

# THE EFFECTS OF EXPENSE PREFERENCE ON FINANCIAL STABILITY\*

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## Abstract

This paper analyses the effects of competition between banks with different ownership structure on financial stability, social welfare, risk-taking incentives and performance. We present a model of strategic competition in the retail banking sector where a profit-maximizing bank (a commercial bank) competes against a bank exhibiting *expense preference behavior* (i.e., a stakeholders' bank).

Our main conclusions are that the presence of a stakeholders' bank makes competition fiercer, increases social welfare, and reduces systemic financial risk. We also show that stakeholders' banks are less risk-inclined and obtain a higher market share than commercial ones, and that any bank is less stable and less profitable when competing against a stakeholders' bank.

Finally, using a cross-country panel database the main model conclusion -the presence of stakeholders banks in the system enhances financial stability- is empirically validated.

**Keywords:** Expense preference behavior, Ownership structure, Risk-taking, Financial stability, Banking regulation.

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## 1.- INTRODUCTION

The way that corporate governance affects the risk-taking incentives of banks have been thoroughly analyzed in the economic literature during the last years. A generally accepted conclusion is that the ownership structure influences the portfolio selection in risky assets: managerially controlled banks are less risky than profit-maximizing banks (e.g., Saunders et al., 1990, Cordel et al., 1993, Gropper and Beard, 1995; Fraser and Zardkoohi, 1996; Esty, 1997; Leaven and Levine, 2006; Iannotta et al., 2007; Čihák and Hesse, 2007). However, to the best of our knowledge, the effects of competition between banks with different ownership structure on financial risk are still far from known and have not received much attention from academics and policy makers.

The economic implications of such a question become relevant, because many countries have a banking system with different ownership structures. Consequently, understanding the effect of competition among heterogeneous banks on financial risk may have important policy implications, something of particular interest at current times: *“The actual financial crisis has put bank stability concern at the heart of public policy debate”* (IMF, 2007). In turn, bank stability seems to be partially related to banks' ownership structure, leading to the question of which ownership form becomes safer.

The present paper is concerned about how the ownership structure affects the strategic interaction between two competing banks. In particular, the following questions are addressed:

- Do the risk profile, the market share and the expected economic profits of a shareholders' bank differ from those of a bank controlled by stakeholders?
- Does the ownership structure of a bank affect the risk-taking incentives of its competitor? And more importantly,

- Does a change in the ownership structure of a bank (from stakeholder bank to stockholder bank or vice versa) affect financial stability and social welfare?

To answer these questions we present a model of duopolistic competition for the retail banking market where the two banks have different ownership structure: financial institutions can either be *stockholder* banks or *stakeholder* banks. The first ones are commercial banks. The second ones can -in our context- be either mutual or savings banks.<sup>1</sup> Commercial Banks (CBs henceforth) are profit-maximisers, while Stakeholders' Banks (SBs henceforth) are not-for-profit organizations competing under the same regulatory and competitive conditions as other ownership forms. Our model specification allows the CB to behave as a SB and vice versa, allowing us to explore the interaction between different combinations of ownership structures (i.e., two CBs, two SBs, one SB + one CB).

The SBs are characterized by extreme diffusion of ownership. The *property rights theory* suggests that the loss of assignment of property rights in these organizations will allow managers to take the actual control of the bank, with preferences which may be (and we assume they are) different from the shareholders' ones, that is, different from value-maximization.

We model the preferences exhibited by SB appealing to the *expense preference theory* of Williamson (1963) and Rees (1974). This theory envisages firms as organizations where managers wish to maximize their utilities through the pursuit of

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<sup>1</sup> Savings banks are a kind of stakeholders banks with no formal owners, and by law they must (a) pursue a wide set of social goals (that may conflict with value maximization); (b) either retain their profits or invest part of them in social programs. Savings banks can be organized in different ways, depending on national legislations. In Europe there are savings banks that are joint stock companies or private entities (Ireland, United Kingdom, Italy, Sweden, Belgium, Finland, Holland and Denmark); public entities (Portugal, Switzerland, Austria, Germany, Greece and Luxemburg); finally, some of them are private foundations (Spain and Norway).

Mutual (or cooperative) banks are customers-owned entities that aim to provide the best possible products and services to its members.

non-profit-maximizing policies, subject to the constraint of not having operating losses. In particular, it is usually accepted that managers increase staff expenditures, managerial emoluments, and discretionary profits beyond the profit-maximizing point (see Williamson, 1963, and Rees, 1974). Therefore, “in its narrow operational form, the expense preference theory posits that firms will hire more staff and/or pay higher managerial wages than profit maximising firms, everything else being equal” (Edwards, 1977).

Following this line of reasoning, we assume that managers of SBs attempt to maximize an objective function that depends on profits and on labor expenditures.<sup>2</sup> As a consequence, SBs show the so-called *expense preference behavior*. The empirical literature has validated such a hypothesis by showing how mutual and savings banks tend to exhibit higher preferences for labour expenditures than CBs (see Hannan and Mavinga, 1980; Verbrugge and Jahera, 1981; Akella and Greenbaum, 1988; Mester, 1989).

The present paper argues that expense preference behavior can have implications on competition, welfare and stability. In particular, we are concerned with the consequences of transforming a CB into a SB on financial stability. Such a transformation can induce an externality which effects on financial stability underpins many of the conjectures often made in policy discussions on the consequences of the presence of certain banks (in our case, stakeholders banks) on the stability of other banks. The empirical literature seems to have provided support for the existence of such externalities. For instance, Čihák and Hesse (2007) and De Nicolò (2000) show that in

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<sup>2</sup> On the one hand, profits increase managers’ utilities due to: (a) the existence of satisfactory profits is necessary to assure the interference-free operation of the bank to the management; (b) managers derive satisfaction from self-fulfillment and organizational achievement, and profits represent a measure of such a success (Williamson, 1963). On the other hand, managers like contracting additional staff as well as practicing *on the job consumption*, which yields higher labor expenditures.

systems with a high presence of non-profit maximizing banks, CBs become less stable than they would be otherwise. We analyze this type of externality and its implications for financial stability.

Our analysis has its starting point in Allen and Gale (2000, Ch. 8) and Purroy and Salas (2000). The first study analyzes the trade-off between financial stability and competition among banks competing à-la-Cournot. They show that the optimal level of risk assumed by a bank increases as the number of deposit market competitors increases. The model is restrained to competition between symmetric banks with a homogenous financial product. The second paper analyzes the effect of different ownership structures on profits, market shares and interest rates, but does not take into account risk considerations. Moreover, their conclusions depend on the type of competition considered, that is, on whether firms compete on quantities with homogeneous products or on prices with differentiated products.

Our setup borrows from both models considering risk as well as different ownership structures. Furthermore, we endogenously determine the kind of competition: appealing to Singh and Vives (1984), we show that competition turns out to be à-la-Cournot. In sum, we introduce ownership considerations into the analysis of the relationship between competition and stability, endogenously determining how banks compete.<sup>3</sup>

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<sup>3</sup> In contrast, past work has focused on either

- (a) the comparison between commercial and stakeholders (savings and mutual) banks in terms of performance (Purroy and Salas, 2000); risk-incentives (Saunders et al., 2001; Esty, 1997; Iannotta et al., 2007; Bøhren and Josefsen, 2007; García-Marco and Robles-Fernández, 2008); lending behaviour (Delgado et al., 2007); and corporate governance practices (Crespí et al., 2004); or
- (b) the relationship between stability and competition among symmetric banks (Keely, 1990; Besanko and Thakor, 1993; Demsetz et al., 1996; Brewer and Saldenber, 1996; Matutes and Vives, 1996, 2000; Hellmann et al., 2000; Salas and Saurina, 2003; Repullo, 2004; Boyd et al., 2005, 2006; Jiménez et al., 2007).

The main conclusions obtained are:

- The presence of a SB increases the intensity of rivalry, reduces financial risk and increases social welfare.
- SBs are less risk-inclined, and outperform CBs in market share and profits. Interestingly, our results suggest that CBs may also improve their own profits by adopting some degree of expense preference.
- A bank (independently of its ownership structure) is less stable and less profitable when competing against a SB.

All these findings are supported by the empirical evidence and can yield policy implications, particularly relevant in the current debate about the conversion of SBs into CBs.

In Section 2, we present and discuss the model assumptions, providing some preliminary results useful in following sections. Section 3 analyses (a) how CBs and SBs differ in their risk behaviour, market share, interest rates and economic profits; (b) how competition between banks with different ownership structure shapes risk-taking incentives and profitability. In Section 4, the implications of expense preference behavior on financial stability and welfare are presented. In Section 5 we test the main conclusion of the paper (the presence of stakeholders banks helps to increase financial stability), providing empirical support. Section 6 concludes.

## **2.- THE MODEL**

This section presents a model of strategic competition for the retail banking sector where risk is explicitly introduced. The model borrows from Allen and Gale (2000, 2004) and Purroy and Salas (2000). Let us present the model assumptions:

## 2.1 Assumptions

(A1) There are two banks with different ownership structures: the first one is a *Commercial Bank* (CB, represented by subindex 1). The second one is a *Stakeholders' Bank* (SB, represented by subindex 2).

Banks offer differentiated financial products, which gives them some market power.<sup>4</sup>

Both banks are risk neutral and choose a portfolio investment consisting of perfectly correlated risks.<sup>5</sup> A portfolio is characterized by its size ( $D_i$ ) and rate of return ( $R_i$ ), where  $i = 1, 2$ .

The implications of different ownership structures are explained in detail in A6.

(A2) The investments made by both banks have a two-point return structure: for each dollar invested, the bank  $i$  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. Each bank chooses the riskiness of its portfolio by choosing the target return  $R_i$  on its investment. Furthermore, the functional form for the probability is assumed to be:

$$P(R_i) = 1 - AR_i \quad i = 1, 2 \quad (1)$$

where  $A \geq 0$  is exogenously given and represents the price of risk, and  $R_i$  is restricted to the interval  $[0, 1/A]$ .<sup>6</sup>

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<sup>4</sup> Although it can be argued that banking products are largely homogeneous with respect to their physical attributes (e.g., deposits or credit cards), differentiation comes from location and quality reasons (e.g., branch network, automatic teller machines, telebanking, ...) or due to their brand or images (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.

<sup>5</sup> This assumption is equivalent to assuming that investment risks can be decomposed into a common and an idiosyncratic component. If there are a very large number of investments, the idiosyncratic component can be perfectly pooled. Then the idiosyncratic risk disappears from the analysis and only the common component (representing the systemic risk) matters.

<sup>6</sup> This functional specification can be seen as the linear approximation of  $\exp(-AR_i)$ .

Therefore, *financial risk* is associated to the probability of banking failure. That is, a bank increases its risk when it chooses a higher target return, since it increases the failure probability.

(A3) Banks have no capital of their own, and raise funds from depositors to invest and lend. To attract deposits, bank  $i$  offers an interest rate  $r_i$ , and it will be paid independently of whether the bank goes bankrupt or not (i.e., as in Allen and Gale, 2000, 2004 and Boyd and De Nicoló, 2005, we assume that there is a full-deposit-insurance, for which banks pay a flat rate  $s > 0$ ). This fact makes the supply of funds independent of the bank portfolio risk.

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 represents a *financial crisis* in our model.

