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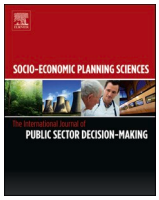

Are listed banks only pretending to be more social?

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ABSTRACT

It is widely accepted that listed organizations have potential to achieve greater economic results. In return, they are expected to provide reliable information on its economic and financial activity in a timely and accurate manner; and also, non-financial or sustainability information since 2018. Nowadays, organizations demonstrate not only their economic performance, but also their social commitment. Therefore, financial institutions attempt to be both economically and socially efficient. This paper tries to resolve this specific issue: determining whether listed financial institutions are more economically and socially efficient, due to the fact that, as they are listed and bigger, they can spend more resources in communication. But we do not know whether they truly are more socially efficient or simply have a reputation as such. To give an answer to this question a three-stage Data Envelopment Analysis has been used, which includes Spanish financial institutions Panel Data from 2014 to 2019.

1. Introduction

It has been traditionally accepted that the efficiency of a country's bank system contributes to its social and economic development [1], but nowadays this principle is being questioned. After the 2018 crisis the banks' role in society has received sharp criticism (see Ref. [2]), and the demand for specific social commitment has increased, in the framework of Sustainability and contribution to the Sustainable Development Goals (SDG). It is worth mentioning that, for instance, in the United States, a country with little inclination to restrict banking activities, in May 2021, the Chief Executive Officers (CEOs) of the country's six major banks–JPMorgan, Bank of America, Citi, Wells Fargo, Goldman Sachs and Morgan Stanley–testified before the Senate Banking Committee. The chairman of the committee, Senator Sherrod Brown [3], stated the following:

"*A few decades ago, a majority of Wall Street capital* funded *the real economy – wages, machinery, research, new construction. Today, much of that capital goes to stock buybacks, dividends, and complex financial instruments–only about 15 percent goes to the real economy. Instead of investing in businesses that actually make things or provide useful services, and that create real jobs in towns all over the country, companies spend billions buying back stocks and handing out CEO bonuses.*" Additionally, by way of example, he mentioned that Bank of America's lending declined 14 % in the previous year, whereas they had allocated US$25 billion to the repurchase of shares buybacks in order to the price in the stock market.

These views agree with the general perception, both in the United States and Europe, that financial system has disconnected from real economy. Nowadays, most of the transactions carried out are computer-driven speculative operations and have no link with the productive economy.

This leads to the conclusion that listed banks, maybe because of their requirements and guarantees to provide truthful information, entail less risk and achieve better results in terms of economic performance. Nonetheless, in the last decade, either because of social pressure or because of the conviction of investors or regulations [4], concerns about social issues have been increasing, for example, as is unavoidable in the Triple Bottom Line [5,6]. In this line, some papers have been produced in which social and economic aspects have been linked in order to understand the reasons for the existing relationships among them in banks.

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It has been concluded, specifically, that there is a positive relationship between social activities or Corporate Social Responsibility (CSR = that leads to a reduction in economic performance (i.e. [7–11]) and in crisis times Forcadell, & Aracil [12] reach the same conclusion; this inverse relation is explained by the cost of implementing social responsibility. On the other hand, some literature defends the opposite view; according to it the most socially conscious banks make this materialize in their financial results, either because of their reputation or because of real improvements (i.e., [13–15]). In fact, some papers defend this idea, regardless of other considerations, it seems that social perspective improves the reputation of financial institutions and increase their credibility [16,17]; and also because it has been proved that listed banks offer more social information and are more interested in reporting on their contributions to culture, sports and the like [18]. In spite of all the efforts and these two perspectives, the first of which could be named Agency-Conflict-Hypothesis (ACH), and the second one Conflict-Resolution-Hypothesis (CRH), for the time being no clear conclusion has been reached ([19–21]; [22,23]). As a consequence of those, a third perspective, which is known as Independent-Dimensions-Hypothesis (IDH), has appeared.

It has been confirmed the effort that financial institutions make to be both economically but also socially efficient. Nevertheless, so far, it is not clear whether the efforts made in social terms have materialized in relative efficiencies or remain as mere aspirations or actions without achieving the results expected by financial institutions. This paper, tries to solve this specific question: it is going to be determined whether listed financial institutions are more economically and socially efficient because, being listed and larger, they can invest more resources in communication and, consequently, they are included in the top positions of all the ethical and social rankings. Nonetheless, we do not know whether this implies being more socially efficient or it is just having the reputation as such. It is truth that listed banks are trying, in addition to be the most economically efficient, as was previously confirmed by Casu & Molyneux [24], to be more socially efficient. This is not necessarily the case, since the stock market price influences the information provided, in the regulation of information (updated and truthful information), and being monitored by govern entities, the market and investors. Their purpose has been to guarantee the capital granted to these entities, but they do not have social aspects as their goal; hence, there is no reason to believe that the fact of being listed implies being more socially efficient. Even so, they try to be socially efficient and they might be so, but both in academia and in society in general, there are still reasonable doubts as to the extent to which they have been successful; in this paper we are going to resolve this concern. And more than this, because depending on what hypothesis is accepted, we will, on the one hand, set a path for other scholars to follow and, on the other hand, provide a formula to review their achievements in comparison with other institutions with regard to social and economic aspects. In fact, this study will help us to shed light on the existing discussion about the conflict between economic efficiency and social wellbeing (social efficiency), since sometimes it might be reasonable to think that "*Doing Well by Doing Good*" [4] is impossible. Banks, in particular listed banks, have achieved very positive financial results after the Covid-19 crisis, but at the same time, their contribution to employees, users and society as a whole has decreased; this explains the civil society's concern, because social welfare does not improve as the economic result increases.

