Working Paper 8914

THE ROLE OF BANKS IN INFLUENCING REGIONAL FLOWS OF FUNDS

by Katherine A. Samolyk

Katherine A. Samolyk is an economist at the Federal Reserve Bank of Cleveland.
The author gratefully acknowledges helpful comments from Mark Gertler, Donald Morgan, and James Thomson.

November 1989

I. INTRODUCTION

Although the recent performance of the U.S. macroeconomy is being hailed as "the longest modern peacetime expansion," failures of depository institutions have been closely linked to certain depressed productive sectors in the country. The most stark examples can be found in the depressed farm-belt and oil-producing regions. Observations indicate that financial firms do not or cannot diversify against industry-specific risk when choosing their loan portfolios. Such behavior may be explained by extensive government regulation of the industry's scale and scope or by technological costs of intermediating credit that encourage specialized lending by region or by industry.

This paper does not attempt to formally explain why depository institutions engage in specialized lending; rather, it examines some implications of regional and sectoral banking in terms of macroeconomic performance.[1] It considers the short-run implications of bank-capital immobility when banks produce real services in channeling the flow of funds into investments. We illustrate how regional banking conditions can affect the mix of aggregate investment and the level of future aggregate output in the absence of macroeconomic fluctuations.

Given the current deregulatory trend in structural policy changes, the nature of the financial services industries has come under intense scrutiny. Recent banking literature has formalized how financial contracts are related to imperfect information. A recurring theme has been that when information is costly, the quantity and nature of external finance has allocative consequences. Diamond (1984) demonstrates how financial intermediaries (hereafter referred to as banks) can improve the efficiency of capital markets by diversifying and thus minimizing information costs; however, perfect diversification makes bank capital and the dispersion of bank asset returns irrelevant to bank portfolio choice.

These strong informational assumptions allow the intermediation process to work more smoothly than we observe. If these conditions are not met, bank capital and the risk of bank assets affect bank profitability. Bernanke and Gertler (1987) show how the inability to eliminate variability in portfolio returns implies that "health" of a bank's balance sheet can affect the flow of funds to risky bank investments. In their model, depositors cannot observe the ex-post returns on bank projects at any cost and bank capital must absorb random asset returns; insufficient bank capital may constrain banks from investing in risky but profitable investments. In a similar framework, Samolyk (1989) examines how the interest-rate risk associated with the maturity transformation in bank portfolios affects bank asset management.

This paper will analyze the implications of imperfect information for investment in a decentralized banking system.[2] We present an intertemporal model of banking similar to that of Bernanke and Gertler. Bankers possess a specialized technology that allows them to channel resources to investment projects that would not be funded in direct credit markets. They also have information about their portfolio returns. Unlike Bernanke and Gertler, this analysis attempts to incorporate the notion that there is more than one productive sector in the economy. We assume that in the short run, bank technology is market-specific and immobile. Local banking conditions, as well as local investment opportunities, affect both the flow of funds to productive projects in a given "market" and the level of future output.

We demonstrate how distributional imbalances in banking conditions across productive sectors affect the aggregate allocation of credit. Local bank capital, relative to the risk of local investments, affects the ability of "banking markets" to use their technology to conduct specialized lending. Ailing banking industries or regions can become capital-constrained in their ability to attract external finance to fund even profitable local investments. Optimally, an interregional flow of funds should occur to equate the marginal products of capital across regions. However, when banks produce real services in conducting intermediation, regional banking conditions can affect the costs of external finance and drive a wedge between returns across productive sectors that would not occur in a world of perfect information. These results are contrasted with regional &posit imbalances to underscore the significance of bank-capital adequacy in facilitating specialized bank finance.

Section II presents the basic model of regional banking and alternative market equilibria. Sections III and IV show how regional imbalances in &posit flows and in bank-capital adequacy differ in their potential effect on bank portfolio choices. Section III examines the effects of regional imbalances in the flow of funds to banks when all regions have identically-distributed production possibilities. Section IV illustrates how productivity shocks across regions can be exacerbated by financial frictions. Section V is the conclusion.