(A4) Depositors are risk-neutral and supply elastically to bank  $i$  ( $i=1,2$ ) according to a linear schedule:

$$D_i = l + fr_i - gr_j \quad i, j = 1, 2 \quad (2)$$

where  $l, f, g$  are positive parameters.

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):

$$U = r_i(D)D_i + r_j(D)D_j - T(D) \quad \text{with} \quad T = \alpha(D_i + D_j) + \frac{(D_i^2 + D_j^2) + (2\gamma D_i D_j)}{2} \quad (3)$$

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

$$r_i = \alpha + \beta D_i + \gamma D_j, \quad i, j = 1, 2 \quad (4)$$



where  $\alpha, \beta, \gamma$  are positive parameters satisfying  $\alpha > 0; \beta \geq \frac{1}{2} \geq \gamma$  (we assume that  $\beta \geq \frac{1}{2}$ ; otherwise, consumer surplus could decrease with the number of deposits).

The parameter  $\alpha$  can be interpreted as the reservation value of the depositors (risk-free rate if there were not *deposit insurance*). If both banks offer the same expected return  $r_1 = r_2 = r$ , supply becomes  $D = l + (f - g)r$  which is positive if and only if  $r > \alpha$ .

The parameter  $\gamma$  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) :

$$l = \frac{-\alpha}{\beta + \gamma}; f = \frac{\beta}{\beta^2 - \gamma^2}; g = \frac{\gamma}{\beta^2 - \gamma^2}, \text{ where } f \geq g \geq 0.$$

The depositor's utility function suggests that he values variety, i.e., he prefers to use both banks rather than only one. This appears to be according to the fact that most of the people have deposit accounts in more than just one bank. This fact can be due to the existence of different services provided, for example because one bank offers better credit card services while the other one offers better conditions for credit loans.

**(A5)** 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  $k_i$  represents the bank's marginal productivity and  $L_i$  represents the number of workers. We further assume that both banks are equally efficient ( $k_1 = k_2 = k$ ),<sup>7</sup> and that there is a perfectly elastic supply of labor at a cost  $\bar{w}$  per worker.

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

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<sup>7</sup> In the case of Spain, the empirical evidence shows that savings banks and commercial banks have similar levels of productive efficiency (Grifell-Tatjé and Lovell, 1997; Lozano-Vivas, 1998).

$$\begin{aligned}
E\pi_i &= P(R_i) \left[ (R_i - r_i(D) - s)D_i - \bar{w}L_i \right] = P(R_i) \left[ R_i D_i - r_i(D)D_i - \bar{w} \frac{D_i}{k} - sD_i \right] = \\
&= P(R_i)(R_i - r_i(D) - c - s)D_i \quad i=1,2
\end{aligned} \tag{6}$$

where  $c = \frac{\bar{w}}{k}$  represents the marginal cost of deposits.

The parameters satisfy  $0 \leq A < \frac{1}{\alpha + c + s}$  (otherwise, deposit supply could be negative).

**(A6)** Banks with different ownership structures pursue different goals, which are characterized through different objective functions. As has been explained in the introduction, we assume that CBs' shareholders are able to enforce first-best contracts to their managers, aiming to maximize expected profits ( $E\pi_1$ ). However, the lack of a clear allocation of property rights in SBs makes their managers take the effective control of those organizations, which will show the so-called *expense preference behaviour* (EPB henceforth). The corresponding utility function (that we call *overall expected benefits*) depend on both profits and labour expenditures,  $\pi_2$  and  $Z_2$  respectively, satisfying  $E(Z_2) = P(R_2)\bar{w}L_2$ ;  $\frac{\partial U_2}{\partial E\pi_2} > 0$ ;  $\frac{\partial U_2}{\partial EZ_2} > 0$ .

Preferences for labour expenditures can be understood as either preferences for a larger staff, or as preferences for higher *emoluments* (the fraction of managerial salaries that are discretionary: rewards which, if removed, would not cause the managers to look for another employment). In order to integrate both views we define the total expected income paid to the workers as:

$$E(w_2, L_2) = P(R_2)(R_2 - r_2(D) - s)D_2, ,$$

$$\text{where } E(w_2) = \frac{P(R_2)(R_2 - r_2(D) - s)D_2}{L_2}$$

and managerial emoluments are given by the difference  $Ew_2 - \bar{w}$ . Thus, the SB objective function can be expressed as:

$$EU_2 = E\pi_2 + \theta_2 E(Z_2), \quad (7)$$

where  $\theta_2 > 0$  measures the degree of EPB. Rearranging we finally obtain:

$$EU_2 = P(R_2)(R_2 - r_2(D) - c(1 - \theta_2) - s)D_2. \quad (8)$$

**Remark 1:** (a)  $\theta_2$  is positive because the *overall expected benefits* of the SB increases with labour expenditures. We assume that  $\theta_2$  is exogenously given and depends on the degree of managerial discretion (which may depend on the SB ownership structure, the regulation of the different regions, or the type and degree of imperfections in goods and capital markets).

(b)  $\theta_2 > 0$  implies that expense preference yields a reduction of the “effective” deposits marginal cost (i.e., the managers perceive  $c(1 - \theta_2)$  as the marginal cost). It can be seen as a strategic competitive advantage in terms of production costs.

(c) If  $\theta_2 = 0$ , then  $EU_2 = E\pi_2$ : the objective of the SB would be profit maximisation, so the SB becomes a CB and competition is established between CBs.

(d) For simplicity, from now on we assume that the CB has  $\theta_1 = 0$ . As we will see in Proposition 1, CBs can increase profits adopting some expense preference behavior,  $\theta_1 > 0$  (for example through the use of managerial incentives linked to expansion). Thus,  $\theta_1 = 0$  must be understood (w.l.o.g.) as a parameter normalization; see Proposition 1(b).

Thus,  $\theta_1 > 0$  would mean that competition is established between two SBs. ♦

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

$$MAX EU_i = P(R_i)[(R_i - r_i(D) - s - c(1 - \theta_i))]D_i \quad i = 1, 2. \quad (9)$$

We now focus on determining the nature of strategic competition between banks. Instead of assuming that banks face Cournot competition (offering identical products) or Bertrand competition (offering differentiated ones), we endogenously obtain how banks compete. The following lemma establishes how is the equilibrium nature of competition in the retail banking sector.

**Lemma 1:** Under assumptions A1 to A6, banks compete *à-la-Cournot*.<sup>8</sup>

Proof: See Appendix 1.

The intuition behind Lemma 1 is that the relevant decision variable in the banking sector is (something related to) the number of branches rather than interest rates. We can link such a variable to the quality of services, which depends on the density of the branch network, number of Automated Teller Machines (ATM), reputation for solvency, or the quality of the staff (Neven, 1990, p. 164). Since the quality of the banking services (perceived by consumers) is higher as the number of customers increases, it seems sensible that banks will compete to get the maximum number of deposits, i.e., *à-la-Cournot*. This result is consistent with Neuberger (1998) and De Bandt (1996), who state that Bertrand competition is not appropriate for retail banking services. They claim that in the retail banking market, the strategic variable decision is quality rather than interest rates.

Once we have determined that competition is established in quantities, we finally assume that the timing of the game is as follows:

(A7) The economy lasts two dates, 0 and 1: at date 0, banks simultaneously choose  $D_i$  and  $R_i$  (unobservable variables to outsiders). At date 1, outsiders can only

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<sup>8</sup> This is a crucial assumption since (as we will comment on later) some paper conclusions will change under price competition.

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 a portfolio selection problem).

## 2.2. Characterization of the equilibrium

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

The pair  $(D_i, R_i)$  is chosen to maximise:

$$\begin{aligned} \text{MAX}_{D_i, R_i} EU_i &= P(R_i) [(R_i - r_i(D) - s - c(1 - \theta_i))] D_i \quad i = 1, 2 \end{aligned} \quad (10)$$

Maximising  $EU_i$  with respect to  $D_i$  and  $R_i$  yields the following First Order Conditions

(necessary conditions for an interior solution:  $D_i > 0$  and  $R \in (0, \frac{1}{A})$ ):

$$\begin{aligned} \frac{\delta U_i}{\delta D_i} = 0 &\Rightarrow R_i - r_i(D) - c \cdot (1 - \theta_i) - s = D_i \cdot r'_i(D) \\ \frac{\delta U_i}{\delta R_i} = 0 &\Rightarrow R_i - r_i(D) - c \cdot (1 - \theta_i) - s = \frac{-P(R_i)}{P'(R_i)} \end{aligned} \quad (11)$$

Hence, the equilibrium must satisfy the following condition:

$$R_i - r_i(D) - c \cdot (1 - \theta_i) - s = D_i \cdot r'_i(D) = \frac{-P(R_i)}{P'(R_i)}. \quad (12)$$

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

**Lemma 2:** There exists a unique equilibrium  $(D^*_i, R^*_i)$ , determined from the equation:

$$R_i - r_i(D) - c \cdot (1 - \theta_i) - s = D_i \cdot r'_i(D) = \frac{-P(R_i)}{P'(R_i)}.$$

Proof: See Appendix 1.

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

$$R_i^* = \frac{4\beta^2 - \gamma^2}{A(6\beta^2 - \gamma^2 - \beta\gamma)} + \frac{(\alpha + c + s)(2\beta^2 - \beta\gamma)}{6\beta^2 - \gamma^2 - \beta\gamma} - c\theta_i \left[ \frac{12\beta^4 - 3(\beta\gamma)^2}{(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2} \right] + c\theta_j \left[ \frac{4\beta^3\gamma - \beta\gamma^3}{(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2} \right] \quad (13)$$

$$D_i^* = \frac{2\beta - \gamma}{A(6\beta^2 - \gamma^2 - \beta\gamma)} + (\alpha + c + s) \left[ \frac{\gamma - 2\beta}{(6\beta^2 - \gamma^2 - \beta\gamma)} \right] - c\theta_i \left[ \frac{24\beta^3\gamma^2 - 3\beta\gamma^4 - 48\beta^5}{(4\beta^2 - \gamma^2)[(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2]} \right] + c\theta_j \left[ \frac{8\beta^3\gamma^3 - 16\beta^4\gamma - \gamma^5}{(4\beta^2 - \gamma^2)[(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2]} \right] \quad (14)$$

$$r_i^* = \alpha + \frac{2\beta^2 + \beta\gamma - \gamma^2}{A(6\beta^2 - \gamma^2 - \beta\gamma)} + \frac{(\alpha + c + s)(\gamma^2 - 2\beta^2 - \beta\gamma)}{(6\beta^2 - \gamma^2 - \beta\gamma)} - c\theta_i \left[ \frac{40\beta^4\gamma^2 + \gamma^6 - 48\beta^6 - 3\beta^2\gamma^4 - 8\beta^3\gamma^4}{(4\beta^2 - \gamma^2)[(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2]} \right] + c\theta_j \left[ \frac{8\beta^4\gamma^3 + 32\beta^5\gamma + 2\beta\gamma^5 - 24(\beta\gamma)^3}{(4\beta^2 - \gamma^2)[(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2]} \right] \quad (15)$$

$$E\pi_i^* = P(R_i^*) \cdot (R_i^* - r_i^* - c_i - s) \cdot D_i^* \quad (16)$$

$$EU_i^* = P(R_i^*) \cdot (R_i^* - r_i^* - c_i(1 - \theta_i) - s) \cdot D_i^*, \quad i=1,2. \quad (17)$$

These expressions allow us to derive predictions on two relevant issues. First, we can check the effect that the interplay between competition and bank ownership structure in the retail banking market has on profits, market share, interest rates, and risk taking incentives (Proposition 1). Second, we can investigate the implications that expense preferences have on welfare and financial stability (Proposition 2). The next section is devoted to obtain and comment on Proposition 1, while Proposition 2 is presented in Section 4.