To provide an answer to this problem that will determine if listed banks are more or less efficient than the non-listed ones, Spain is a very suitable example, since it has a stable financial system that has been strengthened after the crisis and it has not an excessive number of financial institutions. These were the effects of the privatisation of savings banks, that represented before the real estate bubble in the region of 50 % of the banking market, and that were transformed into commercial banks and were, eventually, acquired by large commercial banks [25–27]. An efficiency analysis is conducted by means of the Data Envelopment Analysis (hereinafter, DEA), which is carried out in three stages (see section 3). Specifically, Panel Data are used in order to control random effects and obtain robust results for the period between 2014 and 2019; free from the effects of the financial and health crisis.

This paper has a classical structure. Below we outline the literature, as well as the arguments on which we base our hypotheses. Next, the methodology used is explained, based on the Spanish population of financial institutions, which removes sample bias, and frontiers efficiency is applied, as well as panel data. The results are explained in the fourth section, concluding with the discussion and conclusions, where a reflection on the limitations and future lines of research are included.

2. Literature review hypotheses

According to orthodox economics, the financial institutions' main role, as well as of any kind of institution, is the creation of value for society. The creation of value for investors is not an indicator of the generated social value. Nonetheless, this equivalence is being currently questioned, from both the political and social spheres, where a significant amount of work has been done to analyse the correlation between the two results, but no clear conclusion has been reached regarding the banking sector [19] and other organizations [28] about the casual relationship between both variables. In fact, after reviewing literature on banking and the relationship between social and economic efficiency, three different perspectives are identified:

First, the one we refer to in this paper as **"Agency-Conflict-Hypothesis" (**thereinafter, **ACH)** "assumes that CSR engagement is a driver of value destruction for shareholders" ([29]: 1304). It is based on considering the value distribution by the company as a zero-sum game, where the distribution of value among the stakeholders is viewed as a trade-off among them. This has been the predominant perspective in the neoliberal theory [30], in the agency theory [31] and, in general, in all the models based on the conflict for rent appropriation [32]. This perspective is previous and unrelated to the theory of stakeholders and it is still widely accepted in the political and economic spheres. In this line, several authors state that investing in CSR does not entail any automatic strategic advantage [10]. This is justified by the financial and transaction costs associated to social actions. Thus, they explain that these actions do not result in future earnings and sometimes they may be unsustainable for financial institutions, probably because they operate in highly regulated markets (Schltens & Dam, 2007; Write & Rwabizambuga, 2006). This line of thought, supported by several authors [8,9,11,19] proves that there is a negative correlation between social commitment and financial outcome. This suggests that the more socially efficient one is, the lower the economic result achieved. For instance, using the Down Jones for Sustainability index as social responsibility proxy, an inverse relationship is confirmed [7]. Furthermore, Forcadell & Aracil [12] specify that during a crisis period this relationship is strengthened and confirm that sustainability strategies do not contribute to the economic results in the case of banks classified as more sustainable in the aforementioned index. It is thus demonstrated that sustainability does not always improve economic efficiency.

Second, after the first perspective an alternative one was generated. In this one, both dimensions are considered as complementary. Several authors suggest reconciling economic and social profitability [33], in a win-win perception of CSR [34], with a positive correlation between social responsibility and financial results [10]. This approach is consistent with the theory of stakeholders proposed by Freeman [30], and more specifically with its instrumental perspective. In fact, since the seminal work carried out Donaldson & Preston [35], the stakeholder theory is divided into two large branches, known as instrumental and finalist, characterized by keeping the focus on investor interest, and the remaining interests are legitimated according to their contribution to the final result (profit) [29]. This could be referred to as **Conflict-Resolution-Hypothesis (**thereinafter, **CRH).** This perspective highlights the economic gain derived from having good management of trusting relationships with the stakeholders, and the positive impact it

may generate in the agency problem. The intangible character of financial services makes profitable a reduction in transaction costs through trusting relationships [36,37]. From this perspective it is expected that CSR and any sustainability-related commitment will have a positive impact on financial results [12,21,22,38,39]. The reputation model, according to which the financial return on social spending is expected to be more than 1, would be the materialization of this perspective, being reputation the moderator variable. For instance, some studies suggest that positive news generated by banks have a significant influence, at least, on market value [40], which is an example of reputation achievements. In this line, financial institutions maintain a high profile in front of markets and public opinion; where they need to disseminate information on social responsibility and contribution to sustainability in order to present a responsible image, increase their social capital by building trust with stakeholders and, consequently, legitimate their actions, strategies and decisions [41]. Additionally, as banks are facing increasing levels of customer dissatisfaction [42], recent research suggests that investing in CSR and the subsequent communication [40] can help organizations to create distinct identities, by satisfying and retaining customers and internal stakeholders, and recovering the market's credibility [16,17], thereby generating competitive advantages [43,44]. All in all, there are several reasons to implement CSR systems, not only related to reputation, but also to strategy [45,46], which allows improving bank efficiency, aligning short-term and long-term interests.

