a downward trend

with storage and transportation having the larger variability. On the contrary, loans to the other activities follow smoother paths with fluctuations, as it is also the case for construction activities, though loans to the latter decline from the third quarter of 2016 and thereafter.

Figure 6b: Allocation of loans to non-financial corporations by economic activity in million Euros

(a) ▇ Other activities

(b) ▇ Professional, scientific, technical activities, administrative and support service activities

(c) ▇ Real estate activities

(d) ▇ Information and communication

(e) ▇ Transportation and storage

(f) ▇ Accomodation and food service activities

(g) ▇ Wholesale and retail trade, repair of motor vehicles and motorcycles

(h) ▇ Construction

(i) ▇ Water supply, sewerage, waste maangement and remediation activities

(j) ▇ Manufacturing

(k) ▇ Mining and quarrying

(l) ▇ Agriculture, forestry and fishing

(m) ▬ Total loans to non-financial corporations (right-hand axis)

Source: Bank of Greece (data processing by the authors)

Table 8 depicts the percentage contribution of bank credit extending to each activity to the total for the three subpe-

Table 8: Loans to non-financial corporations by economic activity
as a percentage of total loans to these corporations
Average values during the period 2008Q3-2021Q2

	2008Q3 - 2013Q4	2014Q1 - 2019Q4	2020Q1 - 2021Q2
Agriculture, forestry and fishing	2.4	1.6	1.7
Mining and quarrying	0.4	0.4	0.3
Manufacturing	19.8	22.5	24.4
Water supply; sewerage, waste management and remediation activities	4.2	5.9	8.3
Construction	9.8	11.0	8.9
Wholesale and retail trade; repair of motor vehicles and motorcycles	23.5	21.6	22.9
Accommodation and food service activities	6.3	9.1	11.9
Transportation and storage	14.9	10.9	4.6
Information and communication	1.7	2.5	1.9
Real estate activities	2.7	5.4	5.5
Professional, scientific, technical activities, administrative and support service activities	2.0	3.5	3.2
Other activities	12.3	5.7	6.3

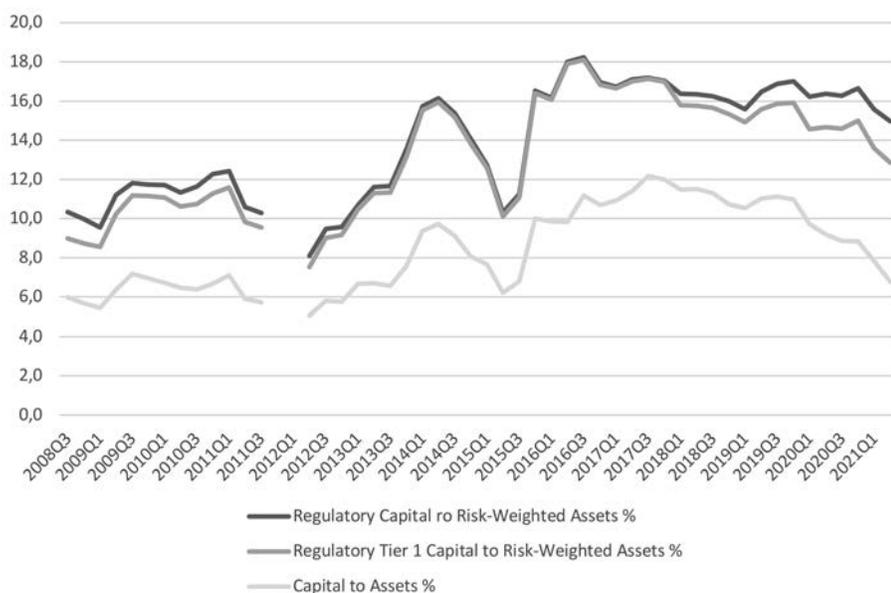*Source*: Bank of Greece (data processing by the authors)

riods. The greater part of loans to non-financial corporations is directed to manufacturing, wholesale and retail trade, and storage and transportation. Bank financing to manufacturing increased over time on average being 19.8% of total credit to non-financial corporations during 2008Q3-2013Q4, 22.5% in the following subperiod 2014Q1-2019Q4 and 24.4% during the pandemic one 2020Q1-2021Q2. The corresponding percentages for wholesale and retail trade are 23.5% for the first subperiod, 21.6% for the second and 22.9% during the last one with an intertemporal average close to 23%. On the contrary, storage and transportation reduce their relative share in bank credit (from 14.9% to 10.9% between the first two subperiods), especially during the pandemic subperiod (just 4.6%). Concerning the rest of economic activities, it is interesting to note how the average share of bank credit to agriculture falls over time (from 2.4% in the first subperiod to 1.7% in the third), the moment we observe a rise in the share of water supply and waste management (from 4.2% to 8.3%), of accommodation and food services (from 6.3% to 11.9%) and of real estate activities (from 2.7% to 5.5%). However, in construction activities, a rise in bank credit during the interval 2014Q1-2019Q4 (from 9.8% to 11%) is followed by a decline during the pandemic 2020Q1-2021Q2 (8.9%).

