

Capital Adequacy Rules: Implications for Banks' Risk-Taking¹

THOMAS GEHRIG*

1. INTRODUCTION

The world of banking seems to have become riskier since the mid-seventies. This is manifested in reduced intermediation margins and increased failure rates of banks. For the U.S. this phenomenon is documented by KEELEY (1990, see figure 1) and in Europe the crisis of the Scandinavian banking systems provides evidence in place.

At the same time national regulation of banks has increasingly reduced its impact. This is partly due to the fact that banks can circumvent national regulations on international capital markets, but it is also partially due to a process of deregulation observed in banking and financial markets more generally. In the U.S. regulation Q was phased out and elsewhere interest rate ceilings were abandoned to allow banks to compete more effectively against emerging mutual and money market funds.²

With the Basle Accord of 1988 a new process of regulation has been initiated that runs counter to the trend of deregulation of national banking markets and national financial markets in the late 70's and early 80's. Capital adequacy rules have become the central policy instrument of this new process of reregulation. This process of reregulation is explicitly driven by the need of harmonization of regulation across national borders.

Why is there a need for statutory regulation in international banking markets, and, more generally, in financial markets? Why have capital adequacy rules become the policy instrument for this process of reregulation? What are the allocative consequences of capital adequacy rules? Are they useful and effective policy instruments?

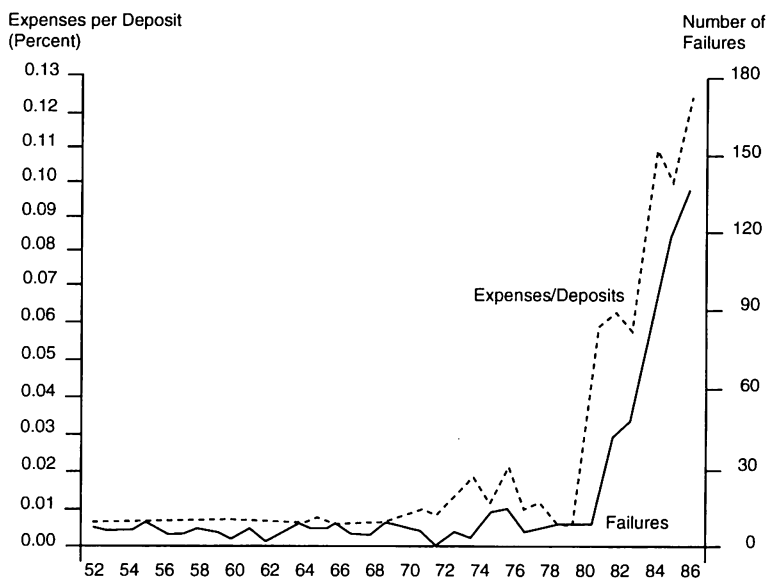
Unfortunately, regulators tell us little about the purpose and the aims of this process of reregulation other than attempting to harmonize national regulations. In particular, this does not explain, why statutory regulation is necessary in the first place. In the absence of clear statements about the ultimate policy goals it is difficult to assess the

* Institut für Volkswirtschaft, WWZ, Universität Basel, Petersgraben 51, CH-4003 Basel, Switzerland.

1. Without implicating them I would like to thank NIKLAUS BLATTNER, JÜRIG BLUM, MARTIN HELLWIG, MONIKA MERZ, GEORGE SHELDON, MARKUS STAUB, EVA TERBERGER and HEINZ ZIMMERMANN for stimulating discussions and comments. Financial support of the Schweizerischer Nationalfonds under grant 1239248.93 is gratefully acknowledged.
2. For the case of Spain see VIVES (1990) and for Sweden see ENGLUND (1990). For deregulation of the European banking industry see GUAL and NEVEN (1992).

choice of policy instruments. In my comments I will take the view that banking regulation is largely motivated by the aim to reduce failure risk of individual banks. Section 2 provides arguments that may support the view that failure risk in banking is more problematic than in other industries. Capital requirements are meant to reduce failure risks. Section 3 outlines reasons of why regulators may have chosen capital adequacy rules as the basis for harmonizing regulation. Section 4 concentrates on the central question of how capital adequacy rules will affect bank failure risk.

Figure 1
Deposit Insurance Expenses per Dollar of Deposits and Bank Failures



From: Keeley, 1990, Deposit Insurance, Risk and Market Power in Banking, AER, 1990.

2. WHAT IS BANK RISK-TAKING?

How can we explain the dramatic increase in the bank failure rate in the U.S. and other countries? Should regulators be worried about the increase in bank failures or should they regard failures just as a side effect of healthy competition that weeds out inefficient and badly managed banks? One could take the view that bank failures have increased as competition between banks and, even more, as competition between banks and nonbanks has intensified. Competition reduces intermediation margins and, therefore, competition

may reduce, or even deplete, accumulated reserves after some unlucky draws in the asset portfolio.