Third, against the two previous viewpoints–ACH postulates that social expenses reduce economic performance, whereas CRH argues that social performance contributes to economic performance–an alternative approach is generated, which considers that the two dimensions are independent, with no relationship among their respective outcomes. Several studies suggest that there is neither a negative relationship between social value and financial performance [19], as postulated by ACH, nor a positive one [47], as would be stated by CRH. In practice, spending or its consequent investment in social responsibility does not seem to generate a competitive advantage with an impact on profitability, at least in banking. Furthermore, results suggest that commitment to CSR or the adoption of good governance practices are not valued by investors [48]. All these data indicate that the performance of the economic and social dimensions would be mutually independent, giving rise to the **Independent-Dimensions-Hypothesis (**thereinafter, **IDH).**

Where papers on listed bank are concerned, efficiency has not been a major concern, at least from a sustainability perspective. The problem is that, in general, previous papers indicate an outperformance of listed banks at European level [24,49,50]. But, in this new situation, in which financial entities (as well as those listed on the stock market) are concerned about social matters, as mentioned in the introduction of this paper, the question arises as to whether the most economically efficient listed banks will also be socially efficient, thereby corroborating the CRH. If, on the contrary, they generate a lower social efficiency, listed banks would be corroborating ACH. Finally, if there is not a significant relationship between both dimensions depending on the entity's typology–listed or not–, it would corroborate IDH.

The above argument leads to three concatenated hypotheses.

H1. Listed banks are more economically efficient than non-listed ones.

H2. Listed banks are more socially efficient than non-listed ones.

H3. Listed banks are more overall efficient than non-listed ones.

There are different viewpoints, the first two of which–the negative relationship between social and economic aspects–have been previously analysed; but the neutral relationship not as much. Furthermore, the approach of this research is a different one, since we use systems for measuring the social and economic perspective in terms, not of ratios, but of relative efficiencies. This allows, not only valuing achievements positively, but also taking into account the component of the best in comparison to the group's achievement; namely the relative analysis. Thus, the most economically and socially efficient banks will be those that are so in comparison to the remaining ones.

The logic used in the methodologic process is represented in Fig. 1.

To begin with, we establish a first hypothesis that allows us to continue with our work or leave it here. It consists of determining whether listed banks are actually more economically efficient in comparison to non-listed banks. If the first hypothesis is rejected, it is because of two reasons: either non-listed banks are more economically efficient or there is not a significant difference. If the hypothesis is not rejected, we could infer that in global and significant terms they are more economically efficient and we can, therefore, continue with the second part of the analysis. In this case, we can analyse whether the so-called CRH is fulfilled, since the first assumption would be confirmed.

Secondly, we have determined a second hypothesis on whether listed banks are more socially efficient compared with non-listed banks. In this point we would be actually analysing whether CRH is being fulfilled or not. In this case, hypothesis 2 could be rejected, because non-listed banks are more socially efficient or because there is no difference. Otherwise, we would decide not to reject the hypothesis, an option that would allow us to confirm, as in the literature, that listed banks are the most economically, but also socially, efficient banks. This would suggest the existence of a positive relationship between economic and social aspects.

Thirdly, in the event that the second hypothesis is rejected, it would lead to decide that CRH is not being fulfilled, which means that listed banks are more economically efficient, but not socially. This would not allow to determine that listed banks are relatively more economically efficient, but not socially, which means that CRH is not being fulfilled. Furthermore, if the last hypothesis, the third one is rejected, we should conclude that there is neither positive relationship (greater economic efficiency does not lead to greater social efficiency), nor a negative one (the greater the social efficiency, there is no reduction in economic efficiency); this would confirm (IDH). This would suggest that each efficiency operates differentially and the fact of being a listed bank would not establish a concrete link between its status as a listed bank and the economic, social or overall efficiency it achieves.

3. Methodology

The relative efficiency of commercial banks has been determined by means of the DEA, which is a non-parametric statistics technique that has been widely used over the last years in banking efficiency literature [51–64]. DEA was proposed by Charnes et al. [65] and developed by Banker et al. [66] and Banker [67]. This technique is particularly appropriate to calculate the efficiency of organizations or units using inputs and outputs. Its non-parametric nature prevents the imposition of a determined functional shape. This methodological process estimates a production frontier by means of linear programming techniques, which are determined by enveloping functions of the input-output combinations provided by the empiric data. To this aim, it is required to have information about various Decision Making Units (hereinafter, DMU), which can be any type of organisation, such as firms, foundations, entities, among others. When comparing this methodology with others –especially the statistical approach of stochastic frontier analysis (SFA)– it is noticeable that DEA methodology has at least three advantages: first, DEA allows describing complex production relationships based on different outputs and inputs with a simple efficiency indicator; second, DEA could work without a previously validated production function, and then it is open to any new function based on open relationship among selected input and outputs; and third, it is an efficient tool for benchmark practice because it is direct and easy to understand.