### 3.- THE EFFECTS ON PERFORMANCE

This section analyses the relationship between bank's ownership, risk and performance. In particular, we explore how is the behavior of a bank depending on its

own and the rival's ownership structures. The following proposition establishes the effects that expense preference has on risk, market share and profits:

**Proposition 1:** (a) *The risk shifting decreases (increases) with its own (the rival's) expense preference:*  $\frac{\partial R_i}{\partial \theta_i} < 0$  ,  $\frac{\partial R_i}{\partial \theta_j} > 0$  .

*The market share increases (decreases) with its own (the rival's) expense preference:*

$$\frac{\partial D_i}{\partial \theta_i} > 0$$
 ,  $\frac{\partial D_i}{\partial \theta_j} < 0$  .

*The offered interest rate increases both with its own and the rival's expense preference:*

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

(b) *The expected economic profit is inversely U-shaped (decreases) with respect to its*

*own (the rival's) degree of expense preference:*  $\frac{\partial^2 E\pi_i}{\partial \theta_i^2} < 0$  ,  $\frac{\partial E\pi_i}{\partial \theta_j} < 0$  .

Proof: See Appendix 2.

The intuition behind Prop. 1 can be seen in terms of the relationship between competition, risk-taking and charter values. Let us first introduce the notions of *charter value* and *competition* and then analyze the relationship between them:

The *charter value* is the benefit that accrues to a bank's shareholders/stakeholders from its future operations, and it represents the opportunity cost of going bankrupt. Therefore, a bank must balance the expected gain from increasing risk-taking and the loss of charter values if it fails.

*Competition for deposits* refers to the absence of market power, i.e., to the inability of a bank to extract rents from deposits. Since we are in a duopoly setting, we can proxy

competition by “intensity of rivalry”, understood as the difficulty faced by a bank to offer lower interest rates to get higher margins.

Following the empirical finding of Keely (1990) of a negative relation between competition and bank failures in the US during the eighties, theoretical research initially stressed how competition worsened the incentives of banks to take risks.<sup>9</sup> The general idea is that competition may erode the so-called *franchise value* of a bank, which might encourage shareholders/stakeholders to pursue riskier policies in order to maintain their former profits (*franchise value paradigm*). In our model, the franchise value paradigm may help to interpret why SBs are less risk-inclined than CBs, and why any bank finds it optimal to assume more risk when competing against a SB. The consistency of the franchise value paradigm with Prop. 1 can be seen noting that the presence of SBs increases the intensity of rivalry: expense preferences, by reducing the “effective” marginal cost of deposits, yield a strategic competitive advantage, making the SB more efficient and competitive. The increase in efficiency allows the SB to increase its deposit supply (and interest rates) making more aggressive its strategy. The higher market share of the SB leads to an increase in its number of branches and labour expenditures, thus increasing its overall benefits (that include both economic profits and labour expenditures). As a result, the SB becomes more valuable, and reduces its risk-taking behaviour. Besides, providing that decisions are strategic substitutes, a more aggressive behaviour of the SB reduces (increases) the market share and charter value (interest rates) of its rival. The CB prefers a symmetric market, where competition occurs between profit-maximising banks. The SB also prefers to compete against a CB.

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<sup>9</sup> For theoretical analysis, papers like Keeley (1990), Besanko and Thakor (1993), Suárez (1994), Matutes and Vives (1996, 2000), Hellmann et al. (2000), and Repullo (2004) develop models supporting a trade-off between competition and financial stability. The papers by Keely (1990), Demsetz et al. (1996), Brewer and Saldenberg (1996), Hellman et al. (2000), Salas and Saurina (2003) and Jiménez et al. (2007) provide empirical support to the former models.



And independently of its ownership structure, any bank becomes eager to select high expected returns (with high bankruptcy probabilities) when competing against a SB. In short: expense preference increases (decreases) the SB (SB's rival) opportunity cost of going bankrupt, which deters (encourages) its risk-taking behaviour. Figures 1a and 1b show how these two effects take place.

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**Insert figures 1a and 1b about here**

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Interestingly, given that the expected profits of any bank show an inverse U-shaped relationship with respect to its degree of expense preference, our model suggests that a CB may be better-off inducing some degree of EPB.<sup>10</sup> This can be achieved by self-inducing the profit-maximizer degree of expense preference through the use of managerial incentives linked to expansion as in Purroy and Salas (2000).<sup>11</sup> Consequently, the optimal strategy of the CB is to imitate its rival (to some extent) by inducing a more aggressive behaviour in their managers. This conclusion is consistent with Allen et al. (2006) prediction of that profits may increase when the firm adopts a multidimensional objective function that recognizes the interest of several stakeholders. In sum, CBs' shareholders use explicit incentives in order to induce the optimal degree

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<sup>10</sup> There is an optimal value of  $\theta_i$  that maximizes (expected) profits. This value is the solution of a second degree equation. Simulations show that ceteris paribus  $\theta_i^*$  decreases with  $A$  and increases with  $\gamma$  (i.e., the less differentiated products, the higher  $\theta_i^*$ , and the higher the price of risk, the lower  $\theta_i^*$ ). This fact is only relevant for CBs, because the SB degree of expense preference  $\theta_2$  can not be chosen in the short term so we take it as exogenously given. Consequently, CBs have higher expected economic profits than SBs.

<sup>11</sup> This finding is in line with the *strategic incentives theory*: when firms choose output, they may benefit from distorting their managers' incentives relative to profit maximization because of its effects on strategic interaction (Fershtman and Judd, 1987; Sklivas, 1987; Vickers, 1985; Schelling, 1960). In the banking sector, this result is empirically supported by Edwards (1977), who shows that the behavior of financial institutions is better explained by an expense preference framework than by a profit maximizing one.

of EPB in their managers, but the use of incentives in SBs becomes irrelevant since they are manager-controlled. Our model then suggests that the presence of explicit incentives will be higher in CBs than in SBs. This result can be related to Rasmussen (1988) and Masulis (1987), who find that financial mutual institutions tend to attract less sophisticated and more risk-adverse managers, since those firms do not offer them explicit incentives like stock-options or bonuses. In what follows and for the sake of simplicity, the maximiser degree of EPB selected by the CB through the use of managerial incentives ( $\theta_1^*$ ) is normalized to zero:  $\theta_1 = 0$  and  $\theta_2 \in (0,1)$  (asterisks are omitted in order to recall that normalized values are not equilibrium values).

Finally, we link the existing empirical evidence to our theoretical results:

- (a) The empirical work on the behaviour of mutual banks suggests that managerially controlled banks have less incentive to take on risks than shareholder-controlled banks. (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, 2006; Iannotta et al., 2007; Čihák and Hesse, 2007).
- (b) Some studies show that in those systems with a high presence of non-profit maximising banks, CBs are less stable than they would otherwise be (Čihák and Hesse, 2007; De Nicolò, 2000).
- (c) The liberalization process of Spanish Savings Banks allowed them to expand beyond their original areas, to compete nationwide and among-themselves, lead them to assume more risks (Illueca, Norden and Udell, 2008). This is consistent with our result showing that a bank (independently of its ownership structure) faces a higher rivalry and takes more risks when competing against a SB. Furthermore, recent empirical studies show that in the retail banking market of countries where Savings Banks are more relevant (Spain and Norway), they are

less risk inclined and tend to outperform CBs by gaining market share (García-Marco and Robles-Fernández, 2008; Bøhren and Josefsen, 2007).

#### 4. THE EFFECTS ON FINANCIAL STABILITY AND WELFARE

In this section we analyse the implications that competition between banks with different ownership structures has on (systemic) financial stability and welfare. We first define *welfare* (Matutes and Vives, 2000) and *financial stability* (Allen and Gale, 2000): *Welfare* is defined as the Expected Gross Surplus (Consumer Surplus plus bank's overall expected utilities) minus the deadweight loss corresponding to the expected social cost of bankruptcy (DL):

$$W = CS + EU_i + EU_j - DL \quad , \quad (i, j=1,2)$$

with

$$CS = U(D) = r_i(D) \cdot D_i + r_j(D) \cdot D_j - T(D) \quad , \quad DL = [(1 - P(R_i))(1 - P(R_j))] FC$$

Therefore, we have:

$$W = D_i [P(R_i)(R_i - r_i(D) - c(1 - \theta_i) - s) + r_i(D)] + D_j [P(R_j)(R_j - r_j - c(1 - \theta_j) - s) + r_j(D)] - T(D) - [(1 - P(R_i))(1 - P(R_j))] FC, \quad i, j = 1, 2 \quad (21)$$

An increase in *financial stability* is understood as a reduction of the overall level of financial risk:  $(1 - P(R_1))(1 - P(R_2))$ . This mathematical expression represents the probability of the event “the two banks go bankrupt”, and in our context such an event is associated to a financial crisis.

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

From a global perspective, the impact of ownership structure on welfare and financial risk becomes:

***Proposition 2: Stakeholders Banks help to***

*(a) increase financial stability;*

*(b) increase social welfare.*

Proof: See Appendix 3.

Expense preferences have a direct effect on the SB and an indirect effect on the SB's rival. Both effects increase the interest rates offered. Moreover, the direct (indirect) effect on the SB (SB's rivals) increases (reduces) both its market share and the overall benefits, at the time that it reduces (increases) its risk-taking incentives (see Prop. 1). 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 the total numbers of deposits, raises interest rates, and reduces the level of global risk. Thus, the appearance of expense preference behaviours makes competition tougher (that is, it leads to an increase in consumer surplus and a reduction in aggregate expected economic profits), at the time that increases welfare and financial stability.

It is worth noting that considering different ownership structures allows us to distinguish between the effect that a change in a bank's ownership structure has on its strategic competitive advantage (i.e., on its "effective cost" efficiency) and on the intensity of rivalry faced by its rival. Both effects determine the impact that the change in banks' ownership has on welfare and financial stability. Our analysis reveals that competition can favour financial stability if the increase in the intensity of rivalry comes from the increase in efficiency (i.e., through a lower effective marginal cost).

This result suggests that the analysis of the relationship between competition and stability should take into account the factors that enhance competition, since different drivers may have distinct effects on financial stability. In particular, we show that if the increase in competition comes from an increase in efficiency (in our case, from the lower SBs' "effective marginal cost" of labour), then there will not be a trade-off between competition and financial stability. We thus conclude that when the increase of rivalry is due to the existence of EPB, then financial stability increases.

