European Economic Review 64 (2013) 241–255

Contents lists available at ScienceDirect

European Economic Review

journal homepage: www.elsevier.com/locate/eer

Bank capital and the optimal capital structure of an economy ☆

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ARTICLE INFO

Article history:
Received 22 December 2011
Accepted 21 July 2013
Available online 17 August 2013

JEL classification:
D41
E4
G2

Keywords:
Financial intermediation
Double incentive problems
Bank capital
Banking regulation
Capital structure of the economy

ABSTRACT

In this paper, we provide an economy-wide perspective on equity and debt across banks and industrial firms when both are faced with incentive problems and equity is scarce. Increasing bank equity may mitigate the bank-level moral hazard but exacerbates the firm-level moral hazard due to the reduction of firm equity. Competition among banks tends to result in an inefficiently low level of equity. In this case, imposing capital requirements on banks leads to a socially optimal capital structure for the economy in the sense of maximizing aggregate output. Such capital regulation is second-best and must balance three costs: excessive risk-taking by banks, credit restrictions that banks impose on firms with low equity, and credit restrictions due to high loan-interest rates. We discuss the implications of these findings for capital requirements, competition policy and banking crises.

1. Introduction

1.1. Approach and results

Should we be concerned with the level of bank capital and can regulatory intervention ensure an optimal level of bank capital? This question has occupied economists, regulators, and bank managers over the past few decades.

In this paper, we provide a general equilibrium perspective on this issue, which yields a new justification of regulatory capital requirements. We study a two-period model with financial intermediation and two interrelated moral hazard problems: banks have incentives for excessive risk-taking and firms may lack incentives to invest efficiently. First we show that without regulatory intervention, banks may not obtain a socially efficient level of equity. Our argument runs as follows: Due to competition for scarce equity, banks need to offer sufficiently high returns to equity holders. If banks attracted a large amount of equity, they would have no incentive to take excessive risks. However, this produces insufficient returns on equity compared to credit-constrained firms. Hence banks cannot attract a large amount of equity. As a result, bank equity is lower than the socially optimal equity level, which induces banks to gamble in a bid to offer sufficiently high equity returns to attract equity in the market.

Regulatory capital requirements can eliminate gambling incentives for banks and yield an improved capital structure. Hence we can provide a general equilibrium rationale for regulatory capital requirements. Such regulations, however, cannot

☆ A first version of this paper has appeared as Gersbach (2003), "The Optimal Capital Structure of an Economy", CEPR Discussion Paper, No. 4016.

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http://dx.doi.org/10.1016/j.euroecorev.2013.07.010

achieve a first-best allocation. Regulatory capital requirements exacerbate the firm-level moral hazard due to the reduction of firm equity and thus tighten credit constraints. Moreover, banks must increase loan-interest rates in order to generate returns that can attract sufficient equity. Accordingly, capital requirements generate higher markups. In turn, higher loan-interest rates exacerbate moral hazard problems in firms and thus reduce loan sizes for highly productive, but credit-constrained firms, which in turn lowers aggregate output.

This being the case, capital requirements must carefully balance three costs: gambling by banks, credit constraints on firms with low equity, and credit constraints from high loan-interest rates. The socially optimal capital structure of an economy, or to put it differently, the optimal debt/equity ratio for financial intermediaries *and* for industrial firms, balances the costs and benefits of bank capital. We show that the second-best capital requirement rule prescribes an equity level that induces banks to renounce gambling while minimizing the remaining costs. The considerations in the paper also indicate that the cost of bank capital corresponds to the marginal returns on the equity of credit-constrained firms in an economy as such firms compete with banks for equity. As discussed in more detail in Section 8, the trade-offs highlighted in our model may inform the policy debate about bank capital requirements.