II. A MODEL OF BANKING AND THE FLOW OF FUNDS

We now present a two-period model of regional banking.[3] In each productive sector there are two types of individuals: depositors and bankers. They are denoted by their endowments, as described below.

Information Assumptions

The following analysis makes these assumptions about the distribution of information in the economy:

1) Bankers possess an information technology for locating and monitoring bank-specific investment projects; depositors do not. To locate and monitor a bank project, a banker uses a proportional fraction of real resources, 6. Thus, banks provide depositors with access to additional investment opportunities.

2) A banker's technology is specialized to his market and is immobile. For expositional simplicity we assume that monitoring costs are zero for bankers within a market and infinite for bankers across markets. Thus, bank technology cannot be used to locate and monitor projects in other markets.

3) Depositors cannot observe the returns of bank investment projects, although they can costlessly observe local bank-investment activity and the distribution of returns on bank-specific investments in their market.

Assumptions (1) and (3) follow Bemanke and Gertler and explain the use of deposit liabilities to fund the specialized investments of banks. These assumptions imply that depositors will not accept a return that is contingent on bank-specific projects. Assumption (2) rules out short-run interregional bank-capital flows.[4]

<u>Production Possibilities</u>

In this model, there are two production technologies in a given market, which produce consumption goods one period later. The following assumptions are used in describing a market's production possibilities:

4) One type of investment available to all investors is a riskless project. The riskless investment is a constant-returns-to-scale technology, which pays a gross rate of return of R^* on any level of resources, 1, invested in it.

5) Bankers can use their technology to invest in a local technology with a random return.[5] The expected return on the risky technology is a function. of the number of projects initiated in a given market. The risky technology yields the expected rate of return of R where

$$R(1) = \frac{f(1)}{1}, \tag{2.1}$$

where $f'>0$, $f''<0$, and $f(1)$ is the expected gross return on an investment of 1. The function $f(1)$ is strictly concave and increasing in 1.

6) The gross rate of return on a risky project has a lower bound of R^m, which is assumed to be invariant to the level of investment in this technology and where

$$R^m < R^*.^6 \tag{2.2}$$

7) Banks cannot perfectly diversify portfolio risk because the scale of an individual bank project is large relative to the size of a bank portfolio.

8) A market's production possibilities are independent of those in other markets.

Assumptions **(1), (3),** (6), and (7) imply that an upper bound exists on the quantity of an individual bank's risky investments, given its capital position, because the return on the share of a bank's portfolio invested in risky projects is uncertain. Assumptions (2) and (8) capture the notion that regional banking is specialized to regional industries. They also imply that a bank can use its technology only to make local investments; it can only **"lend"** to **banks** in other markets.

The Representative Banking Market

Bankers receive an endowment of bank capital and possess the project evaluation and monitoring technology. In this short-run analysis, the endowment of bank capital represents a bank's beginning-of-period internal flow of funds. Bankers live for two periods, investing their endowment in period zero to maximize expected profits (which they consume) in period one.

To simplify the analysis we assume that there is one banker located within each banking sector.[7] We present the profit-maximization problem and the alternative market equilibria in a type i market. (The market indices will be omitted on local flows for simplicity.)

In period zero, the bank in a type i market has the following portfolio balance constraint:

$$d + w^b = (1+\delta)l + l^* + (1+\delta_j)l_j, \tag{2.3}$$

where d is the quantity of deposits, w^b is the quantity of bank capital, 6 and δ_j are local and intermarket bank monitoring costs respectively, 1 and

l_j are the levels of investment in local and intermarket risky bank projects, and l^* is investment in riskless projects. From assumption (7), l_j=0 and δ=0. Total deposits can be disaggregated as

$$(2.4)\quad d = d^p + (d^b - d^b{}_j),$$

where d^p and d^b are deposits purchased by individuals and banks in the local market, respectively, and $d^b{}_j$ are deposits bought by banks from other markets.