In this paper the DMUs are the whole population of commercial banks. The value range is established from 0 to 100; in which those DMUs that have the value of 100 are the most efficient–in a relative way–and the ones that have lower values are those that still have room for improvement in their degree of efficiency. Since DEA does not handle

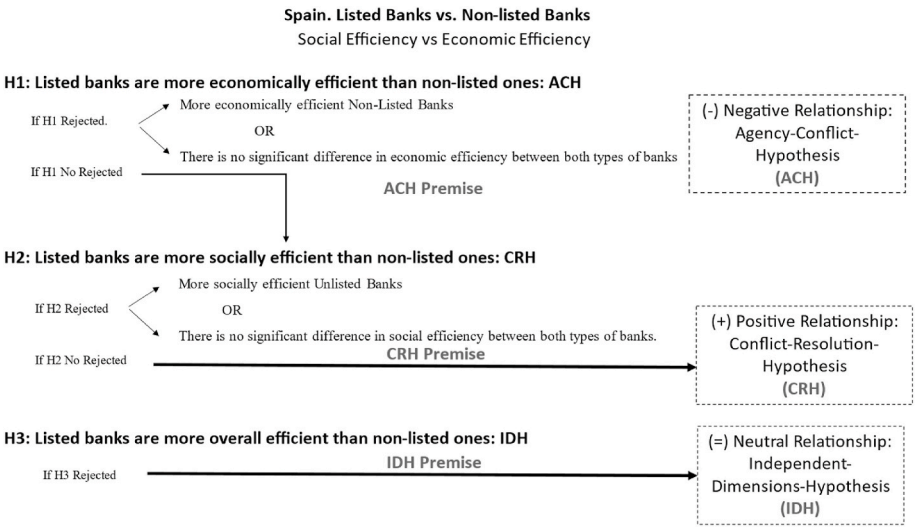

Fig. 1. Sequence of hypotheses for the efficiency analysis in listed vs. non-listed banks.

random noise, extreme values, or heterogeneity, it can only determine each DMU's relative rank score [68]. With this methodology a frontier can be established, which limits the maximum relative efficiency obtained from the group that is being analysed. "Analyst Frontier 4.5" was chosen out of the different available programs, not only because of its reliability but also because of its user-friendliness. As it has been mentioned above, this method obtains the relative efficiency and not the absolute one; therefore, the most efficient DMUs in comparison with the selection under consideration can be obtained. The potentiality of the results is increased by the fact of using the population, since it is possible to establish the efficiency's threshold upon the whole group of units and not only upon a part of them.

We used the constant returns to scale (thereinafter, CRS) option, where various tests have been created over the last years. Banker [69] suggested three statistics to test the null hypotheses of CRS, one of which being the Kolmogorov-Smirnov test statistic. Simar & Wilson [70] propose numerous test statistics: the distance between the CRS and variable returns to scale (VRS) estimated frontiers, a binomial test, the ratio of medians, the ratio of means, the median of ratios, the ratio of 10 % trimmed means, the 10 % trimmed mean of ratios, among others. Banker & Natarajan [71] mentions that Welch and Mann-Whitney tests are those that perform the worst in their simulation exercises and that bootstrapping methods can be an interesting possibility, given that can reduce the bias. Accordingly, we used the Wald Chi test [72] with bootstrapping, such as other banking papers used [56,59,73–75].

Our data set consists of, as shown is Table 1, commercial banks from 2014 to 2019 whose financial information was extracted from the Spanish Banking Association (AEB) and Spanish Confederation of Savings Banks (CECA). The time frame was selected taking into account the fact that Spain started a process of mergers and acquisitions due to the real estate bubble [76]. This process lasted through to 2013. Therefore, in order to analyse the post-crisis effect financial system, 2014 was considered to be a suitable start for our time frame. Both credit cooperatives and savings banks have been excluded from the study, given that they are not anonymous societies and, therefore, cannot be listed. Nonetheless, savings banks transformed into commercial banks [77] have been included, given that some of them are listed whereas others are not.

Table 1
Data sheet.

Sample	Population
Data	2014–2019
Database	Spanish AEB and CECA
DMU	Commercial banks
Observations	3,961
Method	Three-stage DEA
Statistics	Bootstrap Tobit Regression
Software	Frontier Analyst 4.5; Stata 17.0

One of the most important aspects to obtain robust and significant results is the selection and quantification of the inputs and outputs on which the DEA is based [78,79]. Following San-Jose et al. [56,77], three models were created, namely economic, social and overall efficiency, using the same three inputs but different outputs. In regard to inputs, Equity I, Total Assets (A) and Deposits (D) were used based on Minto [80], Gutierrez-Goiria et al. [81] and San-Jose et al. [56]. The selected inputs guarantee the economic-financial equilibrium of banks, because of the sustainable development of the investments and resources of financial institutions. Although variables based on cost efficiency could be incorporated to determine the efficiency from the bank production theory perspective, the aim of the paper includes establishing social efficiency by comparing listed and non-listed banks taking into account several social aspects in order to judge their performance. As far as the outputs of the economic efficiency (thereinafter, EE) model are concerned, Profit (P), Loss (L) and Risk[1] (R) were used based on Hughes [82], Salas & Saurina [83] and Fiordelisi et al. [54]. Specifically, in the context of Spanish banking, these economic outputs were used by San-Jose et al. [56] when analysing the efficiency of savings banks in comparison with commercial banks in Spain. Likewise, Sánchez-González et al. [84] use profits as an output to analyse Spanish mutual fund companies. Concerning social efficiency (hereinafter, SE), a holistic analysis based on stakeholder theory has been used [30], which has resulted in the selection of the following four outputs: customer credit (CC) that is considered to be an indicator of support to the real economy by financial institutions [56,80]; number of jobs (J) because employment creation has a clear social value with a very positive impact both in the economy and in tax collection [80]; Risk (R) is closely related to moral hazard accepted by entities, having a negative impact for society (Gonzalo et al., 2017; 2019); and taxes (T), since they represent the payback given to the Public Administration which is used to cover society's needs, such as infrastructures that will eventually converge on social welfare [54,85]. Within the Spanish banking framework, all these social variables are included by San-Jose et al. [56,77] in their comparative analysis of commercial banks against savings banks. In the

