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Assessment of the causal interplay between the social profile of European countries and main banking sector indicators

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Abstract

Social indicators represent a component of the broader Environmental, Social, and Governance (ESG) framework that is regularly evaluated and monitored at global and European level, in order to identify key social trends and country-specific social challenges which may further impact the real economy or the financial system development. The paper investigates the interplay between the social dimension of a country and several key banking indicators of profitability, capital adequacy, efficiency, credit quality, and savings ratio, as well as bank concentration. The causal relationship between the social and banking indicators is assessed by means of the Granger test, in a granular approach for each European country in the sample. A general result indicates that changes in the level of social indicators precede changes in banking indicators in France and Greece, while in Belgium, Italy, Netherlands, Spain, and Portugal the interplay is relatively balanced between social and banking indicators. The findings show that the predominant social feature that appears most in the statistical relationship with the banking indicators, regardless of the country considered, is the ageing of the population (population ages 65 and above). Bidirectional causality is mainly identified between the population ageing and banking indicators that proxy for the savings rate, credit expansion, solvency, and bank efficiency. From a unidirectional perspective (social characteristics represent the cause and banking indicators are the effect) findings show that people's age and government expenses with education have the ability to influence more of the key banking indicators considered.

1. Introduction

The European Banking Authority (EBA, 2021b) highlights the stages to be followed by financial market players to comply with their crucial role in fighting climate change and supporting the achievement of sustainable development goals. Furthermore, they must gain a clear understanding of the definition and classification of each ESG dimension and develop appropriate evaluation and risk management tools for the ESG risks. Low awareness of the exposure to ESG may affect not only individual financial institutions, but also the entire financial sector and the real economy.

Ziolo et al. (2019) argue that the modern financial paradigm needs to reconcile rational financial behaviour with market efficiency by considering at the same time the social and environmental consequences of financial decisions, apart from the economic and financial ones. In a complementary way, Arkhipova (2022) explains that the modern economy is characterised by the instability of the regulatory environment as a result of the increasing number of technological innovations, demographic changes, and rapid shifts in customers' preferences. In addition, the design of banking products and services is influenced by socio-demographic trends in each geographic region, including financial literacy.

From a prudential perspective, the European Banking Authority distinguished between two concepts related to the mechanism of transmission of ESG factors into the activity of financial institutions, namely: i) the outside perspective: In this case, financial materiality may arise through the impact of ESG factors on the institution's financial and economic activities that affect the value (returns) of the institution's activities; and ii) inside perspective: In this case, environmental and social materiality can arise through the impact of the institution's economic and financial activities on ESG factors (EBA, 2021b).

From this statement, our aim is to uncover which of the two mechanisms of interaction between key banking indicators and the social dimension of the country's ESG profile is most present and generates more influence. The exclusive focus of this paper is on the social dimension of the ESG concept because socio-demographic characteristics (such as age, income level, employment status, government expenditure to support lifelong learning, etc.) are directly influence people's financial inclusion and the depth of the financial relationship with the bank. Given that banks have developed a customer-centric business model, their ability to best serve customers' savings and financing needs will be further translated into the degree of achievement of the main business indicators.

The most suitable statistical method to explore this relationship and conclude about its unilateral or bilateral features is the Granger causality approach. It points out whether the social peculiarities in the country of origin determine (in terms of time precedence) the further developments in the banking activity or vice versa.

Another specific feature of our study comes from the sample of European countries considered, in a country-by-country granular analysis. More to the point, the sample selection took into account an additional external factor that can significantly impact the banking business, namely the climatic profile of the country of origin, as this is a major issue of concern in the broader debate regarding the fight against climate change and the appropriate management of the vulnerability of climate risks. Consequently, the sample is composed of European countries that are included in the category of a temperate climatic profile, according to the classification performed by the World Bank sovereign ESG data portal.

The structure of the paper is as follows: The second section briefly summarises related research and reports published by European institutions, the third one presents the range of variables employed, the fourth section discusses the findings of the Granger causality test, and the last one concludes.

2. Literature Review

Valcin et al. (2021) claim that the social dimension of the ESG refers, broadly speaking, to the potential or actual changes brought to the local community and employees. A company's products or services, as well as its regular operating activities, may cause these changes and may have benefits or cause harm to society. Social risks include the negative impacts of work conditions, health, inequity, labour relations or child labour (EBA, 2021a) and may cause financial instability through inequality as a form of social risk (Natalucci et al., 2022).

A more comprehensive view can be found in the EBA (2021b) report, which points out that environmental, social, and governance factors are susceptible to influence the financial performance or solvency of a financial institution and this effect may be positive or negative.

From the perspective of Lange and Schmitt (2019), banks that comply with sustainable, responsible investment criteria can significantly contribute to making a social turnaround by adopting a sustainable culture that takes into account human rights and good governance standards.

The impact of several demographic indicators on customer attitudes and their ability to use FinTech payment services is investigated by Alshari & Lokhande (2022). The demographic indicators considered are age, education, income, and gender. The results of this study indicate a high positive effect of education and income levels on the perceived benefit of using FinTech and a significant negative effect on risks. Additionally, gender, income, and risks show a significant negative effect on the attitude of bank clients.

