Annals of Finance
https://doi.org/10.1007/s10436-025-00465-w

RESEARCH ARTICLE

Bank competition, financial stability and welfare: does the objective function of competitors matter?

Oscar Gutiérrez[1] · **Mónica López-Puertas**[2]

Received: 26 January 2025 / Accepted: 6 June 2025

Abstract
This paper investigates the implications for financial stability, social welfare, risk-taking incentives and expected profits of competition between banks that differ in their respective objective function. We differentiate between commercial banks (i.e., shareholders' profit-maximizing banks) and stakeholder banks (i.e., stakeholders' welfare-maximizing banks), showing that: (1) The presence of stakeholder banks increases systemic financial stability and social welfare. (2) Stakeholder banks are less risk-inclined and obtain a higher market share than commercial banks. (3) Any bank chooses a riskier portfolio and is less profitable when competing against a stakeholder bank compared to competing against a commercial bank. Our theoretical findings are consistent with the existing empirical evidence and yield important policy implications and new empirically testable predictions.

Keywords Commercial bank · Stakeholder bank · Competition · Risk-taking · Systemic financial stability

JEL Classification G21 · G32 · G18 · G38

The authors gratefully acknowledge Anne Villamil (editor) and the anonymous referees for the constructive criticisms and insightful comments made on the original submission. They also thank Esther Henchenn for her help, and specially acknowledge Vicente Salas for the discussions and insights made throughout the writing of the manuscript.

The authors did not receive support from any organization for the submitted work.

✉ Oscar Gutiérrez
oscar.gutierrez@uab.es

Mónica López-Puertas
mlopezpu@emp.uc3m.es

1 Department of Business Economics, Edificio B Universidad Autónoma de Barcelona, Campus de Bellaterra - Cerdanyola del Vallès, 08193 Barcelona, Spain

2 Department of Business Economics, Universidad Carlos III, Calle de Madrid, 123, 28903 Getafe, Madrid, Spain

Published online: 23 September 2025

1 Introduction

The influence of ownership structure on the strategic behavior of banks has been thoroughly analyzed in the banking literature (see e.g., Saunders et al. 1990; Cordel et al., 1993; Gropper and Beard 1995; Fraser and Zardkoohi 1996; Esty 1997; Lee 2002; Isik and Hassan 2003; Laeven and Levine, 2009; Iannotta et al. 2007; Čihák and Hesse 2007, Degryse et al. 2009, Ferri et al. 2014, Meriläinen 2016, Venanzi and Matteucci 2022, Fernández-Aguado et al. 2024). The general conclusion is that the ownership structure of banks affects their portfolio selection of risky assets, performance and lending behaviors. However, to the best of our knowledge, the effect of competition among banks with different objective functions[1] on systemic financial stability and social welfare is still far from known, and has received little attention from academics and policy makers. The present paper addresses these issues.

In our analysis we differentiate between *Commercial Banks* (CBs henceforth), which are profit-maximizing organizations, and *Stakeholder Banks* (SBs henceforth, such as cooperative, credit unions, savings or public banks), which are stakeholders' welfare maximizing banks. We explore the following three questions: (1) Are CBs different from SBs in terms of their risk profile, market share and expected economic profits? (2) Does the objective function of a bank affect the risk-taking incentives of its competitor? And more importantly: (3) Does a change in the objective function of a bank (from a SB to a CB, or vice versa) affect systemic financial stability and social welfare?

Understanding the implications of the presence of SBs on risk, expected profits, market share, welfare and systemic financial stability is important for academics and policy makers, since most countries have a banking system in which CBs and SBs compete under the same regulatory and competitive conditions.[2] In addition, the proportion of SBs varies widely across countries. While SBs represent an important part of the banking systems of many economies such as France, Germany, Italy, the Netherlands, Canada, Japan, Austria or Finland, at the same time they are largely inexistent in a number of countries, such as UK.

The lack of SBs in some countries could be partially explained by the fact that, for decades, the growing political and liberal market consensus around the world has favored the shareholder-value model in banking. In this environment, SBs have been criticized for being inefficient, and having weak corporate governance arrangements (Ayadi et al. 2010). This view has been challenged as a result of the 2008 global financial crisis, which hit harder those financial systems with a predominant shareholder-approach to banking (DeVries 2009; Ayadi et al. 2010). In addition, SBs have done, on average, much better than CBs during the recent crisis (Ayadi et al.

[1] Differences in banks' objective functions -which depend on profitability and risk- can be the consequence of different ownership forms, organizational structure, or corporate governance arrangements.

[2] To illustrate, the cooperative banking sector, which is an important part of the stakeholder banking sector, is significant in more than 100 countries, where more than 51,000 unions have nearly 200 million members (World Council of Credit Unions 2012). In 2024 in Europe, according to the European Association of Cooperative Banks, cooperative banks have provided 23.3% of all loans and secured 22.4% of all deposits, which represent the highest ever recorded levels.

2010; European Association of Cooperative Banks, 2010; Groeneveld 2011).[3] These observations seems to suggest that the relative stability of SBs may mitigate some of the instability created in the sector by CBs and that a banking system composed of both CBs and SBs may be inherently more stable and less prone to crisis than one populated exclusively by CBs (see Meriläinen 2016; Nitani and Legendre 2021; Venanzi and Matteucci 2022; Fernández-Aguado et al. 2024).

Following this idea, we posit that there are different ways through which SBs may influence financial stability at the systemic level. First, SBs may increase (reduce) systemic financial stability by being inherently safer (riskier). Second, the presence of SBs may produce an externality, positive or negative, affecting the stability of other banks.[4] The existence of such an externality underpins many of the conjectures made in policy discussions on the consequences of the presence of certain banks (in our case, SBs) on the stability of other banks. We analyze this type of externality and its implications for systemic financial stability and social welfare. To this end, we present a model of duopolistic competition for the retail banking market of deposits where banks can either be CB or SB. Our model specification permits the CB to behave as a SB and vice versa, allowing us to explore the interaction between different combinations of banks' objective functions (i.e., two CBs, two SBs, one SB and one CB).

The main distinction between SBs and CBs is the banks' bottom-line objectives and the extent to which profit-maximization is the central focus of the business models. While the main objective of CBs is shareholder value (profit) maximization, SBs aim to maximize social objectives, in addition to profit (Freeman 1984; Evan and Freeman 1988; Blair 1995). Pursuing social objectives means taking into account a wider number of stakeholder interests, including employees, depositors, borrowers, governments and local communities. As a result, the staff, depositors and borrowers of SBs are not merely regarded as providers of labor, deposits or as a source of income, respectively. Instead, their preferences are incorporated into the SBs' objective function since they are considered and treated as partners in the sense that fair and trustful relations with these core stakeholders are of vital importance.

SBs were, originally, created to provide financial services to specific sectors or to improve the financial access in selected geographical areas. Their foundation used to be promoted by local authorities, religious organizations or professional associations. Later on, the transformation and innovation of the financial system increased the competitive environment and, over the past decades, many SBs have undergone a drastic transformation. Today, in terms of the range of services provided, these institutions are

[3] For instance, cooperative banks accounted for only 7% of all the European Banking Industry write-downs and losses between the third quarter of 2007 and first quarter of 2011, even though they had 20 per cent of the market (Rabobank 2011). Most of the losses incurred were made up quite quickly, within a year or two, and now, after the crisis, nearly all the indicators show that they have bounced back and are growing again (Birchall and International Labour Office, 2013).

[4] The empirical literature has provided some support for the existence of such externalities. For instance, Čihák and Hesse (2007) and De Nicolò (2000) show that in systems with a high presence of non-for-profit banks, CBs become riskier than they would be otherwise. In addition, Barth et al. (1999) find that a higher degree of government ownership of banks tends to be associated with a higher fragility of financial systems. Goodhart (2004) interprets this finding as an indication that the presence of non-for-profit banks makes financial systems more fragile.

very similar to their CBs competitors, and they compete with them in a wide range of banking markets under the same regulatory conditions. Nonetheless, SBs have maintained their key characteristic, i.e., a social objective, a regional commitment and a mandate to contribute to the 'general good' by, for instance, providing access to credit to certain categories of the population (Ayadi et al. 2010).

To capture the social objectives of SBs in our model, we modify the CB's objective function so that the interests of other stakeholders than shareholders are represented in the decision making process. In particular, we suppose that SBs aim to maximize expected labor expenditures, in addition to profit.[5] These expected labor expenditures can be understood as a preference for expansion in order to fulfill the social goal of providing banking services, in particular access to credit, to certain categories of the population, or as a preference for maximizing the expected salary pay to the workers. The empirical literature has validated such a hypothesis by showing that SBs exhibit higher preferences for labor expenditures than CBs (Hannan and Mavinga 1980; Verbrugge and Jahera 1981; Akella and Greenbaum 1988; Mester 1989).

Our analysis builds on Allen and Gale (2000, Ch. 8) and Purroy and Salas (2000). The first study analyzes the trade-off between banks' risk taking behavior and competition among banks competing à-la-Cournot. They show that the optimal level of risk of a bank increases with the number of deposit market competitors. However, their model is restrained to competition between symmetric banks with a homogenous financial product. The second study analyzes the effect of competition between banks with different objective functions on profit, market share and interest rates, but it does not take risk considerations into account. Their conclusions depend on the type of competition, that is, whether banks compete on quantities with homogeneous products or on prices with differentiated products. Our setup adds to these models by considering risk as well as competition between banks with different objective functions. Thus, we contribute to the existing literature by introducing the consideration of differences in the objective functions of banks into the analysis of the relationship between competition and stability.[6] In doing so, we offer novel insights into the implications of the coexistence of the shareholder and stakeholder governance model. Furthermore, we endogenously determine the kind of competition. Building on Singh and Vives (1984), we show that in equilibrium competition in the banking sector turns out to be à-la-Cournot.

Our main conclusions are the following: (1) The presence of a SB increases systemic financial stability and social welfare. (2) SBs are less risk-inclined, and obtain a higher market share than CBs. (3) Any bank, independently of its objective function, chooses a riskier portfolio and is less profitable when competing against a SB (compared to

[5] Profit increases SBs' utility since the existence of profit is necessary to assure the continuation of the bank operation. That is, profit is a necessary condition for the SBs to be able to perform their social objectives.