4. *Financial soundness indicators: The Greek banking system in the context of the European experience*

As early as the beginning of the Greek crisis, the literature was concerned with the impact of the new Basel III regulations on banks' balance sheets and performance given the adverse economic conditions (Vogiazas & Alexiou, 2013; Thomadakis & Loizos, 2011). Figures 7a and 7b illustrate the evolution of capital adequacy ratios for the Greek deposit taking institutions. It is clear, that banks' capital adequacy falls significantly in late 2011 and early 2012 while risk-adjusted solvency ratios

(regulatory capital to Risk-Weighted Assets (RWA) and Tier 1 capital to RWA) fluctuate considerably between the second quarter of 2014 and the fourth quarter of 2015. Besides, it is worth noting the fall of all solvency indices especially from the fourth quarter of 2017 onwards (Figures 7a and 7b).
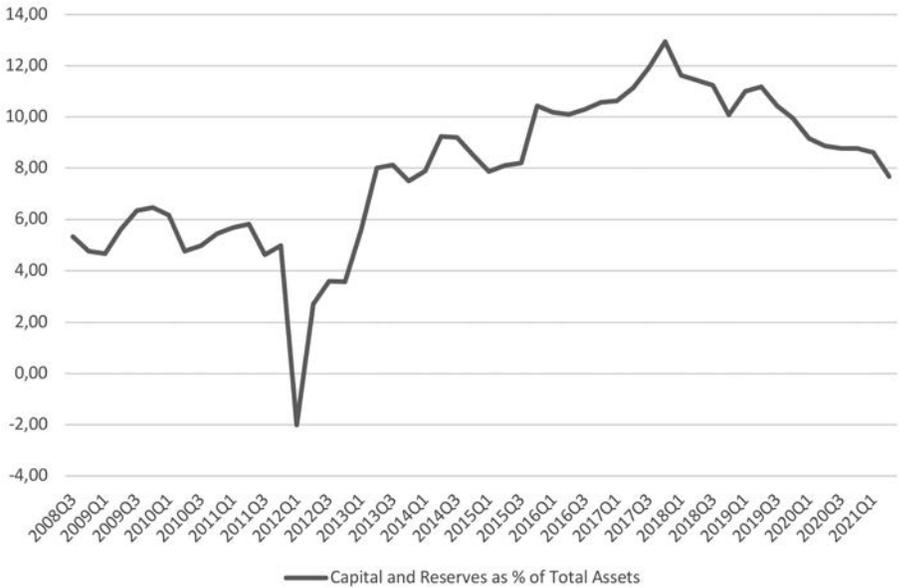
Figure 7a: Capital Adequacy Ratios, Greek banks[9]

Source: IMF, Core FSIs for deposit takers, Greece
(data processing by the authors)

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9. Data are not available for 2011Q4 and 2012Q1 in Core FSIs.

Figure 7b: Capital Adequacy Ratio, Greek Credit Institutions

Source: Bank of Greece, Financial Soundness Indicators
of Credit Institutions (data processing by the authors)

Tables 9 and 10 display summary statistics for capital adequacy ratios in the Greek and the European banking sector. Concerning the Greek case, as expected, mean and median values of non-risk-adjusted capital adequacy measures are clearly lower than the risk-adjusted ones. In the non-risk-adjusted category, capital adequacy ratios are on average between 5% and 6% in the first subperiod, around 10% in the second subperiod and close to 8% in the pandemic subperiod. On the contrary, regulatory capital to RWA ratios assume values of 11%, 15.9% and 16% which in terms of Tier 1 capital to RWA become 10.3%, 15.5% and 14.2% for each subperiod.

Table 9: Capital adequacy ratios, Greek Banks.
Summary statistics[10]

		Regulatory Capital to RWA %	Regulatory Tier 1 Capital to RWA %	Capital to Total Assets %	Capital and Reserves to Total Assets %
Mean	2008Q3 – 2013Q4	11.0	10.3	6.3	5.12
	2014Q1 – 2019Q4	15.9	15.5	10.2	10.18
	2020Q1 – 2021Q2	16.0	14.2	8.5	8.64
Median	2008Q3 – 2013Q4	11.3	10.5	6.4	5.38
	2014Q1 – 2019Q4	16.4	15.8	10.7	10.36
	2020Q1 – 2021Q2	16.2	14.6	8.8	8.77
Standard Deviation	2008Q3 – 2013Q4	1.26	1.33	0.64	2.08
	2014Q1 – 2019Q4	1.94	1.92	1.59	1.35
	2020Q1 – 2021Q2	0.62	0.82	1.06	0.50
Min	2008Q3 – 2013Q4	8.1	7.5	5.1	-2.01
	2014Q1 – 2019Q4	10.3	10.1	6.2	7.86
	2020Q1 – 2021Q2	15.0	12.9	6.8	7.68

10. The first three columns present summary statistics for data with a break in quarters 2011Q4 and 2012Q1. The fourth column refers to summary statistics for a complete time series.

Max	2008Q3 – 2013Q4	13.5	13.1	7.5	8.12
	2014Q1 – 2019Q4	18.2	18.1	12.2	12.94
	2020Q1 – 2021Q2	16.7	15.0	9.7	9.15

Sources: IMF, Core FSIs for deposit takers, Greece and Bank of Greece,
Financial Soundness Indicators of Credit Institutions
(data processing by the authors)

Table 10: CET1 ratio, EU 27 (medians)

Period	Mean	Median	Standard deviation	Min	Max
2014Q3 – 2019Q4	14.85	14.82	0.89	13.22	15.94
2020Q1 – 2021Q2	16.63	16.76	0.64	15.59	17.27

Source: European Central Bank, ESRB Risk Dashboard,
September 9, 2021 (data processing by the authors)