This increased failure risk under competitive conditions is not what is meant under bank risk-taking. Provided *systemic risks*, such as massive deposit withdrawals or contagion, can be contained, there seems little reason to be concerned about an increased rate of failures of individual banks. The social costs of individual failures could easily be overcompensated by the benefits of competition. In this respect the banking industry would resemble any other industry facing a more competitive environment. Bank risk-taking, typically, refers to banking activities that increase the failure risk of the bank, relative to the competitive benchmark (under symmetric information), and, that are specific to banks. This leads us to ask what differentiates banking from other industries.

Banking differs from any other industry in the fact that banks take *deposits*. This makes banks particularly vulnerable to systemic risks. Since banks may deposit large amounts of funds with other banks in the interbank market, failure of one bank may trigger the failure of otherwise sound banks, and thus mushroom to a system wide crisis. Furthermore, to the extent that individual banks perform maturity transformation they may be prone to the risk of massive withdrawals of funds (bank runs) and hence experience liquidity risk.³

National regulations differ widely in their policies to deal with systemic risks. *Deposit insurance* and *implicit government guarantees* to bail out failing banks – particularly large banks – are the predominant policy instruments.⁴ While the short-run consequences of such well-intentioned policies may be quite valuable, in the long-run they may create distorted incentives. The problem of distorting incentives is particularly important since proper pricing of deposit insurance and of the implicit government guarantee are virtually impossible.⁵ In particular, the implementation of risk-sensitive deposit insurance pricing requires a certain degree of market power in the banking market (CHAN, GREENBAUM, THAKOR, 1992). Therefore, in a competitive banking environment it may not be implementable at all. Furthermore, proper pricing of deposit insurance requires accurate measures of asset risk. Such measures, however, are difficult to obtain for non-traded loans.⁶

3. See KAUFMANN (1994), however, for a sceptical assessment about the practical relevance of the bank run problem.
4. It is worth noting that implicit insurance does practically also exist for large industrial companies. This guarantee may be exercised by central banks (BRIMMER, 1989) or by independent government agencies that subsidize large companies.
5. A bank's proper contribution to the deposit insurance fund should reflect the bank's failure risk. Therefore, it should not be uniform across banks, when banks differ in failure risk.
6. Presumably, loans are less liquid than corporate bonds because they are more monitoring intensive. To the extent that banks specialize in originating loans the valuation of such assets is quite difficult to non-originating parties. These difficulties in valuing loans extend to regulators who are typically not involved in originating loans.

Mispricing of deposit insurance and costless government guarantees give rise to serious *moral hazard* problems. Especially under competitive pressure banks may actually select more risky portfolios and thus exacerbate failure risk.

This is most easily seen in the case of capital deficient banks. A bank may be economically insolvent but still be able to continue operations since book values do not incorporate expected losses appropriately. In such a situation a conservative strategy may not allow the bank to avoid insolvency. Risky strategies, however, could help to avoid insolvency. Investment in some risky asset may not pay off, in which case nothing is lost, since the bank will be insolvent anyway. However, there is a positive probability that the risky investment generates high enough returns to allow the bank to avoid insolvency. *Gambling for resurrection* (DEWATRIPONT, TIROLE, 1995) or *betting the bank* (MISHKIN, 1992), essentially, is the only strategy for capital deficient banks to continue operations. This strategy explicitly involves *excessive risk-taking* of the bank. The cost of this strategy is either paid by the deposit insurance fund, the tax payer, or possibly by the depositor. The cost, however, is not taken into account by the bank management.⁷ This form of *excessive risk-taking* has been at the heart of the S&L-crisis in the U.S. (MISHKIN, 1992, DEWATRIPONT, TIROLE, 1995). Consequently, this form of moral hazard has become a prime issue of the regulatory debate in the U.S.

Excessive risk-taking may take several disguises:

- i) One aspect consists of direct investments in risky assets. These assets may just be high risk projects or risky securities. The strategy of asset substitution, whereby safe assets are substituted for risky assets, is particularly difficult to monitor for outside investors or depositors as it relates to commercial loans.
- ii) Risk-taking also occurs, when diversifiable risks are not hedged properly. Accordingly, one sided bets in options or financing risky research ventures in biotechnology are examples of this kind of risk-taking, as well as portfolios that are biased towards specific industries. For example, part of the S&L-debacle did arise from the fact that the S&L-institutions were highly invested in mortgage loans, which were considered safe prior to the crisis.
- iii) Another aspect of risk-taking is that the bank may choose to reduce monitoring efforts. By investing fewer resources in monitoring borrowers' creditworthiness, banks can reduce the marginal costs of providing performing loans. Therefore, the bank explicitly takes a greater risk of (unknowingly and unwillingly) accepting non-performing loans.
- iv) Similarly, a capital deficient bank could attempt to compete more intensely for deposits that could be invested in risky assets. As long as deposits are insured,