In the same vein, Conrad et al., (2019) examine which socio-economic and demographic factors affect the demand for digital financial services at a regional level. The study argues that socio-demographic factors can cause an increased risk of information divide, which is especially present in rural areas because of the socio-demographic nature. High sample's age with a relatively low level of education may cause difficulties in having access to the basic financial services. Additional results of the study reveal a positive and significant effect of population density on the share of online banking accounts, while population age has a negative effect. Moreover, the educational level has a strong positive and significant effect on the share of online banking accounts, but, on the other hand, the educational level exerts a high effect on income level.

A study by Braga et al. (2017) assesses the influence of demographic factors (age, gender, education, and income) on mobile application users. These factors may affect user perception and adaptation to financial innovations that are represented by proxies such as relative advantage, complexity, compatibility, possibility of experimentation, and visibility. They found that the relative advantage is influenced by the income level. Hence, customers with higher levels of income tend to use mobile applications instead of using ATMs or internet banking, and they value it because it is much easier and less complex to access these services. In terms of gender, men seem to be more willing to use mobile banking than women.

In addition, a study by Munusamy et al. (2013) underscores the main role of age in shaping the adoption of Internet banking services among customers. The authors try to explore how demographic factors can impact the behaviour of banking customers in order to use internet banking services. A similar attempt belongs to Margaret & Ngoma (2013) who aim to determine those socio-demographic factors that influence the adoption and use of internet banking. This study uses the level of education, occupation, age and income to reflect the main socio-demographic factors, and the results also show a positive relationship between socio-demographic factors and the use of Internet banking. Ljumović et al. (2021) study the socio- demographic characteristics of banking customers in Serbia, in connection with the digital financial banking services. They assume that income, level of education, and age influence the level of use of these services. Findings uncover a significant relationship with the level of income, employability, and education, so that users of digital financial services seem to be more educated, younger, and active on the labour market.

In a broader respective, Grzelczak (2022) proposes several actions to be implemented by financial institutions in order to decrease cash transactions and promote non-cash ones. The researcher assesses the degree of advancement of non-cash transactions in Polish society, and then determines the relationship between socio-demographic factors and unbanked people. The results of the study, which are based on a survey approach, confirm the significant effect of socio-demographic factors on the level of use of banking services among the Polish population. Specifically, the socio-demographic factors considered (age, level of income, education level, and type of work) record a significant statistical influence on the level of banking of the population, while gender and place of residence were not significant. In addition, the study uncovers that each increase in income level will lead to an increase in the number of banked people; in addition, the increase in educational achievements determines people to move to an upper level of financial interaction with banks.

Berlemann et al. (2010) explore the effect of demographic changes on the banking industry through a simulation model. They estimate the impact of socio-demographic factors on banking profitability, by using the demographic shift which is represented by ageing and population size. In addition, they find that the decline in the size of the population reduces the customer base while ageing increases the profitability of the banks because older customers generate more profit to the bank, so the effect of population ageing will offset the drop in the customer base.

According to a report published by DBRS Morningstar (2022) the social effect of the services and products issued by banks may cause financial or regulatory risks to the banks, and banks may be facing many risks related to social factors such as lack of skilled employees, uncompetitive wages, or even bad relationship between bank employees, which may cause frequent labour relation conflicts that may lead to operational or financial risk. Another kind of risk that may influence banks, being related to reputation and financial performance, occurs in the case of human rights violation or scarcity of gender diversity between staff.

The picture is completed by Kiarie et al. (2013) who study the impact of socio-demographic determinants on the default risk (especially the credit card default) of commercial banks. Socio-demographic factors that can become risk factors related to credit default are represented by age, gender, material status, and level of education. The results of the study show that young card holders are more likely to default compared to older ones, so age

represents a risk factor. In terms of gender, there is no difference between women and men, while the education level was not statistically significant, so it did not represent a risk factor.

Some research focuses on customer behaviour and demographic characteristics, which further influence their behaviour with respect to reimbursing a credit or opening a savings account, or even choosing other banking services and products. In particular, the study by Amari et al. (2020) investigates the effects of socio-demographic factors on saving behaviour and risk aversion. The findings suggest that there are significant effects of demographic factors on risk aversion. Additionally, financial literacy reduces the relationship between avoiding risk and saving behaviour.

In the same vein, Arkhipova and Karminsky (2023) examine the demographic factors that influence the credit behaviour of banking customers, taking also into account other economic and social issues, represented by the education level, social status, and financial and digital literacy. The set of demographic factors consists of the age, gender, family composition, level of health care, birth rate, and the average number of children in a family. They find a positive relationship between income and the volume per capita of credit, a positive relationship between the level of health care (which reflects the quality of life) and the solvency of the customers. According to the study results, there is a positive relationship between the birth rate and the number of loans because the increase in the birth rate leads to an increase in the need of customers for new loans.

The relationship between socio-demographic factors (age, gender, education, income, material status) and the financial behavior of banking customers (credit card users in particular) is also assessed by Memarista et al. (2015), which refers to the willingness of the customer to hold more credit and get more indebted. The results of the study show no significant relationship between customer behaviour and material status, age, gender, and income level, while the level of education has a significant relationship with financial behaviour in terms of using a credit card. Jessa (2023) verifies the influence of demographic factors on customer bank choices and uncovers a large number of differences between customer selection criteria according to demographic factors (age, gender, and income).

Cuesta-González et al. (2021) present a complementary perspective and discuss the interaction between banking institutions and vulnerable customers in terms of social exclusion and poverty (mainly customers with difficulties in access, use and perception of banking). They find that difficulties related to the use of banking products prevail, followed by the perception of difficulties in interacting with the bank due to the lack of financial knowledge or training.