[6] In contrast, past work has either focused on: (a) The comparison between CBs and SBs (savings and cooperative banks) in terms of performance (Purroy and Salas 2000); risk-incentives (Saunders et al. 1990; Esty 1997; Iannotta et al. 2007; Bøhren and Josefsen 2007; García-Marco and Robles-Fernández 2008); lending behavior (Delgado et al. 2007); and corporate governance practices (Crespí et al. 2004). (b) The relationship between stability and competition among symmetric banks (Keely, 1990; Besanko and Thakor 1993; Demsetz et al. 1996; Matutes and Vives 1996, 2000; Hellmann et al. 2000; Salas and Saurina 2003; Repullo 2004; Boyd et al., 2005; Jiménez et al. 2013).

competing against a CB). Interestingly, our results suggest that CBs may strategically choose to adopt a stakeholders approach to improve their expected profits.

Our findings are consistent with existing empirical evidence and yield important policy implications and new empirically testable predictions. First, our results suggest that financial stability analyses should consider the objective functions of banks and the externality that certain type of banks generate on the stability of their rival. In the presence of such an externality, the common presumption that the system as a whole will be safer when individual banks are safer may not hold. Second, our results contribute to the current debate on the regulation and design of a banking sector that optimises its resilience to systemic crises and maximize social welfare (Schmidt 2009; Allen and Gale 2007; Tirole 2006; IMF 2006). Specifically, our findings suggest that policy makers worried about systemic financial stability and social welfare should favor a stakeholder approach in the banking system.

The paper is organized as follows. In Sect. 2, we present and discuss the model assumptions. Section 3 presents the main results of the paper; in particular, it is analyzed: (a) How CBs and SBs differ in their risk behavior, market share, interest rates and expected profits; (b) The implications on systemic financial stability and welfare. Section 4 discusses the results and relates the existing empirical evidence with the model predictions. Section 5 concludes. All proofs are found in the Appendix.

2 The model

2.1 Assumptions

Consider a duopolistic deposit market with two risk neutral banks with different objective functions: the first one is a CB (represented by subindex 1), and the second one is a SB (represented by subindex 2). Banks have access to risky investments portfolios. Each investment portfolio gives a return R for each dollar invested, according to the following return structure: for each dollar invested, the bank $i\,(=1,2)$ receives a return R_i, with probability $P(R_i)$, or a null return with probability $1-P(R_i)$ if the bank goes bankrupt. The functional form for the probability is assumed to be:

$$P(R_i) = 1 - AR_i, \qquad i = 1, 2 \tag{1}$$

where $A > 0$ is exogenously given and represents the price of risk, and R_i is restricted to be in the interval $[0,\ 1/A]$. This functional specification can be seen as the linear approximation of $\exp(-AR_i)$.

Each bank chooses the riskiness of its portfolio by choosing the target return R_i. Therefore, *bank risk* is associated to the probability of banking failure. That is, a bank increases its risk when it chooses a higher target return on its portfolio, since it increases the failure probability.

We assume that banks have no capital to invest but they can raise money from depositors who cannot invest directly in entrepreneurial projects, neither can they establish a cooperative entity because of high transaction costs. To attract deposits, banks offer a standard debt contract.[7] That is, each bank offers an interest rate r_i which will be paid in case the bank does not go bankrupt. If the bank goes bankrupt depositors receive their deposits back as we assumed that there is a full-deposit-insurance (as in Allen and Gale 2000, 2004 and Boyd and De Nicoló, 2005), for which banks pay a flat rate $s > 0$, such that the supply of funds is independent of the riskiness of the banks portfolio. Although we do not consider the private cost of bankruptcy, we assume that when the two banks break down, there is a *social cost of failure FC* (not internalized by the bank) related to external effects, such as the disruption of the payment system. This situation (i.e., the event that "both banks go bankrupt") represents a *financial crisis* in our model.

Banks offer differentiated financial products, which gives them some market power. We consider that products are horizontally differentiated (Hotelling 1929),[8] due to location reasons or due to their brand or image (in financial markets, the image usually does not relate to the product but to the suppliers who seek to create consumers preferences in this way; Neuberger 1998). Market power could be also justified through the existence of natural and regulatory barriers to entry or exit, e.g., switching costs that lead to lock-in effects in banking, asymmetric information, or licensing conditions (Bofondi and Gobbi 2006). For analyses of the efficiency of cooperative banks, see Mäkinen and Jones (2015), Clark et al. (2018), McKillop et al. (2020) and Ayadi et al. (2023).

Depositors are risk-neutral and supply elastically to bank i ($i = 1,2$) according to a linear schedule:

$$D_i = l + fr_i - gr_j, \qquad i, j(\neq i) = 1, 2. \tag{2}$$

This supply function can be thought of as coming from a representative depositor (or a continuum of identical depositors) whose utility function is linear in income (Matutes and Vives 2000):

$$U = r_i(D)D_i + r_j(D)D_j - T(D_i, D_j) \ \text{ with}$$
$$T = \alpha(D) + \frac{\beta(D_i^2 + D_j^2) + (2\gamma D_i D_j)}{2} i, j(\neq i) = 1, 2. \tag{3}$$

The depositors' utility function suggests that depositors value variety, i.e., they prefer to use both banks rather than only one. This is in line with the observation that most of the people have deposit accounts in more than just one bank (Matutes and Vives 2000).

[7] For a rationalization of standard deposit contracts see Townsend (1979); Gale and Martin (1985); Williamson (1986); Krasa and Villamil (1992); Boyd and Smith (1994); Bolton and Scharfstein (1990).

[8] In the traditional one-dimensional product differentiation literature, two models prevail, namely horizontal differentiation (Hotelling 1929) and vertical differentiation (Gabszewicz and Thisse, 1979; Shaked and Sutton 1982). Products are horizontally differentiated when there is no consensus of ranking among consumers based on their willingness-to-pay. Products are vertically differentiated when there is such a ranking at equal prices.

The representative depositor maximizes expected utility, which gives us the inverse supply function:

$$r_i = \alpha + \beta D_i + \gamma D_j, \quad i, j(\neq i) = 1, 2. \tag{4}$$

where α, β, γ are positive parameters satisfying $\beta \geq 1/2 \geq \gamma$ (we assume $\beta \geq 1/2$; otherwise, consumer surplus could decrease with the number of deposits). The parameter γ measures the degree of product differentiation. If $\gamma = \beta$, banks offer homogeneous products; if $\gamma = 0$, banks act as monopolists.

Inverting the system of equations we get the direct supply functions, see Eq. (2), with:

$$l = \frac{-\alpha}{\beta + \gamma}; f = \frac{\beta}{\beta^2 - \gamma^2}; g = \frac{\gamma}{\beta^2 - \gamma^2}$$

.

Each bank is characterized by a production function exhibiting constant-returns-to-scale, as follows:

$$D_i = k_i L_i, \quad i = 1, 2 \tag{5}$$

where k_i and L_i represent the marginal productivity and the number of workers of bank i, respectively. We further assume that: both banks are equally efficient ($k_1 = k_2 = k$)[9]; there is a perfectly elastic supply of labor at a cost $\overline{w}$ per worker; and workers are only paid if the bank does not go bankrupt.

Thus, the (expected) profit of bank $i = 1, 2$ is given by:

$$\begin{aligned} E\pi_i &= P(R_i)[(R_i - r_i(D) - s)D_i - \overline{w}L_i] \\ &= P(R_i)[R_i D_i - r_i(D)D_i - \overline{w}D_i/k - sD_i] \\ &= P(R_i)[R_i - r_i(D) - c - s]D_i, \end{aligned} \tag{6}$$

where $c \equiv \overline{w}/k$ represents the marginal cost of deposits. The parameters satisfy $0 \leq A < \frac{1}{\alpha+c}$ (otherwise, deposit supply could be negative).

Banks pursue different goals, which are characterized by different objective functions. We assume that CBs' shareholders are able to enforce first-best contracts, aiming to maximize expected profits ($E\pi_1$), on their managers. However, SBs take into account the preferences of a broader range of stakeholders, causing their corresponding objective functions to diverge from profit maximization. We assume that SBs aim to maximize the sum of expected profits and a portion of labor expenditures, which is reasonable when the assignment of property rights is not clearly defined. In particular, the model seems sensible in the following situations: (a) SB is a cooperative bank; (b) The employees have representation on the board of directors; for example in Germany, the so called Mitbestimmung (co-determination) guarantees this representation by law in firms with more than 2000 employees; (c) The credit entities are saving

[9] Empirical evidence shows that SBs and CBs have similar levels of productive efficiency; see Grifell-Tatjé and Lovell (1997) and Lozano-Vivas (1998).

banks without owners, such as the *Cajas de Ahorro* in Spain (in which a set percentage of profits is legally required to be allocated to social purposes, with the rest often directed towards increasing labor expenditures; most of these entities disappeared as a result of the 2008 financial crisis).

The corresponding utility function, U_2 (that we call *overall expected benefits*), therefore depends on both profits and labor expenditures, π_2 and φ_2 respectively, and can be expressed as:

$$EU_2 = E\pi_2 + \theta_2 E(\varphi_2), \tag{7}$$

where $E(\varphi_2) = P(R_2)\overline{w}L_2$ and θ_2 (> 0) measures the degree of the stakeholder orientation of the bank, which we refer to as the *degree of stakeholderness* from now on. It can also be seen as a measure of loose of assignment of property rights, allowing several stakeholder groups to appropriate a fraction of the value creation. Rearranging, we finally obtain:

$$EU_2 = P(R_2)[R_2 - r_2(D) - c(1 - \theta_2) - s]D_2. \tag{8}$$

Remark 1

(a) θ_2 is positive because the *overall expected benefits* of the SB increases with labor expenditures. We assume that θ_2 is exogenously given and depends on the SB's implications with their stakeholders, the regulation of the different regions, or the type and degree of imperfections in goods and capital markets. The higher the θ_2 is, the higher will be the stakeholderness-orientation of SB.

(b) $\theta_2 > 0$ implies that the degree of stakeholderness yields a reduction of the "effective" deposits marginal cost, i.e., the SB perceives $c(1\text{-}\theta_2)$ as the marginal cost. This can be seen as a competitive advantage in terms of production costs. Thus, the objective function of SBs captures those situations where the preferences of the stakeholders of the bank imply an implicit subsidy to the cost of producing deposits. In our model the implicit subsidy comes from the preferences for the allocation of the value added of the bank to the employees in the form of total labour costs. But it could also be that banks perceive the side benefits of financial inclusion when supplying deposits to their customers and they discount such benefit from the cost of production instead of adding it to the value of the output as a social benefit.