One important remark is in order. The current paper identifies trade-offs that can occur when capital requirements are introduced. Such conceptual considerations are important for the assessment of such regulations. However, the logic developed in this paper cannot and should not be used to argue for low capital requirements, e.g. for equity capital ratios in the range that prevailed at many banks before the financial crisis in 2008. After an initial shock, low equity capital ratios fostered the wide-ranging collapse of banking systems (see e.g. Hellwig, 2008).

1.2. Relation to the literature

One of our core assumptions is that bank loans and equity are the main sources of funding for small firms, which is consistent with Petersen and Rajan (1994, 1995). The predictions of our model are consistent with the following empirical observations: (i) banks absorb a significant share of equity in an economy, (ii) banks face costs in issuing equity (Calomiris and Wilson, 1998), (iii) without effective capital requirements, banks may be tempted to operate at low equity levels as has become evident in the recent crisis (Hellwig, 2008).

We introduce an optimal capital structure for the economy and endogenize the cost of bank capital, which is equal to the return on equity in credit-constrained firms. Two recent papers have provided alternative perspectives. Gorton and Winton (2000) have proposed an endogenization of the cost of bank capital. In their model, higher bank capital reduces the aggregate amount of bank deposits, forcing consumers to hold more information-sensitive bank equity, which, however, is a poor liquidity hedge. Since our approach is complementary to Gorton and Winton, one might expect to find that the actual costs of bank capital are even higher than those suggested by the papers separately. Diamond and Rajan (2000) have developed another theory, according to which banks create liquidity because deposits are fragile and prone to runs. Bank capital reduces a bank's liquidity creation but increases its chances of survival.

We adopt a regulation perspective similar to e.g. Dewatripont and Tirole (1994) by focusing on the reduction of banks' gambling.[1] Our model, however, tackles incentive problems, at both bank and firm levels, from a macroeconomic perspective. There is a large amount of literature on bank capital focusing on the incentive problem for banks alone, which is a component of our model. At a macroeconomic level, Blum and Hellwig (1995) have shown that strict capital adequacy rules may reinforce macroeconomic fluctuations. Morrison and White (2005) have examined a general equilibrium model in which there are both adverse selection and moral hazard by banks. They show that capital requirements combat moral hazard when the regulator has a high reputation for screening. Our paper is complementary to this work, as we focus on the optimal capital structure for an economy in the presence of multiple incentive problems at bank and firm levels.[2]

At the level of intertemporal models of bank capital regulation, it is useful to compare our modeling strategy for simultaneously endogenizing the rates of returns on banks' assets and liabilities with the well-known paper by Hellmann et al. (2000), which has recently been thoroughly reexamined by Repullo (2004). Hellmann et al. (2000) observe that capital requirements may reduce the banks' franchise value, which would counteract the reduction of risk-taking incentives through the standard capital-at-risk effect. However, Repullo (2004) has shown that capital requirements reduce equilibrium deposit returns in such a way that the banks' franchise value does not change. In our model, a different general equilibrium effect is operative: intermediation margins increase when capital requirements are introduced. The reason is as follows. Capital requirements prevent banks from gambling and thus reduce, *ceteris paribus*, return on equity. Hence, banks can only attract a sufficient amount of scarce equity if higher loan returns raise return on equity. In addition, we consider the investment of entrepreneurs in a moral hazard technology which introduces additional frictions into the economy beyond the gambling incentives of banks. These frictions—the credit constraints banks impose on firms with low equity and the credit constraints due to high loan-interest rates—must be balanced with the gambling incentives of banks.

[1] Comprehensive summaries and discussions of banking regulation can be found in Dewatripont and Tirole (1994), Freixas and Rochet (1997), and Bhattacharya et al. (1998). For a recent comprehensive critique of capital regulation, see Hellwig (2008). For perspectives on macro-prudential regulation, see Borio (2011).

[2] Covitz and Heitfield (1999) study overlapping moral hazard problems between borrowers and banks, and between banks and a government guarantor of bank deposits, and derive interesting consequences for the relationship between market power of banks and interest rates.