3. Presentation of Data

The main indicators of the banking system that we considered for this study comprise: bank concentration, bank cost-to-income ratio as a proxy of operational efficiency, bank deposits to GDP as a proxy of the propensity to save, credit / deposit ratio to designate the credit expansion pattern apart from the core stable funds collected from customers, nonperforming loans to gross loans as a key indicator for the quality of the loan portfolio, regulatory capital to risk-weighted assets as a proxy for banks' solvency or capital adequacy to risks undertaken, ROA and ROE as main profitability indicators. Data are collected from the World Bank Global Financial Development database and cover the timeframe 1997 to 2021 due to data availability constraints. Regarding the social dimension of the countries, the main indicators employed are summarised in Table 1. The sample of countries included in the category of temperate climate profile, as designated by the World Bank sovereign ESG data portal, is represented by: Belgium, France, Greece, Italy, the Netherlands, Portugal and Spain.

Table 1. List of Selected Social Indicators for the S Dimension of the ESG Concept

Social indicator	Description	Source of the data
Government expenditure on education, total (% of government expenditure)	Is expressed as a percentage of total general government expenditure on all sectors (including health, education, social services, etc.)	World Bank ESG indicators
Labor force participation rate, total (% of total population ages 15-64) (modeled ILO estimate)	Is the proportion of the population ages 15-64 that is economically active: all people who supply labor for the production of goods and services during a specified period.	World Bank ESG indicators
Population ages 65 and above (% of total population)	Population is based on the definition of population, which counts all residents regardless of legal status or citizenship.	World Bank ESG indicators
Poverty headcount ratio at national poverty lines (% of population)	National poverty headcount ratio is the percentage of the population living below the national poverty line(s).	World Bank ESG indicators

Source*:* World Bank ESG Data Portal

The graphical representation of each social indicator reveals the countries witnessing a diverging or converging path, as well as the outlier ones.

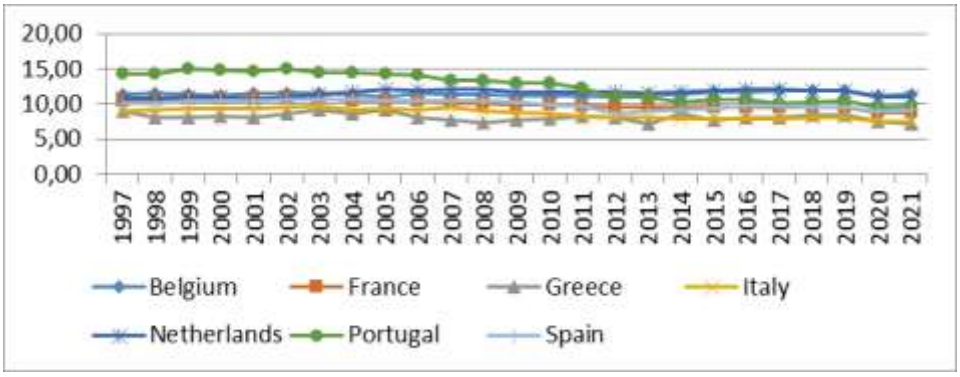

Figure 1. Government Expenditure on Education (%) – Trend Across the Selected Countries

Source: authors

Figure 1 suggests a convergence path among the selected countries, starting in 2012, in terms of the budgetary strategy adopted by the governments that is related to the financing of education. In the last reporting year, the gap between these countries is of 3 percentage points (ranging from 7% to 11%). Portugal had recorded the highest share of public expenditure on education in total expenditure until 2011, and then entered a decreasing slope. Greece portrays a highly fluctuating situation, while the remaining countries exhibit a steady pattern.

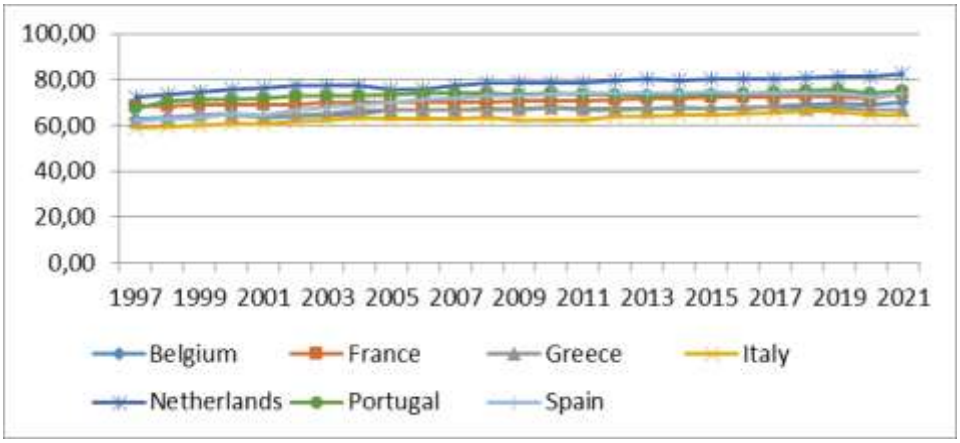

Figure 2. Labor Force Participation Rate (%) – Trend Across the Selected Countries

Source: authors

Regarding the labour force participation rate (% of total population ages 15-64), the selected countries follow a similar dynamic: a relatively steady one with slow upward trend (figure 2). Belgium has historically witnessed the highest employability rate, on the contrary being Italy.

