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A Theoretical Analysis of Narrow Banking Proposals

Shuji Kobayakawa* and Hisashi Nakamura**

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Abstract

The purpose of this paper is to consider what is the most desirable structure of narrow banks. First we survey narrow banking proposals presented in the United States and Japan, and categorize them according to two criteria: (i) whether the safe assets that a narrow bank is allowed to hold are limited to short-term assets, and (ii) whether the narrow bank is allowed to provide lending services. Secondly we examine the feasibility of each proposal with regard to the purpose of achieving financial system stability, making use of two theoretical models: that of Wallace (1996) and that of Kashyap, Rajan and Stein (1999). Finally we conclude that the most desirable narrow bank is one that conducts both deposit-taking and lending activities, though restrictively, and is allowed to invest in short-term safe assets.

Keywords: bank run; narrow banks

JEL Classification Code: G21; G28

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1. Introduction

The recent trend in bank regulation discussions concerns the question of how to prevent contagion in the financial system. Bank regulation thus far has been mainly dependent on a safety net such as deposit insurance. The crucial feature of a safety net is that it relies on the *ex post* discretionary intervention of the state. Lately it has been pointed out that, while the stability of the financial system owes much to such a safety net, the latter has also generated social costs due to the moral hazard behavior of financial institutions. Thus, an *ex ante* regulatory method based on market discipline is now being sought to replace *ex post* discretionary regulation. Narrow banking proposals are now being given much attention because it is considered that they may constitute one of the regulatory mechanisms that could replace discretionary regulation. The proposals are that two major functions of banks (i.e. deposit-taking and lending activities) should be undertaken by different institutions in order to prevent contagion of financial risk via the payment system. In this discussion, narrow banks are broadly referred to as banks that specialize in deposit-taking/payment activities, while not being able to provide lending services. But the precise definition of narrow banks varies a great deal between the various proponents. For example, in one proposal narrow banks are defined only as those that invest in short-term safe assets such as treasury bonds (Pierce's (1991) proposal) and in another only those banks that lend money to small firms are included (Bryan's (1991) proposal), yet they both define the banking structure as "narrow banks." This ambiguity in the definition of a narrow bank leads us to question how robust each proposal would be in providing protection against financial risk and which proposals are more feasible for the stability of the financial system.

Nonetheless, such differences in proposals have not been analyzed extensively¹.

This paper first describes several narrow banking proposals presented in the United States and Japan, and categorizes them via two standards: (i) whether the safe assets that narrow banks are allowed to hold should be limited to short-term assets, and (ii) whether narrow banks are allowed to provide lending services along with deposit-taking (and settlement) services. Secondly, we examine how feasible each proposal is for achieving financial system stability, making use of two theoretical models: that of Wallace (1996) and that of Kashyap, Rajan and Stein (1999). We rely on Wallace (1996) to examine the first standard of the classification of the proposals, and Kashyap, Rajan and Stein (1999) to examine the second standard of the classification. Let us go through their arguments briefly.

First, Wallace (1996) claims that if the narrow bank is allowed to invest only in the short-term safe assets the financial system may achieve a Pareto optimum. On the other hand, if the bank holds long-term safe assets as well as short-term assets, the system cannot achieve a Pareto optimum because the narrow bank may fall into a liquidity shortage due to a costly liquidation of its long-term assets; in some cases (e.g. when all depositors wish to withdraw their deposits) the bank cannot fulfill all the liquidation needs of the depositors.

¹ As we see in next section, some of the proposals examine the compatibility of a safety net. But the proposals have begun to be discussed for the purpose of achievement of the stability of financial system without *ex post* discretionary intervention of the government, such as deposit insurance. To be sure, the safety net and narrow banking proposals are not necessarily opposed to each other. This paper focuses on narrow banking proposals without the safety net.