7. It is worth noting that this strategy of excessive risk-taking in the case of capital deficient banks may not only be chosen by management acting in the interest of shareholders. Even regulators may have an interest to cover-up insolvencies and may thus encourage risk-taking (KANE, 1989).

overbidding by failing institutions may be perfectly feasible since depositors rely on the solvency of the deposit insurance fund.⁸

In the last two cases, excessive risk-taking of individual undercapitalized banks will exert negative consequences on rivals via market interactions. For example, «excessive competition» for deposits increases failure risk also for otherwise economically solvent banking firms. These externalities can be exacerbated when the number of risk-taking institutions becomes large.

Risk-taking is not only restricted to the very small banks and to smaller S&L-institutions in financial trouble. Also large banks may have additional incentives to engage in risky activities when they are protected by implicit government guarantees, such as the *too-big-to-fail-policy*. For example, BOYD and GERTLER (1994) find that in the U.S. from 1983-1991 large banks with assets above 10 billion US\$ did incur the highest loan losses per unit of credit (see figure 2). BOYD and GERTLER argue that asset portfolios as well as the liability structure has been more risky for the large banks than for medium sized banks.⁹ In particular, large banks were highly invested in loans to less developed countries and in commercial real estate loans.

Of course, the incentive for large banks to engage in risky activities depends on the intensity of competition in the banks' areas of activity. As long as large banks do enjoy market power in certain market segments, the desire to maintain future rents will prevent bank management to engage in risky activities. The value of the implicit government subsidy rises as the intensity of competition increases and the banks' charter value declines.¹⁰

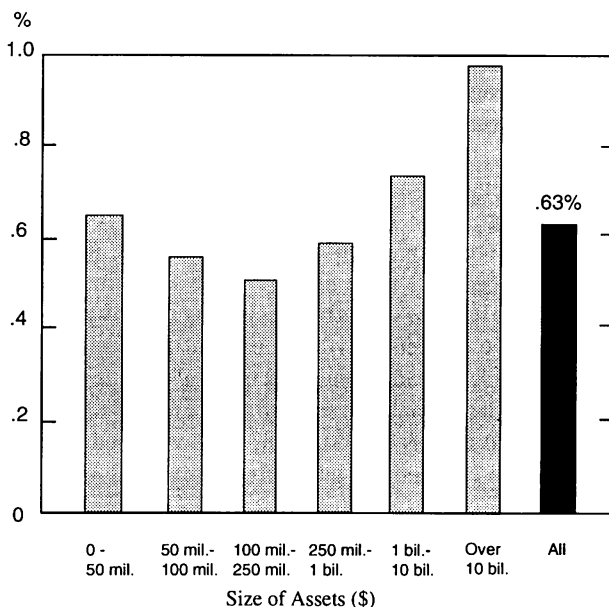
As charter values decline, even large banks may engage in risky activities. Moral hazard at the level of large banks may manifest itself in the form of taking unhedged derivative positions. Accordingly, as competition intensifies, the need for proper risk management procedures becomes more urgent. At the same time, pressured banks feel tempted to consolidate the balance sheets by speculating in derivative markets. This form of risk taking in derivative markets may be of particular concern to regulators, since a small set of very large banks already dominates trading activities in derivatives markets (BIS, 1995a). These very large banks do seem to hold substantial open positions, which, according to GORTON and ROSEN (1995), seem to be well hedged in the overall asset portfolio. Nevertheless, as competition intensifies, intentional pricing errors¹¹ or inten-

8. In the U.S. intermediaries specialized on breaking up large deposits into smaller units that were completely insured. These so-called *brokered deposits* allowed failing banks and S&L's to bid aggressively for deposits (MISHKIN, 1992).
9. In fact, BOYD and GERTLER (1994) find that loan losses are U-shaped across size classes. Accordingly, small banks and large banks incur higher loan losses than medium sized banks.
10. The charter value is the discounted stream of expected revenues derived from the asset portfolio in case of continued bank operation. Since it does not reflect liquidity risk – and the risk of bank failure – it is not the value of the bank.
11. Pricing errors can be intentional, when management relies on historical information even in situations of dramatic change. The internal model approach suggested in the 1995 supplement (BIS, 1995b) creates

tional lack of hedging can easily expose large banks to substantial risks that may ultimately have to be paid by tax payers.