The two basic hypotheses in the literature relating financial stability and competition has been the *franchise value paradigm* (competition reduces financial stability) and the *risk-shifting hypothesis*<sup>12</sup> (competition increases financial stability). Most of the work in this branch of the literature has focused on the relationship between financial stability and competition among symmetric banks (proxy by concentration).<sup>13</sup> However, the studies have not analyzed the drivers of competition as has been done here, and do not provide a clear prediction (neither theoretical nor empirical) on the trade-off between competition and financial stability. It is worth mentioning that our model seems to provide support to the franchise value paradigm when considering the relationship between an increase in competition and *individual* bank risk-taking (i.e., the exhibition of expense preference behavior by a bank increases the risk-taking incentives of its rival), and to the risk-shifting hypothesis when considering the *overall* effect on financial stability (i.e., an increase in competition coming from the exhibition of EPB

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<sup>12</sup> 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).

<sup>13</sup> However, several papers (Berger et al., 2004; Beck et al., 2006; Schaeck et al., 2009; Jiménez et al., 2007) claim that competition and concentration are distinct from each other. They 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 ownership structure may be another determinant of the degree of contestability of banks.

reduces financial instability). Somehow, our model helps to integrate the franchise value paradigm with the risk-shifting hypothesis.

It must be mentioned that the type of competition is crucial to our results. For instance, the conclusions obtained in Proposition 1 would not remain under price competition. In such a case, banks' risk would decrease with its own and rival degree of expense preference, and the results on market share and interest rate would reverse with respect to the case analyzed (quantity competition): banks' market share would decrease (increase) with its own (the rival's) expense preference and the offered interest rate would decrease with its own and rival degree of expense preference. Furthermore, profits would decrease (increase) with respect to its own (the rival's) degree of expense preference. As a result, the conclusion on welfare in Proposition 2 would not hold under price competition: SBs would reduce the social welfare. The only conclusion that remains (independently of the type of competition) is that SBs help to make the financial system less risky.

Our conclusion on the higher welfare of systems dominated by SBs (Proposition 2b) is in line with the higher "social role" played by stakeholder-controlled banks. Savings Banks, credit unions and financial cooperatives contribute significantly to provide financial services to communities that, otherwise, could be excluded. This access is especially critical in periods of crisis, since the higher the opportunity of people to get finance, the higher their chances to generate income, accumulate assets or build human capital.

Regarding financial stability and risk-taking behaviour, our model predicts that stakeholder-controlled banks are less risky and help to reduce financial instability. In the next section, we provide empirical support for the second conclusion. Furthermore, our results are consistent with the empirical work of Čihák and Hesse (2007). For a sample of OECD countries, those authors find that cooperative banks are more stable

than commercial ones, and that a higher proportion of cooperatives help to reduce financial instability. This fact seems to be in line with the performance of cooperative banks along the financial crisis, where they have proved to be more stable: the group of banks that has seemingly been least affected by the current financial crisis are cooperative banks. None of them, anywhere in the world, has received government recapitalization as a result of the financial downturn and seem to remain well capitalized (World Council of Credit Unions, 2009).

From a regulatory point of view, Proposition 2 suggests that policy makers aiming to maximize 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 stakeholder-controlled banks.

## **5. OWNERSHIP STRUCTURE AND FINANCIAL STABILITY: EMPIRICAL EVIDENCE.**

The way that ownership structure affects stability and performance of banks (Prop. 1) has been analyzed in the empirical literature; see references above. In this section we conduct an empirical test on the main conclusion of the paper: increasing the proportion of SBs in a country (*stakeholderness*) favors its financial stability. The section is organized as follows: we first describe the data and summary statistics together with our measures of financial stability and stakeholderness. Second, we present the estimation methodologies. Lastly, we discuss the results.

### **5.1 Data and Summary statistics**

We have collected individual bank data from the BankScope database provided by Bureau van Dijk. The examined data corresponds to the period ranging from 1993 to

2007, and includes savings, commercial and cooperative banks from 72 countries: 17,876 banks, comprising 12,100 commercial banks, 3,359 cooperative banks and 2,417 savings banks. We use consolidated statements whenever available, and unconsolidated statements otherwise. In addition to the bank level data, we also use a number of macroeconomic, institutional, regulatory and other system-wide indicators. In Appendix 4, Table A.4.1 includes a detailed description of the variables as well as the data sources. Table A4.2 provides an overview of the descriptive statistics for the most important variables used in the analysis.

### **Empirical measures**

We first discuss some features of financial stability, and then we define *financial stability* and *stakeholderiness*, two variables drawn from the theoretical model.

Regarding financial stability at the systemic level, “one of the main challenges is the lack of an operational definition of its subject, i.e., financial stability” (Čihák, 2007, p. 2). However, most definitions agree on the basics. In particular, that financial stability is about the absence of system-wide episodes in which the financial system fails to function (crises), and about resilience of financial systems to stress (for a survey see, e.g., Čihák, 2006). Our theoretical model has considered an increase in financial stability as a reduction on the overall level of financial risk, i.e., as the reduction of the probability associated to the event “the two banks go bankrupt”:  $(1 - P(R_1))(1 - P(R_2))$ . Such an event is chosen to represent a systemic banking crisis.

Thus, to test Proposition 2(a), we use:

First, a *crisis dummy variable* that takes on the value 1 if a systemic crisis is observed in a particular year and 0 otherwise. We use the scheme used by Demirgüç-Kunt and Detragiache (2005) for the classification and timing of systemic banking problems.<sup>14</sup>

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<sup>14</sup> According to this scheme, one of the following criteria has to be met for a country to be classified as having experienced a systemic crisis: (i) emergency measures such as deposit freezes or bank holidays are



Since many crises run for multiple years we follow Demirgüç-Kunt and Detragiache (2002), Beck et al (2006) and Schaeck et al. (2009), who exclude the years after the initial year of the crisis in order to avoid endogeneity problems. This is because the crisis itself may affect the behavior of some of the explanatory variables. However, we also perform the analysis including the crisis year (both with value zero and value one) and our main result remains unchanged.

Second, to capture the second feature of financial stability (resilience of financial systems to stress) we use the *country-portfolio Z-score*, (Demirgüç-Kunt and Detragiache, 2010; Čihák, 2007, De Nicolò and Loukoianova, 2007) as a rough measure of systemic soundness. We compute the country-portfolio Z-score by weighted aggregation of all individual banks' Z-score in the country  $j$  at time  $t$ . The individual bank's Z-score is widely used as a measure of bank distance to default (Boyd and Runkle, 1993, Maechler et al., 2005, Beck and Laeven, 2006, Laeven and Levine, 2006). This measure decreases with the banks' probability of failure (i.e. the higher the probability of failure the lower the Z-score). The Z-score of a bank  $i$  at time  $t$  in a country  $j$  is defined as:

$$Z_{ijt} = \frac{ROA_{ijt} + (E/A)_{ijt}}{\sigma(ROA)}, \text{ where:}$$

- $ROA_{ijt}$  stands from Return on Assets of bank  $i$  at time  $t$ ;
- $(E/A)_{ijt}$  is the equity capital of bank  $i$  at time  $t$  in percentage of total assets;
- $\sigma(ROA)$  is the  $ROA$  standard deviation (volatility).

The Z-score measures the distance from insolvency (Roy, 1952), which is defined as a state in which losses surmount equity:  $E < -\pi$ , where  $E$  represents equity and

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implemented; (ii) large-scale bank nationalizations take place; (iii) non-performing assets reach at least 10% of total assets; or (iv) fiscal cost of the rescue operations reaches 2% of GDP. We have updated Demirgüç-Kunt and Detragiache database by adding the 2007 systemic financial crisis in US and UK.

$\pi$  represents profits.<sup>15</sup> In our model banks fail when gross profits are insufficient to pay-off depositors, since banks are for simplicity assumed to operate without equity capital. (If we include equity capital in the model, bankruptcy will occur when equity capital is depleted, and the definition of the Z-score should be generalized in order to reflect that banks can hold equity).

The country-portfolio Z-score is constructed by weighting the Z-score of each bank by the ratio of its assets to total country assets. Lower (higher) levels of the aggregate Z-score imply a higher (lower) probability of systemic joint failure.<sup>16</sup> The

“country-portfolio Z-score” of country  $j$  at time  $t$  is defined as  $Z_{jt} = \sum_{i=1}^n Z_{ijt} \times \alpha_{ijt}$ , where:<sup>17</sup>

- $Z_{ijt}$  stands for Z-score of bank  $i$  at country  $j$  at time  $t$  as defined above.
- $\alpha_{ijt}$  stands for each bank  $i$  ratio of asset at time  $t$  in country  $j$  to total country assets.

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<sup>15</sup> The probability of insolvency can be expressed as  $\text{Prob}(-ROA < E/A)$ . If profits are normally distributed, then the inverse of the probability of insolvency is equal to  $(ROA + E/A) / \sigma(ROA)$  (Laeven and Levine, 2009). Then, the Z-score represents the number of standard deviations below the mean by which profits would have to fall so as to just deplete equity. Even if profits are not normally distributed, the Z-score is a lower bound on the probability of default (by Tchebycheff inequality). A higher Z-score then implies a lower probability of insolvency.

<sup>16</sup> We are concerned about the limitations of this measure of financial stability since it does not take into account the correlation of losses across defaults and losses given default.

In unreported regressions, we perform robustness tests using alternative definitions of the country-portfolio Z-score. Our main result (SBs favor financial stability) holds when the country portfolio Z-score is constructed by adding all the assets and liabilities in the system, creating a single fictitious “mega-institution” for which the Z-score is computed. The result also holds when we use the median and the average Z-score across banks in a country.

<sup>17</sup> An undesirable feature of additive aggregation is the full compensability that it implies: low Z-scores of some banks can be compensated by sufficiently high Z-values of other banks in the country, resulting in a high country-portfolio Z-score. The geometric average can then be a preferable measure since it is less compensatory. In our case, however, the geometric average is not well-defined because the Z-score could take negative values.

We measure the *degree of stakeholderiness* (or for the sake of brevity, *stakeholderiness*) by the proportion of total assets held by stakeholders' banks (cooperative and savings banks) in country  $j$  at time  $t$ . Thus, we define stakeholderiness as:

$$\text{Degree of Stakeholderiness}_{jt} = \frac{\sum_{i=1}^n (\text{Savings' banks assets} + \text{Cooperatives' banks assets})_{ijt}}{\sum_{i=1}^n (\text{Total assets})_{ijt}}$$

where total assets are equal to the sum of assets held by cooperatives, savings and commercial banks in the system (in the country  $j$  at time  $t$ ).<sup>18</sup> Table A4.3 presents the average country portfolio Z-score, the average degree of stakeholderiness, and the crisis periods for each country in the sample.

As reported in Table A4.2 there is wide cross-country variation in the sample, both regarding the average degree of stakeholderiness and the averaged portfolio country Z-score. On the one hand, the average degree of stakeholderiness ranges from 0 (e.g., Benin) to 39% percent (Austria), with a sample mean of 5.32%. On the other hand, the portfolio Z-score has a mean value of 18.16%, with Tunisia showing the highest average Z-score during the sample period (55.44) and Colombia the lowest (2.36).<sup>19</sup>

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<sup>18</sup> In order to test for robustness, we have also measured the stakeholderiness as the proportion of liabilities; proportion of loans; proportion of deposits held by SBs; and by the ratio number of SBs to total number of banks. The main conclusion remains unchanged under these alternative measures. Furthermore, we check (a) whether the presence SBs helps to increase financial stability by including a dummy with value 1 if there are SBs in a country and 0 otherwise; (b) running a piecewise regression where the stakeholderiness measure is broken into quartiles and into deciles (assuming a non-linear relationship between stakeholderiness and financial stability).