Secondly, Kashyap, Rajan and Stein (1999) study the banks' provision of a commitment line to their client firms, and claim that there may exist significant economic synergy between deposit-taking and loan commitment activities as long as deposit withdrawals and commitment takedowns are not too highly correlated. In other words, banks providing both deposit-taking and loan commitments can share some of the costly overheads incurred by holding large volumes of liquid assets such as cash and securities. They conclude both theoretically and empirically that it is efficient if one financial institution carries out both functions under the same roof, rather than having two separate institutions specialize in either of these two activities.

Summing up the results derived by these two models, we conclude that a desirable narrow bank structure is one that carries out both deposit-taking and lending activities, with investment limited to short-term safe assets which include mortgage loans and loans made under commitment line.

Let us point out in advance several limitations of our analysis. First, we focus only on liquidity risk, without considering credit risk at all. A bank run, according to Wallace (1996), is only due to unexpected deposit withdrawals, not to badly-performing bank loans. Secondly, the payment mechanism is not examined rigorously in the model. The depositors' motivation to hold deposits is their desire to achieve optimal consumption under future uncertainty, not to settle their "due-to" positions. Owing to these limitations, it is not appropriate to derive policy implications regarding such questions as whether Japan's postal saving system should continue to exist as a narrow

bank², or whether central banks and narrow banks should compete.

This paper is organized as follows. Section 2 explains the narrow banking proposals presented in the United States and Japan, and sorts them according to the above-mentioned two standards. Sections 3 and 4 examine the theoretical feasibility of each proposal for achieving financial system stability, making use of two theoretical models: that of Wallace (1996) and that of Kashyap, Rajan and Stein (1999). Section 5 concludes the paper.

2. A Practical Survey of Narrow Banking Proposals

Narrow banks are often cited as the banks that specialize in deposit-taking/payment activities, and are prohibited from engaging in lending activities. Although the underlying notion of narrow banks varies widely among different proposals, academics have hitherto paid scant attention to these differences. In this section, we first survey several narrow banking proposals and clarify the concept of narrow banks.

² In Japan, the postal saving system has planned to become a public corporation by 2003. As a first step of this reform, the duty of deposit in the Ministry of Finance will be abolished in 2001. This reform means that the postal saving system will be like a narrow banking system.

2-1. A History of Narrow Banking Proposals

Historically the origin of narrow banking proposals can be traced back to the “Chicago Plan,” first advocated in the United States in 1933. This plan includes the idea of 100% Money, which removes credit creation mechanism from private banks for the purpose of preventing bank runs and reducing the volatility of economic fluctuations. The plan, however, was rejected by Congress and later the Bank Act in 1935, which included an improvement in the provision of deposit insurance and a restriction on deposit rates, was enacted. Ironically, economists such as Fisher (1935) and Friedman (1960) were active supporters of 100% Money. But their ideas were mainly focused on the abolition of credit creation, reducing the volatility of economic fluctuations and enhancing the controllability of money supply, and less attention was paid to the stability of the financial system.

From the 1980s, financial liberalization and securitization were under way and financial crises, such as the S&L debacle, manifested themselves. This naturally brought more attention to the stability of regulatory methods based on market discipline than to current discretionary regulation. Through the course of discussion, some light was cast on narrow banking proposals.

2-2. A Conceptual Classifications of Narrow Banking Proposals

This section overviews major narrow banking proposals. In the following, we survey three proposals; those of Litan (1987), Pierce (1991), and Bryan (1991). Let us describe them in order.

(i) Litan's (1987) proposal

The first narrow banking proposal in history was set forth by Professor Robert Litan of the Brookings Institute (Litan (1987)). This proposal is that “financial holding companies” be authorized to become highly diversified financial conglomerates. These companies would have two kinds of subsidiaries: “banks” and separately incorporated lending subsidiaries. The banks would serve as transaction processors, accepting deposits and investing only in highly liquid safe securities, or in practice, obligations of the United States Treasury or other federally guaranteed instruments. On the other hand, the financial holding companies would extend lending services only through their lending subsidiaries, wholly funded by commercial paper, debentures and equity, etc³.