[1] Risk has been calculated as the inverse of the sum of contingent risks and recognised commitments.

Table 2
Inputs and outputs of Economic, Social and Overall Efficiency models.

	INPUTS	OUTPUTS
Economic Efficiency (EE)	Equity (E) Total Assets (TA) Deposits (D)	Profit (P) Loss (L) Risk (R)
Social Efficiency (SE)	Equity (E) Total Assets (TA) Deposits (D)	Customer credit (CC) Jobs (J) Risk (R) Taxes (T)
Overall Efficiency (OE)	Equity (E) Total Assets (TA) Deposits (D)	Profit (P) Loss (L) Customer credit (CC) Jobs (J) Risk (R) Taxes (T)

same line, customer credit is used by Floros et al. [86] in the DEA of PIGS countries (namely, Portugal, Italy, Greece and Spain) banking intermediaries, by means of using gross loans. Galariotis et al. [87] analyse the impact of mergers and acquisitions on the efficiency levels of European banking, including Spain, in a sample of forty-three listed commercial banks from eight different countries. Minviel & Ben Bouheni [88] use DEA to investigate the conditional technical and managerial efficiency of European banks, selecting the largest commercial banks in six countries, including Spain, and use also loans as an output. Neves et al. [89] use loans as an output to analyse, by means of DEA, the efficiency of banking in Portugal and Spain. Total loans are used by Sierra-Fernández et al. [90] when analysing the efficiency of Spanish credit unions. Likewise, Martínez-Campillo & Fernández-Santos [91] use loans as an output to assess the social efficiency in Spanish credit cooperatives. Finally, overall efficiency (thereinafter, OE) considers each and every of the six outputs introduced in the previous models to quantify economic and social efficiency. Table 2 shows the inputs and outputs used for the three models.

A three-stage DEA [92,93] has been carried out, being the first stage, the calculation of efficiencies using the CRS mode [65] and seeking to maximise outputs as follows:

$$\text{Max } \varphi(k=1\to n)=\frac{u_1*y_{11}+u_2*y_{21}+\ldots+u_s*y_{s1}}{v_1*x_{11}+v_2*y_{21}+\ldots+v_m*x_{m1}} \quad (1)$$

where φ is the efficiency rating; k is the number of DMUs; u_r is the coefficient or weight assigned by DEA to output o; y_{ok} is the amount of output o used by k unit; o is the number of outputs from 1 to s; v_i is the coefficient or weight assigned by DEA to input i; x_{ik} is the amount of input i used by k unit; and i is the number of inputs from 1 to m.

For each DMU from 1 to n the Economic Efficiency (maximizing the outputs) is shown as:

$$\text{Max } \varphi_{EE}(k=1\to n)=\frac{u_1*P_{11}+u_2*L_{21}-u_3*R_{51}}{v_1*E_{11}+v_2*TA_{21}+v_3*D_{31}} \quad (2)$$

For each DMU from 1 to n the Social Efficiency (maximizing the outputs) is shown as:

$$\text{Max } \varphi_{SE}(k=1\to n)=\frac{u_1*CC_{10}+u_2*J_{20}-u_3*R_{50}+u_4*T_{20}}{v_1*E_{11}+v_2*TA_{21}+v_3*D_{31}} \quad (3)$$

For each DMU from 1 to n the Overall Efficiency (maximizing the outputs) is shown as:

$$\text{Max } \varphi_{OE}(k=1\to n)=\frac{u_1*P_{11}+u_2*L_{21}+u_3*CC_{31}+u_4*J_{41}-u_5*R_{51}+u_6*T_{21}}{v_1*E_{11}+v_2*TA_{21}+v_3*D_{31}} \quad (4)$$

The second stage consists on applying a cross-sectional Tobit censured regression combined with a bootstrap (C = 2000) for each and every year with the aim to establish the type-effect (listed and non-listed) in regard to the three models used (economic, social and overall efficiency). Nonetheless, there are other alternative methods for this kind of analysis, such as truncated regression, robust-OLS (Ordinary Least Square) regression or Papke-Wooldridge (PW) models [71,94–97]. Stata 17.0 was used to carry out the bootstrap Tobit regressions, using the Herfindahl-Hirschman (thereinafter, HH) as a control variable [98] based on the fees registered as incomes. The HH index analyses the concentration of a market and it is calculated by squaring the market share of each financial institution. In this regard, financial incomes have not been taken into account in the calculation of this index, given that the negative interest rate policy in which Europe was immersed during some years of the analysed time horizon may distort this industry concentration index. Equation (5) sums up the model used:

$$DEA_i=\beta_0+\beta_1\cdot L_i+\beta_2\cdot HH_i+\varepsilon_i \quad (5)$$

where *DEA* represent the economic, social and overall efficiency; L_i is a dummy variable which takes value 1 for listed companies, and 0 otherwise; *HH* is the Herfindahl-Hirschman index; and ε_{it} is the residual term.