(c) We first consider that CB has $\theta_1 = 0$ (then, $\theta_1 > 0$ will mean that the CB adopts certain degree of staheholderness). In turn, if $\theta_2 = 0$, then $EU_2 = E\pi_2$, so the objective of the SB would be profit maximization and the SB becomes a CB. This model specification allows us to explore the interaction between different combinations of banks' objective functions (i.e., two SBs, two CBs, or one CB and one SB).

The optimization problems can thus be written in more compact form as follows:

$$\max_{R_i, r_i} EU_i = P(R_i)[R_i - r_i(D) - c(1 - \theta_i) - s]D_i, \ i = 1, 2. \tag{9}$$

We now focus on determining the nature of strategic competition between banks. Instead of assuming that banks either face Cournot or Bertrand competition, we endogenously obtain how banks compete. The following lemma establishes the equilibrium nature of competition in our model of duopolistic competition in the retail banking sector:

Lemma 1 *Under the model's assumptions, banks compete à-la-Cournot.*

Proof See Appendix 1.

The interpretation behind Lemma 1 is that the relevant decision variable in the banking sector is (related to) the number of branches rather than interest rates.[10] We can link such a variable to the quality of services. Since the quality of the banking services (perceived by consumers) is higher as the number of branches increase, it seems sensible that banks will compete to get the maximum number of deposits, i.e., à-la-Cournot (Neven 1990, p. 164). This result is consistent with Neuberger (1998) and De Bandt (1996), who state that Bertrand competition is not appropriate to model competition in the retail banking industry. They claim that in the retail banking market, the strategic decision variable is quality rather than interest rates.

We finally assume that the timing of the game is as follows: the economy lasts two periods, 0 and 1: in period 0, banks simultaneously choose D_i and R_i (unobservable variables to outsiders). In period 1, outsiders can only observe and verify, at no cost, whether the investment outcome has been successful (positive interest rate) or unsuccessful (null interest). It is important to note that both banks have complete control over the choice of risk (after having solved the portfolio selection problem).

2.2 Characterization of the equilibrium

In the Nash-Cournot equilibrium, banks simultaneously choose D_i and $R_i \in [0, \frac{1}{A}]$.

The pair (D_i, R_i) is chosen to maximize the corresponding objective functions:

$$(D_i, R_i) \in \underset{D_i, R_i}{\operatorname{argmax}} \{EU_i = P(R_i)(R_i - r_i(D) - c(1-\theta_i) - s)D_i\} \quad i = 1, 2 \tag{10}$$

Maximizing EU_i with respect to D_i and R_i yields the following First Order Conditions (FOC)[11]:

$$\begin{aligned} \frac{\partial EU_i}{\partial D_i} &= 0 \Rightarrow R_i - r_i(D) - c(1-\theta_i) - s = D_i \frac{\partial r_i(D)}{\partial D_i} = \beta D_i \\ \frac{\partial EU_i}{\partial R_i} &= 0 \Rightarrow R_i - r_i(D) - c(1-\theta_i) - s = \frac{-P(R_i)}{P'(R_i)} = 1/A - R_i. \end{aligned} \tag{11}$$

[10] It is worth noting that the result in Lemma 1 makes the analysis of the equilibrium properties of our model under price competition irrelevant as in equilibrium, banks compete à-la-Cournot. Nevertheless, for robustness purposes, we solve the model under price competition. Our main findings hold independently of the type of competition considered.

[11] The necessary conditions for an interior solution are $D_i > 0$ and $R_i \in [0, \frac{1}{A}]$.

Hence, the equilibrium must satisfy the following conditions:

$$R_i - r_i(D) - c(1-\theta_i) - s = \beta D_i = 1/A - R_i. \tag{12}$$

The next result characterizes the Nash-Cournot equilibrium of competition between banks:

Lemma 2 *There exists a unique equilibrium* (D_i^*, R_i^*)*, determined by the equations:*

$$R_i - r_i(D) - c(1-\theta_i) - s = \beta D_i = 1/A - R_i.$$

Proof See Appendix 2.

From the best-response functions, we solve the system of equations and characterize the equilibrium values:

Equilibrium values: The equilibrium values for R_i^*, r_i^* and D_i^* are provided in Appendix 3.

The equilibrium values allow us to derive predictions on two relevant issues. First, it allows us to analyze whether the behavior of a bank in terms of risk profile, expected profit and market share is contingent on its own and its rival's degree of stakeholderness (Proposition 1). Second, it permits to investigate the implications of the stakeholder-value model of banking on welfare and systemic financial stability (Proposition 2). In the next section we present the main theoretical results of the paper.

3 Results

3.1 The effects on risk, interest rates, market share and expected profits

The following proposition establishes the effects of the stakeholder-value model of banking on risk, market share, interest rates and expected profits:

Proposition 1

(a) The risk taking incentives of a bank decreases (increases) with its own (the rival's) degree of stakeholderness: $\frac{\partial R_i^*}{\partial \theta_i} < 0$, $\frac{\partial R_i^*}{\partial \theta_j} > 0$.

(b) The market share increases (decreases) with its own (the rival's) degree of stakeholderness: $\frac{\partial D_i^*}{\partial \theta_i} > 0$, $\frac{\partial D_i^*}{\partial \theta_j} < 0$.

(c) The offered interest rate increases with its own and the rival's degree of stakeholderness:

$$\frac{\partial r_i^*}{\partial \theta_i} > 0, \frac{\partial r_i^*}{\partial \theta_j} > 0.$$

(d) The expected profit is inversely U-shaped (decreases) with respect to its own (the rival's) degree of stakeholderness: $\frac{\partial^2 E\pi_i^*}{\partial \theta_i^2} < 0$, $\frac{\partial E\pi_i^*}{\partial \theta_j} < 0$.

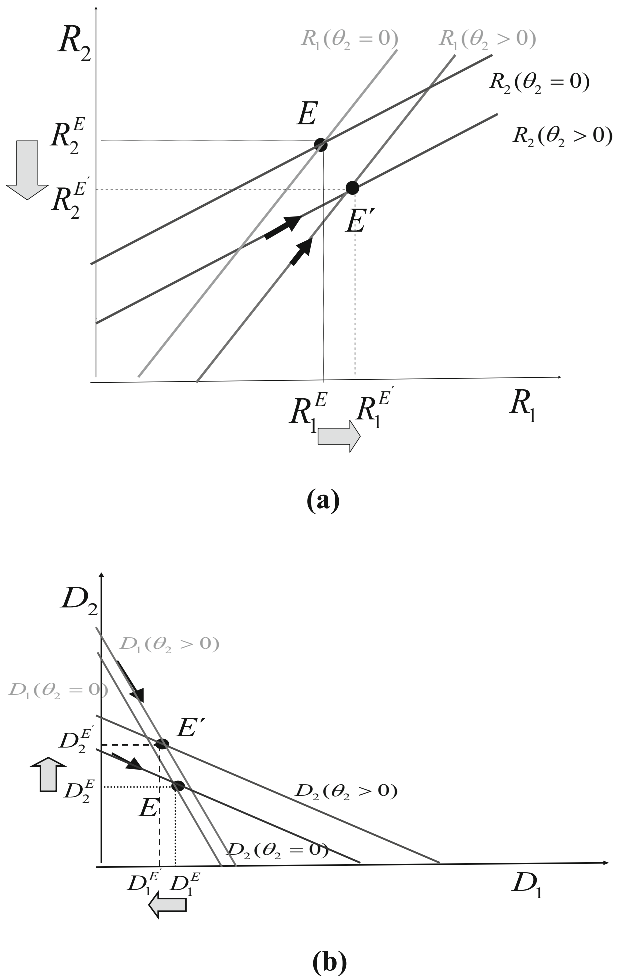

Fig. 1 **a** and **b** show the banks' reaction functions for revenues and deposits, respectively. We start with the basic case of competition between two CB and analyze what happens if a bank turns to show a positive degree of stakeholderness. First, when both firms maximize profits, the symmetric equilibrium solution corresponds to point E: $(D_1^E, D_2^E, R_1^E, R_2^E)$. Then, if Bank 2 turns to exhibit a positive degree of stakeholderness ($\theta_1 = 0, \theta_2 > 0$: a CB competes against a SB) the reaction functions corresponding to deposits and revenues shift to the right. Firms end up in equilibrium such that: $\mathrm{E}' = (D_1^{E'}, D_2^{E'}, R_1^{E'}, R_2^{E'})$, with $D_1^E < D_1^{E'}; D_2^E > D_2^{E'}; R_1^E > R_1^{E'}; R_2^E < R_2^{E'}$

Proof See Appendix 4.

In our setup, the competing banks have two ways to achieve their goals (i.e., to maximize their respective objective functions): by choosing the return and risk of the portfolio of assets, and by choosing the amount of deposits offered to their customers (which in turn determines the interest rates on these deposits). The intuition behind Proposition 1 is that SBs choose to increase its deposit supply and to invest in safer, and therefore less profitable, portfolios than CBs because the former can increase the value of their objective function through the strategic effect of the implicit subsidy in the costs of deposits. In contrast, CBs are in a strategic disadvantage in generating profits from deposits and this leads them to invest in riskier and more profitable assets. In addition, CBs have more incentives for risk-shifting compared to SBs since CBs only care about profits while SBs are also concerned about the benefits that their stakeholders would lose if the bank fails.[12] As a consequence, SBs are more concerned with avoiding bankruptcy since they internalize the cost that the failure would have on its stakeholders.[13] In short, the degree of stakeholderness increases (decreases) the SB (SB's rival) opportunity cost of going bankrupt, which deters (encourages) its risk-taking behavior. Figures 1a and 1b show how these two effects take place.

An interesting consequence of Prop. 1(d) is that CB will strategically choose to adopt a SB orientation to improve its expected profits. In what follows, and for the sake of simplicity, the degree of stakeholderness selected by the CB to maximize expected profits θ_1^* is normalized to zero (and asterisks are then omitted in order to recall that normalized values are not equilibrium values).

3.2 The effects on systemic financial stability and welfare

In this subsection, we analyze the implications of competition between banks with different objective functions on (systemic) financial stability and welfare. We first define *systemic financial stability* (Allen and Gale 2000) and *welfare* (Matutes and Vives 2000).