Taking into account Basel III capital standards (BCBR, 2010a) and economic distress during the period under examination, the above average ratios of capital adequacy seem to be rather satisfying, notwithstanding the negative value of at least one of these measures (capital and reserves to total assets) during the first quarter of 2012. However, the variability of the latter index falls over time from the first to the last subperiod while, in the other indices standard deviations fall only between the second and the third subperiod. Moreover, reduced variability in the pandemic subperiod around an average value of capital adequacy ratios which, in most cases, is lower than the one in the second subperiod, implies the need for Greek banks to boost their solvency ratios against possible risks. The fact that regulatory capital to RWA ratio remains close to 16%

should not be a source of complacency, let alone that Basel III also emphasizes capital adequacy indices calculated without adjusting assets for perceived risk.
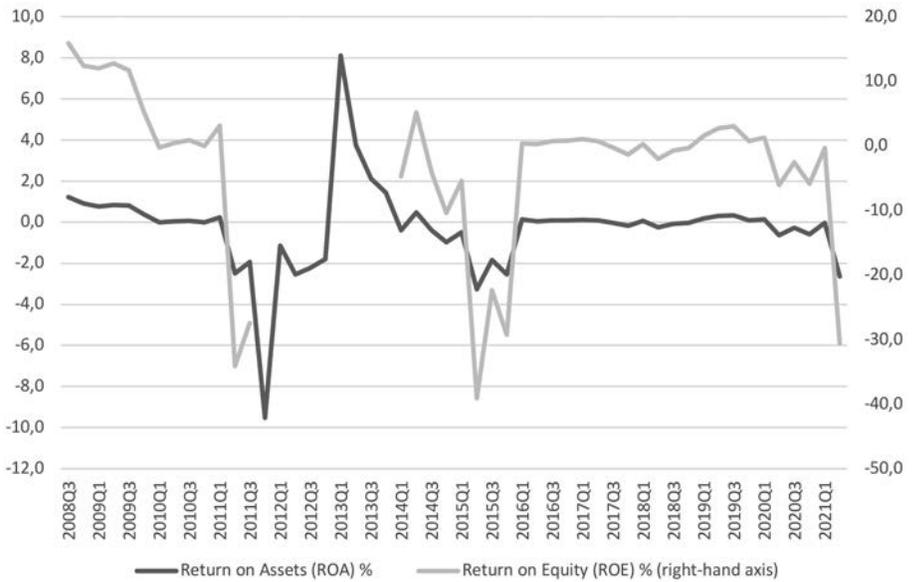
Comparing the above results with European medians concerning Tier 1 capital (Table 10) shows an encouraging picture since the Greek banking system is not far away from the European average which was close to 14% during the second subperiod and about 16% in the third one. The only difference is that in the Greek case this average falls during the pandemic subperiod in contrast to the corresponding European average.

Figure 8 portrays the evolution of two essential indices of profitability in the Greek banking sector, Return on Assets (ROA) and Return on Equity (ROE).[11] Both profitability ratios, ROA and ROE, fluctuate significantly between 2011Q1 and 2015Q4 where positive and negative outliers alternate, and decline sharply in the second quarter of 2021. In the interval 2016Q1 – 2021Q1 both ratios seem to stabilize to a value close to 0% with small fluctuations around it, though ROE's variability is wider. High variability in banks' profitability in terms of returns in 2011Q1 – 2015Q4 relates clearly to the effects of their participation in sovereign debt restructuring (Private Sector Involvement-PSI) and the ensued three recapitalizations of Greek banks: the first in May-June 2013, the second in April-May 2014 and the third in December 2015 (Kolliopoulos, 2020: 7, 13-14). On the other hand, falling profitability in the second quarter of 2021 is due to rising provisions of banks against possible losses because of the pandemic (Bank of Greece, 2021: 26; Mourmouras, 2020).

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11. The time series of ROE is not complete because of lack of data from 2011Q4 to 2013Q4.

Figure 8: Return on Assets and Return on Equity, Greek banks

Intertemporal trends in Greek banking sector profitability by summary statistics for each subperiod are depicted in Table 11. Average profitability in terms both of returns on assets and equity, decreases over time and turns from positive or zero during the first subperiod to increasingly negative in the next two subperiods. The same falling trend we observe in median values of the respective ratios, though in this case negative values exist only in the pandemic subperiod. However, we need to mention the large variability around the mean value, especially in the case of ROE, which, despite its fall in second subperiod, rises again during the pandemic subperiod. This significant variability is also justified by the extreme low values of ROE indicating the high risk assumed by Greek banks' shareholders.

Table 11: Return on Assets and Return on Equity, Greek banks

		ROA %	ROE %
Mean	2008Q3 – 2013Q4	0.0	1.0
	2014Q1 – 2019Q4	-0.4	-4.3
	2020Q1 – 2021Q2	-0.7	-7.4
Median	2008Q3-2013Q4	0.2	3.1
	2014Q1 – 2019Q4	0.0	0.0
	2020Q1 – 2021Q2	-0.4	-4.2
Standard Deviation	2008Q3-2013Q4	3.14	15.24
	2014Q1 – 2019Q4	0.92	10.79
	2020Q1 – 2021Q2	1.01	11.78
Min	2008Q3 – 2013Q4	-9.5	-34.1
	2014Q1 – 2019Q4	-3.3	-39.1
	2020Q1 – 2021Q2	-2.6	-30.7
Max	2008Q3-2013Q4	8.1	15.9
	2014Q1 – 2019Q4	0.5	5.2
	2020Q1 – 2021Q2	0.1	1.3

Source: IMF, Core FSIs for deposit takers, Greece
(data processing by the authors)

Comparison with European averages is possible by the summary statistics in Tables 12 and 13. Mean and median returns on assets in European banks are positive and take values close to 0.4% for the second subperiod and about 0.3% for the pandemic subperiod. This contrasts the corresponding zero or negative values in the Greek case, thereby indicating the better mean profitability of European banks. In terms of returns on equity European banks show mean and median values of ROE around 6.5% in the second subperiod and about 4% in the third one, which again are positive as opposed to the respective figures for Greek

banks. Nevertheless, European banking too, faces a reduction of average returns and a rise in variability and risk in the third subperiod. Besides, the coefficient of variation[12] in absolute values for this subperiod is equal to 1.59 for Greek banks and just 0.53 for European banks, implying much higher variability and risk in the Greek banking sector.