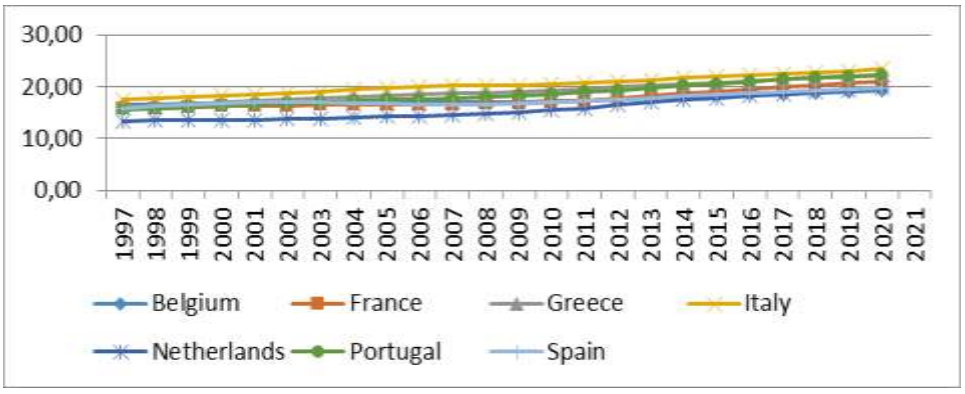

Figure 3. Population Ages 65 and Above (%) – Trend Across the Selected Countries

Source: authors

The ageing of the population is a matter of interest at the global level, being present also in the selected countries. The highest ageing rate is observed in the case of Portugal and the Netherlands, over the last two decades (figure 3). All countries face a growing trend, at a higher pace starting with 2010. For example, the 10-year percentage change (2020 compared with 2010) reveals that the ageing ratio has augmented by 12 percentage points for Belgium, 15 percentage points for Greece and Italy, while the maximum increase belongs to the Netherlands (27 percentage points).

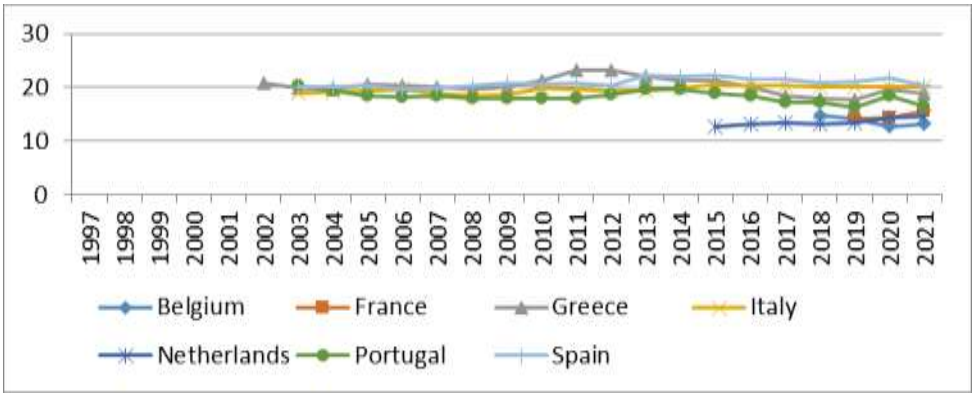

Figure 4. Poverty Headcount Ratio at National Poverty Lines (%) – Trend Across the Selected Countries

Source: authors

Regarding the percentage of the population living below the national poverty line, the plot in Figure 4 exhibits heterogeneous trends. Greece and Portugal had the most fluctuating pattern, but overall the trend is downward, which signals a beneficial situation, an improvement in the standard of living. Italy appears to stabilise at a steady value of 20% since 2015. A slight upward trend can be observed for France and Belgium, signaling a worsening of living conditions since 2020.

Preliminary data processing, in terms of primary descriptive statistics (Table 2), highlights the intrinsic data specificities for each country and each indicator.

Table 2. Descriptive statistics

Government expenditure on education							
	Belgium	France	Greece	Italy	Netherlands	Portugal	Spain
min	10,98	8,82	7,11	7,44	10,72	9,61	8,56
max	11,98	10,96	9,24	9,64	12,14	15,09	10,63
standard deviation	0,25	0,60	0,54	0,70	0,48	1,92	0,59
Labor force participation rate							
	Belgium	France	Greece	Italy	Netherlands	Portugal	Spain
min	62,82	68,28	61,92	58,72	72,31	67,50	62,11
max	70,19	73,84	67,79	66,06	82,27	75,52	74,34
standard deviation	1,97	1,43	1,57	1,97	2,48	1,67	4,12
Population ages 65 and above							
	Belgium	France	Greece	Italy	Netherlands	Portugal	Spain
min	16,40	15,70	16,00	17,43	13,41	15,64	15,87
max	19,21	21,01	22,18	23,37	19,65	22,30	19,67
standard deviation	0,79	1,62	1,81	1,71	2,09	2,04	1,11
Poverty headcount ratio at national poverty lines							
	Belgium	France	Greece	Italy	Netherlands	Portugal	Spain
min	12,70	14,20	17,70	18,40	12,70	16,20	19,70
max	14,80	15,60	23,10	20,60	14,50	20,40	22,30
standard deviation	0,81	0,64	1,45	0,59	0,62	1,03	0,79

Source: authors' computation

The minimum value of government expenditure on education indicator is 7.11 which is registered in Greece, while the maximum value is 15.09 and belongs to Portugal. The latter also witnesses the highest value of the standard deviation statistic in our sample, indicating increased heterogeneity of the time series values with the largest fluctuation around the mean value. Therefore, Portugal records an unsteady pattern in terms of

government expenditure on education. On the contrary lies Belgium, with the minimum value of the standard deviation for government expenditure on education indicator (only 0.25) which suggests a pattern of homogeneity of the time series.