Bank profits in a type i market in period 1 are

$$(2.5)\qquad \pi = R(l)l + R^*l^* - r^d d^p - r^d{}_b(d^b - d^b{}_j),$$

where R and R^* are the gross realized rates of return on risky and riskless projects, respectively; r^d is the gross cost of local deposits, and $r^d{}_b$ is the gross cost of deposits traded by banks in different markets. The actual profits earned by bank-equity holders are a random variable because of the random return on part of the bank portfolios.

Finally, to constrain the relative yields on alternative investments in a way that will result in banks holding a non-trivial quantity of risky investments, it is assumed that

$$(2.6)\qquad R^* < f'(w^b),$$

in all markets. This inequality constraint implies that banks will want to invest at least their bank capital in the risky technology.

To attract deposits, a bank must offer a deposit rate that satisfies

$$(2.7)\qquad r^d \geq R^*,$$

$$(2.8)\qquad R^m l + R^*l^* \geq r^d d.$$

Constraint (2.7) follows from the assumption that any individual can invest in the risk-free technology. Constraint (2.8) follows from the informational assumptions (1), (2), and (3): it requires bank solvency in the worst state of possible portfolio returns. Equations (2.6) and (2.8) imply an upper bound on profitable but risky bank projects.

Bankers are risk-neutral and therefore maximize expected profits, subject to their portfolio constraints. Expected bank profits are

$$(2.9) \qquad E(\pi) = R(l)l + R^*l^* - r^d d.$$

Thus, a bank chooses (l, l^*, d^b) in period zero to maximize (2.9) subject to (2.3), (2.4), (2.7), and (2.8). Using equations (2.3) and (2.4) to substitute in the bank's choice variables, eliminating personal deposits, the first-order necessary conditions for the investments of a bank are

$$(2.10) \qquad (R'(l)+\beta R^m) \geq (1+\beta)r^d,$$

$$(2.11) \qquad R^* \geq r^d.$$

The multiplier β, associated with the bank's solvency constraint, only appears in the first-order condition for the risky asset. A positive value for this multiplier implies that a bank in a type i market is capital-constrained in choosing the level of risky investments.

Conditions (2.7) and (2.11) imply that $r^d=R^*$; depositors will receive the risk-free rate. Note that (2.1), (2.10), and (2.11) imply that $R(l)>R^*$ also must hold or l^* would dominate l; thus, the expected return on bank capital is above the risk-free rate and bankers have positive expected profits.[8]

Depositors' Endowments

Depositors in the economy receive their endowments in period zero and invest them to provide for consumption in period one. They desire to maximize expected future consumption. Depositors are located in a given market in period zero and they &posit their endowments in local banks. Normalizing the number of depositors at unity, local deposits in a given market are

(2.12) $d^P = w^d$,

where w^d is the endowment of depositors in a type i market.

Alternative Equilibria In Local Markets

The local alternative market equilibria are presented when no inter-market trading occurs. These results will be used in describing how variability in local banking conditions across markets can affect aggregate investment.

The relevant parameters that determine which allocation occurs in any particular market are the debt-equity ratio of banks, the total funds invested in the market, and the respective distributions on the alternative investment opportunities.

We assume that the relative rates of return are such that the optimal local investment portfolio includes some risk-free projects

(2.13) $f'(w^b+w^d) < R^*$.[9]

A banking market is not capital-constrained when

(2.14) $R^m w^b \geq (w^d - l^*_u)(R^* - R^m)$.

The unconstrained banking allocation is

(2.14a) $l_u = l(R^*)$, where $l(R^*) = R(l)^{-1}$,

(2.14b) $l^*_u = w^b + w^d - l(R^*)$,

where l^*_u and l_u are the unconstrained level of investments in the risk-free and risky technologies, respectively.. The expected returns on both types of projects are equated at the margin and a fraction of depositors' funds are invested in the risk-free technology.[10]