By way of summarizing, it seems that an increase in the intensity of competition can explain the increase in bank failures in the U.S. It is useful, however, to separate two channels through which failure rates are affected. Competition directly increases the probability of individual bank failures since it depletes banks' profits as buffers against failure risk. But the decrease in the value of bank charters additionally creates a moral hazard problem of banks' risk-taking. By betting against the deposit insurance fund, or against the tax payer, ailing banks and large banks can extract unpriced subsidies. The general lesson drawn from the U.S. experience is that policies that aim to prevent systemic risks by some form of an insurance scheme may create serious moral hazard problems. The temptation to take risk increases as competition intensifies. A necessary condition to curtail this temptation involves the determination of insurance premia that accurately reflect the asset risk of depository institutions.

Figure 2:
Loan Loss Provisions as a Percentage of Assets



Source: Boyd, Gertler, 1994: The Role of Large Banks in the Recent U.S. Banking Crisis, Quarterly Review, Federal Reserve Bank of Minneapolis.

such opportunities. Furthermore, blind reliance on arbitrage pricing methods may involve significant risks in periods of shortage of risk capital (HELLWIG, 1994). In such situations reliance on historically «proven» methods constitutes a strategy of risk-taking.

3. WHY CAPITAL ADEQUACY RULES?

How can we understand the choice of the particular regulatory instruments? Before attempting an interpretation of the regulatory choice it is useful to assess the recent developments. In particular, it is important to understand what factors may have led to the dismantling of national regulation in banking. If deregulation was the source of intensified competition among banks which ultimately culminated in an increased failure rate one could simply restore the regulatory system of the «good old days» and thus implement a stable banking system.

However, such a view does not seem very convincing. Rather it seems that the regulatory system itself is endogenous and has reacted to dramatic changes in the market environment. Since the liberalization of international capital flows, much of the deregulation in banking and in international capital markets can be attributed to the concern of national regulators about the competitiveness of their national banking systems and their financial institutions in international capital markets (HELLWIG, 1994, 1995). Technological changes in communication and information processing capabilities have made financial intermediaries, and even customers, much more mobile. Without the technological advances in communication technologies in the 80's the swap markets could have hardly developed. Financial innovation and modern risk management techniques do rely on informationally and computationally intensive pricing methods. And, last not least, with modern technology huge sums of capital can be moved across borders, or between banks, at low physical cost almost instantly. The enhanced information processing capacity and the increased mobility of clients mount considerable competitive pressure on banks, financial intermediaries, and, also on national regulators, who are concerned about the competitiveness of domestic banks or financial intermediaries. This process of deregulation in banking and financial markets may actually be a rational response of national regulators towards increasingly competitive international banking and capital markets (GEHRIG, 1994).

According to this view, regulation can be effective only, when coordinated across countries. The Basle Accord 1988 can be seen as a first step towards international harmonization of banking regulation. Presumably, considerations about national sovereignty of monetary policy imposes serious restrictions on the choice of the policy variables. For example, properly priced international deposit insurance requires that insurance premia reflect currency risk for assets denominated in foreign currencies. This currency risk can be eliminated altogether when exchange rates are fixed. On the other hand, when national governments exercise discretionary monetary policy, a fair assessment of currency risk does not seem feasible. Accordingly, either national control of the money supply has to be abandoned to allow for proper pricing of deposit insurance or correct pricing of deposit insurance is not feasible altogether, in which case risk taking may remain an important problem.¹²

12. Likewise it would be difficult to coordinate on an implicit international too-big-to-fail-policy, since

But besides these political considerations, correct pricing of deposit insurance also requires correct and close supervision of individual banks' asset choices. Such a policy is informationally quite demanding. Even more, national governments, if they had the precise information, might be reluctant to share this information internationally because of strategic concerns.

These arguments, based on political concerns, suggest the choice of a fairly simple and robust instrument as the basis for harmonization of regulation. Ideally, this instrument should not interfere with national monetary policy or national industrial concerns. Accordingly, capital adequacy rules seem to be an obvious choice. Capital requirements create a buffer against loan losses and thus tend to reduce bank failure risk. Especially, when a capital-to-asset ratio of 100% is chosen, the risk of bank failure is minimal. This shows that capital requirements may be an effective instrument to control the safety and soundness of the banking system. However, the allocational consequences of capital restrictions are less clear. In particular, what are the costs of capital requirements, and who has to bear them? A discussion of some consequences of uniform standards, as mandated by the Basle Accord, will be the topic of the next section. Before, we shall describe further conceivable roles of capital requirements and the nature of the Basle Accord.

An alternative role of capital ratios can be seen in their function as warning bells for ailing banks. As banks find it difficult to meet capital requirements, regulators might like to intervene with management at an early stage in order to prevent gambling for resurrection well before bank insolvency occurs. One could imagine a system of staggered capital requirements that leads to increasing monitoring activity and intervention by the regulator as the capital basis gets depleted.¹³ The Basle Accord, however, does not exploit this potential information generating property of capital requirements. Presumably, it is difficult to harmonize discretionary intervention by national regulators for the different warning limits. Therefore, it is not surprising that such a system with staggered requirements cannot be implemented.