Finally, the third stage consists on a Tobit censured regression panel data combined with a bootstrap with the aim to check whether the efficiencies are transitory or consolidated over time [99,100]. Given the longitudinal nature of our datable, the use of panel data enables us to control for individual-unobserved heterogeneity and time-invariant factors since cross-sectional and time-series do not control it and may provide biased results [101,102]. As both cross-sectional and time-varying data must be considered, with panel data it is better to study the dynamics of adjustment providing light on the adjustment process and yielding data on changes for individuals, since cross-sectional distributions that seem relatively stable may conceal substantial changes. Moreover, panel data give more informative data and more efficiency [103]. Our panel data approach allows us to observe the intertemporal relation between listed individual banks and the types of efficiency, as well as to identify and measure effects [100].

As accepted in similar studies that also use DEA procedure to estimate the banks' efficiency, we use random-effects panel data Tobit model due to the truncated nature of our dependent variable [24,92,93,101,104], yielding consistent estimates. Then, we use Tobit regression with a left censored limit of zero and right censored limit of one. Random-parameters Tobit model shows superiority in terms of goodness of fit when handling unobserved heterogeneity across observations [105]. To test our hypotheses in a panel data setting, the following model is used:

$$DEA_{it}=\beta_0+\beta_1\cdot L_i+\beta_2\cdot HH_{it}+\beta_3\cdot CPI_t+\beta_4\cdot GDP_t+\eta_i+\varepsilon_{it} \quad (6)$$

where *DEA* represents the economic, social and overall efficiency; *L* is a dummy variable which takes value 1 for listed companies, and 0 otherwise; *HH* is the Herfindahl-Hirschman index; *CPI* is the consumer price index of time *t*, published by the Spanish National Statistics Institute (*Instituto Nacional de Estadística*, thereinafter INE); *GDP* if the Gross Domestic Growth rate of time *t*, also published by INE; η_i represents the unobservable firm-specific fixed effects of the company "i" (management, reputation, etc.); and ε_{it} is the residual term. In Equation (6) GDP and CPU control variables of macro level are added [98,106,107].

Table 3
Descriptive of DEA scores.

	Banks	2014	2015	2016	2017	2018	2019
		Mean	Mean	Mean	Mean	Mean	Mean
		σ	σ	σ	σ	σ	σ
Economic efficiency	Non-listed	24.66	17.78	20.78	23.12	23.28	19.42
		22.91	20.20	18.33	19.58	15.12	17.79
	Listed	35.50	32.92	39.38	42.47	40.82	43.49
		33.38	34.59	39.49	40.17	37.28	35.46
Social efficiency	Non-listed	68.54	68.28	72.09	64.74	63.96	62.84
		24.00	27.28	21.89	23.65	24.84	26.21
	Listed	72.58	67.95	73.47	71.50	65.19	72.08
		28.91	30.46	29.48	29.95	31.06	25.02
Overall efficiency	Non-listed	72.02	70.11	74.94	68.48	67.63	63.92
		21.65	26.14	21.70	22.64	25.18	26.32
	Listed	79.58	76.61	78.57	77.89	68.98	77.39
		23.42	26.78	25.26	27.82	29.89	22.34

Table 4
Bootstrap Tobit regression analyses.

Years/dependent variables	Economic efficiency β; t value[P]	Social efficiency β; t value[P]	Overall efficiency β; t value[P]
LISTED$_{2014}$ Wald Chi	4.34	0.65	3.15
HH	−1.15	−0.42	−0.88
Listed	1.95*	0.76	1.64
Constant	5.75***	14.93***	17.00***
Observations	70	70	70
LISTED$_{2015}$ Wald Chi	6.51**	0.00	1.39
HH	−0.67	−0.05	−0.49
Listed	2.54**	−0.02	1.14
Constant	4.74***	13.49***	14.31***
Observations	67	67	67
LISTED$_{2016}$ Wald Chi	8.07**	0.08	0.67
HH	1.02	−0.15	−0.43
Listed	2.82***	0.28	0.78
Constant	5.99***	17.51***	18.21***
Observations	60	60	60
LISTED$_{2017}$ Wald Chi	6.28**	1.20	2.97
HH	−0.40	−0.21	−0.58
Listed	2.51**	1.09	1.70*
Constant	5.86***	13.33***	15.03***
Observations	58	58	58
LISTED$_{2018}$ Wald Chi	6.15*	0.30	0.32
HH	−0.65	−0.49	−0.29
Listed	2.48**	0.43	0.51
Constant	7.82***	12.73***	13.10***
Observations	52	52	52
LISTED$_{2019}$ Wald Chi	11.08***	1.93	5.57*
HH	−0.55	−0.27	−0.47
Listed	3.32**	1.39	2.33**
Constant	5.32***	11.32***	11.88***
Observations	52	52	52

***Significant at 1 %. **Significant at 5 %. *Significant at 10 %.

4. Results

With regard to the first stage of the analysis, the means and standard deviation of the efficiency scores obtained by means of the DEA are shown in Table 3. For each and every efficiency and year–with the exception of social efficiency in 2015–listed banks are more efficient than non-listed banks.