A banking market is capital-constrained when (2.14) does not hold. Then the share of depositors' funds invested in the risk-free technology must increase to guarantee depositors the risk-free return. The capital constraint is satisfied by

$$(2.15) \qquad R^m w^b = (w^d - l^*_c)(R^* - R^m),$$

where the subscript c denotes the constrained equilibrium. The mix of bank investments as determined by (2.15) is now:

$$(2.15a) \qquad l^*_c = w^d - w^b\left(\frac{R^m}{(R^* - R^m)}\right),$$

$$(2.15b) \qquad l_c = w^b\left(\frac{R^*}{(R^* - R^m)}\right).$$

The expected asset yields, respectively, are

$$(2.16) \qquad R^* < R(l_u) < R(l_c).$$

In summarizing these alternative equilibria, a banking market can be capital-constrained any time the earnings on bank capital cannot guarantee the risk-free rate of return on the share of depositors' funds invested in risky projects. When this occurs, a larger share of depositors' funds is invested in risk-free projects, although the marginal expected return on a risky project is greater than the risk-free rate. From (2.9), expected profits to bank equity-holders are lower than in the unconstrained equilibrium. However, because of the informational asymmetry, banks cannot attain the first-best equilibrium.

The following sections illustrate how distributional factors can affect the aggregate allocation of resources even when the first-best allocation is feasible in the aggregate economy.

III. DISTRIBUTIONAL IMBALANCES AND AGGREGATE INVESTMENT

In this section, we show how capital imbalances across markets prevent an economy from undertaking potentially profitable, albeit privately monitored projects. This result is contrasted by first considering the implications of regional deposit imbalances across otherwise identical banking markets. It is assumed that all banking regions have identically-distributed production possibilities.

Deposit Imbalances Across Banking Markets

The aggregate quantity of deposits is assumed to be such that if banking markets received the average quantity of deposits, banks would not be capital-constrained in choosing their portfolio of investments; the average debt-equity ratio allows banks to invest in their optimal amount of risky projects. Consider, then, a simple scenario where depositors are distributed unevenly across markets, with one half of the markets receiving a low quantity of deposits, w^d_L, and the other half receiving a high level of deposits, w^d_H. Thus, if each market received the average quantity of deposits, all markets would receive

(3.1) $$d^P = \bar{w}^d = 1/2w^d_L + 1/2w^d_H,$$

where $w^d_L < w^d_H$. The equilibrium that results from (3.1) will be referred to as the economy-wide equilibrium; in all other aspects the banking markets are assumed to be identical. When the economy-wide equilibrium is characterized by **(3.1)**, all markets are identical; thus

(3.2) $d = d^p = \bar{w}^d$, for all type i markets.

In this scenario, the unconstrained economy-wide equilibrium satisfies the equilibrium described by (2.14) in the last section; all banks are investing in risky projects until their expected return equals the risk-free rate.

When deposits are distributed as described in (3.1), regional deposit imbalances can create yield differentials across local banking markets if w^d_L satisfies

(3.3) $f'(l_L) = f'(w^b+w^d_L) > R^*$.

Because on the margin, all additional deposits in deposit-rich banks (those markets receiving w^d_H) are used to fund risk-free projects, aggregate investment in these projects is above the optimal level. If there is **costless** inter-bank lending across markets, deposit-constrained banks will borrow to fund risky projects until their marginal expected yield equals the risk-free rate. The quantity of inter-bank deposit liabilities issued by these banks is

(3.4) $d^b_L = (l(R^*) - (w^b+w^d_L)) < (\bar{w}^d - w^d_L)$,

which equals only the amount necessary to fund the optimal **portfolio.**[11] The level of risky investments is equated across all markets because they all have sufficient capital to fund the optimal portfolio and identically-distributed production possibilities.

Regional Imbalances In Bank Capital

Distributional differences in the quantity of bank capital across markets have very different implications for market equilibrium and the aggregate allocation of resources. Capital imbalances can be motivated as a simple way to consider how past profitability can affect the short-run portfolio choices of banks; capital-constrained markets cannot fund projects with high expected returns. As in the previous section, it will be assumed that half of the markets receive a low endowment of bank capital while the other half receive an above-average endowment. If bank capital was evenly distributed, the average quantity of bank capital in a market would be

$$\bar{w}^b = 1/2w^b_L + 1/2w^b_H, \tag{3.5}$$

where $w^b_L < \bar{w}^b < w^b_H$. In all other aspects, the markets are identical. It will also be assumed that if all markets received the average quantity of bank capital, banks would not be capital-constrained in choosing their investments in risky projects. This implies that (2.14) holds for the economy-wide average quantity of bank capital and the economy-wide market allocations would satisfy (2.14a) and (2.14b). These market allocations will be referred to as the economy-wide equilibrium.