In terms of the labour force participation rate indicator, the minimum value is also registered in Greece, and the maximum one is registered in the Netherlands, while the highest value of the standard deviation is 4.12 and belongs to Spain. This signals a very high level of heterogeneity in the values of the time series, a broad spread around the mean value, which reflects an unbalanced pattern in the dynamics of labour force participation. The minimum value of standard deviation is 1.43 (in France) so one can conclude that this country exhibits a lower variability among the time series values and hence a more balanced pattern of evolution regarding the labour force participation indicator.

The minimum value of the population ages 65 and above as a percentage of the total population is 13.41 being witnessed in the Netherlands. Consequently, the ageing rate is the lowest in the Netherlands, while the maximum level of population ageing rate is registered in Italy (23.37), closely followed by Portugal and Greece with more than 22%. According to the standard deviation value, the highest variability around the mean value is recorded in the Netherlands (2.09) and Portugal (2.04). Thus, during the time frame considered, there is presence of outlier values (both high and low values) that shape the unbalanced pattern of evolution. The smallest value of the standard deviation is 0.79 in Belgium, indicating a low deviation of the sample values around the mean and hence low variability between the data and a steady path of evolution.

Regarding the poverty headcount ratio indicator, the minimum value among countries is 12.70 and is recorded in both the Netherlands and Belgium, while the maximum one is 23.10 in Greece, followed at close distance by Spain with 22.3. The standard deviation (data spread around the mean value) exhibits a minimum value of 0.59 in Italy and a maximum value of 1.45 in Greece. Consequently, the former country faces a more homogeneous pattern in the time series data features, while the latter witnesses larger fluctuation among the time series data.

By summarising the information retrieved from the preliminary analysis of the main descriptive statistics, we can extract some general conclusions. The Netherlands presents the most balanced development pattern in all the social indicators considered, as it exhibits the maximum value of the labour force participation rate, the minimum value of the poverty headcount ratio, a high value of government expenditure on the education rate, and a minimum value of population 65 years of age and older. Therefore, a high level of employment and an increase in education expenditure naturally lead to a reduction in the poverty rate. The weakest levels of social indicators are observed in Greece, which is characterised by a minimum value of government expenditure on education, a minimum labour force participation rate, and the highest levels of the poverty headcount ratio and of population ageing. Consequently, public policies must be better tailored and focused on improving social indicators.

Generally, Belgium and France appear to follow a quite balanced pattern of evolution in terms of the social indicators included in the study, with no sharp upward or downward shifts.

4. Causality Analysis of Countries' Social Dimension and Banking Indicators

The causal relationship between the social component of a country's ESG and several key banking indicators is distinctly assessed for each country in the sample, in a granular way to gain insight into the specific relationships that occur at the country level.

We apply the Granger causality test that has as null hypothesis the assumption that there is no causal relationship from a variable *x* to *y*. If the null hypothesis is rejected, one can conclude that changes in variable *x* precede the variation in variable *y* (Hurlin and Venet, 2008; Horváth et al. 2012) and hence the fluctuation of one time series has the capacity to determine or forecast the dynamics of another (Wei, 2016; Oravecz and Vandekerckhove, 2023). The informational content brought by the causality analysis relies on validating 'whether one variable in a linear relation can be meaningfully described as a dependent variable and the other variable as an independent variable, whether the relation is bidirectional or whether no functional relation exists at all' (Stern, 2004).

Table 3 illustrates only statistically significant relationships that have been identified between pairs of variables.

Table 3. Banking System Indicators and Country-Level Social Dimension

Country	Granger test relationship	Obs.	F-statistic	Prob.
Belgium	Population ages 65 and above (% of total population) does not Granger cause ROA	19	3,78	0,048
	Population ages 65 and above (% of total population) does not Granger cause bank concentration	19	4,29	0,035
	Labor force participation rate, total (% of total population ages 15-64) does not Granger cause bank cost to income ratio (%)	20	3,67	0,0504
	Bank cost to income ratio does not Granger cause labor force participation rate, total (% of total population ages 15-64)	20	4,04	0,039
	Population ages 65 and above (% of total population) does not Granger cause bank cost to income ratio (%)	19	5,93	0,014
	Bank deposits to GDP (%) does not Granger cause labor force participation rate, total (% of total population ages 15-64)	19	4,06	0,0405
	Population ages 65 and above (% of total population) does not Granger cause bank deposits to GDP (%)	18	4,29	0,037
	Bank deposits to GDP (%) does not Granger cause population ages 65 and above (% of total population)	18	3,52	0,059
	Bank non-performing loans to gross loans (%) does not Granger cause Government expenditure on education	21	3,85	0,043
	Labor force participation rate, total (% of total population ages 15-64) does not Granger cause bank regulatory capital to risk-weighted assets (%)	21	3,29	0,063
	bank regulatory capital to risk-weighted assets (%) does not Granger cause population ages 65 and above (% of total population)	21	8,43	0,003
France	Bank concentration does not Granger cause Population ages 65 and above (% of total population)	19	4,65	0,028
	Bank credit to bank deposits does not Granger cause labor force participation rate (% of total population ages 15-64)	19	6,48	0,0101
	Population ages 65 and above (% of total population) does not Granger cause bank credit to bank deposits (%)	18	9,88	0,0025
	Population ages 65 and above (% of total population) does not Granger cause bank deposits to GDP (%)	17	3,43	0,066
	Bank deposits to GDP (%) does not Granger cause population ages 65 and above (% of total population)	17	6,14	0,014
	Labor force participation rate, total (% of total population ages 15-64) does not Granger cause bank non-performing loans to gross loans (%)	14	4,49	0,044