Table 12: ROA, EU 27 (medians)

Period	Mean	Median	Standard deviation	Min	Max
2014Q3 – 2019Q4	0.42	0.43	0.06	0.30	0.53
2020Q1 – 2021Q2	0.28	0.26	0.14	0.10	0.47

Source: European Central Bank, ESRB Risk Dashboard,
September 9, 2021 (data processing by the authors)

Table 13: ROE, EU 27 (medians)

Period	Mean	Median	Standard deviation	Min	Max
2014Q3 – 2019Q4	6.46	6.40	0.70	5.11	7.80
2020Q1 – 2021Q2	4.05	3.60	2.17	1.35	7.12

Source:: European Central Bank, ESRB Risk Dashboard,
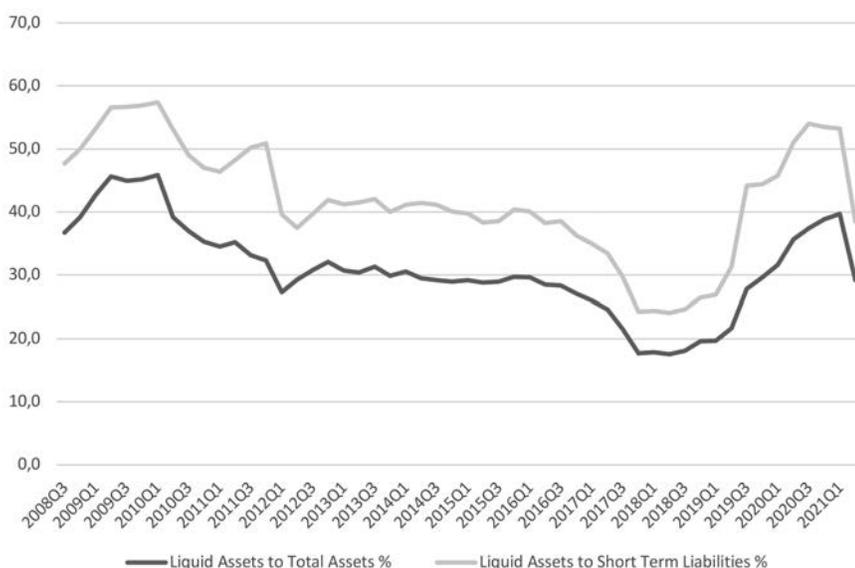September 9, 2021 (data processing by the authors)

Finally, in Figure 9 we present the evolution of two liquidity ratios for Greek banks: the ratio of liquid assets to total assets and the ratio of liquid assets to short-term liabilities of banks. Independently of the measure used, Greek banks'

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12. It is calculated as the ratio of standard deviation to expected (average) return (Francis, 1993: 251)

liquidity follows a downward trend from the beginning of 2010 until the end of 2017 while from 2018 until early 2021 is rising, only to fall again during the second quarter of 2021. If we compare the way measures of liquidity and measures of capital adequacy against losses have developed during this period, we understand that Greek banks were much more active in restoring their capital rather than taking care of their liquidity. This finding implies that the managers of Greek banks followed the traditional point of view, which is predominant both in the academia and in the financial markets and focuses on capital adequacy as an indication of financial soundness. Such an idea is usually expressed in the context of a causality that runs from solvency to liquidity (Pierret, 2015; Vogiazas & Alexiou, 2013) despite new findings in the literature (Jordà, Richter, Schularick & Taylor, 2017) and the novelty of Basel's III emphasis on liquidity (BCBR, 2010b).

Figure 9: Liquidity Ratios, Greek Banks

The evolution among subperiods of average values for liquidity measures is provided in Table 14. According to both mean and median values, it seems that liquidity in the third subperiod recovers, after its fall in the second subperiod, with less variability around mean values compared to the two previous subperiods. Hence, despite the delay in taking care of their liquidity and its decline in the second quarter of 2021, Greek banks are probably now in the process of restoring their liquidity. However, this effort depends on both the condition of the economy in the future which will affect banks' liquidity preference and monetary policy in the Eurozone. Furthermore, comparing the ratio of liquid assets to short-term liabilities in the Greek and the European banking sector during the second subperiod, Greek banks' higher liquidity is clear with an average ratio of 35.1% as opposed to 22.41% for European banks while the median value is even higher (38.3% compared to 22.39%). However, this ratio's variability in the Greek case is larger than the one for European banks since, it includes the interval in which Greek banks attempted to restore their liquidity.