(ii) Pierce's (1991) proposal

This proposal, which was designed by Professor James Pierce of the University of California, Berkeley (Pierce (1991)), separates monetary and financial functions into individual institutions. While Monetary Service Companies fulfill the monetary

³ In Herring and Litan (1995), however, Professor Litan himself seems to cast doubt about a feasibility of narrow banking proposals.

function, the financial function is handled by Financial Service Companies. Monetary Service Companies provide checking accounts and wire transfers, and are permitted to pay interest on all their accounts. But the extent of the assets that they can hold is restricted. That is, the assets are limited to purchases of the kind of short-term, highly marketable, and highly rated instruments that are in the portfolios of today's money market mutual funds, such as short-term Treasury securities, and highly rated commercial papers. Thus Monetary Service Companies correspond to narrow banks and provide payment services, including check clearing, electronic funds transfer, and discount windows. On the other hand, Financial Service Companies can conduct all other activities, including insurance and retail banking⁴.

(iii) Bryan's (1991) proposal

Lastly let us review the core bank proposal by Lowell Bryan of McKinsey. In this proposal, like that of Litan, a financial holding company is established and the bank subsidiary fulfills narrow banking function. The extent of the safe assets the bank subsidiary can hold is broad – some of the lending services such as mortgage loans can be provided by the bank subsidiary; hence, we conclude that the bank subsidiary in this proposal is engaged in credit creation. The lending subsidiary, on the other hand, provides such services as highly-leveraged transactions and LDC lendings.

To summarize, one proposal allows the narrow bank to invest only in short-term safe assets such as treasury bonds (Pierce's (1991) proposal) while the other proposal allows

⁴ In addition, the Pierce proposal presents that the Monetary Service Companies have a capital base and enjoy federal insurance for all their liabilities without limit.

the bank to extend credit to small firms (Bryan's (1991) proposal). In other words, there is no uniform definition of a narrow bank as regards its range of functions. This difference in defining narrow banking activities leads us to question how robust each proposal would be in protecting against financial risk and what kind of proposal is more effective for maintaining the stability of the financial system.

In order to classify the proposals, we set up two criteria. These criteria are (i) whether the safe assets that the narrow bank is allowed to hold are limited to short-term assets and (ii) whether the narrow bank is allowed to participate in lending activities. In examining the proposals, one has to consider what is left outside narrow banking activities. We call non-narrow banks "finance companies," which provide services that are not taken care of by narrow banks. First, we study criterion (i), that is, the range of safe assets that narrow banks are allowed to hold. One proposal restricts them to short-term safe assets, while other proposals permit the banks to invest in long-term assets as well as short-term assets. In holding long-term safe assets, banks face liquidity risk. Without suspension of convertibility or issuance of subordinated debts, the banks may not be prevented from suffering bankruptcy due to liquidity shortage.

Secondly, we interpret criterion (ii), that is, the synthesis of a bank's deposit and lending activities under the same roof. One proposal removes lending activity from narrow banks, while others allow them to create credit through restricted lending services. Suppose then that a narrow bank is prohibited from making any loans. That is, the bank only conducts deposit-taking activities. In this case, however, the bank may not offer higher interest rates than in the case in which it has two activities because deposit-

taking activity is generally thought to be less profitable than lending activity. In addition, it may be difficult in practice to differentiate between deposit assets and other assets. Therefore, in the case in which a narrow bank is strictly prohibited from lending money, payment systems other than a narrow bank would usually be used. In other words, a narrow bank might become a nuisance. That is why some of the narrow banking proposals are thought to permit the narrow bank to engage in lending activity, or a finance company to participate in the payment system alongside the narrow banks. It, however, would be necessary that the companies which the narrow bank could lend money to and the payment methods that the finance company could use should be restricted in some ways. In these cases, it follows that the efficiency of the proposals, that is, the degree to which credit risk is excluded from the payment system, would be decreased. Thus, we divide the proposals into classes according to these criteria as follows.