Stakeholderiness remains significant under definition (a). Under definition (b), the results indicate that the stabilizing effect of SBs is statistically significant (at 1%) for the highest quartile and for the two highest deciles.

<sup>19</sup> Although most of the country-portfolio Z-score observations lie in the 10-90 deciles, there are some extreme observations (ranging from -1.5991 to 174.617). Since we are interested in periods of instability, we include those extreme observations. However, since the extreme values may be due to very specific,

Regarding the crisis dummy, 3.1% of the countries in our sample went into a crisis with a total of 31 crisis episodes in our sample.

The differences of means presented in Tables 1 and 2 seem to provide support to Proposition 2(a). Table 1 shows that countries which have not gone into a systemic crisis have, on average, a higher degree of stakeholderness than those that went into a crisis. Table 2 ratifies this result, showing that the average stakeholderness measure is higher in countries with a *Z*-score above the mean. The difference of means is significant at the 5 and 1 percent level respectively.

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Insert Tables 1 and 2 about here

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The univariate analysis provides support to Proposition 2(a). However, the effect of other possible influences on financial stability has not been taken into account. To investigate the relationship between financial stability and stakeholderness, we turn to a multivariate analysis where we control for macroeconomic, banking system, regulatory and institutional factors that could affect financial soundness. Following Demirgüç-Kunt and Detragiache (1998, 2002, 2005), Beck et al. (2006), Boyd et al. (2006) and Schaeck et al. (2009), we include GDP growth, change in the terms of trade, the rate of inflation and the real interest rate to capture macroeconomic factors that are likely to affect the stability of banks. In addition we control for banks vulnerabilities to sudden capital outflows triggered by a run on the currency, and bank exposure to foreign exchange risk by including as a regressor the rate of exchange rate depreciation.

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one-off events, or to data errors, we have performed the calculations both for the full sample and for a sample excluding the outliers (and the results have not changed).

Because it takes a short time for economic shocks to be transmitted to the banking system (Demirgüç-Kunt and Detragiache, 2005), we introduce all these variables evaluated at time  $t$ . As in Beck et al. (2006), we introduce credit growth, lagged by two periods, as a control variable since high rates of credit expansion may be used to finance an asset price bubble that may cause a crisis when it bursts. To control for the moral hazard problem introduced by the existence of explicit deposit insurance (Demirgüç-Kunt and Detragiache, 1998; 2002), we introduce a dummy variable that takes value 1 in those countries and years without an explicit deposit insurance scheme in place, and 0 otherwise. We also include an income dummy variable (1 if a country is classified as low income or lower middle income by Demirgüç-Kunt (2009), 0 otherwise) in order to control for the level of economic development of countries.

Finally, to properly draw inferences about the impact of SBs on stability, we need to test whether the link between stakeholderiness and financial stability holds when we control for the structure of the market. Beck et al. 2006 finds a positive effect of concentration on bank stability, so we also include a measure of concentration<sup>20</sup> from the recent database of Beck and Demirgüç-Kunt (2009). We further control for the effect of competition by introducing the H-statistic computed by Schaeck et al. (2009)<sup>21</sup> from 1998 to 2005. Since our sample period expands from 1993 to 2007, we assume it to be constant over the sampling period since the regulatory and supervisory

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<sup>20</sup> Concentration is calculated as the market share of the three largest institutions in each country. Beck and Demirgüç-Kunt (2009) retrieve the information from BankScope database, so for each country we have averaged the annual bank concentration ratio over our sampling period in order to smooth about the problem of coverage of BankScope.

<sup>21</sup> The H-statistic has become a popular measure in the literature on banking competition (Molyneux, Lloyd-Williams, and Thornton 1994, Bikker and Haaf, 2002, Claessens and Laeven 2004). It was developed by Panzar and Rosse (1977, 1982, 1987). The H-statistic refers to the ability of a bank to pass on increases in factor input prices to customers, and is calculated as the sum of elasticities of the total banks' revenues with respect to the banks' input prices.  $H=0$  corresponds to a monopoly,  $H=1$  to perfect competition, and  $0 < H < 1$  to monopolistic competition; see Panzar and Rosse (1987).

environment (which represents an important determinant for the degree of competition) has not undergone major changes (Barth et al. 2001, 2006).

We further control for regulatory and institutional factors to check for robustness. To this end, we employ some measures of time-invariant banking regulation and supervision proposed by Barth et al. (2004), i.e., the overall activities restrictiveness, the entry into banking requirements, the capital regulatory index and the independence of the supervisory authority bank (see Appendix 4 for the definition of those variables).<sup>22</sup> To control for the institutional environment we also include the legal tradition of a country (by means a dummy variable that takes on value 1 if the legal system is British, German, Scandinavian or French origin; 0 otherwise. British is the *left-out dummy* variable) since the legal origin has been found to be a determinant for the protection of creditor rights, playing a key role for financial development and helping to explain cross-country differences in institutional, economic and banking development (La Porta et al., 1998, Levine, 1998, Beck et al., 2003).

The correlation coefficients show the expected signs. Specifically, the correlation matrix shows that countries in crisis has a lower distance to default, grow more slowly, experience negative terms of trade shocks, and have higher inflation, interest rates and depreciation rates than countries that are not in a crisis. We test for possible multicollinearity problems by considering the independent and control variables. The Variance Inflation Factor (VIF) gives a mean value of 1.23 and a maximum value of 1.42 for non-explicit deposit insurance, which indicates that there are no multicollinearity problems.

## **5.2. Modelling the effect of stakeholderiness on financial stability**

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<sup>22</sup> Measures of bank regulation and supervision come from Barth et al. (2001, 2004). The data set is collected through surveys of government officials in the late 1990s. There is some evidence, however, that regulatory policies have not changed much in most countries (Barth et al., 2001, 2006).

The tests performed are (i) a logit probability model that is robust to heteroskedasticity and allows for clustering within countries and (ii) a cross-country fixed-effects model with robust standard errors.

The log-likelihood function for the logit model is:

$$LnL = \sum_{t=1...T} \sum_{j=1...n} \{P(j,t) \ln[F(\beta_k' X_k(j,t))] + (1-P(j,t)) \ln[1-F(\beta_k' X_k(j,t))]\} . \quad (22)$$

The cross-country regression for the fixed-effects model is:

$$y_{jt} = \alpha_{jt} + \beta_s S_{jt} + \sum \beta_k X_{jt,k} + \varepsilon_{jt} \quad (23)$$

where  $P(j,t)$  is a dummy variable that takes on the value one when a banking crisis occurs in country  $i$  at time  $t$ ; zero otherwise. If a country suffers multiple separate crises, each episode will be included.  $Y_{jt}$  represents the Z-score in country  $j$  at time  $t$ ,  $S_{jt}$  the degree of stakeholderiness of country  $j$  at time  $t$ , and  $\beta_k$  the vector of coefficients. The explanatory variables are denoted by  $X_{jt,k}$ , and  $F(\beta_k' X_k(j,t))$  is the cumulative probability distribution function evaluated at  $\beta_k X_k(j,t)$ . The explanatory variables are the same in both models, including the level of stakeholderiness ( $S_{jt}$ , our variable of interest) as well as the set of control variables already commented.

In selecting between a fixed-effects or a random-effects model, we have applied the Hausman test. We reject the null hypotheses that individual effects are random at the 5% significance level. Therefore, the fixed effects model seems to be the adequate model as it provides consistent estimators.

By means of Eqs. (22) and (23), we want to test whether the estimated stakeholderiness coefficient ( $\beta_s$ ) provides empirical support to Proposition 2(a). Considering model (22), we expect to find a negative coefficient ( $\beta_s < 0$ ), since a country with a high proportion of SBs is expected to be more stable. If we use the bank

distance to default as a proxy for financial soundness (model 23), we will expect  $\beta_s > 0$  if Proposition 2(a) is to be confirmed

### **5.3.- Regression results**

First, we present an empirical test on our main result (SBs favor financial stability) for the benchmark model. Then, we make robustness tests by controlling for cross-country differences in market structure. Finally, we investigate the impact that the stakeholderness has on stability when controlling for regulatory and institutional variables.

#### **Main results**

Table 3 shows the results obtained for the logit model considering specifications (1)-(3), and the results from the fixed effect model considering specifications (4) and (5). Specifications (1) and (4) are the basic models, which include the control variables mentioned above. Specification (2) and (5) include our stakeholderness measure, while specification (3) checks for the impact of SBs on the probability of suffering a systemic crisis when we further control for the effect of competition.

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Insert table 3 about here

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The coefficient that corresponds to stakeholderness is negative and significant at the 1% level in specification (2). This result supports Proposition 2(a) since it indicates that the probability of a crisis declines in systems with a higher proportion of SBs. The conclusion from the logit model is corroborated by the fixed-effects model (specification (5)), where *stakeholderness* shows a positive and significant coefficient at the 1% level, indicating that the SBs increase financial stability. These results give support to our main model prediction. Finally, specification (3) shows that our results



are not driven by the contestability of the market: the stakeholder coefficient remains negative and significant at the 5% level when including the H-statistic as a regressor.

The stakeholder measure is not only statistically significant, but also economically. In order to analyze the economic impact that stakeholder has on stability, we estimate its marginal effect on the probability of a systemic banking crisis (evaluated at the sample mean) using the logit model: the marginal coefficient estimate at the sample mean in model 2 is of -0.0013. This fact means that increasing our measure of stakeholder one standard deviation (10.8) leads to a decrease of the probability of a crisis of 1,4 % (-0.0136), which represents a substantial reduction since crisis probabilities are quite low, with a mean value of 3% in our sample. The economic impact of SBs on the probability of a systemic banking crisis is ratified by the fixed-effects model, where increasing the measure of stakeholder by one standard deviation increases the country distance to default (measured by the country Z-score) by 4.5188 units ( $10.8 \times 0.4181$ ). These results provide support to Proposition 2(a): the presence of SBs fosters a more stable banking system.

In the logit model (specifications (1) to (3)) the control variables GDP growth, no-explicit-deposit-insurance, bank concentration, and the H-statistic enter with a negative and significant coefficient. Credit growth, bank concentration, and the lower middle income dummy variables enter positively significant. In the fixed-effects model, inflation (in specifications (4) and (5)) and real interest rate (in specification (5)) are the regressors with a negative and significant sign. These results are in line with economic theory and earlier empirical studies. The coefficient of the H-statistic enters specification (3) negatively and significant at the 1% level, indicating that the probability of going into a systemic crisis decreases as the degree of competition increases. This result agrees with previous findings in the literature, giving support to

the competition-stability view (Boyd and De Nicolò, 2005; Boyd et al., 2006; De Nicolò and Luoikoanova, 2007; Schaeck et al., 2009). The concentration ratio is negative and significant at the 1% level in specification (1) and (2), and at the 5% level in specification (3), suggesting that the probability of going into a crisis also decreases in concentrated banking systems. Such a result seems to confirm that competition and concentration must be considered as measuring different things (see Berger et al., 2004; Beck et al., 2006; Schaeck et al., 2009; Jiménez et al., 2007). Credit growth is positive and significant at the 1% level in specification (1) and (2), which lends support to the argument that credit booms increase the probability of falling into a crisis. However, that hypothesis is not supported neither in specification (3) where the H-statistic is introduced (the reduction in the number of observations as well as a significant correlation between the H-statistic and the credit growth variable might explain the loss of significance of credit growth) nor in the fixed-effects model. Finally and in line with Demirgüç-Kunt and Detragiache (2002) we obtain that those countries with an explicit deposit insurance scheme are more likely to go into a systemic crisis than those countries without it.