	Labor force participation rate, total (% of total population ages 15-64) does not Granger cause bank regulatory capital to risk-weighted assets (%)	17	15,78	0,0004
	Population ages 65 and above (% of total population) does not Granger cause bank regulatory capital to risk-weighted assets	14	3,16	0,091
	Poverty headcount ratio at national poverty lines does not Granger cause bank regulatory capital to risk-weighted assets	17	2,86	0,096
Greece	Bank cost to income ratio (%) does not Granger cause Government expenditure on education	16	5,39	0,023
	Government expenditure on education does not Granger cause bank credit to bank deposits (%)	19	3,33	0,066
	Population ages 65 and above (% of total population) does not Granger cause bank non-performing loans to gross loans (%)	21	2,98	0,079
	Poverty headcount ratio at national poverty lines does not Granger cause bank non-performing loans to gross loans (%)	17	5,71	0,018
	Government expenditure on education does not Granger cause bank deposits to GDP (%)	19	2,83	0,093
	Bank deposits to GDP (%) does not Granger cause population ages 65 and above (% of total population)	18	4,54	0,032
	Bank deposits to GDP (%) does not Granger cause poverty headcount ratio at national poverty lines	18	4,86	0,026
	Population ages 65 and above (% of total population) does not Granger cause bank regulatory capital to risk-weighted assets	21	4,61	0,026
	Bank regulatory capital to risk-weighted assets does not Granger cause poverty headcount ratio at national poverty lines	17	3,04	0,085
	Population ages 65 and above (% of total population) does not Granger cause ROA	14	4,15	0,052
	Population ages 65 and above (% of total population) does not Granger cause ROE	14	5,007	0,034
	Poverty headcount ratio at national poverty lines does not Granger cause ROE	15	3,68	0,063
Italy	Bank concentration does not Granger cause population ages 65 and above (% of total population)	19	7,02	0,007
	Government expenditure on education does not Granger cause bank credit to bank deposits (%)	19	3,14	0,075
	Labor force participation rate, total (% of total population ages 15-64) does not Granger cause bank credit to bank deposits	19	3,45	0,061
	Population ages 65 and above (% of total population) does not Granger cause bank credit to bank deposits (%)	18	4,85	0,026

	Poverty headcount ratio at national poverty lines does not Granger cause bank credit to bank deposits (%)	17	7,67	0,007
	Bank credit to bank deposits (%) does not Granger cause poverty headcount ratio at national poverty lines	17	3,94	0,048
	Bank deposits to GDP does not Granger cause Government expenditure on education	19	3,36	0,064
	Population ages 65 and above (% of total population) does not Granger cause bank deposits to GDP	18	3,05	0,082
	Bank deposits to GDP does not Granger cause population ages 65 and above (% of total population)	18	8,52	0,004
	Bank non-performing loans to gross loans (%) does not Granger cause labor force participation rate, total (% of total population ages 15-64)	21	4,17	0,035
	Bank regulatory capital to risk-weighted assets does not Granger cause population ages 65 and above (% of total population)	21	6,04	0,011
	Bank regulatory capital to risk-weighted assets does not Granger cause poverty headcount ratio at national poverty lines	16	4,54	0,036
Netherlands	Bank credit to bank deposits (%) does not Granger cause government expenditure on education	20	4,28	0,054
	Labor force participation rate, total (% of total population ages 15-64) does not Granger cause bank credit to bank deposits	20	3,37	0,084
	Bank credit to bank deposits does not Granger cause labor force participation rate (% of total population ages 15-64)	20	6,02	0,025
	Population ages 65 and above (% of total population) does not Granger cause bank credit to bank deposits (%)	19	4,29	0,054
	Bank credit to bank deposits (%) does not Granger cause population ages 65 and above (% of total population)	19	5,3	0,035
	Labor force participation rate, total (% of total population ages 15-64) does not Granger cause bank deposits to GDP (%)	20	3,06	0,098
	Bank deposits to GDP (%) does not Granger cause population ages 65 and above (% of total population)	19	10,98	0,004
	Government expenditure on education does not Granger cause bank concentration (%)	21	7,59	0,013
	Bank non-performing loans to gross loans (%) does not Granger cause Government expenditure on education	18	3,26	0,09
	Bank non-performing loans to gross loans (%) does not Granger cause Population ages 65 and above (% of total population)	18	5,15	0,038