Table 1. Classification of the Narrow Banking Proposals

	Permitted to possess short-term safe assets	Permitted to possess long-term Safe assets as well as short-term ones
Prohibited from conducting lending activity	Pierce, 1991	Litan, 1987
Permitted to conduct lending activity	n.a.	Bryan, 1991

When we see the proposals on the basis of Table 1, the “narrowest” bank among them is the narrow bank as defined in the Pierce proposal. While the narrow bank as defined in the Litan proposal is subject to liquidity risk because it has safe but long-term assets, the narrow bank as defined in the Bryan proposal is permitted to engage in lending

activity. Thus, this inspection leads us to question how robust each proposal would be in protecting against financial risk and which proposal is more effective in achieving the stability of the financial system. In the following two sections, we examine theoretically the proposals in accordance with the classifications in Table 1.

3. A Theoretical Analysis of Narrow Banks using the Diamond and Dybvig Model

In this section, we examine narrow banks with reference to Wallace (1996), focusing on the first criterion outlined in the previous section, namely whether the safe assets that the narrow bank is allowed to possess are limited to short-term assets.

Wallace (1996) defines narrow banks as perfectly liquid banks without subordinated debts to their deposits or suspension of convertibility. Here, the “liquid banks” are defined as those which can accommodate any deposit withdrawal. In other words, only the banks that satisfy any level of deposit withdrawals can be called narrow banks. Under this definition, the economy consists of a narrow bank and an “illiquid bank.” In addition, it assumes two cases of narrow banks: one which is allowed to invest only in short-term safe assets, as in the Pierce proposal, and the other, which is allowed to invest in long-term safe assets as well as short-term assets, as in the Litan proposal. Using this setup, we examine how much welfare can be achieved in the two cases.

In his model, Wallace extends that of Diamond and Dybvig (1983). The Diamond and Dybvig model, which consists of three dates ($t = 0,1,2$), has three main features. First, there are many identical consumers at date 0, and each consumer is uncertain about his/her preferences over consumption at dates 1 and 2. The preferences are either an impatient type or a patient type. An impatient consumer is willing to sacrifice less of date 1 consumption per unit of additional date 2 consumption than a patient consumer. Each consumer learns his or her type at the beginning of date 1, but needs to make a decision about his or her asset portfolio at date 0. Secondly, banks have two linear constant-returns-to-scale technologies: short-term and long-term technologies. While a short-term technology has a gross one-period return R_1 , a long-term technology has a gross two-period return R_2 . There is also a return for liquidation of investment in the long-term technology after one period; this yields a gross return equivalent to r_1 . We assume $R_2 > (R_1)^2 > (r_1)^2$. Thirdly, the banking system deals with depositors on a first-come first-served basis. Based on these assumptions, the model examines bank runs caused by liquidity shortage. In addition, Wallace (1996) extends the third assumption of the Diamond and Dybvig model and assumes that, at date 1, the illiquid bank can suspend deposit withdrawals if they surmount the volume of the optimal consumption at date 1. This extension excludes bank runs of the illiquid bank from the model and focuses only on bank runs of the narrow bank.

Before examining narrow banks in detail, we point out in advance some limitations of the models of Diamond and Dybvig and of Wallace. First, neither model enables us to examine bank runs originating from bad loans, because both models fail to assume default risk on loans. Secondly, the analysis of payment services is beyond their scope.

Although deposits are widely used as a payment method in practice, cash transactions among banks are not analyzed in the original Diamond and Dybvig model. Recent contributions, such as those of Freixas, Parigi and Rochet (1998), however, deal with financing among banks, extending the Diamond and Dybvig (1983) model, and examine contagion effects in the payment system, making comparative analysis on the real time gross settlement system and designated time net settlement system. Such extensions of the Diamond and Dybvig model into the analysis of payment services are noteworthy as representing highly important academic progress towards the explicit categorization to model payment systems.