The fit of the model is satisfactory and seems to confirm previous research on the topic. Model 2, where the stakeholderiness measure is introduced, classifies 74.54% of all observations and 86.67% of crisis accurately. Pseudo R-squares range between 0.2039 and 0.3435 depending on the specification, while the R-square for the fixed-effects model ranges from 0.11 in the base model to 0.2132 when stakeholderiness is included.

#### **Stakeholders banks regulation and financial stability**

Given that institutional and regulatory factors can well affect financial stability, we want to test whether our result holds when controlling for these factors. Table 4

presents the results for the logit model in columns (1) to (6).<sup>23</sup> In each specification one institutional factor is included: firstly, only one institutional factor is included, in order to avoid collinearity problems. Then we introduce all of them simultaneously to check whether stakeholderiness remains significant.<sup>24</sup>

The coefficient of stakeholderiness remains negative and significant under all the conditioning sets.

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Insert Table 4 about here  
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In specifications (1) and (2) we introduce activity and entry restrictions to control for the government restrictions on banking freedom and financial openness, respectively. The stakeholderiness coefficient remains negative and significant at the 1% level in both specifications. We then conclude that our results do not seem to be driven by regulatory measures regarding the competitiveness of the system.

Moreover, it seems that it is the degree of openness of the financial system (and not the capacity to diversify activities and assets) what actually influences financial stability: only the coefficient corresponding to entry into banking requirements is positively significant at the 1% level. As has been mentioned above, this result is consistent with the positive effect that competition has on financial stability, and gives support to the competition-stability view.

Similarly, when controlling for the independence of the supervisory authority bank, for the capital regulatory index, and for the legal tradition of a country

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<sup>23</sup> We use the logit model because the fixed-effects model controls for all stable characteristics of each country. However, we have also performed a random-effect model in which we control (a) for competition through the introduction of the H-statistic; and (b) for regulatory and institutional factors. Our main conclusion holds.

<sup>24</sup> These specifications exclude the income dummy because of its correlation with the overall institutional environment, including bank regulations. However, our results remain unchanged including the dummy.

(specifications (3) to (6)) the sign, size and significance level of the stakeholderness coefficient remains virtually unchanged.

We interpret the results of this section as providing empirical support to Proposition 2(a): the presence of SBs helps to increase financial stability. The stakeholderness coefficient is significant both in the logit (where it enters negatively) and in the fixed-effects model (where it enters positively). The inclusion of additional variables that affect financial stability (like measures of competition and regulation) does not change the sign and significance of our variable of interest, the level of stakeholderness. We then conclude that the ownership structure of banks can influence financial stability and that SBs seems to enhance it.

## **6.- CONCLUSIONS**

This paper analyses the effect that rivalry between banks with different ownership structure has on welfare, financial stability, risk-taking behavior and performance. For that purpose, we propose a duopoly model of retail banking competition between a profit-maximizing bank and a bank exhibiting *expense preference behavior*.

We begin establishing the nature of the competition between banks: invoking a known result by Singh and Vives (1984), we show that the strategic decision variable when banks offer a differentiated product is quantity rather than prices (obviously, when the product is homogeneous, competition is also in quantities). Then, we introduce ownership structure and welfare considerations into the analysis of the relationship between competition and financial stability. The paper has policy implications since many countries have a portion of their banking system that is not privately owned, and where no-profit-maximizing-banks compete against profit-maximising ones.

The main conclusions obtained are:

(a) The presence of a SB makes competition fiercer. It increases total welfare and reduces financial risk (Prop. 2).

(b) SBs are less risk-inclined, obtain a higher market share, and offer higher interest rates than CBs (Prop. 1). Furthermore, there is an optimal degree of expense preference that maximizes the economic profits of CBs. This finding suggests that CBs would be better off by inducing a more aggressive behavior in their managers (which could be achieved through managerial incentives).

(c) Banks (independently of their ownership structure) are less stable and less profitable when competing against a SB.

We can provide empirical evidence for most of these results. In particular and for the sake of brevity, we show that the presence of SBs helps to increase financial stability.

All these findings lead to policy implications. In particular, two suggestions emerge from our analysis. First, financial policy should differ across financial systems as well as across banks: regulation may be set in a more or less restrictive way depending on i) banks' ownership; ii) the proportion of SBs in the system. Second, policy makers aiming to maximize social welfare may favor a stakeholder-approach in the retail banking sector.

Although shedding some light on the effect of the strategic interaction between banks with different ownership structures, we recognize that the model presented is still a simple model. It lacks of many features of banking competition that could be analyzed in future research. Some limitations of our model are, for instance, the full-deposit insurance assumption, and its abstraction from the consequences of diversification-based or size related economies of scale. The model could also be improved by considering a continuous asset return distribution instead of the two-point return structure considered here. From an empirical point of view, our measure of systemic

financial stability (the country portfolio Z-score) presents several limitations since it does not take into account the correlation of losses across defaults and losses given default. As a result, this measure understates the risk of system failures. We leave this for further research.

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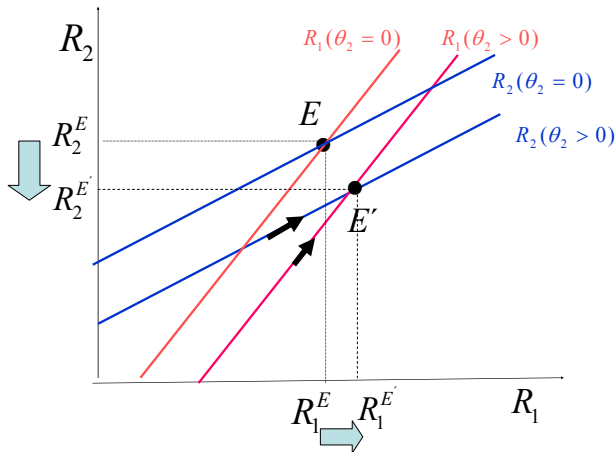


FIGURE 1(A)

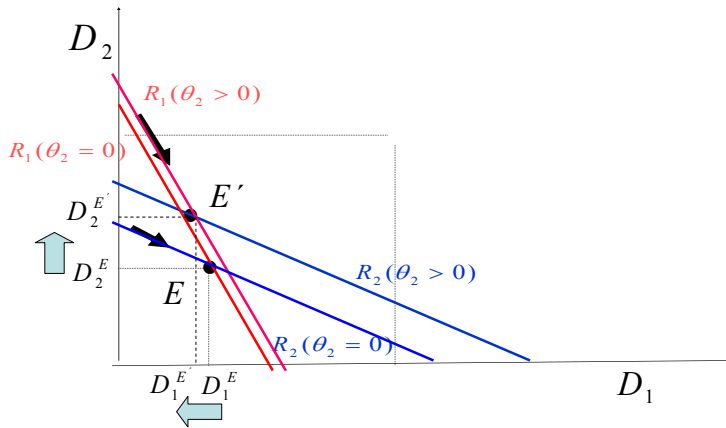


FIGURE 1(B)

Figures 1a and 1b show the reaction functions for deposits and revenues, respectively.

We start with the basic case of competition between two CB and analyse what happens if a bank turns to show an expense preference behaviour.

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 expense preference behaviour ( $\theta_1 = 0, \theta_2 > 0$  : a CB competes against a SB) the reaction functions corresponding to deposits and revenues are shifted to the right. Firms end up in an equilibrium such that:

$$E' = (D_1^{E'}, D_2^{E'}, R_1^{E'}, R_2^{E'}), \text{ with } D_1^{E'} < D_1^E; D_2^{E'} > D_2^E; R_1^{E'} > R_1^E; R_2^{E'} < R_2^E.$$

## **TABLES**

**Table 1: Difference of means**

Difference of means: Stakeholdersness index by crisis						
Group	Observations	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
No crisis	45	7.014357	1.893677	12.70317	3.197903	10.83081
Crisis	27	2.505515	0.830179	4.313737	0.799057	4.211972
Combined	72	5.323541	1.245271	10.56648	2.840541	7.806542
Difference		4.508843**	2.533854		-0.54477	9.562456

\*\*\*, \*\*, \* : Statistically significant at the 1, 5 and 10% level respectively.

**Table 2: Difference of means**

Difference of means: Stakeholdersness index by Z-score						
Group	Observations	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
Countries with Z score below the mean	39	1.493404	0.50228	3.136739	0.476591	2.510217
Countries with Z score over the mean	33	9.850068	2.443493	14.0368	4.872836	14.8273
Combined	72	5.323541	1.245271	10.56648	2.840541	7.806542
Difference		-8.35666***	2.310364		-12.9645	-3.74879

\*\*\*, \*\*, \* : Statistically significant at the 1, 5 and 10% level respectively.

**TABLE 3 : Stakeholderiness and Financial Stability**

	Logit models			Fixed effect models	
	(1)	(2)	(3)	(4)	(5)
GDP growth	-0.1485*	-0.1862**	-0.2288**	0.0605	0.0666
	(0.0821)	(0.0817)	(0.1131)	(0.0575)	(0.0535)
Inflation	0.0229	-0.0009	0.0913***	-0.0466**	-0.0380*
	(0.0271)	(0.0312)	(0.0301)	(0.0192)	(0.0215)
Real interest rate	0.0296	0.0187	0.0643	-0.0497*	-0.0445
	(0.0221)	(0.0229)	(0.0748)	(0.0276)	(0.0281)
Real exchange	0.0042	-0.0025	-0.0053	0.0074	0.0173
	(0.0287)	(0.0261)	(0.0448)	(0.0222)	(0.0190)
Net Barter term of trade	0.0131	0.0089	0.0280**	0.0310	0.0301
	(0.0139)	(0.0135)	(0.0124)	(0.0289)	(0.0273)
Credit growth (t-2)	3.1855***	3.2758***	0.9266	-0.2212	-0.8904
	(0.8669)	(0.8857)	(2.3915)	(1.2328)	(0.9776)
No explicit deposit insurance	-1.8492***	-2.1379***	-6.9811**	.	.
	(0.4796)	(0.5641)	(3.0132)	.	.
Bank concentration	-4.1695***	-5.9290***	-13.9742**	.	.
	(1.3671)	(2.0365)	(7.0418)	.	.
Lower-middle income	2.0419***	1.5311**	3.7162***	.	.
	(0.6127)	(0.6029)	(1.4412)	.	.
Stakeholderiness × 100		-0.1637***	-0.3650**		0.4181***
		(0.0508)	(0.1735)		(0.0904)
H statistic			-7.4587***		
			(2.5897)		
Cons	-3.0794	0.3055	5.4917	16.2414***	12.3200***
	(3.4285)	(3.6071)	(8.2734)	(3.8092)	(3.1402)
N	432	432	308	493	493
AIC	123.7186	119.6010	81.9189	2663.3654	2604.6131
Log Likelihood	-51.8593	-48.8005	-28.9594	-1324.6827	-1294.3066
Pseudo R <sup>2</sup>	0.2039	0.2509	0.3435	39	39
Number of countries	39	39	28		
Number of crises	15	15	10		
Wald $\chi^2$	57.90***	76.82***	324.25***		
% Crisis correct	73.33%	86.67%	90%		
% Correct	73.15%	74.54%	77.27%		
R <sup>2</sup> within				0.0426	0.1536
R <sup>2</sup> between				0.2492	0.2441
R <sup>2</sup> Overall				0.1176	0.2132
F				3.3240***	11.5901***

We estimate Logit probability models in models (1)–(3) and Fixed effect models in models (4)–(5). The dependant variable in the logit probability models is a dummy variable that equals 1 if a crisis is observed and 0 otherwise. As most crises run over multiple years, we remove observations classified as a crisis after the first year of the crisis. In the fixed probability model, the dependant variable is the log of a country Z-score. Model (1) and (4) are our benchmark models. The stakeholderiness index enters in model (2) and (5). Model (3) analyzes the effect of stakeholderiness when controlling for the H statistic as computed by Schaeck et al., (2009). The proportion of crisis correctly classified is calculated as the total number of crisis observations divided by the number of crisis in the sample that yields a cutoff point of 0.03. White's heteroskedasticity standard errors are given in parentheses.