	Labor force participation rate, total (% of total population ages 15-64) does not Granger cause Bank regulatory capital to risk-weighted assets (%)	22	4,38	0,05
	Population ages 65 and above (% of total population) does not Granger cause Bank regulatory capital to risk-weighted assets	22	12,16	0,003
	Bank regulatory capital to risk-weighted assets (%) does not Granger cause Population ages 65 and above (% of total population)	22	20,56	0,0002
Portugal	Government expenditure on education does not Granger cause Bank concentration (%)	20	6,12	0,011
	Bank concentration (%) does not Granger cause Labor force participation rate, total (% of total population ages 15-64)	20	3,4	0,06
	Population ages 65 and above (% of total population) does not Granger cause Bank concentration (%)	19	6,34	0,011
	Government expenditure on education does not Granger cause Bank credit to bank deposits (%)	19	7,57	0,006
	Population ages 65 and above (% of total population) does not Granger cause Bank credit to bank deposits (%)	18	13,13	0,0008
	Bank credit to bank deposits (%) does not Granger cause Population ages 65 and above (% of total population)	18	9,45	0,003
	Bank credit to bank deposits (%) does not Granger cause Poverty headcount ratio at national poverty lines	17	3,009	0,087
	Population ages 65 and above (% of total population) does not Granger cause Bank deposits to GDP (%)	18	9,79	0,003
	Bank deposits to GDP (%) does not Granger cause Poverty headcount ratio at national poverty lines	17	2,87	0,095
	Government expenditure on education does not Granger cause Bank non-performing loans to gross loans (%)	18	2,93	0,088
	Bank non-performing loans to gross loans (%) does not Granger cause Labor force participation rate, total (% of total population ages 15-64)	18	3,18	0,074
	Population ages 65 and above (% of total population) does not Granger cause Bank non-performing loans to gross loans (%)	18	10,28	0,002
	Population ages 65 and above (% of total population) does not Granger cause Bank regulatory capital to risk-weighted assets	21	4,12	0,036
	ROA does not Granger cause Population ages 65 and above (% of total population)	16	10	0,003
	ROE does not Granger cause Government expenditure on education	20	3,72	0,048
	ROE does not Granger cause Population ages 65 and above (%	19	7,37	0,006

	of total population)			
Spain	Labor force participation rate, total (% of total population ages 15-64) does not Granger cause Bank concentration (%)	20	10,95	0,002
	Labor force participation rate, total (% of total population ages 15-64) does not Granger cause Bank cost to income ratio (%)	20	9,17	0,002
	Bank cost to income ratio does not Granger cause Labor force participation rate, total (% of total population ages 15-64)	20	3,44	0,059
	Population ages 65 and above (% of total population) does not Granger cause Bank cost to income ratio (%)	19	3,02	0,082
	Bank cost to income ratio (%) does not Granger cause Population ages 65 and above (% of total population)	19	6,91	0,008
	Government expenditure on education does not Granger cause Bank credit to bank deposits (%)	19	4,01	0,041
	Labor force participation rate, total (% of total population ages 15-64) does not Granger cause Bank credit to bank deposits	19	3,55	0,056
	Bank credit to bank deposits does not Granger cause Labor force participation rate, (% of total population ages 15-64)	19	12,98	0,0006
	Population ages 65 and above (% of total population) does not Granger cause Bank credit to bank deposits (%)	18	8,12	0,005
	Bank credit to bank deposits (%) does not Granger cause Population ages 65 and above (% of total population)	18	8,96	0,004
	Bank credit to bank deposits (%) does not Granger cause Poverty headcount ratio at national poverty lines	17	6,46	0,012
	Bank deposits to GDP (%) does not Granger cause Government expenditure on education	19	4,17	0,037
	Bank deposits to GDP (%) does not Granger cause Population ages 65 and above (% of total population)	18	8,63	0,004
	Government expenditure on education does not Granger cause Bank non-performing loans to gross loans	21	5,36	0,016
	Bank non-performing loans to gross loans (%) does not Granger cause Population ages 65 and above (% of total population)	21	4,05	0,037
	Poverty headcount ratio at national poverty lines does not Granger cause Bank non-performing loans to gross loans (%)	16	3,07	0,087
	Bank non-performing loans to gross loans does not Granger cause Poverty headcount ratio at national poverty lines	16	4,69	0,034
	Government expenditure on education does not Granger cause Bank regulatory capital to risk-weighted assets (%)	21	4,07	0,037
	Bank regulatory capital to risk-weighted assets (%) does not Granger cause Labor force participation rate, total (% of total	21	4,86	0,022

population ages 15-64)			
Population ages 65 and above (% of total population) does not Granger cause Bank regulatory capital to risk-weighted assets	21	4,17	0,034
Bank regulatory capital to risk-weighted assets (%) does not Granger cause Poverty headcount ratio at national poverty lines	16	3,87	0,053
Population ages 65 and above (% of total population) does not Granger cause ROA	19	3,21	0,071
ROA does not Granger cause Poverty headcount ratio at national poverty lines	17	3,28	0,073
Population ages 65 and above (% of total population) does not Granger cause ROE	19	5,05	0,022

Source: authors, by using EViews software

The findings show that the four indicators used as a proxy for the social dimension of a country record a causal relationship with the indicators of the banking system, but only for Italy and Portugal. In Belgium and the Netherlands there is no statistical interplay between banking indicators and the poverty headcount ratio, in Greece it is missing the interplay with labour force participation rate, while in France there is no presence of an interplay with the amplitude of government spending on education. In absolute numbers, the most statistically significant causal links have been identified for Spain (24), followed by Portugal (16), the Netherlands (13), Italy and Greece (12), and, respectively, Belgium (11) and France (9).