Systemic financial stability is defined as the probability of the event that "both banks go bankrupt": $[1 - P(R_1)][1 - P(R_2)] = A^2 R_1 R_2$. The lower the probability of this event, the higher is systemic financial stability and vice versa. Thus, an increase in systemic financial stability is understood as a reduction of the probability of the event that "both banks go bankrupt". This event, in our theoretical model, is associated to a financial crisis.

Welfare is defined as the expected gross surplus (consumer surplus plus the banks' overall expected utilities) minus the expected deadweight loss (EDL) corresponding to the social cost of a financial crisis (FC).

$$W = CS + EU_1 + EU_2 - EDL \tag{13}$$

with:

$$CS = U(D) = r_i(D) \cdot D_i + r_j(D) \cdot D_j - T(D) \tag{14}$$

$$\text{where } T(D) = \alpha(D) + \frac{\beta(D_i^2 + D_j^2) + (2\gamma D_i D_j)}{2} \text{ (see equ. (3))};$$

[12] If the bank fails depositors may face the cost of finding new banks to place their money, while borrowers, from certain categories of the population, may be excluded from access to financing.

[13] In our model SBs internalize that they are able to pay the labour expenditures to their employees and to expand to fulfil their social goal of financial inclusion only if they do not go bankrupt.

$$EU_i = P(R_i)[R_i - r_i(D) - c(1-\theta_i) - s]D_i, \quad i = 1, 2; \tag{15}$$

and

$$\text{EDL} = [1 - P(R_1)][1 - P(R_2)]FC = A^2 R_1 R_2 FC. \tag{16}$$

Therefore, taking $\theta_1 = 0$, we have:

$$\begin{aligned} W = \; & D_1\{P(R_1)[R_1 - r_1(D) - c - s] + r_1(D)\} \\ & + D_2\{P(R_2)[R_2 - r_2(D) - c(1-\theta_2) - s] + r_2(D)\} - T(D) - A^2 R_1 R_2 FC. \end{aligned} \tag{17}$$

Then, an overall lower probability of default together with a greater deposit supply and higher interest rates will yield higher welfare, since more loan funds become available to firms and households with a higher number of deposits. This is, in fact, associated with higher levels of economic growth and welfare (Levine et al. 2000).

From a macroeconomic perspective, the impact of competition between banks with different objective functions on systemic financial stability and welfare becomes as follows:

Proposition 2 *The presence of SBs in the banking system:*

(a) increases systemic financial stability;
(b) increases social welfare.

Proof See Appendix 5.

Proposition 1 shows that adopting a stakeholder-orientation has a direct effect on the bank adopting it, as well as an indirect effect on its rival. Both effects lead to an increase in the interest rates offered. Moreover, the direct (indirect) effect on the bank adopting the degree of stakeholderness (its rival) leads to an increase (reduction) in both its market share and its overall profit, while reducing (increasing) its risk-taking incentives. The idea behind Proposition 2 is that, in absolute terms, the direct effect becomes stronger than the indirect effect. As a result, the existence of SBs in the market increases systemic financial stability and welfare.

3.3 Intuition

This subsection provides an intuitive exposition of Propositions 1 and 2, along with their respective proofs.

Consider first a banking sector where a CB (with $\theta_1 = 0$) competes with a SB (with $\theta_2 > 0$). In equilibrium, the corresponding objective functions are obtained from Eq. (9), $\max_{R_i, r_i} EU_i = P(R_i)[R_i - r_i(D) - c(1-\theta_i) - s]D_i, i = 1, 2$:

$$\begin{aligned} E\pi_1^* = EU_1^* &= P(R_1^*)(R_1^* - r_1^* - c - s)D_1^*, \\ EU_2^* &= P(R_2^*)(R_2^* - r_2^* - c(1-\theta_2) - s)D_2^*. \end{aligned}$$

The equilibrium values r_i^*, R_i^*, D_i^* are explicitly given in Appendix 3 (taking $\theta_1 = 0$ and $\theta_2 > 0$) in terms of the model parameters A, α, β, γ, c and s. The measures on financial stability and welfare (*SFS* and *W* respectively) are then written in terms of those equilibrium values.

Consider now the situation where CB can choose its stakeholder orientation by selecting a positive degree of stakeholderness, $\theta_1 > 0$. We solve a two-stage problem recursively: in the first stage, banks with different degrees of stakeholderness compete over interest rates and market shares, and in the second stage, the CB strategically chooses θ_1 (θ_2 is given for SB). In the first stage, the CB's expected utility (written as a function of θ_1) is $EU_1 = P(R_1^*)[R_1^* - r_1^* - c_1(1-\theta_1)]D_1^*$; then CB optimally selects its stakeholders orientation (θ_1^*) by maximizing $E\pi_1$ with respect to θ_1 for a given $\theta_2 : \arg\max_{\theta_1} E\pi_1 = \theta_1^* > 0$ (the objective function of CB, $E\pi_1$, is concave in θ_1, so θ_1^* is positive; see footnote 15). Obviously, varying θ_1 from 0 to $\theta_1 > 0$ makes $E\pi_1$ change as the equilibrium values R_i^*, r_i^* and D_i^* depend on θ_1 (see Appendix 3). Besides, these changes alter the financial stability and welfare via their dependence on θ_1, R_i^*, r_i^* and D_i^*, improving them. The intuition behind the fact that CB finds optimal to adopt a certain degree of stakeholderness lies on the advantage derived from the positive influence of θ_1 on its own demand, which is increasing with θ_1 (Prop. 1(b)); and also on that CB benefits from that the probability of going bankrupt ($= AR_1$) decreases with θ_1 (Prop. 1(a)). Furthermore, by adopting $\theta_1 > 0$, the CB enjoys a positive externality associated with the fact that the SB's best response yields a lower market share for itself (and higher for CB (Prop. 1(b)). All these factors contribute to the idea that a stakeholder-oriented approach enables the CB to improve $E\pi_1$, reducing EU_2 (as the SB's market share D_2^* decreases with θ_1, Prop. 1(b), and the interest rate r_2^* rises, Prop. 1(c)). Thus, CB's expected profits are maximized by choosing $\theta_1^* > 0$, but given that the objective function of the SB, EU_2, values the labor expenditures more than $E\pi_1$, SB is necessarily more "stakeholders-oriented" than CB: $\theta_1{}^* < \theta_2$. For the sake of simplicity we take $\theta_1 = 0$, and $\theta_2 > 0$ is then interpreted as SB being more stakeholders-oriented than CB: $\theta_2 > \theta_1^*$.

On the other hand, financial stability and welfare also increase due to the stakeholder orientation that CB strategically adopts. First, financial stability increases since the probability of the CB going bankrupt (AR_1) decreases with θ_1 (by Proposition 1).[14] Second, welfare improves partly because the interest rates offered by both CB and SB increase (Proposition 1(c)); furthermore, the expected deadweight loss (EDL) decreases as CB becomes more stable when $\theta_1 > 0$. The resulting changes in the equilibrium values R_i^*, r_i^* and D_i^* driven by the adoption $\theta_1 > 0$, generate a positive externality which leads to an increase in the systemic financial stability and welfare, as establishes in Proposition 2.

Finally, competition between two CBs (CB-CB) would result in higher expected profits for both banks, driven by factors analyzed above and their shared profit-maximization objectives. However, systemic financial stability and social welfare decline under CB-CB competition since profit-maximization leads to Bank 1 to adopt a lower degree of stakeholderness than it would be if maximizing expected utility

[14] The probability associated to SB going bankrupt, AR_2, increases in response to the increase in θ_1, see Prop. 1(a), but no sufficiently to offset the direct effect caused by the increase of θ_1.

($\max EU_1$) instead of expected profits. As a result, Bank 2 select riskier projects (compared to operating as an SB), while Bank 1 select less risky projects (compared to competing against an SB), as outlined in Proposition 1(a). Since the initial, direct effect is stronger, financial stability and welfare ultimately decrease when competition is exclusively between CBs.

In summary, an SB's objective function values labor expenditures; the SB's objective function is considered to be given, so θ_2 is fixed. This bank competes against a CB which, by adopting certain degree of stakeholderness $\theta_1 > 0$ (for example by means of adequate incentives to expansion), improve its expected profits (the objective function being a CB). The optimal degree of stakeholderness θ_1^* is necessarily positive, but lower than θ_2. Choosing $\theta_1^* > 0$ has the following outcomes: it increases the expected profits of CB ($E\pi_1$), reduces the expected utility of SB (EU_2), and improves the financial stability and welfare of the banking sector.

4 Discussion

4.1 Interpretation of results

Proposition 1 suggests that the CB prefers a symmetric market, where competition occurs between profit-maximizing banks. The SB also prefers to compete against a CB. And independently of its objective function, any bank is encouraged to select a riskier portfolio (with higher expected returns) when competing against a SB compared to competing against a CB. The result of Proposition 1 is in line with the empirical evidence showing that SBs focus on traditional financial intermediation targeting domestic retail banking (particularly retail funding), pursue limited exposure to toxic assets, follow a longer term perspective and are less affected by stock market cycles than CBs (Fonteyne 2007, Birchall and International Labour Office, 2013, Ayadi et al. 2010).

Interestingly, since the expected profit of any bank shows an inverse U-shaped relationship with its degree of stakeholderness,[15] our model suggests that a CB may benefit from incorporating a certain stakeholder approach into its strategy. This conclusion aligns with Allen et al.'s (2014) prediction that profits may increase when the firm adopts a multidimensional objective function that accounts for the interests of several stakeholders. It is also consistent with Gregory et al. (2016) findings, which indicate that corporate social performance is value relevant and provides firms with a competitive advantage. CBs may self-induce the profit-maximizing degree of stakeholderness in their managers through the use of managerial incentives linked to expansion, as in Purroy and Salas (2000). Our model, then, suggests that the presence of explicit

[15] There is an optimal value of θ_i that maximizes (expected) profits. This value is the solution of a second degree equation. Simulations show that, ceteris paribus, θ_i* decreases with A and increases with γ(i.e., the higher the price of risk the lower θ_i*, and the less differentiated products the higher θ_i*). This is only relevant for CB, because the SB's degree of stakeholderness θ_2 cannot be chosen in the short term so we take it as exogenously given. Consequently, CBs have higher expected economic profits than SBs.

incentives will be higher in CBs than in SBs.[16] This result can be related to Rasmussen (1988) and Masulis (1987), who find that cooperative banks tend to attract less sophisticated and more risk-adverse managers because these banks do not offer explicit managerial incentives like stock-options or bonuses.