Table 14: Liquidity Ratios, Greek Banks

		Liquid Assets to Total Assets %	Liquid Assets to Short Term Liabilities %
Mean	2008Q3 – 2013Q4	35.8	47.6
	2014Q1 – 2019Q4	25.4	35.1
	2020Q1 – 2021Q2	35.4	49.3
Median	2008Q3 – 2013Q4	34.9	48.0
	2014Q1 – 2019Q4	28.1	38.3
	2020Q1 – 2021Q2	36.5	52.1
Standard Deviation	2008Q3 – 2013Q4	5.89	6.41
	2014Q1 – 2019Q4	4.74	6.86
	2020Q1 – 2021Q2	4.18	6.12

Min	2008Q3 – 2013Q4	27.3	37.5
	2014Q1 – 2019Q4	17.6	24.1
	2020Q1 – 2021Q2	29.2	38.5
Max	2008Q3 – 2013Q4	45.9	57.4
	2014Q1 – 2019Q4	30.5	44.4
	2020Q1 – 2021Q2	39.7	54.0

Source: IMF, Core FSIs for deposit takers, Greece
(data processing by the authors)

Table 15: Liquid Assets to Short Term Liabilities (%),
EU 27 (medians)[13]

Period	Mean	Median	Standard deviation	Min	Max
2014Q3 – 2018Q1	22.41	22.39	1.90	18.82	24.99

Source: European Central Bank, ESRB Risk Dashboard,
September 9, 2021 (data processing by the authors)

## 5. *Financial sector: Data on employment and unemployment*

The above-described financial developments did have an impact on the level of employment in the sector (Missos and Loizos 2020). Primarily, some important observations can be made by comparing the sector's labor market data[14] with the total

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13. Data drawn from ECB's Risk Indicators refer only to the period 2014Q3 – 2018Q1.

14. Financial sector is represented by the broad sector of economic activity which includes the bank institutions, insurance companies and all other types of companies whose main activity concerns financial intermediation. See the two-digit classification from 64 to 66, according to the Statistical Classification of Economic Activities (NACE rev. 2). For the branch of banking activities in particular, see below.

economy. The quarterly changes of both sector and total employment are depicted in Figure 10, using the first quarter of 2001 as a base (100) for comparison. The figure is divided into three sub-periods to denote the upper and lower level of total employment reached throughout the period between 2001-2021Q2. Accordingly, from 2001 up to the third quarter of the 2008, a 10% increase in total employment is documented in juxtaposition to the level of financial sector's employment which has gone through various fluctuations and instability. Be that as it may, from 2003Q3 to 2008Q1 the general trend of the level of employment in the financial sector was mildly positive.

Figure 10: Employment changes in comparison
to the 2001Q1 (100), 2001Q1 – 2021Q2, Greece
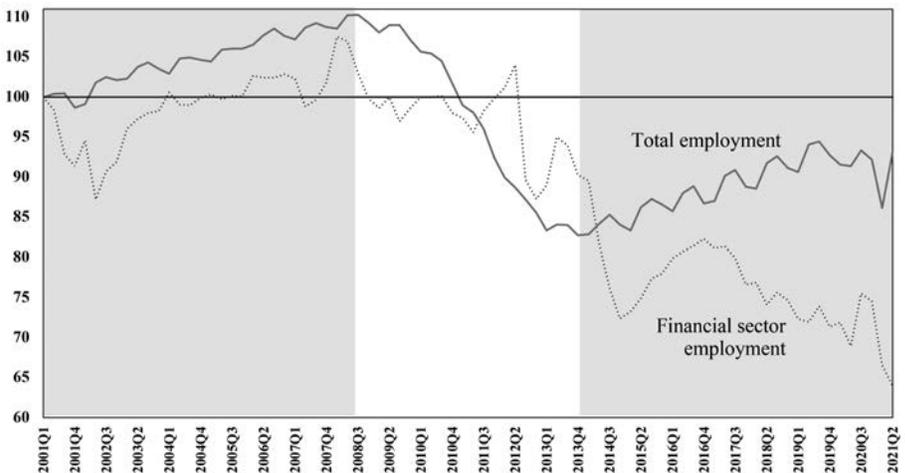
Source: Labour Force Survey, ELSTAT

The second phase – from 2008 to 2013Q4 – is marked by a substantial decrease of the absolute number of total employees, reaching a level of -18 percentage points in comparison to that of the 2001Q1. During the same time-frame, the level of employment at the financial sector was varied though it showed considerable resilience in comparison with total employment.

However, contrary to the relative stability of the average number of jobs that it was preserved during the first phase of the 2009 economic crisis, in what followed, the financial sector's employment was seriously diminished.

More specifically, from the 2013Q4 – when the highest level of unemployment was documented – the level of employment of the financial sector follows an autonomous path, continuing its intensely diminishing trend, overdrawing the percentage change of total employment. From 2014 to 2019Q2 financial jobs losses were estimated at 20% and its main trend was kept diverging from the modest recovery path of total employment. As a result, the overall contribution of financial jobs to total employment was diminishing towards 2%, from an average of 2.7%.

Figure 11: Employees of '25-44' and 'over 45' years old,
as a percentage of total and financial employment, 1983-2020, Greece
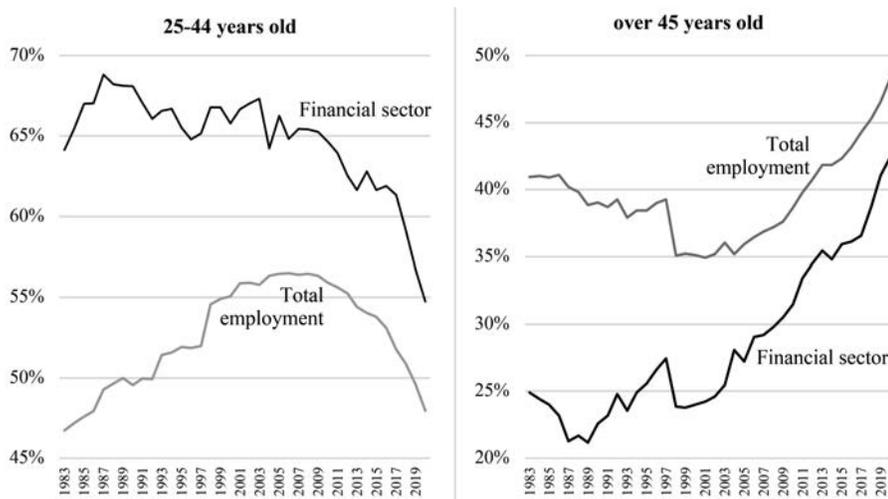
Source: Labour Force Survey, ELSTAT