In terms of indicator type, the results show that changes in the level of social indicators seem to act as the main precursors of banking indicators in France and Greece (hence a change in the social characteristics of the country is the cause and the developments of the banking indicators are the effect) while in Belgium, Italy, the Netherlands, Spain and Portugal the interaction is relatively balanced between social and banking indicators.

Bidirectional causality (both variables act as cause and effect for each other) has been identified between:

- labour force participation rate and bank cost-to-income ratio (in Belgium, Spain),

- labour force participation rate and bank credit to bank deposits (the Netherlands, Spain),

- population ages 65 and above and bank deposits to GDP (in Belgium, France, Italy),

- population ages 65 and above and bank credit to bank deposits (the Netherlands, Portugal),

- population ages 65 and above and bank regulatory capital to risk-weighted assets (the Netherlands),

- population ages 65 and above and bank cost-to-income ratio (Spain),

- poverty headcount ratio and bank credit to bank deposits (Italy),

- poverty headcount ratio and bank non-performing loans to gross loans (Spain).

Banking system indicators that were identified to precede shifts in the social ones (unidirectional relationships only) are related to: bank credit to bank deposits (France, the Netherlands, Portugal, Spain), bank deposits to GDP (Belgium, Greece, Italy, the Netherlands, Portugal, Spain), bank non-performing loans to gross loans (Belgium, Italy, the Netherlands, Portugal, Spain), bank regulatory capital to risk-weighted assets (Belgium, Greece, Italy, Spain), bank cost to income ratio (Greece), bank concentration (France, Italy, Portugal), ROE (Portugal), ROA (Portugal, Spain). In summary, banking characteristics in terms of savings ratio, credit expansion, as well as credit portfolio quality and solvency influence the further dynamics of the social indicators in most countries in the sample.

As regards the opposite unidirectional relationship, established from social characteristics as cause towards the banking indicators as effect, results emphasise that change in population ageing further influences: the level of ROA (Belgium, Greece, Spain) and respectively ROE (Greece and Spain); bank concentration (Belgium, Portugal); bank cost-to-income ratio (Belgium); bank credit to bank deposits (France, Italy); bank deposits to

GDP (Portugal); bank non-performing loans to gross loans (Greece, Portugal); bank regulatory capital to risk-weighted assets (France, Greece, Spain).

In a similar manner, previous changes in labour force participation rate further impact: bank deposits to GDP (the Netherlands), bank non-performing loans to gross loans (France), bank regulatory capital to risk-weighted assets (Belgium, France, the Netherlands), bank concentration (Spain). The unidirectional poverty headcount ratio determines bank regulatory capital to risk-weighted assets (France), bank non-performing loans (Greece), and ROE (Greece), while the change in government spending for education further influences bank credit to bank deposits (Greece, Italy, Portugal, Spain), bank deposits to GDP (Greece), bank concentration (the Netherlands, Portugal), bank non-performing loans (Portugal, Spain) and bank regulatory capital to risk-weighted assets (Spain).

To sum up, from a unidirectional perspective, the findings show that people's ageing and government expenses with education have the ability to further influence most of the key banking indicators considered. However, this relationship is not present in all the countries in our sample, a fact that reinforces the need for future granular in-depth studies conducted at country level.

5. Conclusions

Several indicators related to the banking industry seem to be in ongoing evolution, being connected with the socio-demographic trends. The socio-demographic factors play an important role in shaping many aspects related to the functioning of the banking sector and appear to determine the achievement of key performance indicators. Therefore, examining relationships, effects, and understanding the unique characteristics of each society will lead to a comprehensive view of the exogenous factors that have the potential to influence the conduct of banking activity.

The initial conjecture we started from, regarding the investigation of the two transmission mechanisms that model the interplay between a series of key banking indicators and the social dimension of a country, is validated by the statistical findings obtained. We found evidence for both the outside-in perspective (the social indicators trigger an influence towards the banking ones) and the inside-out perspective (a change in banking developments seems to precede a shift in several social indicators).

Bilateral causality is present mostly in the Netherlands and Spain, while the variables most often included in this causal link are related to population ageing and bank credit to bank deposits. Unidirectional relationships established between banking system indicators and the social ones (changes in banking precede shifts in the social indicators) appear the most frequently in Spain and Portugal and are related to features such as savings ratio, credit expansion, credit portfolio quality, and solvency. The opposite unidirectional relationships, having social indicators as cause and banking indicators as effect, have been identified in most cases in Greece, Portugal, and Spain, people's ageing and government expenses with education exhibiting the ability to influence more of the main banking indicators considered.

It should be emphasised that the Granger causality test provides robust, statistically significant evidence on this interaction, but has no ability to signal the direction of this relationship (positive or negative).

Another interesting conclusion is that the predominant social characteristic that appears most in the statistical relationship with banking indicators is stable from one country to another, being represented by the ageing of population (population ages 65 and above ratio). In Belgium and Greece, it is the most often found as statistically significant and seems to be connected with five banking indicators. The same situation occurs in France, Italy, and the Netherlands (in relation with four banking indicators), while Portugal and Spain lead with the interplay of population ageing with seven key banking indicators.

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