Proposition 2 suggests that the analysis of the relationship between competition and stability should take into account banks' objective function and the externality that certain type of banks may generate on the stability of their rival. However, most of the work in this line of research focus on the relationship between banks' risk taking behavior and competition among symmetric banks[17] and derive implications for systemic financial stability by implicitly assuming that the system as a whole will be safer when individual banks are safer. Under these assumptions, the two basic hypotheses in the literature that link bank risk (systemic financial stability) to competition has been the *franchise value paradigm* (competition increases bank risk and hence, reduces systemic financial stability) and the *risk-shifting hypothesis*[18] (competition reduces bank risk, thus increases systemic financial stability). Our model lends support to the franchise value paradigm when considering the relationship between competition and individual bank risk-taking, i.e., the presence of SBs and their more aggressive behavior in the deposit market increases the risk-taking incentives of their rivals. In addition, the model also provides support to the risk-shifting hypothesis when considering the effect of competition on systemic financial stability, i.e., an increase in the intensity of rivalry in the deposit market stemming from a stakeholder value approach, increases systemic financial stability. In this sense, our model helps to integrate the franchise value paradigm with the risk-shifting hypothesis.

From a regulatory point of view, Proposition 2 suggests that policy makers, aiming to increase systemic financial stability and social welfare, may favor a stakeholder-approach in the retail banking sector, by dictating social responsibility for all banks (such as imposing employee directors) or favoring depositors' preferences for SBs.

4.2 Theoretical predictions and empirical evidence

The model proposed yields several empirical predictions. In this subsection we draw on the existing empirical evidence to discuss the relevance of the results obtained. Our analysis shows that the degree of stakeholderness of a bank affects its own and its

[16] The use of incentives in SBs becomes irrelevant because the SB's degree of stakeholderness is exogenously given.

[17] It is worth noting that several scholars (Berger et al. 2004; Beck et al. 2006; Schaeck et al. 2009; Jiménez et al. 2013) claim that competition and concentration are distinct from each other. These authors claim that concentration is only one of the variables that one must look at in order to determine the degree of competition. Other variables are, for example, the relative position of competitors, the existence of potential entrants, and the countervailing power of buyers. Our finding suggests that the objective function of banks may be another determinant of the degree of contestability of banks.

[18] Theoretical analyses have developed models supporting the *franchise value paradigm* (e.g., Keeley 1990; Besanko and Thakor 1993; Suárez, 1994; Matutes and Vives 1996, 2000; Hellmann et al. 2000; and Repullo 2004). The studies by Keely (1990), Demsetz et al. (1996), Hellman et al. (2000), Salas and Saurina (2003) and Jiménez et al. (2007) provide empirical support to the former models. The risk shifting model was first pointed out by Boyd and De Nicolò (2005) and has been empirically supported by Boyd et al. (2006) and De Nicolò and Loukoianova (2007).

rival's risk-taking incentives, expected profits and market share and that, overall, the direct effect that the degree of stakeholderness has on the banks adopting it (i.e., a SB) becomes stronger than the indirect effect on its rival (i.e., a SB or a CB). Concerning the direct effect, the model predicts that SBs choose more conservative portfolios than CBs (Proposition 1(a)). This prediction is consistent with the empirical work on the risk behaviour of cooperative and savings banks which suggests that SBs are more stable than CBs.[19] In particular, Iannotta et al. (2007), using a sample of large European banks, find that cooperative banks are the most stable banking group, and Čihák and Hesse (2007) find that cooperative banks are more stable than CBs for a sample of OECD countries. Similar results are obtained by García-Marco and Robles-Fernández (2008) and by Beck et al. (2009), who respectively analyze the Spanish and the German banking sectors, showing that SBs are more stable than CBs. For the years after the 2008 financial crisis, Nitani and Legendre (2021) show that small business loans advanced by cooperative lenders have a significantly lower probability of default (than those disbursed by CBs), and Venanzi and Matteucci (2022) found that in 2019, larger cooperative banks have lower systematic and business risk if compared to (comparable) CBs.

Building on the result of higher stability of SBs compared to CBs, Llewellyn (2009), Ayadi et al. (2010), the EACB (2010), Stefancic (2010), Groeneveld (2011) and Stefancic and Kathitziotis (2011) and Meriläinen (2016) argue that cooperative banks promote the stability of national banking systems. However, the contribution of SBs to the soundness of their financial system is a controversial issue in the empirical literature. Despite the above mentioned positive effects of a higher stability of SBs, a strand of research suggests that greater presence of SBs decreases the stability of the financial system since in systems with a high presence of non-for-profit banks, CBs are less stable than in systems with a low presence (Čihák and Hesse 2007; De Nicolò, 2000). Proposition (1a) is consistent with this last argument since it asserts that any type of bank increases its risk taking behaviour when competing against a SB. However, in Proposition 2 we also show that the presence of SBs increases systemic financial stability since their higher stability overcame the lower stability that they induce on their rivals. Thus, our model contribute to the debate about the role of SBs in financial stability and help to conciliate the existing empirical evidence by providing a plausible explanation for the effect that the stakeholder orientation of a bank has on both its own and rival's risk taking behaviour, and more importantly, by providing a theoretical framework to analyse the overall effect of the presence of SBs on systemic financial stability.

While the existing empirical evidence on the implications of the presence of SBs on systemic financial stability is based on the common assumption that the system as a whole will be safer when individual banks are safer, we show that this assumption may not hold, as certain types of banks may generate an externality on the stability of their rivals. Considering this externality, our model predicts that the presence of SBs increases systemic financial stability and social welfare (see Proposition 2). These predictions are novel and have not been tested empirically yet, although some authors

[19] See O'Hara (1981), Rasmusen (1988), Saunders et al. (1990), Cordell et al. (1993), Gropper and Beard (1995), Fraser and Zardkoohi (1996), Knopf and Teall (1996), Esty (1997), Leonard and Biswas (1998), Hansmann (1996), Laeven and Levine (2009).

suggest that a larger presence of SBs could reduce the overall risk of a financial system as there may be systemic advantage in having a heterogeneous mix of institutions with different portfolio structures. For instance, Allen and Gale (2000) argue that macro-economic shocks affect countries much less when non-for-profit banks play an important role in the financial sector (compared to when the banking sector is exclusively composed of private banks whose shares are listed and traded on a stock market). Regarding the importance of the "social role" played by SBs, the European Savings Bank Group (2007) and the European Commission (2008) argue that savings and cooperative banks, because of the solid relationship with their members, clients and local communities, are key elements to tackle financial exclusion. Ayadi and Rodkiewicz (2008), Ayadi et al. (2010) and Carbó et al. (2007) provide empirical support to these arguments as they show that European countries, where SBs play an important role, display low levels of financial exclusion.

Our model also predicts that banks, independently of their objective function, offer higher interest rates on deposits and are less profitable when competing against SBs. This prediction suggests that the presence of SBs in the market makes competition for deposits tougher. Given that SBs are more aggressive in the deposit market as a result of their lower effective costs, which stem from the implicit subsidy from stakeholders' preferences, our results suggest that competition can enhance financial stability if the increase in the intensity of rivalry comes from an increase in efficiency. This prediction is in line with the result of Schaeck and Cihák (2014) that efficiency is the conduit through which competition contributes to stability and of Chortareas et al. (2011) that low efficiency levels are a signal of poor asset quality loans. In addition, the result that SBs are able to obtain a higher market share than CBs is supported by empirical studies showing that SBs tend to outperform CBs in terms of market share (García-Marco and Robles-Fernández 2008; Bøhren and Josefsen 2007).

Besides, the model proposed suggests that there is an optimal degree of stakeholderness that maximizes the expected profits of CBs. According to this result, CBs would benefit from taking into account the interest of other stakeholders. An interesting issue is whether there are alternative contractual mechanisms that may allow CBs to achieve the same commitment as SBs. One mechanism could be managerial incentives. Anecdotal evidence on CBs adopting a stakeholder orientation by investing in Corporate Social Responsibility, e.g. Scotiabank or Santander Bank, is suggestive of our implications of an optimal degree of stakeholderness in CBs.

5 Conclusions

Most countries have a financial system in which for profit maximizing banks (i.e., CBs) compete against stakeholders' welfare maximizing banks (i.e., SBs) under the same regulatory and competitive condition. However to the best of our knowledge, the effect of such a competition for financial stability, social welfare, banks' risk taking incentives, expected profits and market share has been largely unexplored. In this paper we try to fill this gap. We propose a duopoly model of retail banking competition between a commercial bank (i.e., profit-maximizing bank) and a stakeholder bank (i.e., Stakeholders' welfare maximizing bank) and we establish the nature of the competition between banks, invoking the results from Singh and Vives (1984). Our model specification allows us to explore the interaction between different types of banks (i.e., two CBs, two SBs, one SB and one CB) and yields new empirical prediction that we hope will spur further empirical work on the subject. The equilibriums reveal that: (a) the presence of a SB increases social welfare and systemic financial stability. (b) SBs are less risk-inclined and obtain a higher market share than CBs. Furthermore, there is an optimal degree of stakeholderness that maximizes the economic profits of CBs. This finding suggests that CBs would benefit from taking into account the interest of other stakeholders (which could be achieved through managerial incentives). (c) Banks, independently of their objective function, choose riskier portfolios and are less profitable when competing against a SB than against a CB.

These results are in line with the existing empirical evidence and they suggest that when analyzing financial stability it is important to consider the objective function of banks and the externality that certain type of banks may generate on the stability of their rivals. We show that, under the presence of such an externality, the common presumption that the system as a whole will be safer when individual banks are safer may not hold. In particular, we find that the SB's more aggressive behaviour in the deposit market, caused by its lower "effective" deposits marginal cost, increases individual bank risk-taking (i.e., the presence of SBs increases the risk-taking incentives of its rival) but at the same time it increases systemic financial stability. Thus, in this sense, our model helps to integrate (a) The two main hypotheses in the literature regarding the influence of competition on bank risk: the franchise value paradigm, and the risk-shifting hypothesis and (b) The empirical evidence on the influence of SBs on financial stability.

This paper adds to the existing literature by introducing the consideration of the banks' objective function into the analysis of the relationship between competition, bank risk, social welfare and systemic financial stability. Our results are consistent with, and an intuitive explanation for, the existence empirical evidence and yield new empirically testable predictions and important policy implications. First, our findings contribute to the current debate on the future of stakeholder banks suggesting that policy makers aiming to maximize systemic financial stability and social welfare may favour a stakeholder-approach in the retail banking sector. Second, our findings suggest that financial policy should differ across financial systems as well as across banks. Specifically, regulation aiming to reduce banks' risk should be set in a more or less restrictive way depending on (i) Banks' objective functions; (ii) The proportion of SBs in the system. Finally, it is suggested that CBs can adopt a certain degree of stakeholder-orientation to enhance the expected profits.