Based on these assumptions, we examine the implications of Wallace (1996) concerning narrow banks. First, suppose that the narrow bank is prohibited from participating in lending services and is only allowed to invest in short-term safe assets, as in the Pierce proposal, while the illiquid bank is allowed to invest in entrepreneurial firms, and short-term and long-term safe assets, and takes not only demand deposits but also time deposits.

This model concludes that, at date 0, the consumer invests funds equivalent to the amount of consumption that will be necessary at date 1 under uncertainty in the narrow bank and that the remaining funds go to the illiquid bank. Consequently, the level of consumption at date 1 can be covered only by short-term safe assets while consumption at date 2 can be covered only by long-term safe assets. This case can avoid inefficient resource allocation in contrast to the case of autarky where no banks exist because uncertainty concerning future consumption on the part of all consumers disappears.

Secondly, suppose that the narrow bank is permitted to invest in long-term safe assets as well as short-term assets, as in the Litan proposal. The narrow bank, by definition, guarantees any deposit withdrawals and can hold safe but illiquid assets. Consequently, at date 0, consumers invest funds equivalent to the level of consumption that will be needed at date 1 under uncertainty in short-term safe assets in any kind of bank deposit, and the remaining in long-term assets. This case takes account of the uncertainty of future consumption for the consumers and thus attains a lower level of welfare than the above-mentioned Pierce case.

Wallace shows that whether or not a narrow banking proposal can achieve Pareto optimality depends on the definition of narrow banks and, in addition, that the Pierce proposal is more efficient than that of Litan.

4. A Theoretical Analysis of Narrow Banking Proposals using the model of Kashyap, Rajan and Stein (1999)

This section studies the second criterion in the classification of the narrow banking proposals, i.e. whether the narrow banks can participate in lending activities, along with deposit-taking activities. We are especially interested in the recent contribution by Kashyap, Rajan and Stein (1999), who suggest that there exists a synergy effect in terms of liquidity needs between lending and deposit-taking activities.

Recently, organizational structures of financial institutions have varied widely – some institutions, such as investment banks, only provide lending services while not engaging in deposit-taking activities; others, such as regional banks, continue to provide both deposit-taking and lending services. These structural differences in banking organization raise a question: is there a rationale in providing two services in a single institution, or, to put it another way, how can such narrow banking proposals as those of Litan and Pierce be justified if there is a rationale in integrating the two services?

The academic contribution thus far has not dealt with such questions. For example, Diamond (1984) regards a bank as an entity which distinguishes good potential borrowers from bad ones. This is often called the *ex ante* monitoring role of financial intermediation. Similarly, Aoki, Patrick and Sheard (1994) stress the role of the main bank in the Japanese financial system as an *ex post* monitor of borrowers. These monitoring activities are often referred to as a bank's delegated monitoring, which has to be integrated into financial institutions, due to the fact that monitoring is costly. In other words, investors always have an incentive to free-ride on others' monitoring activity, and if the worst comes to the worst, nobody will monitor. In order to prevent "no-monitoring" situations, banks play the role of delegated monitor. These papers, nevertheless, take the liability side of the bank's balance sheet as given, so that it does not matter whether the bank raises funds by means of deposits or mutual funds; hence the integrating of lending and deposit-taking services cannot be justified. Another strand of research, as outlined in Diamond and Dybvig (1983), focuses on deposit-taking activity, stressing the role of banks as insurers against liquidity shock. This approach does not rigorously analyze the asset side of a bank's balance sheet.

Researchers have recently started examining a bank's activities on both sides of the balance sheet. The core question to ask is whether there is a rationale in undertaking both deposit-taking and lending activities within the same financial institution. The essence of the discussion is given by Rajan (1996), which we shall now summarize.