Concerning the second stage of the analysis, Table 4 shows the results of the Bootstrap Tobit regression analyses conducted, with the efficiency scores obtained in the previous stage, in order to compare the differences on three efficiencies between listed and non-listed banks.

The European authorities pushed to Spanish government to reform banking sector in Spain, and it was positive for both bank efficiency and bank solvency [108]. Regarding the effect on listed banks, our results show that being listed influences significantly in regard to economic efficiency. The results are consistent with a higher and significant difference in economic efficiency for listed banks in comparison with non-listed ones and are in the line with the conclusions of similar studies, such as Das et al. [109], Girardone et al. [50]. This is in line with some papers published on Spanish banking. Guzman & Reverte [110] conclude that listed banks in Spain have better levels of economic efficiency. Likewise, Casu & Molyneux [24] apply a two-stage DEA with and without bootstrapping Tobit regression in a five-country sample, being one of them Spain and affirm that listed banks are more economically efficient than their unlisted rivals. As far as social efficiency is concerned, the difference of efficiency in favour of listed banks–with the exception of 2015–are not significant. Concerning overall efficiency, listed banks are more efficient than non-listed ones in each and every year, being significant the difference only for 2017 and 2019. López-Penabad et al. [111, p4] conclude that *"countries like Spain and Belgium, which in the recent past had some problems with the sustainability of public finances, are part of the group of countries with more stable banking sectors"*. This phenomenon may primarily be attributed to stringent regulations and oversight from European authorities, as well as the significant role that reputation plays in enhancing efficiency. Additionally, a profound cultural shift towards sustainability and ethical practices in Spain over recent years could also be contributing to these dynamics.

Regarding our third-stage, in Table 5 we show the results of the panel data Tobit regressions from Equation (6).

The reporter coefficient of "rho" in Table 5, which represents the proportion of the total variance provided by the panel-level variance component, is significant, which indicates that panel data estimations are different from pooled estimations. We also conducted the likelihood-ratio test for the panel estimator against the pooled estimator, obtaining the same results. Finally, as previously, we combined random-effects panel data Tobit regression with bootstrap (C = 2000), although we also present the estimations without bootstrapping. Table 5 shows that listed banks depict larger economic and overall efficiency (coefficients 11.777*** and 7.326**, respectively). However, even though the coefficient is positive, social efficiency is not significant (coefficient 3.566). In order to add robustness to the results, we have also carried out the analysis using truncated regression with bootstrapping, robust OLS and Papke-Wooldridge model, obtaining similar results, which can be obtained under request. These results help us to conclude that listed banks are more efficient in terms of the generation of economic performance, but not concerning socioeconomic value creation.

To sum up, the results suggest in regard to the formulated hypotheses that.

- (H_1) "Listed banks are more efficient than non-listed banks in regard to economic efficiency". Both cross-sectional and panel data confirm this hypothesis.
- (H_2) "Listed banks are more efficient than non-listed banks in regard to social efficiency" Whereas, in general, listed banks are more efficient, the null hypothesis must be upheld given that there are no significant differences neither in the cross-sectional nor in the panel data analyses. Therefore, it should be concluded that: Listed banks are just as socially efficient as non-listed banks.
- (H_3) "Listed banks are more efficient than non-listed banks in regard to overall efficiency". The null hypothesis is upheld in most years–-with the exception of 2017 and 2019– by means of the cross-sectional approach. Likewise, panel data confirms that this significant difference is upheld over time.

Table 5
Random-effects panel data Tobit.

	Model I Bootstrap	Model II	Model III Bootstrap	Model IV	Model V Bootstrap	Model VI
Dependent Variable	EE	EE	SE	SE	OE	OE
Listed	11.777***	11.777**	3.566	3.566	7.326**	7.326*
	(4.268)	(4.907)	(3.606)	(4.112)	(3.566)	(3.848)
HH	−0.0668	−0.0668	−0.042	−0.042	−0.0713	−0.0713
	(0.0985)	(0.0578)	(0.058)	(0.050)	(0.0867)	(0.0451)
CPI	68.904	68.904	16.782	16.782	−15.047	−15.047
	(130.427)	(113.286)	(86.081)	(90.425)	(82.271)	(91.514)
GDP	−200.991	−200.991	−54.809	−54.809	12.908	12.908
	(128.578)	(128.212)	(103.170)	(102.272)	(115.301)	(103.683)
Constant	30.155***	30.155***	70.311***	70.311***	71.456***	71.446***
	(4.687)	(5.664)	(3.942)	(4.788)	(4.197)	(4.499)
sigma_u	24.323***	24.323***	22.378***	22.378***	18.862***	18.862***
	(2.680)	(2.374)	(1.975)	(2.054)	(1.953)	(1.784)
sigma_e	18.374***	18.374***	14.644***	14.644***	14.863***	14.862***
	(1.690)	(0.772)	(1.096)	(0.610)	(1.312)	(0.618)
Rho	0.636***	0.636***	0.700***	0.700***	0.616***	0.616***
Observations	359	359	359	359	359	359

Standard errors in parentheses ***p < 0.01, **p < 0.05, *p < 0.1.