While our model sheds new light on the effect of the strategic interaction between banks with different objective functions, we recognize that the model could be further extended. For future research, it would be interesting to investigate the negative effects of a high proportion of SBs on the economy. In this sense, systems with a high degree of stakeholderness may face more difficulties to overcome periods of crisis, in terms of larger drops in GDP, or time to recovery. Thus, it would be interesting to analyse whether there is an optimal proportion of SBs that maximize systemic financial stability and social welfare and whether there are contractual mechanisms that may allow CBs to achieve the same commitment with their stakeholders as SBs. Another interesting issue left for further research is related to Corporate Social Responsibility[20]: CBs obtain the highest expected profits by choosing an optimal value of θ_1^*, but a bank adopting social responsibility could obtain higher profits raising θ_1 if this allows the bank to attract customers "socially responsible" (an adequate modelling taking this feature into account is then required). However, if its rival adopts the same strategy, the two banks find themselves in a prisoner's dilemma equilibrium; the expected profits for both banks are reduced, while welfare and financial stability improve.

Appendix 1: Proof of Lemma 1 (Competition is à-la-Cournot)

Although the demand function in our model is an upward sloping linear function, the banks objective function is concave:

$$\begin{aligned} EU_i &= P(R_i)\left[(R_i - \alpha - \beta D_i - \gamma D_j - s - c \cdot (1-\theta_i)\right] \cdot D_i \\ &\Rightarrow \frac{\partial^2 U_i}{\partial D_i^2} = -2\beta P(R_i) < 0 i = 1, 2. \end{aligned}$$

Then, we appeal to Singh and Vives (1984), who show that players optimally compete in quantities.

Appendix 2: Proof of Lemma 2 (Uniqueness of the equilibrium)

Let assume that for each bank $i = 1, 2$ there exist two equilibria (D_i, R_i) and $(D_i^{'}, R_i^{'})$ satisfying the equilibrium condition in Eq. (12), with $R_i > R_i^{'}$. This fact implies that $\frac{-P(R_i)}{P'(R_i)} < \frac{-P(R_i')}{P'(R_i')} \Rightarrow D_i' > D_i$ (since $\frac{\partial r_i(D)}{\partial D_i} = \frac{\partial r_i(D')}{\partial D_i'} = \beta$).

Given Eq. (4), $r_i(D') > r_i(D)$ holds, then:

$$R_i - r_i(D) - c \cdot (1 - \theta_i) - s > R_i' - r_i(D') - c \cdot (1 - \theta_i) - s.$$

This inequality contradicts $\frac{-P(R_i)}{P'(R_i)} < \frac{-P(R_i')}{P'(R_i')}$. Therefore, there is one equilibrium at most.

[20] We thank an anonymous referee for suggesting us this model extension.

Appendix 3: Equilibrium values

$$R_i^* = \frac{4\beta^2 - \gamma^2}{A(6\beta^2 - \gamma^2 - \beta\gamma)} + \frac{(\alpha + \mathrm{c} + s)(2\beta^2 - \beta\gamma)}{6\beta^2 - \gamma^2 - \beta\gamma} - c\theta_i \left[\frac{12\beta^4 - 3(\beta\gamma)^2}{(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2} \right] + c\theta_j \left[\frac{4\beta^3\gamma - \beta\gamma^3}{(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2} \right] \quad (18)$$

$$D_i^* = \frac{2\beta - \gamma}{A\left(6\beta^2 - \gamma^2 - \beta\gamma\right)} + (\alpha + c + s)\left[\frac{\gamma - 2\beta}{\left(6\beta^2 - \gamma^2 - \beta\gamma\right)} \right] - c\theta_i \left[\frac{24\beta^3\gamma^2 - 3\beta\gamma^4 - 48\beta^5}{(4\beta^2 - \gamma^2)\left[(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2\right]} \right] + c\theta_j \left[\frac{8\beta^3\gamma^3 - 16\beta^4\gamma - \gamma^5}{(4\beta^2 - \gamma^2)\left[(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2\right]} \right] \quad (19)$$

$$r_i^* = \alpha + \frac{2\beta^2 + \beta\gamma - \gamma^2}{A(6\beta^2 - \gamma^2 - \beta\gamma)} + \frac{(\alpha + c + s)(\gamma^2 - 2\beta^2 - \beta\gamma)}{(6\beta^2 - \gamma^2 - \beta\gamma)} - c\theta_i \left[\frac{40\beta^4\gamma^2 + \gamma^6 - 48\beta^6 - 3\beta^2\gamma^4 - 8\beta^3\gamma^4}{(4\beta^2 - \gamma^2)\left[(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2\right]} \right] + c\theta_j \left[\frac{8\beta^4\gamma^3 + 32\beta^5\gamma + 2\beta\gamma^5 - 24(\beta\gamma)^3}{(4\beta^2 - \gamma^2)\left[(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2\right]} \right] \quad (20)$$

Finally, the expected profits and utilities are:

$$E\pi_i^* = P(R_i^*)(R_i^* - r_i^* - c - s)D_i^*, \quad i = 1, 2. \quad (21)$$

$$EU_i^* = P(R_i^*)[R_i^* - r_i^* - c(1 - \theta_i) - s]D_i^*, \quad i = 1, 2. \quad (22)$$

Appendix 4: Proof of Proposition 1

(a) The results of Proposition 1(a) to 1(c) are immediately obtained from Eqs. (18) and (19).

(b) To proof the results of Proposition 1(d), we first use backward induction to show that there is an optimal θ_1 which maximizes CB's profits. Second, we show that the profits of one bank decrease with its rival's degree of stakeholderness.

For a given value of θ_2, the equilibrium solution corresponding to the CB can be obtained as we did in Sect. 2. Then, since the equilibrium depends on θ_1, its optimal value corresponds to the problem:

$$\max_{D_1, R_1} EU_1 = P(R_1)[R_1 - r_1(D) - c(1 - \theta_1) - s]D_1 \tag{23}$$

which yields the equilibrium solutions in Eqs. (18) to (22). The CB's expected profits are then given by:

$$\begin{aligned} E\pi_1 &= P(R_1)\,[(R_1 - r_1(D) - c - s] \cdot D_1 \\ &= [M + c\theta_1 Q - c\theta_2 B] \cdot [K + c\theta_2 E - c\theta_1 F] \cdot [Z + c\theta_2 T - c\theta_1 H] \end{aligned} \tag{24}$$

where:

$$\begin{aligned}
F &= \frac{96\beta^6 - 64\beta^4\gamma^2 + 6\beta^2\gamma^4 + 8\beta^3\gamma^4 - \gamma^6}{(4\beta^2 - \gamma^2)\left[(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2\right]}, \\
T &= \frac{8\beta^3\gamma^3 - 16\beta^4\gamma - \gamma^5}{(4\beta^2 - \gamma^2)\left[(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2\right]}, \; Q = \frac{12\beta^4 - 3(\beta\gamma)^2}{(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2} \\
K &= \frac{(2\beta^2 - \beta\gamma)(1 - A(\alpha + c + s))}{A(6\beta^2 - \gamma^2 - \beta\gamma)}, \; Z = \frac{(2\beta - \gamma)(1 - A(\alpha + c + s))}{A(6\beta^2 - \gamma^2 - \beta\gamma)}, \\
H &= \frac{24\beta^3\gamma^2 - 3\beta\gamma^4 - 48\beta^5}{(4\beta^2 - \gamma^2)\left[(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2\right]} \\
F &= \frac{96\beta^6 - 64\beta^4\gamma^2 + 6\beta^2\gamma^4 + 8\beta^3\gamma^4 - \gamma^6}{(4\beta^2 - \gamma^2)\left[(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2\right]}, \\
T &= \frac{8\beta^3\gamma^3 - 16\beta^4\gamma - \gamma^5}{(4\beta^2 - \gamma^2)\left[(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2\right]}, \; Q = \frac{12\beta^4 - 3(\beta\gamma)^2}{(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2}.
\end{aligned}$$

Therefore, θ_1^* is given by:

$$\theta_1^* = \arg\max_{\theta_1} [M + c\theta_1 Q - c\theta_2 B] \cdot [K + c\theta_2 E - c\theta_1 F] \cdot [Z + c\theta_2 T - c\theta_1 H] \tag{25}$$

whose FOC leads to:

$$\begin{aligned}
\frac{\partial E\pi_1}{\partial \theta_1} = \; & 3\theta_1^2 c^3 FQH - 2\theta_1[c^2(FQZ - FMH + KQH) \\
& + \theta_2 c^3(QFT + QEH + BFH)] \\
& + \theta_2^2 c^3(QET + BFT + BHE) \\
& + \theta_2 c^2(QEZ + TQK + BFZ + FMT + BHK - HME) \\
& + c(QKZ - FMZ - HMK) = 0.
\end{aligned} \tag{26}$$

As $\beta > \gamma$ (see Sect. 2.1), $M > 0; Q > 0; B > 0; K > 0; E < 0; F > 0; Z > 0; T < 0; H < 0$.

The second derivative must be negative for θ_1 to be a maximum. We check this numerically:

$$\frac{\partial^2 E\pi_1}{\partial\theta_1^2} = 6\theta_1 c^3 FQH - 2\Big[c^2(FQZ - FMH + KQH) + c^3\theta_2(QFT + QEH + BFH)\Big] \tag{27}$$

which is negative for typical values of the parameters.

Then, there is an optimal value of θ_1 that maximizes the CB's profits.

Finally, we show that a bank's profits decrease with its rival's degree of stakeholderness. From (24),

$$\frac{\partial P(R_i)}{\partial\theta_j} = -cB < 0; \frac{\partial(R_i - r_i(D) - c)}{\partial\theta_j} = cE < 0; \text{ and; } \frac{\partial D_i}{\partial\theta_j} = cT < 0 \quad i,\ j = 1, 2,$$

which ensures that $\frac{\partial E\pi_i}{\partial\theta_j} < 0$.