As implemented in the 1988 Accord capital adequacy rules are fairly unsophisticated.¹⁴ For commercial loans, they require a capital-to-asset ratio of at least 8%. Assets are weighted according to the type of counterparties (government, banks, nonbanks), but not according to economic risk. These capital requirements do not interfere directly with national monetary policy. Although their implementation only required consensus on a common definition of capital, history tells us that the process of coordinating on a common definition was already quite painful and lengthy.

national governments might have different preferences about the banks they would like to support in case of insolvency.

13. The Federal Deposit Insurance Improvement Act (FDICIA) of 1991 for the U.S. builds precisely on this idea. It is a timid version of the earlier Treasury plan (U.S. Treasury, 1991) trying to relate more stringently admissible activities to bank capital. According to this view well capitalized banks can engage in a larger set of activities than low capitalized, or even undercapitalized banks.
14. See SHELDON (1995) for a detailed description of the 1988 Accord and the 1995 Supplement.

4. CAN CAPITAL ADEQUACY RULES REDUCE RISK-TAKING?

Is it true that capital requirements reduce failure risk and hence increase the safety and soundness of banks? But then, if safety and soundness of individual banks is the regulatory goal, why did regulators not choose a capital-to-asset ratio of 100% (BLUM, HELLWIG, 1994)? When capital-to-asset ratios are strictly less than 1, the allocational consequences of capital requirements are quite complex. The present section elaborates on a variety of mechanisms through which capital requirements affect economic activity, and particularly bank risk-taking, in potentially different institutional contexts. Such knowledge is fundamental to any evaluation of the potential welfare and distributional effects of capital regulations.

When analyzing the effects of capital adequacy rules on bank failure risk it is useful to distinguish between *direct* and *indirect* effects. As already described, the direct effect of capital requirements is the creation of a buffer against loan losses. *Ceteris paribus* a larger buffer reduces the risk of bank failures. Accordingly, the buffer directly reduces failure risk. However, this is not the complete story since banks may react to the imposition of capital requirements by changing the structure of their portfolios. Hence, capital requirements also affect portfolio selection and thus contribute indirectly to failure risk. This indirect effect on failure risk can reinforce, or counteract, the direct effect. In particular, the indirect effect may dominate the direct effect, which implies that a well-intentioned policy to increase the safety and soundness of banks may well prove counter-productive and actually increase failure risk.

In the sequel I discuss how indirect effects may reinforce or counteract the direct effect. Since indirect effects are generated by endogenous reactions of banks, a multitude of such effects are likely to be important. In the sequel I selectively isolate partial effects that may seem particularly relevant for banking. The overall reaction, of course, is determined by the interplay of all these partial considerations. In subsection a) the discussion centers on the role of risk weights. Improperly chosen risk weights can increase bank failure risk in competitive loan markets. This effect does not require informational asymmetries. In situations of asymmetric information between depositors, bankers and regulators, capital requirements will additionally affect incentives of bank management. These are the concern of subsection b).

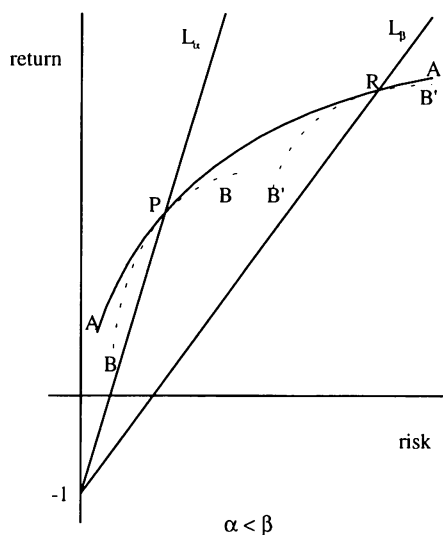
a) Portfolio Approach – The Role of Risk Weights

KAHANE (1977), KOEHN and SANTOMERO (1980), KIM and SANTOMERO (1988), and ROCHET (1992) show that in competitive financial markets risk-based capital standards may increase failure risk of individual banks when the risk weights are not properly chosen. In particular, when risk weights do not correctly reflect the correlations between different assets, less risk averse banks may choose to restructure their portfolios such

that overall failure risk may be increased. This argument holds even in the absence of informational asymmetries.