Several qualitative features of these data are able to offer important insights for evaluating the changes of employment in the financial sector. The vulnerability of the sector itself,

was one crucial aspect of the long series of structural issues that emerged from the Greek economy during the period of prolonged recession. This can be seen by examining the age distribution of the employees working in finance, in comparison with the overall age distribution of the labor market. Figure 3.2.2 illustrates that from the early 1980s to the late 1990s, the percentage of employees over 45 years of age were – on average – estimated at 38% of the total, whereas at the financial sector in particular, it was close to 24%. Since then, the respective trends go upwards with the financial sector moving faster than the average, with the employees over 45 resulting at 48.3% of the total and the 42.4% of the finance sector – increased by 18.5 percentage points! Undoubtedly, at this sector, the burden of decreasing employment was unequally bore at the shoulders of the younger ages.

On the other hand, the percentage contribution of the 25-44 age-group at the finance sector employment is characterized by a long-term diminishing trend which is even accelerated during the period 2004-2020. From 1983 to 1996, the share of that age-group between total and financial sector employment, was differed by 17 percentage points whereas, during the next period (1997-2020) this difference was shrunk to 6.8 percentage points. The importance of this issue is highlighted by the other factors such as, the rapid demographic ageing trend of the overall population that also contributes to the increase of the average age of employees. In addition, the 2009-2016 recession had a severe impact on employment and did set a serious obstacle at the process of jobs creation – especially for the younger population whose unemployment rate was estimated extremely high.

This last observation is in part confirmed by examining the unemployment data. Apart from the level of employment, that of unemployment may also provide a variety of valuable insights. Figure 12 presents the population of unemployed for the period 2000-2020, whose previous activity was concerned with the financial sector. Once again, the population is divided into two age-groups. That of '25-44' and that of 'over 45'

years old. From 2000 to 2008, the unemployment of younger age-group is found to be disproportionately greater to the older group, indicating the high mobility that existed in that sector. From 2009 onwards, both magnitudes increase sharply while, after 2014, the difference between them was lowered.

Combined results from figures 11 and 12, lead to the conclusion that the expectations and aspirations of the younger age-group of unemployed were possibly altered during the time that they remained out of the labor market. Younger ages seem to have changed their ambitions and to have stopped searching for work into the financial sector. As the data on banks' personnel show, the sector's capacity in creating new jobs has gradually ceased and from 2009, banks have not only started decreasing their job offers, but in addition, they have cut a significant portion of their working positions.

Figure 12: Unemployed population (in thousand persons) from the financial sector per age-group, 2000-2020, Greece.
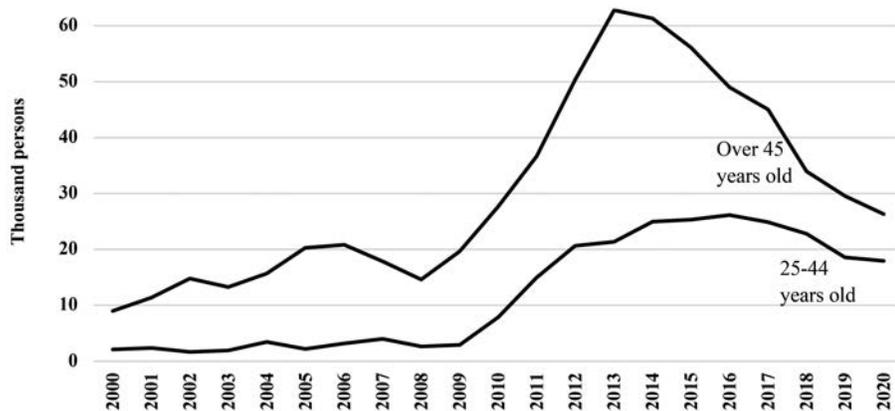
Source: Labour Force Survey, ELSTAT

Data on the banking sector's employment provide a clear reflection of the substantial changes that occurred during the long period of recession. Apart from the series of merging prac-

tices between domestic financial institutions[15], the remaining firms in the banking sector went through a sharp shrinkage of the number of branches available to their customers. More specifically, in 2009, the total number of branches in Greece were 4,163 and in 2020, it was 1,680 – a contraction of 60%! As it is depicted in figure 13, an adjustment of such a magnitude had a serious impact on the level of employment.

Figure 13: Banking sector's personnel (in thousand persons) and number of branches (in thousands) of financial institutions, members of the Hellenic Bank Association, 2000-2020
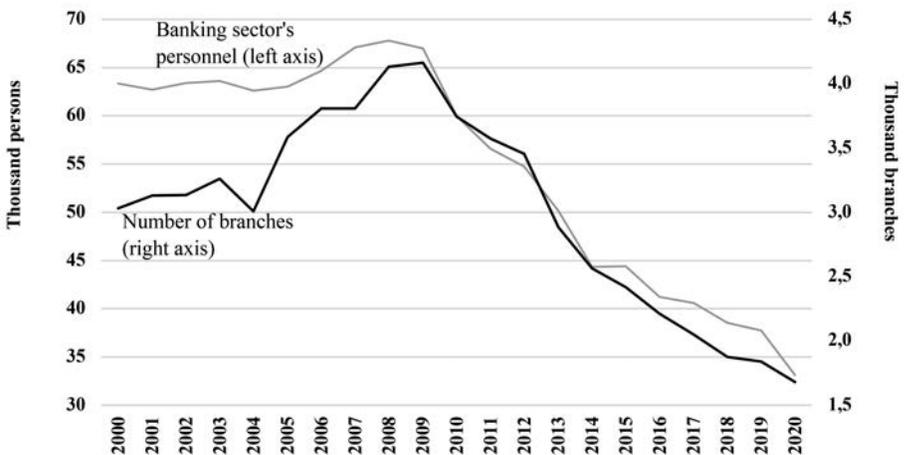
Source: Hellenic Bank Association