Appendix 5: Proof of Proposition 2

In order to demonstrate that SBs help to increase welfare, we will show that $\frac{\partial W}{\partial\theta_i} > 0$ $i = 1, 2$. Given the definition of welfare, $W = CS + EU_1 + EU_2 - EDL$, the following conditions ensure that $\frac{\partial W}{\partial\theta_i} > 0$:

$$\frac{\partial CS}{\partial\theta_i} > 0 \tag{28}$$

$$\frac{\partial(EU_1 + EU_2)}{\partial\theta_i} > 0 \tag{29}$$

$$\frac{\partial(EDL)}{\partial\theta_i} > 0 \tag{30}$$

where

$$CS = r_i(D)D_i + r_j(D)D_j - \alpha(D_i + D_j) - \frac{\beta(D_i^2 + D_j^2) + (2\gamma D_i D_j)}{2},$$

$EDL = \left[((1 - P(R_i))((1 - P(R_j))\right] FC$, and

$$EU_i = P(R_i)[(R_i - r_i(D) - c \cdot (1 - \theta_i) - s] \cdot D_i \\ = \left[M + c\theta_i Q - c\theta_j B\right] \cdot \left[K + c\theta_j E + c\theta_i (1 - F)\right] \\ \cdot \left[Z + c\theta_j T - c\theta_i H\right] \quad i, j = 1, 2$$

(parameters *M, K, Z, B, Q, E, F, T*, and *H* are given in Appendix 4).

Then, taking into account that:

$\frac{\partial CS}{\partial D_i} = D_i(2\beta - 1) + \gamma D_j > 0$ (which is positive whenever β < 1/2); $\frac{\partial DL}{\partial R_i} = A^2 R_j FC > 0$; and that

$$\frac{\partial D_i}{\partial \theta_i} > 0, \frac{\partial D_j}{\partial \theta_i} < 0, \frac{\partial R_i}{\partial \theta_i} < 0, \frac{\partial R_j}{\partial \theta_i} > 0$$

sufficient conditions for (28) and (30) to hold are:

$$\left|\frac{\partial D_i}{\partial \theta_i}\right| = \left|\frac{24\beta^3\gamma^2 - 3\beta\gamma^4 - 48\beta^5}{(4\beta^2 - \gamma^2)[(6\beta^2 - \gamma^2)^2 - \beta^2\gamma^2]}\right| > \left|\frac{\partial D_j}{\partial \theta_i}\right| \\ = \left|\frac{8\beta^3\gamma^3 - 16\beta^4\gamma - \gamma^5}{(4\beta^2 - \gamma^2)[(6\beta^2 - \gamma^2)^2 - \beta^2\gamma^2]}\right| \tag{31}$$

$$\left|\frac{\partial R_i}{\partial \theta_i}\right| = \left|\frac{12\beta^4 - 3\beta^2\gamma^2}{(6\beta^2 - \gamma^2)^2 - \beta^2\gamma^2}\right| > \left|\frac{\partial R_j}{\partial \theta_i}\right| = \left|\frac{4\beta^3\gamma - \beta\gamma^3}{(6\beta^2 - \gamma^2)^2 - \beta^2\gamma^2}\right| \tag{32}$$

Provided that $\beta > \gamma$, conditions (31) and (32) hold.

Taking into account that the Expected Deadweight Loss (EDL) is inversely related to financial stability, part (a) of the Proposition 2 is demonstrated.

Finally, we need to prove that condition (29) holds. $\frac{\partial EU_i}{\partial \theta_i} > 0, \frac{\partial EU_j}{\partial \theta_i} < 0$.

Since $\frac{\partial EU_i}{\partial \theta_i} > 0$, $\frac{\partial EU_j}{\partial \theta_i} < 0$, condition (29) will hold if

$$\left|\frac{\partial EU_i}{\partial \theta_i}\right| > \left|\frac{\partial EU_j}{\partial \theta_i}\right|. \tag{33}$$

Given (31) and (32), a sufficient condition for (33) to hold is:

$$\left|\frac{\partial\left[R_i - r_i(D) - s - c(1 - \theta_i)\right]}{\partial \theta_i}\right| = |c(1 - F)| \\ > \left|\frac{\partial\left[R_j - r_j(D) - s - c(1 - \theta_j)\right]}{\partial \theta_i}\right| = |cE| \tag{34}$$

which holds because $\beta > \gamma$.

As β < 1/2, conditions (28), (29) and (30) hold, and this implies that $\frac{\partial W}{\partial \theta_i} > 0$, $i = 1, 2$, *QED.*

Funding Open Access Funding provided by Universitat Autonoma de Barcelona.

References

Akella, S.R., Greenbaum, S.-I.: Savings and loan ownership structure and expense-preference. J. Bank. Financ. **12**, 419–437 (1988)

Allen, F., Gale, D.: Comparing Financial Systems. MA, MIT Press, Cambridge (2000)

Allen, F., Gale, D.: Competition and financial stability. J. Money, Credit, Bank. **36**, 453–480 (2004)

Allen, F., Gale, D.: Understanding Financial Crises. Clarendon Press, Oxford (2007)

Allen, F., Carletti, E., Marquez, R.: Stakeholder governance, competition and firm value. Rev. Financ. **19**, 1315–1346 (2014)

Ayadi, R., Llewellyn, D., Schmidt, R.H., Arbak, E., de Groen, W.P.: Investigating diversity in the banking sector in Europe: key developments, performance and role of cooperative banks. Centre for European Policy Studies, Brussels (2010)

Ayadi, R., Challita, S., Cucinelli, D.: Cooperative banks, business models and efficiency: a stochastic frontier approach analysis. Ann. Oper. Res. **2023**, 1–43 (2023)

Ayadi, R. and Rodkiewicz, J.: Tackling financial exclusion in Europe: The market response. Working Paper (available at http://www.fininc.eu/index.en.html) (2008).

Barth, J.R., Caprio, G.J. and Levine, R.: Banking systems around the globe: do regulation and ownership affect performance and stability? World Bank Policy Research Working Paper, No. 2325 (1999).

Beck, T., Demirgüç-Kunt, A., Levine, R.: Bank concentration, competition, and crises: first results. J. Bank. Finance **30**, 1581–1603 (2006)

Beck, T., Hesse, H., Kick, T., von Westernhagen, N.: Bank ownership and stability: evidence from Germany. *Unpublished Working Paper, Federal Deposit Insurance Corporation. Washington, DC.* (2009)

Berger, A.N., Demirgüç-Kunt, A., Levine, R., Haubrich, J.: Bank concentration and competition: an evolution in the making. J. Money, Credit, Bank. **36**, 433–451 (2004)

Besanko, D., Thakor, A.: Relationship banking, deposit insurance and bank portfolio choice. In: Mayer, C., Vives, X. (eds.) Capital Markets and Financial Intermediation. Cambridge University Press, Cambridge (1993)

Birchall, J., International Labour Office: Resilience in a downturn: The power of financial cooperatives. International Labour Office, Geneva (2013)

Blair, M.M.: *Ownership and control—rethinking corporate governance for the twenty-first century*. The Brookings Institute Washington, D.C. (1995)

Bofondi, M., Gobbi, G.: Informational barriers to entry into credit markets. Rev. Financ. **10**, 39–67 (2006)

Bøhren, Ø. and Josefsen, M.G.: Are owners Redundant? Working Paper. Available at SSRN: http://ssrn.com/abstract=966284 (2007).

Bolton, P., Scharfstein, D.: A theory of predation based on agency problems in financial contracting. Am. Econ. Rev. **80**, 94–106 (1990)

Boyd, J.H., De Nicoló, G.: The theory of bank risk taking and competition revisited. J. Financ. **60**, 1329–1343 (2005)

Boyd, J., Smith, B.D.: How good are standard debt contracts? Stochastic versus nonstochastic monitoring in a costly state verification environment. J. Bus. **67**, 539–561 (1994)

Boyd, J.H., De Nicoló, G., Al Jalal, A.: Bank risk taking and competition revisited: new theory and new evidence. University of Minnesota, Manuscript, Carlson School of Management (2006)
Carbó, S., Humphrey, D.B., del Paso, R.L.: Do cross-country differences in bank efficiency support a policy of "national champions." J. Bank. Financ. **31**(7), 2173–2188 (2007)
Chortareas, G.E., Girardone, C., Ventouri, A.: Financial frictions, bank efficiency and risk: evidence from the Eurozone. J. Bus. Financ. Acc. **38**, 259–287 (2011)
Čihák, M., Hesse, H.: Cooperative banks and financial stability. IMF Working Paper 07/02 (2007).
Clark, E., Mare, D.S., Radić, N.: Cooperative banks: What do we know about competition and risk preferences? J. Int. Finan. Markets. Inst. Money **52**, 90–101 (2018)
Commission, E.: Financial services provisions and prevention of financial exclusion. Final Report European Commission, Brussels (2008)
Cordell, L.R., MacDonald, G.D., Wohar, M.E.: Corporate ownership and the thrift crisis. J. Law Econ. **36**, 719–756 (1993)
Crespí, R., García-Cestona, M.A., Salas, V.: Governance mechanisms in Spanish banks: does ownership matter? J. Bank. Financ. **28**, 2311–2330 (2004)
De Bandt, J.: Business services: markets and transactions. Rev. Ind. Organ. **11**, 19–33 (1996)
Degryse, H., Laeven, L., Ongena, S.: The impact of organizational structure and lending technology on banking competition. Rev. Financ. **13**, 225–259 (2009)
Delgado, J., Salas, V., Saurina, J.: Joint size and ownership specialization in bank lending. J. Bank. Financ. **31**, 3563–3583 (2007)
Demsetz, R., Saidenberg, M., Strahan, P.: Banks with something to lose: the disciplinary role of franchise value. Fed. Reserv. Bank N. Y. Econ. Policy Rev. **2**, 1–14 (1996)
DeVries, B.: European cooperative banks in financial and economic turmoil. Paper for the UN Expert Group Meeting on Cooperatives, April, New York, (2009).
Edwards, F.: Managerial objectives in regulated industries: expense preference behavior in banking. J. Polit. Econ. **85**, 147–162 (1977)
Esty, B.C.: Organizational form and risk taking in the savings and loan industry. J. Financ. Econ. **44**, 25–44 (1997)
European Association of Co-operative Banks.: European co-operative banks in the financial and economic turmoil. Research Paper Financial Services Research, No., 12 (2010).
European Savings Bank Group: Microcredit in Europe, experience of savings banks. Publications and research brochure, ESGB Brussels (2007)
Evan, W.M., Freeman, R.E.: A Stakeholder Theory of the Modern Corporation. Kantian Capitalism. In: Beauchamp, T.L., Bowie, N.E. (eds.) Ethical Theory and Business, 3rd edn., pp. 97–106. Englewood Cliffs, New Jersey (1988)
Fernández-Aguado, P.G., Ureña, A.P., Martínez, E.T.: Risk contribution to deposit insurance: evidence from commercial and cooperative banks in the Eurozone. Econ. Anal. Policy **81**, 341–355 (2024)
Ferri, G., Kalmi, P., Kerola, E.: Does bank ownership affect lending behavior? Evidence from the Euro area. J. Bank. Finance **48**, 194–209 (2014)
Fershtman, C., Judd, K.L.: Equilibrium incentives in oligopoly. Am. Econ. Rev. **5**, 927–940 (1987)
Fonteyne, W.: Cooperative banks in Europe', Policy Issues, International Monetary Fund Working Paper (International Monetary Fund, Washington, DC), (2007).
Fraser, D., Zardkoohi, A.: Ownership structure, deregulation, and risk in the savings and loan industry. J. Bus. Res. **37**, 63–69 (1996)
Freeman, R.E.: Strategic Management. A Stakeholder Approach. Pitman, Boston, MA (1984)
Gabszewiczj, J.J., Thisse, J.F.: Price competition, quality and income disparities. J. Econ. Theory **20**, 340–359 (1979)
Gale, D., Martin, H.: Incentive-compatible debt contracts: the one-period problem. Rev. Econ. Stud. **52**, 647–663 (1985)
García-Marco, T., Robles-Fernández, M.D.: Risk-taking behavior and ownership in the banking industry: the Spanish evidence. J. Econ. Bus. **60**, 332–354 (2008)
Goodhart, C.: Some New Directions for Financial Stability. The Per Jacobsson Lecture. Bank for International Settlements, Basel (2004)
Gregory, A., Whittaker, J., Yan, X.: Corporate social performance, competitive advantage, earnings persistence and firm value. J. Bus. Financ. Acc. **43**, 3–30 (2016)
Grifell-Tatjé, E., Lovell, L.A.K.: The sources of productivity change in Spanish banking. Eur. J. Oper. Res. **98**, 364–380 (1997)