To see this, consider figures 3.a and 3.b.¹⁵ Consider entrepreneurial banks that are managed by their owners. Banks can invest in risky assets and risky deposits. There is no riskless security. Capital requirements essentially restrict the set of feasible portfolios, since they impose a maximum number on the capital-deposit ratio. In this setting the curve AA represents the efficient frontier in the absence of regulation. The curve BB represents the frontier when uniform capital standards are imposed. Likewise $B'B'$ represents a restricted frontier to a higher standard. The efficient frontier envelopes the restricted frontiers. Hence, each choice of a uniform standard corresponds to the choice of a particular restricted frontier. Assume that standards are chosen such that tangency portfolio P implies a failure risk of $\alpha > 0$. Then all portfolios on the line L_α all carry the same failure risk, while portfolios to the left imply lower failure risk and portfolios to the right imply higher failure risk. Consider now a bank that has a preference for portfolio R in the unrestricted case. The portfolio R implies a failure risk of $\beta > \alpha$. Apparently, the bank is less risk averse than a bank selecting portfolio P . In figure 3.b, the bank's preference is such that after applying uniform capital standards it would prefer portfolio R' , which implies an even higher failure risk than β .

Figure 3.a



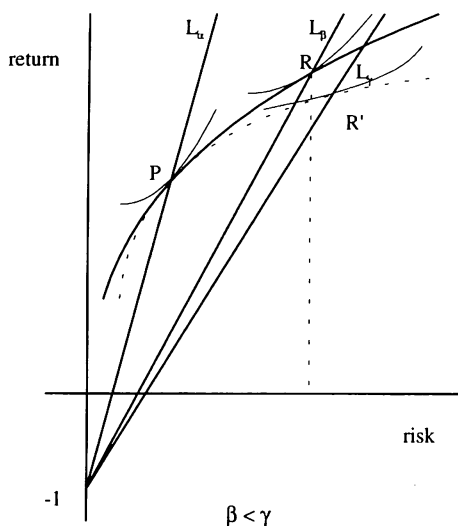
Accordingly, when capital requirements are tightened only very risk averse banks will select portfolios with lower failure risk, while less risk averse banks may prefer to

15. In the presentation I follow KIM and SANTOMERO (1988).

take portfolios that increase failure risk. If one takes the view that large banks tend to behave in a less risk averse manner, incorrect risk weights might particularly affect the failure risk of large banks.

This concern is of practical relevance for the discussion about extending capital regulation to cover market risk. When risks are priced according to the building block approach essentially uniform weights are applied for commercial loans and capital market instruments. In this case, in competitive markets, banks may prefer less hedging of their loan portfolios and thus deliberately incur higher failure risk. For example, consider a situation where banks employ derivatives to hedge parts of their loan portfolios. When rigid capital charges are applied to both, the loan portfolio and the derivative position, the bank may prefer not to hedge the position to the extent it would have done without capital requirements. In fact, if the bank chooses not to hedge its loans at all, the resulting portfolio, with capital charges applied, may imply a higher failure risk than the hedged portfolio in the absence of capital regulation. Only risk sensitive weights that account properly for correlations between different assets will induce banks to reduce failure risk. These optimal risk weights depend on expected asset returns, the variance-covariance structure of asset returns and an upper bound on admissible insolvency risk, judiciously chosen by regulators.¹⁶

Figure 3.b



16. The discussion in this section assumes unlimited liability of the bank management. This assumption biases the results against bank risk-taking. ROCHET (1992) derives risk weights when limited liability of the banks is taken into account.

b) *Incentive Approach – Controlling Management*

An important aspect of banking is that banks serve as delegated monitors. That is, banks invest resources in monitoring and controlling loans, the returns of which are private information to the banks' management. Accordingly, bank management has privileged information about the quality of its outstanding loans, which in general is not shared by other market participants, regulators, or depositors. Because of the informational privileges, bank management enjoys large amounts of discretion, both in the *portfolio choice*, as well as in the choice of the *monitoring intensity* of its loans. This discretion can be used against the interests of depositors. As discussed above, management of economically insolvent banks might attempt to avoid insolvency procedures by gambling for resurrection.

This incentive to gamble for resurrection of an insolvent bank is fairly independent of the particular governance structure of the bank, and the particular incentive scheme, under which management is remunerated. An entrepreneurial owner, protected by limited liability, would feel tempted to undertake high risk investments, just as the manager of a large stock bank.¹⁷ Similarly, both an entrepreneurial banker, and a bank manager on an incentive scheme, are constrained by the imposition of capital requirements, even well before the bank is insolvent; but for different reasons. The entrepreneurial banker has to support risky loans by his own funds. In contrast, the manager of a stock bank would have to raise money by issuing shares on the stock market. Presumably, such external funding invites capital market monitoring of management. Hence, capital requirements essentially serve as constraints on managements' discretion. They limit asset growth for a bank with fixed capital, and they provide for capital market monitoring as the bank plans to issue new equity. Both consequences tend to constrain risk-taking activities of the bank management. In this sense capital requirements can be seen as preventive measures (BALTENSBERGER, DERMINE, 1987).