Rajan (1996) argues that the most fundamental function of the financial institution is not only to provide liquidity to borrowers but also to provide a "commitment line," whereby borrowers have access to liquidity within a limit set up in advance by the financial institution concerned. In return, banks receive a fee⁵. As the fee-related business accounts for a large share of banking activities, it would be helpful to see some numerical evidence in the US. Figure 2 shows that 74.1 % of the outstanding commercial and industrial loans (122 billion US dollars) made during the first week of November 1998 were conducted on the basis of a commitment line contract.

⁵ Strictly speaking, the liquidity shock generated by the commitment line appears on the liability side, namely that banks, making loans under the commitment line, transfer the equivalent amount of money in the borrower's account through which borrowers establish access to the liquidity. The consequence henceforth is not different from the liquidity shock generated by the withdrawal of deposit. We are however more interested in the source of the shock, which we can differentiate between the commitment line and the deposit withdrawal.

Commercial and Industrial Loans
made by All Commercial Banks (November 2-6, 1998)

(US million \$, %)

	Amount of Loans	Made Under Commitment
All Loans	122,252	74.1
0 to daily	49,558	62.6
2 to 30 days	30,458	89.9
31 to 365 days	18,059	87.9
over 365 days	3,076	59.0

Source: Federal Reserve Statistical Release “Survey of Terms of Business Lending”

In Japan, however, legal uncertainty concerning the interpretation of the Interest Rate Restriction Law leads to the fact that the commitment line service has not been widely used. For historical reasons, Japanese banks have provided an overdraft service to their clients. This service has a similar role to that of the commitment line, in the sense that the banks are exposed to liquidity shocks arising from the asset side of their balance sheets. On the aggregate level, overdrafts comprise almost 20 % of bank lending, since large firms, in particular, have used overdraft facilities to cope with their urgent short-term liquidity needs. This implies that Japanese banks have also been exposed to liquidity shocks arising from the asset side.

Such services as commitment lines cannot be provided by investors in financial markets, where the borrower-investor relationship tends to be separated at arms' length. Rajan

(1996) stresses that a market-based relationship cannot satisfy unpredictable/flexible liquidity needs, and it is exactly with regard to this function that financial institutions have a comparative advantage over financial markets.

As pointed out above, liquidity needs are expected to have a synergy with the liquidity shock arising from the liability side, i.e. deposit withdrawals. In a demand deposit contract, depositors are given the option of withdrawing their deposit at their discretion. Hence, short-term safe assets can be more efficiently used if they can satisfy the liquidity needs derived from both the commitment line and deposit withdrawals. In the next section, we examine if there is a synergy effect between deposit-taking and lending services, based on Kashyap, Rajan and Stein (1999), and derive a policy implication concerning narrow banking proposals.

To summarize the argument in the next section, we first suppose a situation whereby banks are exposed to a liquidity shock arising from both the asset and liability sides. Naturally, banks hold liquidity assets in order to satisfy the customers' liquidity needs while at the same time they would as much as possible like to reduce the amount of liquid assets they hold. This is due to the fact that (a) banks incur an opportunity cost by holding liquid assets, and (b) by holding more liquid assets, managers generate an incentive to indulge in opportunistic behavior and the agency cost may prevail. In this situation, as long as the liquidity needs on both the asset and liability sides are not perfectly correlated, that is, that the needs for liquidity do not arise simultaneously, banks can use their liquid assets more efficiently; hence, there is a rationale for them to provide two services under the same roof.

This leads to the conclusion that narrow banking proposals such as those of Pierce and Litan, whereby the two services are separated, generate inefficiency because they deprive the banks of the synergy effect of liquidity. On the other hand, the Bryan proposal whereby deposit-taking and lending activities should be integrated, seems to achieve a more efficient outcome.