Groeneveld, H.: The value of European cooperative banks for the future financial system', In paper presented at the International Co-operative Alliance (ICA) Global Research Conference in Mikkely, Finland, 24-27Aug 2011, (2011).
Gropper, D.M., Beard, T.R.: Insolvency, moral hazard and expense preference behavior: evidence from US Savings and Loans associations. Manag. Decis. Econ. **6**, 607–617 (1995)
Hannan, T.H., Mavinga, F.: Expense preference and managerial control: the case of banking firm. Bell J. Econ. **11**, 671–682 (1980)
Hansmann, H.: The ownership of enterprise. The Belknap Press of Harvard University Press, Cambridge, MA (1996)
Hellmann, T.F., Murdock, K.C., Stiglitz, J.E.: Liberalization, moral hazard in banking, and prudential regulation: are capital requirements enough? Am. Econ. Rev. **90**, 147–165 (2000)
Hotelling, H.: Stability in competition. Econ. J. **39**, 41–57 (1929)
Iannotta, G., Nocera, G., Sironi, A.: Ownership structure, risk and performance in the European banking industry. J. Bank. Finance **31**, 2127–2149 (2007)
IMF.: Belgium: financial system stability assessment, IMF Staff Country Reports, No. 06/75. International Monetary Fund, Washington, D.C (2006).
Isik, I., Hassan, M.K.: Efficiency, ownership and market structure, corporate control and governance in the Turkish banking industry. J. Bus. Financ. Acc. **30**, 1363–1421 (2003)
Jiménez, G., López, J.A., Saurina, J.: How does competition impact bank risk taking? J. Financ. Stab. **9**(2), 185–195 (2013)
Keeley, M.C.: Deposit insurance, risk and market power in banking. Am. Econ. Rev. **80**, 1183–1200 (1990)
Knopf, J., Teall, J.: Risk-taking behavior in the U.S. thrift industry: ownership structure and regulatory changes. J. Bank. Financ. **20**, 1329–1350 (1996)
Krasa, S., Villamil, A.P.: Monitoring the monitor: an incentive structure for a financial intermediary. J. Econ. Theory **57**, 197–221 (1992)
Laeven, L., Levine, R.: Corporate governance, regulation, and bank risk taking. J. Financ. Econ. **93**, 259–275 (2009)
Lee, S.W.: Insider ownership and risk–taking behaviour at bank holding companies. J. Bus. Financ. Acc. **29**, 989–1005 (2002)
Leonard, P.A., Biswas, R.: The Impact of regulatory changes on the risk-taking behavior of state chartered savings banks. J. Financ. Serv. Res. **13**, 37–69 (1998)
Levine, R., Loayza, N., Beck, T.: Financial intermediation and growth. J. Monet. Econ. **46**, 31–77 (2000)
Llewellyn, D.T.: British building societies and the financial crisis: the continuation of the mutual business model. In: Mooij, J., Boonstra, W.W. (eds.) Eeneigen koers, Coöperatief bankieren in turbulente tijden. Amsterdam VU University Press, Amsterdam (2009)
Lozano-Vivas, A.: Efficiency and technical change for Spanish banks. Appl. Financ. Econ. **8**, 289–300 (1998)
Mäkinen, M., Jones, D.C.: Comparative efficiency between cooperative, savings and commercial banks in Europe using the frontier approach. Ann. Public Coop. Econ. **86**(3), 401–420 (2015)
Masulis, R.W.: Changes in ownership structure: conversions of mutual savings and loans to stock charter. J. Financ. Econ. **18**, 29–59 (1987)
Matutes, C., Vives, X.: Competition for deposits, fragility, and insurance. J. Financ. Intermediation **5**, 184–216 (1996)
Matutes, C., Vives, X.: Imperfect competition, risk taking, and regulation in banking. Eur. Econ. Rev. **44**, 1–34 (2000)
McKillop, D., French, D., Quinn, B., Sobiech, A.L., Wilson, J.O.: Cooperative financial institutions: a review of the literature. Int. Rev. Financ. Anal. **71**, 101520 (2020)
Meriläinen, J.M.: Lending growth during the financial crisis and the sovereign debt crisis: the role of bank ownership type. J. Int. Finan. Markets. Inst. Money **41**, 168–182 (2016)
Mester, L.: Testing for expense preference behavior: mutual versus stock savings and loans. RAND J. Econ. **20**, 483–498 (1989)
Neuberger, D.: Industrial organization of banking: a review. Int. J. Econ. Bus. **5**, 97–118 (1998)
Neven, D.J.: Structural adjustment in European retail banking: some views from Industrial Organization. In: Dermine, J. (ed.) European Banking in the 1990s, pp. 153–78. Blackwell, Oxford (1990)
De Nicolò, G., Loukoianova, E.: Bank ownership, market structure and risk. Working Paper, International Monetary Fund, Washington, D.C. (2007).

De Nicolò, G.: Size, charter value and risk in banking: an international perspective. International Finance Discussion Paper No. 689. Board of Governors of the Federal Reserve System (2000).

Nitani, M., Legendre, N.: Cooperative lenders and the performance of small business loans. J. Bank. Finance **128**, 106125 (2021)

O'Hara, M.: Property rights and the financial firm. J. Law Econ. **24**, 317–332 (1981)

Purroy, P., Salas, V.: Strategic competition in retail banking under expense preference behavior. J. Bank. Financ. **24**, 809–824 (2000)

Rabobank. 2011. *Special report: cooperative banks in the spotlight*. Economic Research Department.

Rasmussen, E.: Mutual banks and stock banks. J. Law Econ. **31**, 395–421 (1988)

Repullo, R.: Capital requirements, market power, and risk-taking in banking. J. Financ. Intermediation **13**, 156–182 (2004)

Salas, V., Saurina, J.: Deregulation, market power and risk behavior in Spanish banks. Eur. Econ. Rev. **47**, 1061–1075 (2003)

Saunders, A., Strock, E., Travlos, N.: Ownership structure, deregulation and bank risk taking. J. Financ. **45**, 643–654 (1990)

Schaeck, K., Čihák, M.: Competition, efficiency, and stability in banking. Financ. Manage. **43**(1), 215–241 (2014)

Schaeck, K., Čihák, M., Wolfe, S.: Are more competitive banking systems more stable? J. Money, Credit, Bank. **41**, 711–734 (2009)

Schelling, T.: The Strategy of Conflict. Harvard University Press, Cambridge, MA (1960)

Schmidt, R.H.: Microfinance, Innovations and Commercialisation. In: Anderloni, L., Llewellyn, D., Schmidt, R.H. (eds.) Financial Innovation in Retail and Corporate Banking. Edward Elgar, Aldershot (2009)

Shaked, A., Sutton, J.: Relaxing price competition through product differentiation. Rev. Econ. Stud. **49**, 3–14 (1982)

Singh, N., Vives, X.: Price and quantity competition in a differentiated duopoly. RAND J. Econ. **15**, 546–554 (1984)

Sklivas, S.D.: The strategic choice of managerial incentives. RAND J. Econ. **18**, 452–458 (1987)

Stefancic, M., Kathitziotis, N.: An evaluation of Italian banks in the period of financial distress. Int. Business and Econ. Res. J. **10**, 103–114 (2011)

Stefancic, M. (2010) Cooperative credit network: advantages and challenges in Italian cooperative credit banks. Euricse Working Papers, No. 16

Tirole, J.: The theory of corporate finance. Princeton University Press, Princeton, NJ (2006)

Townsend, R.M.: Optimal contracts and competitive markets with costly state verification. J. Econ. Theory **21**, 265–293 (1979)

Venanzi, D., Matteucci, P.: The largest cooperative banks in Continental Europe: a sustainable model of banking. Int. J. Sust. Dev. World **29**(1), 84–97 (2022)

Verbrugge, J.A., Jahera, J.S., Jr.: Expense-Preference behavior in the saving and loan industry. J. Money, Credit, Bank. **13**, 465–476 (1981)

Vickers, J.: Delegation and the theory of the firm. Econ. J. **95**(Supplement), 138–147 (1985)

Williamson, S.D.: Costly monitoring financial intermediation and equilibrium credit rationing. J. Monet. Econ. **18**, 159–179 (1986)

World Council of Credit Unions. (2012). *2011 Statistical Report* (Madison, WI, USA)