\*\*\*, \*\*, \*: Statistically significant at the 1, 5 and 10% level respectively.

**TABLE 4 : Stakeholders and Financial Stability**

	Logit models					
	(1)	(2)	(3)	(4)	(5)	(6)
GDP growth	-0.1787** (0.0830)	-0.1565* (0.0821)	-0.1875** (0.0875)	-0.1579* (0.0886)	-0.1132 (0.0749)	-0.1358 (0.0830)
Inflation	0.0021 (0.0265)	-0.0128 (0.0267)	0.0024 (0.0346)	0.0055 (0.0295)	0.0067 (0.0237)	0.0093 (0.0344)
Real interest rate	0.0181 (0.0250)	0.0186 (0.0232)	0.0268 (0.0318)	0.0235 (0.0299)	0.0300 (0.0211)	0.0549* (0.0315)
Real exchange	0.0019 (0.0264)	0.0022 (0.0257)	-0.0008 (0.0252)	0.0076 (0.0261)	0.0050 (0.0246)	-0.0109 (0.0316)
Net Barter term of trade	0.0048 (0.0153)	0.0094 (0.0143)	0.0032 (0.0183)	0.0046 (0.0160)	0.0018 (0.0153)	0.0122 (0.0190)
Credit growth (t-2)	2.8064*** (0.9498)	2.6548*** (0.8755)	3.0523*** (1.0698)	2.2095** (0.9027)	2.5035*** (0.9143)	1.2179** (0.6201)
No explicit deposit insurance	-1.5948*** (0.5467)	-1.8582*** (0.5155)	-1.8848** (0.7364)	-1.6759*** (0.5565)	-1.7794*** (0.6082)	-3.5874*** (1.0923)
Bank concentration	-4.9887** (2.1873)	-6.3011*** (2.2000)	-6.1056** (2.5246)	-6.3829** (2.5378)	-7.4841** (3.7138)	-12.2246** (5.1470)
Stakeholders × 100	-0.1867*** (0.0560)	-0.2762*** (0.0601)	-0.2281*** (0.0646)	-0.2212*** (0.0594)	-0.2203*** (0.0821)	-0.4228*** (0.1485)
Overall activities restrictiveness	0.1763 (0.1540)					
Entry into banking requirements		0.7332** (0.3608)				0.8250*** (0.2983)
Authority bank independence			0.6251 (0.8214)			1.1054 (1.2181)
French legal origin				-0.1849 (0.7514)		0.2543 (0.8910)
German legal origin				-0.1212 (1.1912)		0.6089 (1.2309)
Scandinavian legal origin				1.6471 (1.2327)		4.8575* (2.7409)
Capital regulatory index					0.3175 (0.2187)	0.4916* (0.2830)
Cons	-1.1634 (3.7067)	-4.6301 (4.7440)	1.0241 (3.9191)	-0.8310 (4.1590)	-0.5004 (4.0098)	-4.6043 (5.6436)
N	424	432	421	432	392	381
AIC	123.7365	118.4257	117.2904	127.9730	117.7221	109.6152
Pseudo R <sup>2</sup>	0.2157	0.2599	0.2242	0.2173	0.2076	0.3154
Log Likelihood	-50.8683	-48.2128	-47.6452	-50.9865	-47.8611	-38.8076
Number of countries	38	39	38	39	36	35
Number of crises	15	15	14	15	14	13
Wald $\chi^2$	69.22***	81.55***	62.94***	115.15***	70.65***	457.32***
% Crisis correct	86.67%	93.33%	78.57%	86.67%	85.71%	84.62%
% Correct	71.23%	76.39%	73.16%	72.69%	69.90%	77.17%

We estimate logit probability models in models 1–6. The dependant variable in the logit probability models is a dummy variable that equals 1 if a crisis is observed and 0 otherwise. As most crises run over multiple years, we remove observations classified as a crisis after the first year of the crisis. Models 6 and 11 control for activity restrictions, in addition to the other control variables. Model (1) adds overall activities restrictiveness; while model (2) includes entry restrictions. Additionally, we control for the independency of the authority bank (model 3), legal origin (model 4), and capital regulatory index in model 5. Finally, model 6 includes all five variables measuring the regulatory and institutional environment. The proportion of crisis correctly classified is calculated as the total number of crisis observations divided by the number of crisis in the sample that yields a cutoff point of 0.03. White's heteroskedasticity standard errors are given in parentheses

\*\*\*, \*\*, \* : Statistically significant at the 1, 5 and 10% level respectively.

## **Appendix 1**

### **Proof Lemma 1 (Competition is in Quantities)**

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

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

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

### **Proof Lemma 2 (Existence and 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 (13) such that  $R_i > R'_i$ . This fact implies

$$\text{that } \frac{-P(R_i)}{P'(R_i)} < \frac{-P(R'_i)}{P'(R'_i)} \Rightarrow D'_i > D_i \text{ (since } \frac{\delta r_i(D)}{\delta D_i} = \frac{\delta r_i(D')}{\delta D'_i} = \beta).$$

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

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

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

### **Appendix 2 (Proof of Proposition 1)**

(a) Immediate from Eqs. (13) and (14).

(b) First, we use backward induction to show that there is an optimal  $\theta_1$  which maximizes CB's profits. Second, we show that the profits of one bank decrease with its rival's degree of expense preference.

For a given value of  $\theta_2$ , the equilibrium solution corresponding to the CB can be obtained as we did in Section 2. Then, since the equilibrium depends on  $\theta_1$ , its optimal value maximizes the (expected) economic profits:



$$\max_{D_1, R_1} EU_1 = P(R_1)[(R_1 - r_1(D) - s - c \cdot (1 - \theta_1))] \cdot D_1 \quad (\text{A2.1})$$

which yields the equilibrium solutions in Equations (14) to (18). The CB's expected profits are given by:

$$E\pi_1 = P(R_1)[(R_1 - r_1(D) - s - c)] \cdot D_1 = [M + c\theta_1 Q - c\theta_2 B] \cdot [K + c\theta_2 E - c\theta_1 F] \cdot [Z + c\theta_2 T - c\theta_1 H] \quad (\text{A2.2})$$

where:

$$M = \frac{(2\beta^2 - \beta\gamma)(1 - A(\alpha + c + s))}{6\beta^2 - \gamma^2 - \beta\gamma}, \quad B = \frac{A(4\beta^3\gamma - \beta\gamma^3)}{(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2}, \quad E = \frac{16\beta^3\gamma^3 - 16\beta^5\gamma - \beta\gamma^5 - 8\beta^4\gamma^3}{(4\beta^2 - \gamma^2)[(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2]}$$

$$K = \frac{(2\beta^2 - \beta\gamma)(1 - A(\alpha + c + s))}{A(6\beta^2 - \gamma^2 - \beta\gamma)}, \quad Z = \frac{(2\beta - \gamma)(1 - A(\alpha + c + s))}{A(6\beta^2 - \gamma^2 - \beta\gamma)}, \quad H = \frac{24\beta^3\gamma^2 - 3\beta\gamma^4 - 48\beta^5}{(4\beta^2 - \gamma^2)[(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2]}$$

$$F = \frac{96\beta^6 - 64\beta^4\gamma^2 + 6\beta^2\gamma^4 + 8\beta^3\gamma^4 - \gamma^6}{(4\beta^2 - \gamma^2)[(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2]}, \quad T = \frac{8\beta^3\gamma^3 - 16\beta^4\gamma - \gamma^5}{(4\beta^2 - \gamma^2)[(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2]}, \quad Q = \frac{12\beta^4 - 3(\beta\gamma)^2}{(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2}$$

Therefore,  $\theta_1^*$  is given by:

$$\theta_1^* = \arg \max_{\theta_1} : [M + c\theta_1 Q - c\theta_2 B] \cdot [K + c\theta_2 E - c\theta_1 F] \cdot [Z + c\theta_2 T - c\theta_1 H] \quad (\text{A2.3})$$

whose FOC leads to:

$$\begin{aligned} \frac{\partial E\pi_1}{\partial \theta_1} = & 3\theta_1^2 c^3 FQH - 2\theta_1 [c^2(FQZ - FMH + KQH) + c^3\theta_2(QFT + QEH + BFH)] + \\ & + \theta_2^2 c^3 [QET + BFT + BHE] + \theta_2 c^2 [QEZ + TQK + BFZ + FMT + BHK - HME] + \\ & + CQKZ - CFMZ - CHMK = 0 \end{aligned} \quad (\text{A2.4})$$

As  $\beta > \gamma$  (see Assumption A4),

$$M > 0; Q > 0; B > 0; K > 0; E < 0; F > 0; Z > 0; T < 0; H < 0.$$

The second derivative must be negative for  $\theta_1$  to be a maximum. We check it numerically:

$$\frac{\partial^2 E\pi_1}{\partial \theta_1^2} = 6\theta_1 c^3 FQH - 2 [c^2(FQZ - FMH + KQH) + c^3\theta_2(QFT + QEH + BFH)] \quad (\text{A2.5})$$

which is negative for typical values of the parameters.

Then, we have shown that there is an optimal value of  $\theta_1$  that maximize CB's profits. ♦

Finally, let us show that a bank profits decrease with its rival's degree of expense preference. From (A3.2),

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

which ensures that  $\frac{\delta E\pi_i}{\delta \theta_j} < 0$  ♦

### APPENDIX 3 (Proof of Proposition 2)

In order to demonstrate that SBs help to increase welfare, we will show that

$\frac{\delta W}{\delta \theta_i} > 0 \quad i=1$ . Given the definition of welfare,  $W = (CS + EU_1 + EU_2 - DL)$ , the

following conditions ensure that  $\frac{\delta W}{\delta \theta_i} > 0$ :

$$\frac{\delta CS}{\delta \theta_i} > 0 \quad (\text{A3.1})$$

$$\frac{\delta(E\pi_1 + EU_2)}{\delta \theta_i} > 0 \quad (\text{A3.2})$$

$$\frac{\delta(DL)}{\delta \theta_i} < 0 \quad (\text{A3.3})$$

where:

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

$$DL = \left[ (1 - P(R_i))(1 - P(R_j)) \right] FC, \text{ and}$$

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

(parameters  $M, K, Z, B, Q, E, F, T$ , and  $H$  are given in Appendix 3).