4.1 The Synergy Effect between Deposit-Taking and Lending

This section outlines the synergy effect between deposit-taking and lending activities. It is worth mentioning that some argue that the primary reason behind the combination of these two activities is the existence of financial regulation, rather than the synergy effect. Banks have a natural tendency to prefer a fund which is covered by deposit insurance, causing moral hazard to prevail. In order to obviate the banks' moral hazard problem, it is better to separate deposit-taking and lending activities into different institutions; thus, narrow banking proposals such as those of Pierce and Litan are supported.

Another view which stresses the existence of this synergy effect finds that the Pierce-Litan type of narrow banking proposal is a source of inefficiency. They stress that the core activity on the banks' assets side is to provide a commitment line service to their customers. The commitment line has similar features to those of a demand deposit, since customers have free access to liquidity up to an amount specified in advance.

Consider the following two situations: first, the liquid asset is owned by a single bank which takes care of the liquidity needs on both the asset and liability sides, and secondly, the liquid asset is owned by two separate banks, one of which deals with the liquidity need on the asset side while the other deals with the need on the liability side. The welfare level of the former seems to be higher than the welfare level of the latter. This seems to suggest that the narrow banking proposal submitted by Bryan, who claims that the two activities should be provided at the same institution, is supported.

4.2 The Model

This section examines Kashyap, Rajan and Stein (1999). We start with describing the basic setup of the model. The model consists of three periods (period 0, 1, and 2). There exist a bank, a firm and depositors. In period 0, a bank diversifies L to a loan and S_0 to a liquid asset. The maturity of the loan arrives in period 2, which generates a net return equivalent to rL . The liquid asset can be liquidated either in period 1 or period 2, but it costs S_0 due to either an opportunity cost or an agency cost. Moreover, the bank provides a commitment line amounting to C and in return it receives fC as a commitment fee. The loans based on the commitment contract are assumed to be short-term. In addition, the bank issues equity in periods 0 and 1. The equity issued in period 0 pays a dividend equal to $(2\mu + \mu^2)e_0$ where e_0 is the amount of equity issuance in period 0 and the equity issued in period 1 pays a dividend equal to $\mu e_1 + \frac{2}{\alpha} e_1^2$ where e_1 is the amount of equity issuance in period 1. The balance sheet under this setup can be shown below.

Bank	
Reserve RS	Demand Deposit D^D
Short-term Safe Asset S	Time Deposit D^T
Loan L	Equity e
Commitment Line C	

The reserve RS is assumed to be constant, and for simplicity's sake, we assume it to be zero. On the balance sheet, the execution of the commitment line is counted as an increase in loans and an increase in demand deposits. The firm will satisfy the liquidity need by letting its customers withdraw from its demand deposit. In practice, loans made under commitment contract and others cannot be distinguished. Nonetheless, we indicate this by C in order to separate from the ordinary loans, L . The maximization problem of the bank is written as follows.

$$\max_{L,C,S_0} E_0 \{ rL + fC + \mu zC + \mu S_1 - \tau S_0 - (2\mu + \mu^2)e_0 - \mu e_1 - \alpha / 2e_1^2 \} \quad (1)$$

$$\text{s.t.} \quad L + S_0 = D_0 + e_0 \quad (2)$$

$$L + S_1 + zC = D_0(1 - \omega) + e_0 + e_1 \quad (3)$$

$$S_1 \geq 0 \quad (4)$$

where μ is the market rate and z is the state variable indicating a use of the commitment line. Similarly ω represents the state variable showing a withdrawal of the demand deposit, and α represents the coefficient of the risk premium generated by information asymmetry. In the maximization problem, conditions (2) and (3) are the

liquidity constraints in periods 0 and 1. Condition (2) means that the bank lending and the liquid asset have to come from either demand deposits or equities. Condition (3) means that the bank lending in period 1, the liquid asset and the use of the commitment line all have to be financed by the demand deposit in period 1 and the equity raised in periods 0 and 1. Condition (4) states there is no short-sale of the liquid asset.