For example, capital requirements curtail incentives to compete excessively for insured deposits. Even when deposits are insured, and depositors have little incentives to monitor the bank's portfolio selection, equity owners may be reluctant to provide new equity to risky or ailing banks. An ailing bank that has exhausted its possibilities to substitute safe for risky assets, can invest in new gambles only by recapitalization. The need to satisfy capital requirements effectively restricts the extent of the gambling activities and thus risk-taking.

17. Here two sources of moral hazard have to be distinguished. First, an agency problem may arise between bank owners and managers. Second, an agency problem exists between bank management and depositors. While bank owners may at times prefer more risky investments than depositors, bank managers' incentives will largely depend on their remuneration package. If the package includes implicit seniority based long-term contracts, management may be reluctant to invest in risky activities. If, on the other hand, the compensation package largely centers on stock options, bank management might be willing to incur high risks, as the recent example of Mr. Leeson of Baring Brothers demonstrates.

In a similar vein, DEWATRIPONT and TIROLE (1995) argue that outside control may be necessary to discipline self-interested bank managers, pursuing their own personal goals within the company and extracting personal rents and perquisites. As long as capital requirements can be met, management control should rest with shareholders. Since shareholders are rewarded with returns in successful periods they may prefer sound but risky investment strategies to a larger extent than holders of fixed claims. However, when capital requirements cannot be met, control should switch to depositors, or to banking regulators acting on behalf of depositors, in order to prevent unsound risk-taking. Accordingly, capital requirements reduce management discretion and hence the feasibility of risk-taking strategies.

In contrast, the effects of capital requirements on the monitoring intensity may be less desirable. As long as risk weights do not account for market correlations, management may not be willing to invest resources in accurate monitoring of individual loans.¹⁸ In fact, to the extent that capital requirements serve as some form of portemanteau insurance against loan losses, banks may reduce costly information acquisition and rely on stable buffers. Hence, they may just substitute a form of mandatory insurance against loan losses for costly monitoring. Accordingly, the quality of information about their own books may deteriorate within banks. Even attempts to mark loans to market could be adversely affected by the lower quality of credit information. In this sense, banks' loan decisions become less qualified and banks tend to take larger risks since their information about loan portfolios is more opaque. This form of risk-taking is particularly relevant in highly competitive markets.¹⁹

Accordingly, in *perfectly competitive* banking markets capital requirements constrain management discretion which tends to reduce bank risk taking. On the other hand, capital requirements may reduce the rewards to monitoring and thus increase failure risk for banks. The overall effect of capital requirements may increase or decrease failure risk (BESANKO, KANATAS, 1993) depending on the relative importance of these effects in a general equilibrium setting.

Sufficiently large bank charter values stemming from oligopolistic rents or government subsidies are an alternative mechanism that reduces incentives for bank risk-taking. By taking risks an entrepreneurial banker sets at stake the whole stream of expected future rents. Therefore, in *imperfectly competitive* markets, bank risk-taking in the form of asset substitution is less of a concern.²⁰ On the other hand, capital requirements will

18. Of course, when risk weights are improperly chosen, banks feel tempted to substitute assets. Their monitoring activities tend to concentrate on identifying opportunities for regulatory arbitrage. This argument, however, applies to information about industries, or risk factors, and less to individual loans.
19. BESANKO, KANATAS (1993), BOOT, GREENBAUM (1993) and CERASI, DALTUNG (1995) provide related arguments. They argue that an increase in external equity reduces costly monitoring efforts of entrepreneurial management, since parts of the returns on monitoring activities accrue to outside shareholders.
20. Of course, to the extent that competition is relaxed, also incentives to monitor loans are low and the bank bears a higher level of risk than desired by the bank owners, even for sound banks. But this is a consequence of market conduct rather than regulatory policy.

affect the nature of strategic competition among banks. In particular, two opposing effects need to be distinguished. In an oligopolistic context capital requirements tend to reduce the *heterogeneity* of banking firms. On the other side, temporarily they act as *capacity constraints* for the bank's lending activities.

Capital requirements increase conformity of banking firms. This implies that banks' ability to differentiate from competitors is reduced, and, therefore, price competition tends to become more intense. This effect increases failure risk. Furthermore, since banks are more homogeneous, depositors' and possibly also shareholders' incentives to monitor banking activities are reduced. Thus the burden on monitoring banks falls increasingly on the shoulders of statutory regulators. Reduced incentives for private monitoring have to be compensated by increased efforts in public monitoring in order to constrain the discretion of bank managers.