5. Discussion and concluding remarks

With regard to economic efficiency, listed banks have behaved according to the expectations, scoring significantly higher than non-listed ones and the results have been resounding in this aspect. This confirms that, managing financial institutions in regulated markets, with reporting requirements on capital and capital management, financial institutions become more economically efficient. This agrees with the conclusions reached by Casu & Molyneux [24], Iannota et al. [49] and Girardone et al. [50].

On the contrary, when it comes to social efficiency the hypothesis is null; in other words, both types of entities are similar when it comes to this kind of efficiency. Listed banks are not more socially efficient, at least in a significant way. Nonetheless, the alternative hypothesis, remains unverified because listed banks are not doing worse than listed banks in terms of social efficiency. Therefore, there is no other option but to maintain the null hypothesis, without identifying any significant difference between the two types of entities in any way.

This leads us to a first additional conclusion: social efficiency and economic efficiency are not correlated, neither negatively nor positively; this, in turn, is also disproving both "Agency-Conflict-Hypothesis" (ACH) and Conflict-Resolution-Hypothesis (CRH). The first one because a higher economic efficiency does not seem to be counterbalanced by lower social efficiency; in this regard, no trade-off appears to exist between social cost and benefit. Or, alternatively, we could consider that economic efficiency is not achieved at the expense of social efficiency. Conflict-Resolution-Hypothesis (CRH) is not confirmed by data; consequently, we cannot appreciate a positive correlation between social efficiency and economic efficiency. In any case, any possible relationship between the two types of efficiency is not moderated by the fact of being listed entities.

The obtained data seem to confirm Independent-Dimensions-Hypothesis (IDH), which suggests that there is neither a positive relationship–the higher the economic efficiency, the lower the social efficiency–nor a negative one–a higher social efficiency does not imply a reduction in economic efficiency. This is a major breakthrough in bank theory since it allows distancing from the two dominant interpretations of the present time. First, the subtractive value character of classical economic theory or the conflict over rent appropriation theory, which considers that social spending results in reducing the benefits [7,10,12,31,32]. And, second, the instrumental perspective on social value creation, which considers that social performance contributes to the economic results of financial entities [12,21,22,29,34,38,39].

On the other hand, the rejection of the third hypothesis deserves particular reflection. From a logical viewpoint, we can conclude that an entity that is more efficient in a certain dimension and just as efficient in another one, could be considered more efficient in global terms. And this logical deduction would be applicable to the listed entities versus the non-listed ones. Nonetheless, from a more particular perspective, it is not a simple dimensional addition, not even of results; what is being analysed is whether, from a consolidated standpoint, efficiency in one dimension is enough by itself to generate a significant global difference. And this hypothesis is rejected. In accordance with this third hypothesis, the findings of the paper seem to indicate that both types of performance are not directly related and, therefore, correspond to two dimensions that operate in parallel and are aligned with the responsibility of bank managers, as proposed by the triple bottom line [5,6]. It seems that having an impact on just one of them is not enough to improve global efficiency, buy its optimization requires both efficiencies to be managed in a differential and complementary manner.

These conclusions generate, additionally, a number of practical implications, since the current discourse of such entities is largely based on the premise of *Well Doing by Good Doing*, which the research has proved to be, in line with previous works, a "great illusion" [4]. This can motivate entities to abandon the instrumental argument for social welfare, focusing, in the positive cases, on a finalist approach; which can contribute to further development of a socially responsible culture in the banking industry.

5.1. Limitations and future lines of research

We have tested that listed banks can be more economically efficient, but it has not been analysed whether this achievement is maintained during uncertainty times, as was the case in the work of Forcadell & Aracil [12], according to which the economic achievements obtained with social responsibility in non-crisis time were not achieved during crisis period and this could also have been the case here in Covid-19 era.

In spite of having used the fact of banks being listed as a moderator

variable, the truth is that it is inherently dichotomous and it might conceal a possible relationship between social and economic efficiency that is not specific to either type of banks, but transversal to both. Future lines of research could address this question, analysing directly the correlation between both types of efficiency during the analysed period.

There is no doubt that being circumscribed to a single country is a limitation of this paper, because in different countries, due to regulatory, cultural or any other reasons, the relationships between the two efficiencies a'd the bank's listing of the entities may show another kind of relationship. Thus, expanding the research to other countries that have the information needed for its analysis is certainly a future line of research.

On the other hand, social efficiency is a poliysemic term and, as such, it can be understood in different ways; and although the measure used has been previously used by other researchers, in order to make the line of research more robust, it would be useful to correlate this measure of efficiency with other complementary ones such as Dow Jones for Sustainability or other benchmark ratings, such as FTSEForGood.

CRediT authorship contribution statement

Jose Torres-Pruñonosa: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Leire San-Jose:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Methodology, Investigation, Funding acquisition, Formal analysis. **Jose Antonio Clemente-Almendros:** Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Methodology, Investigation, Formal analysis, Conceptualization. **Jose-Luis Retolaza:** Writing – review & editing, Writing – original draft, Visualization, Validation, Resources, Project administration, Investigation, Formal analysis, Conceptualization.

Data availability

Data will be made available on request.

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