In the markets receiving the low quantity of bank capital, the capital constraint is binding at the expected profit-maximizing level of investment in the risky technology. Insufficient capftal causes banks to restrict their risky investments below the first-best quantity. Capital-poor banks must hold a lower share of risky investments than in the economy-wide equilibrium.

The equilibrium in capital-constrained markets in this case is characterized by (2.15a) and (2.15b). Capital-rich banks invest marginal funds in the risk-free technology. Unambiguously, both markets now fund a larger number of risk-free projects and aggregate expected future output is lower than in the economy-wide equilibrium as

$$(3.6) \qquad \frac{1}{2}(R(l_L)l_L+R(l_u)l_u+ R^*(2(\bar{w}^b+w^d)-(l_L+l_u))) < (R(l_u)l_u + R^*((\bar{w}^b+w^d)-l_u)),$$

where $l_u=l(R^*)$.

Inter-market lending will not eliminate the distortion; capital-rich markets will not lend to capital-poor sectors because they cannot observe risky project yields outside of their locality. Capital-poor banks have an incentive to originate local investments and sell them to capital-rich regions; however, the assumption of infinite monitoring costs prohibits such sales. Interregional flows of bank capital will not resolve the agency problem because bankers in other markets cannot observe project returns outside their locality; bank technology is localized and immobile in the short run. Because securitization is not feasible, only an outright transfer to capital-poor bankers will resolve the regional imbalance.

An interesting point to note is that the volume of assets that capital-constrained bankers would like to originate and sell is larger than merely the differential in bank capital across sectors. From (2.15) and (3.6), the quantity of asset sales to capital-rich markets that would equate the level of risky investments across markets is

$$A_H = l(R^*) - \frac{w^b{}_L R^*}{(R^*-R^m)} > (\bar{w}^b - w^b{}_L). \tag{3.7}$$

This underscores the relative impact of'capital shocks in terms of their effect on aggregate output. Distributional shocks to bank capital can lead to a misallocation of resources across productive sectors that is greater than shocks to other sources of bank funds. This is because bank capital allows a bank to use its intermediation technology. An increase in the dispersion of relative capital shocks across sectors of the economy will increase the volume of asset swaps that would occur, if they were feasible.

IV. REGIONAL DIFFERENCES IN PRODUCTION POSSIBILITIES

Regional Productivity Imbalances

The implications of differences in regional production technologies in this model will be illustrated by considering multiplicative regional productivity imbalances. We assume that one half of productive regions receive high and low productivity shocks to their local distributions of project returns, respectively, where

$$f_i(l_i) = (1+\alpha^i)f(l_i), \; i=H,L, \tag{4.1}$$

$$-\alpha^H = \alpha^L. \tag{4.2}$$

In all other respects, the markets are identical. We also assume that

$$(1+\alpha^H)f'(w^b+w^d) < R^*, \tag{4.3}$$

so that regional risky projects can be funded locally.

Unconstrained Regional Investment Activity

A regional banking market is unconstrained if

$$(4.4)\qquad w^b R^m{}_i \geq (R^* - R^m{}_i)(l_i - w^b).$$

When resources can flow optimally to alternative investment opportunities, the local allocations will satisfy

$$(4.5)\qquad (1-\alpha^H)f'(l_L) = (1+\alpha^H)f'(l_H) = R^*,$$

$$(4.6)\qquad l_i = l_i(R^*) \text{ where } l_i(R^*) = R(l_i)^{-1} = (f(l_i)/l_i)^{-1},$$

$$(4.7)\qquad l^*{}_i = (w^b+w^d) - l_i(R^*).$$

Because of the concavity of $f(l_i)$, (4.5) implies that $l_L<l_H$; banks in high-productivity markets invest more in risky projects and banks in low-productivity markets invest more in risk-free projects. The effect of regional productivity imbalances on unconstrained aggregate expected output depends on both the net level and the dispersion of risky'investments in the economy, as a function of the concavity of regional production possibilities.[12]