Solving this problem, we derive the following equation.

$$f = \left[\frac{\alpha(1-\rho)}{4-2\rho} - \frac{df}{dC} \right] C^* + \frac{\alpha(1-\rho)(2\rho-\rho^2-1)}{4-2\rho} D_0 + \frac{\tau + \mu + \mu^2}{2-\rho} \quad (5)$$

Suppose now that the probability of the use of the commitment line conditional on the deposit withdrawal is denoted by ρ . As long as $\rho < 1$, meaning that the use of the commitment line and the deposit withdrawal are not perfectly correlated, we derive $(2\rho - \rho^2 - 1) < 0$ and the coefficient of D_0 is negative. Also $df/dC < 0$ leads us to conclude that the coefficient of C^* is positive. In order for equation (5) to be always equal to f , an increase in C^* has to be offset by an increase in D_0 . In other words, as a result of the bank's optimizing behavior, the more demand deposits the bank collects, the more liquid asset the bank has to hold in order to prepare for the withdrawal which occurs with probability ω . In order to promote an efficient use of liquid assets, the bank raises an upper limit of the commitment line.

To summarize the conclusion in this section, the bank's assets can be used to satisfy the liquidity needs generated from both the asset and liability sides. In this situation, if the

liquidity needs on both sides are not perfectly correlated, implying that the use of the commitment line and deposit withdrawals cannot take place simultaneously, there is a rationale in providing two services together.

From this view point, the complete separation of the lending and deposit-taking activities deteriorates the synergy effect of the liquidity needs on both asset and liability sides; hence, narrow banking proposals which support the separation of these activities cannot be accepted.

5. Concluding Remark and Future Work

This paper examines the implications of narrow banks from the point of view of economic theory. First, we classify narrow banks presented in the practical narrow banking proposals, according to two criteria: (i) whether the safe assets that narrow banks are permitted to possess are limited to short-term ones, and (ii) whether a narrow bank is permitted to participate in lending activities. Secondly, we examine the feasibility of each proposal for achieving the stability of the financial system, making use of two theoretical models: that of Wallace (1996) and that of Kashyap, Rajan and Stein (1999), on the basis of the classification outlined in Table 1.

Wallace (1996) shows that if the safe assets that the narrow bank is permitted to invest are limited to short-term ones, the financial system may achieve a Pareto optimum. On the other hand, if the narrow bank is allowed to possess long-term safe assets as well as

short-term assets, the system cannot achieve the Pareto optimum. Thus, Pierce's (1991) proposal is more efficient than Litan's (1987). On the other hand, Kashyap, Rajan and Stein (1999) focuses on whether deposit-taking and loan commitment, part of bank lending activity as a fee-related business, can share some of the costly overhead incurred by holding the large volume of liquid assets such as cash and securities, and examines theoretically and empirically whether there is a synergy effect in the deposit-taking and commitment line services. It is empirically shown to be efficient that one institution carries out both functions under the same roof. Summing up the two results in the models, we show that a desirable narrow bank is one that carries out both deposit-taking and lending activities, though restrictively, and is allowed to invest in short-term safe assets. Comparing this result with the classification in Table 1, the desirable structure of the narrow bank corresponds to the one that has not been proposed so far⁶.

To end with, let us point out two limitations of the theoretical analysis in this paper. First, we focus only on liquidity risk, which is only one example among many risks managed by banks. Bank runs in our model are due to unexpected deposit withdrawals, not caused by poor performance of bank loans. Secondly, the payment mechanism is left out of the model; in it, consumers make deposits in order only to achieve their optimal consumption under future uncertainty, not to settle their accounts with others. These limitations are left for future works.

⁶ If, however, a narrow bank enjoys deposit insurance without limit, the Pierce proposal may not be always superior to the Litan proposal in the Wallace's (1996) model.

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