The data shown in figure 13 come from data published by the Hellenic Bank Association (HBA) which, among others, concern the number of personnel of the financial institutions

15. Indicatively, in 2007, apart from cooperative banks operating in Greece, the financial sector was comprised of 19 institutions seated in Greece, 18 institutions seated in other countries of the European Union and 4, seated in countries outside the EU. In 2020, the overall number of financial institutions operating in the country was reduced to 13. See https://www.hba.gr/4Statistika/UplPDFs/2021/2020-SinSigPar.pdf

that are members of the HBA. As it becomes clear, during 2000-2009, the level of employment was particularly stable, around 65 thousand persons. From then onwards, a sharp reduction from 66.9 to 33.1 thousand persons was followed. Such a reduction of 50.5% during a period of prolonged recession that was followed by a short-period of sluggish growth, characterize the extremely critical phase in which the banking sector in Greece has shifted over. From a different point of view, such a phase is marked by a broad range of issues, related to the sector's restructuring, imposed by the bad quality of assets accumulated during the previous period (for example, the large volume of NPLs). In addition, from August 2013 to October 2021, the practice of cost cutting becomes apparent in the 9.6 thousand voluntary terminations – employees make a decision to leave by voluntarily ending their contracts – documented in the monthly reports of the 'salaried employment flows' of the informational system of ERGANI of the Ministry of Labour. A variety of motives were offered by financial institutions to older aged and experienced employees for achieving a mutual agreement in terminating their contracts.

6. *Conclusions*

After a period of economic turbulence, the Greek economy was confronted by a multiplicity of macroeconomic challenges that was difficult to manage within the narrow frame of EAPs (2010-2018) implemented. The financial sector underwent a deep restructuring, the level of which signified a complete rearrangement of its operational character and modified its objectives, as it was based on a new entrepreneurial model following the international trends of competition. The management of the crisis did have a significant impact on the operational cost of the banking activities which was firmly reduced.

Among the data reported, these concerning the NPLs are of utmost importance. Financial institutions seem to have

eliminated the 'burden' imposed by NPLs from their financial balances, but together, to have also reduced the value of their activities. On the other hand, from 2014 onwards, the branches of manufacture, commerce and communications, have absorbed the greater part of new credit as a percentage of the overall new loans. Their capital adequacy ratio is described by numerous fluctuations and is generally diminishing. In addition, the volatility of financial profits is high, and its trend is decreasing. Liquidity is signified by a high level of fluctuations, depending on the macroeconomic conditions while, as a strategy, banks seem to have given a disproportional role on how their capital adequacy ratios will be rectified.

As a consequence, the sector's level of employment was directly influenced. Job cuts and the sharp reduction in the number of branches, clearly portrays a new phase of low operational cost, whose short-term impact upon the level of total employment and income was immediate. The average age level of the sector's personnel increased, highlighting its inability to absorb new and young employees while, the gradual decrease in the unemployed coming from that sector, indicates that their job searching has shifted to other activities. This new phase of the financial sector is the outcome of the long-lasted recession, displaying the structural characteristics of the Greek economy.

The above developments in the Greek banking sector might have short-term and medium to long-term repercussions on the economy. To the degree, that credit-less recovery is a rare phenomenon and when it happens leads to a rather feeble growth (Loizos, 2022), restoring credit extension to firms and households is of utmost importance. Credit is vital to support firms' investment projects which in turn will add to current employment and generate income for households and other firms. Rising incomes add to existing cash flows for households and enterprises and decrease the possibility of new NPLs in the future as debtors can pay out their contractual obligations to banks. Besides, rising incomes also add to banks' profits and generate internally more capital able to cover future losses. The

above virtual circle might contribute to the resilience of the Greek economy concerning future crises. As far as new credit is directed to crucial sectors of the Greek economy in the context of long-term development planning, it might also contribute to the change of its productive base to more export-led growth given its competitive advantages, including its human capital. On the contrary, loan growth to support consumption might only have short-term benefits for banks and the economy to the detriment of its long-term prospects.

References

Adrian T. & Shin S. H. (2010). 'The changing nature of financial intermediation and the financial crisis of 2007-09', Staff Report no. 439, Federal Reserve Bank of New York.

Argeitis G. (2012). *Default and economic crisis. Failure and collapse of the Greek capitalist model* [in Greek: *Χρεοκοπία και οικονομική κρίση. Αποτυχία και κατάρρευση του ελληνικού μοντέλου καπιταλισμού*] Athens: Alexandria.

Bank of Greece (2014). *Governor's annual report for 2013*, Athens: Bank of Greece (April)

Bank of Greece (2014). *The years of great crisis. The Bank of Greece 2008-2013* [in Greek: *Το χρονικό της μεγάλης κρίσης. Η Τράπεζα της Ελλάδος 2008-2013*], Athens: Bank of Greece.

Bank of Greece (2018). *Governor's annual report for 2017*, Athens: Bank of Greece (February).

Bank of Greece (2021). *Governor's annual report for 2020*, Athens: Bank of Greece (April)

Basel Committee on Banking Regulation, BCBR (2010a). Basel III: *A Global Regulatory Framework for More Resilient Banks and Banking Systems*, Bank for International Settlements.