Alternativ Constrained Regional Banking ons

We now examine how the bank capital constraint may prevent the economy from exploiting the productivity imbalances across sectors, thus reducing expected future output relative to the unconstrained allocations implied by (4.2) and (4.5) -(4.7). Whether regional productivity imbalances can constrain regional investment activity depends on the concavity and the dispersion of the regional production possibilities.

When the productivity differential is positively related to both the expected returns and lower bounds of the production technologies, the capital constraint,

$$(4.8) \qquad w^b(1+\alpha^i)R^m < (R^* - (1+\alpha^i)R^m)(l_i - w^b),$$

implies that either type of shock may constrain regional investment. This is because the optimal levels of and the minimum returns on risky projects are positively related to the shocks. Thus, the change in the optimal bank investment in risky projects relative to the change in the minimum return on these projects will determine which regions become constrained by productivity shocks as from (4.8) ,

$$(4.9) \qquad d\alpha^i l_i - (R^* - (1+\alpha^i)R^m)\frac{\partial l_i}{\partial \alpha^i} d\alpha^i \gtrless 0 \text{ where,}$$

$$(4.10) \qquad \frac{\partial l_L}{\partial -\alpha^H} = \frac{f'(l_L)}{(1-\alpha^H)f''(l_L)} < 0,$$

$$(4.11) \qquad \frac{\partial l_H}{\partial \alpha^H} = - \frac{f'(l_H)}{(1+\alpha^H)f''(l_H)} > 0.$$

For a binding capital constraint to arise in markets receiving the positive net shock to the distribution of returns, the risk associated with inflow of inter-market deposits must exceed the increase in the lower bound on risky project returns; this is more likely to occur if the regional production technologies are less concave. When regional production possibilities are not very concave, productivity imbalances have a large effect on the optimal distribution of risky investment across regions. When the capital constraint becomes binding, bank-capital immobility implies that funds will not flow into high-productivity markets to equate the marginal expected returns. The amount of risky investments will be such that (4.8) holds with strict equality.

When the lower bounds of the regional technologies are invariant with respect to the productivity imbalances, the variances of the project returns change correspondingly. Thus, markets receiving the positive productivity shocks are more likely to become constrained as the optimal level of regional investment increases. When $dR^m_i/d\alpha^i = 0$,

$$(4.9') \qquad \cdot \; (R^* - (1+\alpha^H)R^m)\frac{\partial l_H}{\partial \alpha^H}d\alpha^H < 0 \text{ as}$$

$$(4.11') \qquad \frac{\partial l_H}{\partial \alpha^H} = - \frac{f'(l_H)}{(1+\alpha^H)f''(l_H)} > 0.$$

Finally, mean-preserving shifts in the dispersion of production possibilities across productive sectors are quite analogous to capital shocks in their effect on the level of bank investments in risky projects. In markets where there is an increase in project variance, the lower bound on the risky project decreases. Given a homogeneous quantity of market bank capital, the capital constraint becomes more binding in these markets (and vice versa). Banks in high-variance markets may have to restrict their investment in risky projects, and all the conclusions of section IV follow qualitatively.

V. RELATED ISSUES IN MONEY AND BANKING

The model presented in this paper captures some of the features of banking in a decentralized economy. Banks originate assets that are different from those traded in direct credit markets, often to borrowers that cannot obtain funds in these markets. Thus, banks provide intermediation services in channeling funds to alternative real investments. A second important feature is the informational asymmetry between banks and investors supplying external finance, which implies that the contractual nature of external finance is not irrelevant. Finally, banks specialize in lending to heterogeneous productive sectors, thus operating in different "banking markets." We show how the factors affecting the relative health of regional banking markets can affect the mix of real investments, independent of aggregate economic conditions.