On the other side, capital requirements act as capacity constraints. To the extent that issuing shares is costly, and to the extent that recapitalization is a time consuming process, the installed capital base defines a lending capacity for banks. This capacity constraint tends to soften price competition (KREPS, SCHEINKMAN, 1983), both in deposit and loan markets. Strictly speaking, this argument only applies to a static context, where recapitalization is very costly (or impossible). In a dynamic context, banks may actually build up «capital reserves» to exploit the option of funding promising projects. In such a context recapitalization will occur well before the capacity limits start to constrain lending operations. Nevertheless, even in a dynamic context, capital choices are commitments that affect price competition in the future. It would be useful to know more about banking competition and the roles of capital requirements in a truly dynamic environment.

Again the nature of competition between banks will also be affected by the *managerial compensation schemes* employed. The compensation scheme itself is a strategic variable, since it affects managers' incentives to engage, or avoid, cut-throat competition. For example, the incentive argument of BRANDER, LEWIS (1986) also applies to entrepreneurial banks. It states that bank managers will behave «softer» the more equity they contribute to the lending process. In this sense, capital requirements may reduce the force of price competition between entrepreneurial banks.

Again the overall effect on the intensity of competition and on bank failure risk depends on the importance of deposits and loans for the financial system, and on the availability of alternative capital market products. Accordingly, the effect of capital requirements on bank failure risk has to be assessed in a general equilibrium framework that explicitly takes into account the coexistence of capital markets and their financing role.

However, to the extent that capital requirements imply costs to intermediation they serve as a *barrier to entry* into banking and contribute to maintaining bank charter values. In a political environment that does not allow harmonization of direct industry regulation (for reasons discussed in section 3.), capital requirements may seem an appropriate indirect instrument to industry regulation.²¹ Of course, as competition between banks

and non-banks intensifies, charter values can only be preserved when capital regulation is applied to both, banks and non-banks. Otherwise, when capital requirements are imposed on banks only, and when traditional banking activities can be performed by non-bank financial intermediaries, bank charter values may decline even faster.

5. CONCLUSION

The last section has demonstrated that the consequences of capital requirements for banks may be quite different for countries with different financial institutions, and with different characteristics of the overall financial system. For each individual country the effects of imposing capital requirements, or varying capital ratios, can only be assessed by an integrated approach towards the (national) system of financial intermediation at large. The effects on bank failure risk, and the failure risk of financial intermediaries more generally, are ambiguous from a theoretical point of view. Consequently, it is surprising to see, how little empirical work is devoted to assessing the likely consequences of capital regulation.

Maybe the lack of knowledge about the allocational consequences of imposing «simple rules» is advantageous for the process of harmonizing regulatory policy. But it leaves the question of what negative externalities ultimately do justify regulatory intervention into the operation of financial markets. What kind of systemic risk requires special regulatory attention? Maybe such a focus can prevent «excessive protection» of incompetent bank management. Maybe the «narrow bank» should be the proper regulatory choice to deal with depositor protection. Such a policy could be easily harmonized, and it requires minimal statutory intervention.

21. GEHRIG (1995) argues that characteristics of the product market invite «excessive entry» of banks which in the presence of aggregate risks causes a high failure rate of banks. In such an environment capital requirements may limit entry and reduce bank failure risk, while the first best regulatory policy is direct regulation of industrial structure.

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SUMMARY

It is argued that the liberalization of financial markets and the increasing mobility of customers have rendered national banking regulation increasingly ineffective and led to a process of deregulation. Capital adequacy rules are the central instrument for a starting process of reregulation and international harmonization of the regulation of banks. Their advantage consists in their simplicity. Their allocative consequences are less clear. For example, it is argued that the structure of the competitive environment is important in assessing the likely consequences of capital regulation. In perfectly competitive markets capital requirements tend to reduce management discretion and, therefore, reduce risk-taking. In imperfectly competitive markets capital requirements tend to reduce the intensity of competition. Nevertheless their overall consequences are ambiguous.

ZUSAMMENFASSUNG

Es wird argumentiert, dass durch die Liberalisierung der Finanzmärkte und die zunehmende Kundenmobilität die nationale Bankenregulierung zunehmend ineffektiv geworden seien. Eigenkapitalvorschriften sind das zentrale Instrument eines beginnenden Reregulierungsprozesses, welcher insbesondere zu einer Harmonisierung der unterschiedlichen nationalen Regulierungssysteme führen soll. Ihr Vorteil ist, dass sie einfach anwendbar sind. Ihre allokativen Folgen sind allerdings recht unerforscht. Beispielsweise können sie in Märkten mit grosser Wettbewerbsintensität tendenziell den diskretionären Spielraum des Bankenmanagements einschränken und somit die exzessive Übernahme von Risiko begrenzen. In Märkten mit unvollständigem Wettbewerb können sie zusätzlich tendenziell dazu beitragen, die Wettbewerbsintensität zu reduzieren.