Basel Committee on Banking Regulation, BCBR (2010b). Basel III: *International Framework for Liquidity Risk Measurement, Standards and Monitoring*, Bank for International Settlements.

EBA (2019). *Report on NPLs: Progress made and challenges ahead*, European Banking Authority.

European Commission (2012). 'The second economic adjustment programme for Greece', *European Economy, Occasional Economic Papers 94*.

Francis, J. C. (1993). *Management of Investments*, McGraw-Hill International Editions.

IMF (2019). *Global financial stability report: Lower for longer*, Washington: International Monetary Fund.

Jordà, Ò., B. Richter, M. Schularick, & A. M. Taylor (2017). 'Bank capital redux: Solvency, liquidity, and crisis', *NBER Working Paper Series. Number 23287*.

Kolliopoulos, A. (2020). 'Bank recapitalizations in Greece: From state-laid bailouts to the ownership transfer of banks to foreign hands', ELIAMEP, Working Paper 112/2020, (May).

Liargovas P. (2020). *Ten years of crisis, three memorandums and one pandemic* [in Greek: *Δέκα χρόνια κρίση, τρία μνημόνια και μία πανδημία: Η Ελλάδα αναζητώντας διέξοδο*], Athens: Patakis.

Loizos K. (2019). 'Solving the NPLs' problem in Greece: where do we stand?'. In: *Ten years into the global financial crisis - The current state of finance in the EU: Prospects and alternatives*, Nicos Poulantzas Institute, transform! Europe/EuroMemorandum Group.

Loizos, K. (2020). 'The new bankruptcy law in Greece. An evaluation from the perspective of economic theory and policy', *Greek Economic Outlook*, 43: 58-62.

Loizos, K. (2022). *The dimensions of the Non-Performing Loans problem and the Greek case 2002Q4-2019Q1*, Centre of Planning and Economic Research (KEPE) Studies (forthcoming).

Maris, G. & Flouros F. (2021). 'Economic crisis, COVID-19 pandemic, and the Greek model of capitalism', *Evolutionary and Institutional Economics Review*, https://doi.org/10.1007/s40844-021-00228-y

Maris, G., Sklias, P. & Maravegias, N. (2021). 'The political economy of the Greek economic crisis in 2020', *European Politics and Society*: 1-21.

Missos V. (2021) 'Introducing a safety net: The effects of neoliberal policy on welfare, poverty and the net social wage during the Greek crisis', *Review of Radical Political Economics*, 53(1): 58-76.

Missos V., Prodromidis P. & Reziti I. (eds., 2021). *Special issues on regional entrepreneurship and innovation planning*, Centre of

Planning and Economic Research (KEPE) and Regional Development Fund of the Region of Western Greece.

Missos V. & Loizos K. (2020) 'The employment adjustment of the financial sector in Greece' *Greek Economic Outlook*, issue 41, (February): 40-46.

Mourmouras, J. (2020) 'The pandemic crisis as a challenge. Greece the day after', Opening speech at the IMN's Greek Banking & NPL Management Virtual Event, September 9 available at https://www.bis.org/review/r201009b.htm

Mouzoulas, S., Panagopoulos, Y. & Peletidis, I. (2020) 'The implementation of the "Hercules" project for the NPLs: Assessment and sustainability prospects', *Greek Economic Outlook*, 41: 70-90.

Naili, M., & Lahrichi, Y. (2020). 'The determinants of banks' credit risk: Review of the literature and future research agenda', *International Journal of Finance & Economics*, 8: 1-27.

Nikolopoulos, K. & Tsalas, A. (2017). 'Non-Performing Loans: A Review of the Literature and the International Experience' in Monokroussos, P. & Gortsos, C. (eds.) *Non-Performing Loans and Resolving Private Sector Insolvency. Experiences from the EU Periphery and the Case of Greece*, Palgrave Macmillan.

Pierret, D. (2015). 'Systemic risk and the solvency-liquidity nexus of banks', *International Journal of Central Banking* 11(3): 194-227.

Provopoulos, G. A. (2014). 'The Greek economy and banking system: recent developments and the way forward', *Journal of Macroeconomics*, 39: 240-249.

Sklias, P. & Maris, G. (2013). 'The political dimension of the Greek financial crisis', *Perspectives on European Politics and Society*, 14(1): 144-164.

Stournaras, Y. (2019). 'A systemic approach towards improving asset quality of Greek banks', speech at the event *Tackling NPLs within the Greek Banking System*, Hellenic Bank Association, Athens, January, 24 available at https://www.bis.org/review/ r190201a.htm

Thomadakis S. & Loizos K. (2011). 'Financial regulation and financial institutions' capital cost' [in Greek: 'Η χρηματοοικονομική ρύθμιση και το κόστος κεφαλαίου των πιστωτικών ιδρυμάτων'], in Chardouvelis G. and Gortsos Ch. (eds.) *The international crisis, the eurozone crisis and the Greek financial system*, Athens: Hellenic Bank Association.

Vaitsos K. & Missos V. (2018). *The Real Economy: Experience of Development, Crisis and Impoverishment in Greece* [in Greek: *Πραγματική οικονομία: Εμπειρίες ανάπτυξης, κρίσης και φτωχοποίησης στην Ελλάδα*], Athens: Kritiki.

Vogiazas, S. & Alexiou, C. (2013). 'Liquidity and the business cycle: Empirical evidence from the Greek banking sector', *Economic Annals*, LVIII (199): 109-125.

Zervas, A. & Fasianos, A. (2018). 'Assessing the impact of bankruptcy protection schemes on Non-Performing Loans: The Greek Case', mimeo.