Our most important result is that imbalances in bank capital relative to existing productive opportunities have greater allocative consequences than imbalances in the sources of debt finance. This underscores the importance of banks as information producers and bank capital as their ante in risky investments. Relative changes in current health of specialized banking sectors can generate persistence in output fluctuations because they have greater effects on the costs of funding risky projects and the mix of current investments.

Although asset swaps are not feasible in this stylized model, we are able to characterize a scenario in which banks desire to sell assets rather than use debt finance to fund projects. Thus, it provides a starting point for analyzing one possible motivation for securitization as an alternative to heterogeneous risk preferences or arbitrary legal restrictions. Banks will sell off assets rather than obtaining external finance when they can find buyers that have access to the intermediation technology and will accept a return contingent upon the underlying investment opportunity. This is because when a bank is capital-constrained, an asset sale cannot include any claim on the seller's net worth.

For example, if we relax the assumption that intermarket monitoring costs are infinite, banks will engage in asset swaps if the costs are not prohibitive. However, two important results remain: 1) interbank capital flows will not take the form of unsecured bank liabilities, and 2) finite intermarket monitoring costs will reduce but not eliminate yield differentials on bank-specific projects across markets. This illustrates that the results of this highly stylized model are only qualitatively affected by less extreme assumptions about bank monitoring technologies.

The results obtained in this particular model will generalize to a broader class of models. The critical feature of debt-contracting models in general is that when default is possible, the amount of insider equity affects the cost of external finance and the volume of resources allocated across projects. This paper has presented some implications of specialization by financial intermediaries. It is not likely that these issues will disappear with deregulation. The potential for bank default will remain an issue as long as banks write contracts that are not fully contingent on the random return on their portfolios. Currently, we do not observe banks divesting themselves of what can be defined as "aggregate risks." This may be due to the highly specialized characteristics of bank investments or because "aggregate risks" increasingly reflect relative changes in economic conditions across sectors.

As long as banks do not write contracts contingent on a representative "market portfolio," regional banking conditions have important consequences for investment in an economy.

Footnotes

1. The private economies of scale and scope are currently somewhat obscured by substantial financial regulation. In the wake of the current trend toward deregulation, it will be interesting to see what form depository institutions take. One unregulated extreme is a market of homogeneous institutions. Each would offer the market menu of indirect claims and hold the optimally-diversified market portfolio of investments, including a homogeneous share of loans to small, risky borrowers. Given the heterogeneity in the real sector of our economy, this outcome would require very large nation-wide financial firms and no diseconomies of scale and scope, or the developement of secondary markets in which bank-generated financial claims could be traded.

2. This analysis actually has implications for financial segmentation across types of intermediaries as well as within a particular intermediary industry.

3. In Bernanke and Gertler (1987), banks both: 1) initiate loans to primary borrowers, and 2) conduct liquidity and risk transformation in the issue of indirect liabilities to depositors. Here we abstract from considering the maturity transformation within bank portfolios to focus on the regional allocation of credit. For an analysis of liquidity transformation, see Samolyk (1989).

4. This assumption is overly restrictive and the sensitivity of our results to it will be discussed in the conclusion.

5. In terms of a bank loan asset, the upper bound of a project's return is the promised yield and the lower bound is the collateral value (less any liquidation costs.)

6. It could be assumed that the lower support of the distribution is a concave function of the level of investment (assumed to represent the liquidation value of this technology). This modification would complicate the exposition without altering the basic qualitative conclusions.

7. Because the regional production technology is concave, the expected average rate of return on bank investments exceeds the risk-free rates, and bankers will receive any realized economic profits. The assumption of a monopoly bank does not affect the optimal portfolio, but simplifies the determination of the deposit rate.

8. This does not alter any qualitative conclusions in the following analysis of the capital constraint. It merely implies that the bankers bear the cost of the constraint, as will be shown.