Then, taking into account that

$$\frac{\delta CS}{\delta D_i} = D_i(2\beta - 1) + \gamma D_j > 0, \text{ (which is positive whenever } \beta > 1/2)$$

$$\frac{\delta DL}{\delta R_i} = A^2 R_j FC > 0 \quad \text{and that} \quad \frac{\delta D_i}{\delta \theta_i} > 0; \frac{\delta D_j}{\delta \theta_i} < 0; \frac{\delta R_i}{\delta \theta_i} < 0; \frac{\delta R_j}{\delta \theta_i} > 0$$

sufficient conditions for (A3.1) and (A3.3) to hold are:

$$\left| \frac{\delta D_i}{\delta \theta_i} \right| = \left| \frac{24\beta^3\gamma^2 - 3\beta\gamma^4 - 48\beta^5}{(4\beta^2 - \gamma^2)[(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2]} \right| > \left| \frac{\delta D_j}{\delta \theta_i} \right| = \left| \frac{8\beta^3\gamma^3 - 16\beta^4\gamma - \gamma^5}{(4\beta^2 - \gamma^2)[(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2]} \right| \quad (\text{A3.4})$$

$$\left| \frac{\delta R_i}{\delta \theta_i} \right| = \left| \frac{12\beta^4 - 3(\beta\gamma)^2}{(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2} \right| > \left| \frac{\delta R_j}{\delta \theta_i} \right| = \left| \frac{4\beta^3\gamma - \beta\gamma^3}{(6\beta^2 - \gamma^2)^2 - (\beta\gamma)^2} \right|, \quad i, j=1, 2. \quad (\text{A3.5})$$

Providing that  $\beta > \gamma$  (see Assumption 4), conditions (A3.4) and (A3.5) hold.

Taking into account that DL is inversely related to financial stability, part (a) of the Proposition 2 is demonstrated. ♦

Finally, we just have to prove that condition (A3.2) holds.

Since  $\frac{\delta EU_i}{\delta \theta_i} > 0$ ,  $\frac{\delta EU_j}{\delta \theta_i} < 0$ , condition (A3.2) will hold if

$$\left| \frac{\delta EU_i}{\delta \theta_i} \right| > \left| \frac{\delta EU_j}{\delta \theta_i} \right|. \quad (\text{A3.6})$$

Given (A3.4) and (A3.5), a sufficient condition for (A3.6) to hold is:

$$\left| \frac{\delta(R_i - r_i(D) - s - c \cdot (1 - \theta_i))}{\delta \theta_i} \right| = |c(1 - F)| > \left| \frac{\delta(R_j - r_j(D) - s - c \cdot (1 - \theta_j))}{\delta \theta_i} \right| = |cE|, \quad (\text{A3.7})$$

which holds because  $\beta > \gamma$ .

As  $\beta > 1/2$ , conditions (A3.1), (A3.2) and (A3.3) hold, and this implies that  $\frac{\delta W}{\delta \theta_i} > 0$ ,  $i=1,2$ , QED.

APPENDIX 4

Table A4.1: Variable Description

Variable name	Description	Data Source
Crisis	Dummy variable that takes on the value 1 if a systemic crisis is observed and 0 otherwise.	Demirgüç-Kunt and Detragiache (2005)
Country portfolio Z-score	It measures the distance to default of a country. It is estimated as $(ROA+equity/assets)/sd(ROA)$ . The standard deviation of ROA, $sd(ROA)$ , is estimated as a 5-year moving average.	Beck and Demirgüç-Kunt (2009)
Stakeholderness index	The stakeholderness index measures the proportion of assets held by SBs in a country. It is calculated as the ratio of savings banks assets plus cooperatives banks assets over total assets.	Bankscope. Authors' calculation
H-statistic	The H-statistic (Panzar and Rosse, 1987) is an indicator of competition that measures the ability of a bank to pass on increases in factor input prices to customers. It is calculated by estimating the sum of the (price-costs) elasticities from the reduced-form revenue equations with respect to factor input prices.	Schaeck et al. (2009)
Concentration	Concentration is calculated as the market share of the three largest institutions in each country averaged over the sample period.	Beck and Demirgüç-Kunt (2009)
Overall Activities Restrictiveness	Activity restrictions index for securities, insurance, real estate, and ownership of non-financial firms that take on values between 3 and 11, whereby greater values indicate more restrictions.	Barth et al. (2004)
Entry into banking requirements	Index that takes on values between 0 and 8, whereby a higher index value indicates greater entry restrictions arising from legal requirements.	Barth et al.(2004)
Independence of the authority bank	Index that takes on values between 0 and 1. It measures the degree to which the supervisory authority is independent from the government, and legally protected from the banking industry.	Barth et al.(2004)
Capital regulatory index	Summary index of capital stringency, calculated as the sum of the overall capital stringency (which evaluates whether there are explicit regulatory requirements regarding the amount of capital that a bank must have relative to various guidelines) and the initial capital stringency (which measures whether the source of funds counted as regulatory capital can include assets other than cash and government securities and borrowed funds).	Barth et al. (2004)
British/French/German/Scandinavian legal origin	Dummy variable that takes on the value one if the country's legal system is of British/French/German/Scandinavian origin and zero otherwise.	La Porta et al. (1998)
GDP growth (lagged by one period)	Rate of real growth of the gross domestic product.	World Bank Development Indicators
Depreciation	It measures changes of the exchange rate.	World bank Development Indicators
Inflation	Rate of change of the GDP deflator.	World Bank Development Indicators
Real interest rate	Is the change in nominal interest rate minus the rate of inflation.	World Bank Development Indicators
Terms of trade	It measures the change in net barter terms of trade.	World Bank Development Indicators
No explicit deposit insurance scheme	Dummy variable that takes on the value 1 if the country has not deposit insurance, and 0 otherwise.	Barth et al.(2004)
Lower-middle income	Dummy variable taking the value one whenever a country is classify as low income or lower middle income, following Beck and Demirgüç-Kunt (2009).	Beck and Demirgüç-Kunt (2009)
Credit growth (lagged by two periods)	Rate of growth of the ratio: private credit by deposits money banks to GDP.	Bankscope. Authors' calculation

**Table A4.2: Summary Statistics**

<b>Variable (country level)</b>	<b>N</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Banking crisis	972	0.031893	0.175806	0	1
Z- score	1080	18.16394	15.47487	-1.59909	174.617
Stakeholderness × 100	1080	5.323541	10.80811	0	50.0475
GDP growth	1065	3.739906	3.273405	-13	34
Inflation	1065	11.51455	92.72783	-23	2252
Real interest rate	888	8.195946	10.31827	-35	87
Real exchange	675	102.3852	13.50809	63	172
Net Barter term of trade	912	101.7895	16.31979	44	236
Credit growth (t-2)	985	0.034062	0.13278	-0.4785	1.449139
No explicit deposit insurance	990	0.287879	0.453003	0	1
Bank concentration	1080	0.632105	0.185525	0.239005	0.990817
H-statistic	674	0.303843	0.188731	-0.08	0.79
Lower-middle income	1080	0.361111	0.480545	0	1
Overall activities restrictiveness	975	7	1.857335	3	11
Entry into banking requirements	990	7.242424	1.338479	0	8
Authority bank independence	975	0.569231	0.495438	0	1
Capital regulatory index	930	6.354839	1.705719	3	10

**Table A4.3: Average Stakeholder Index**

Country	Mean Z country score	Average Stakeholder Index (%)	Crisis periods
ARGENTINA	5.398479	4.39163	1995, 2001-2002*
AUSTRIA	27.38085	39.5802	
BAHRAIN	19.68278	0	
BANGLADESH	4.210268	0	
BELGIUM	27.49697	11.0371	
BENIN	13.60487	0	
BERMUDA	12.29834	0	
BOLIVIA	10.36934	0	1994-1997**, 2001-2002*
BRAZIL	10.65534	0.166	1994-1999
BURUNDI	11.08748	0	1994-1997**
CANADA	35.27205	1.93423	
CHILE	7.273147	0.36609	
COLOMBIA	2.36781	1.8782	1999-2000
COSTA RICA	4.404427	2.63457	
CYPRUS	8.573777	7.11127	
DENMARK	26.46561	1.84563	
DOMINICAN REPUBLIC	6.283938	0	
ECUADOR	11.89449	0	1995-2002*
EGYPT	17.63286	0	
EL SALVADOR	22.72291	0	
FINLAND	18.02455	0	1991-1994
FRANCE	28.2679	38.6312	
GERMANY	32.04587	39.2794	
GREECE	2.763203	1.532	
GUATEMALA	20.69287	0	
HONDURAS	20.58212	0	
HONG KONG	5.249863	0	
INDIA	3.76805	3.10167	1991-1994**
INDONESIA	4.128348	0	1992-1995**, 1997-2002*
IRELAND	26.41901	0.42459	
ISRAEL	22.94844	0	
ITALY	27.47266	24.9492	1990-1995
JAMAICA	12.31178	0	1996-2000
JAPAN	17.91722	15.3372	1992-2002*
JORDAN	38.08102	0	
KENYA	12.7222	6.62855	1993-1995
KUWAIT	18.71137	0	
LATVIA	15.43829	0	
LEBANON	22.76892	0	
LUXEMBOURG	48.20466	0	
MALAYSIA	19.3934	1.28221	1997-2001
MALTA	26.75831	0	
MEXICO	8.499288	0.00573	1994-1997
MOROCCO	18.54826	0	
NETHERLANDS	53.35163	20.3248	

**Table A4.3: Average Stakeholder Index - continued**

Country	Mean Z country score	Average Stakeholder Index (%)	Crisis periods
NEW ZEALAND	40.10464	0	
NIGERIA	17.72177	0.03389	1991-1995
NORWAY	21.10811	24.6285	1987-1993
PAKISTAN	6.631608	0	
PANAMA	24.25956	3.0615	
PAPUA NEW GUINEA	5.934707	0	
PARAGUAY	9.217764	0	1995-1999
PERU	13.3828	0.00849	
PHILIPPINES	23.16922	2.57846	1998-2002*
POLAND	11.9982	2.36444	
PORTUGAL	25.36466	32.4799	
SAUDI ARABIA	14.79186	0	
SENEGAL	10.30854	0	
SLOVENIA	11.15606	0	
SOUTH AFRICA	16.35568	0.0155	
SPAIN	35.1903	32.8686	
SRI LANKA	9.655081	0	1989-1993
SWEDEN	18.84523	26.2689	1990-1993
SWITZERLAND	20.41695	6.90289	
TAIWAN	22.80743	0	1997-1998
THAILAND	4.675993	8.45987	1997-2002*
TUNISIA	59.44393	0	1991-1995
TURKEY	5.532223	0.83242	1994, 2000-2002*
UNITED KINGDOM	26.13549	1.45301	2007
URUGUAY	2.983768	0	2002*
USA	30.70321	15.522	2007
VENEZUELA	9.764165	3.37527	1993-1997

\* The crisis was still ongoing as of 2005. However, we consider the end of the crisis in 2002, as in Demirgüç-Kunt and Detragiache (2005).

\*\*The end date for the crisis is not known with certainty, a four-year duration is assumed.