9. Assumptions (2.2) and (2.6) define the respective yields on local investments. An alternative equilibrium could be characterized; one where unconstrained banks fund only risky investments with local funds. For brevity in exposition, we will only consider the equilibrium where unconstrained banks hold only both types of investments.

10. The unconstrained banking allocation is equivalent to the full-information banking allocation. When ex-post bank project returns are costlessly observable, the quantity of bank capital is irrelevant to bank portfolio choice; depositors will accept contingent deposit contracts.

11. There is no incentive to fund risk-free projects in another locality because the technology is assumed to exhibit constant returns to scale.

12. Expressions (4.2) and (4.5-4.7) implicitly &fine the economy's unconstrained "investment demand functions," $l_i(\alpha^H)$ and $l^*_i(\alpha^H)$, for $i=L,H$. Differentiating (4.4) with respect to $\alpha^H=-\alpha^L$ allows us to compare the differences in l_i across sectors where

$$\frac{\partial l_L}{a\text{-}d'} = \frac{f'(l_L)}{(1-\alpha^H)f''(l_L)} < 0,$$

$$\frac{\partial l_H}{\partial \alpha^H} = -\frac{f'(l_H)}{(1+\alpha^H)f''(l_H)} > 0, \text{ where } \frac{\partial l_L}{\partial \alpha^H} + \frac{\partial l_H}{\partial \alpha^H} > 0 \text{ as,}$$

$$\frac{f'(l_L)^2/f''(l_L)}{f'(l_H)^2/f''(l^H)} < 1.$$

References

Bernanke, Ben, "Nonmonetary Effects of the Financial Crisis in the Propagation of the Great Depression," American Economic Review, 1983, 73, 257-76.

__________, and Mark Gertler, "Agency Costs, Collateral, and Business Fluctuations," Social Science Research Institute Working Paper 8627, University of Wisconsin, Madison, 1986.

__________, and Mark Gertler, "Banking and Macroeconomic Equilibrium," in William Barnett and Kenneth Singleton, eds., New Approaches to Monetary Economics, New York: Cambridge University Press, 1987, 89-111.

Bhattacharya, S. and D. Gale, "Preference Shocks, Liquidity and Central Bank Policy," in William Barnett and Kenneth Singleton, eds., New Approaches to Monetary Economics, New York: Cambridge Press, 1987, 69-88.

Boyd, John and Edward Prescott, "Financial Intermediary-Coalitions," Journal of Economic Theory, 1986, 38, 221-232.

Diamond, Douglas, "Financial Intermediation and Delegated Monitoring," Review of Economic Studies, 1984, 51, 393-414.

Diamond, Douglas, and Philip Dybvig, "Bank Runs, Deposit Insurance, and Liquidity," Journal of Political Economy, 1983, 91, 401-419.

Fama, E., "Banking in the Theory of Finance," Journal of Monetary Economics, 1980, 6, 39-57.

__________, "What's Different About Banks?," Journal of Monetary Economics, 1985, 15, 29-40.

Gertler, Mark, "Financial Structure and Aggregate Economic Activity: An Overview," Journal of Money, Credit, and Banking, 1988, 20, 559-588.

Moore, Robert, "Three Essays on Asymmetric Information and Financial Contracting," University of Wisconsin, Ph.D. Thesis, 1987.

Samolyk, Katherine, "Portfolio Risks and Bank Asset Choice," Federal Reserve Bank of Cleveland, Working Paper 8913, 1989.

Smith, Bruce, "Bank Panics, Suspension, and Geography: Some Notes on the 'Contagion of Fear' in Banking," Carnegie-Mellon University, mimeo, 1986.

__________, "Private Information, Deposit Insurance Rates, and the 'Stability' of the Banking System," Journal of Monetary Economics, 1984, 14, 293-317.

Townsend, Robert, "Optimal Contracts and Competitive Markets with Costly State Verification," Journal of Economic Theory, 1979, 21, 265-93.

Williamson, Stephen, "Costly Monitoring, Financial Intermediation, and Equilibrium Credit Rationing," Journal of Monetary Economics, 1986, 18, 159-79.