

A Theoretical Analysis of Narrow Banking Proposals

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The purpose of this paper is to examine narrow banking proposals. First, we survey the narrow banking proposals presented in the United States and Japan, and categorize them by means of two standards: (1) whether safe assets that a narrow bank is allowed to hold are limited to short-term assets, and (2) whether a narrow bank is allowed to engage in lending activity. Second, we examine the feasibility of each proposal for the purpose of achieving the stability of the financial system, making use of two theoretical models: Wallace (1996) and Kashyap, Rajan, and Stein (1998). Finally, we conclude 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.

Key words: Narrow bank; Bank run; Integrated operation of deposit-taking and lending services; Liquidity

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I. Introduction

The recent trend in bank regulation concerns how to prevent contagion in the financial system. Bank regulation thus far has been mainly dependent on the safety net, such as deposit insurance. The crucial feature of the safety net relies on an *ex post* discretionary intervention of the state. Recently it has been pointed out that, while the stability of the financial system depends on the safety net, it has also generated a social cost due to moral hazard behavior of the financial institutions. Thus, an *ex ante* regulatory method based on market discipline is now being sought to replace the *ex post* discretionary regulation, and narrow banking proposals are attracting much attention as such a regulatory mechanism.¹

Proposals suggest 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 from the payment system. In this case, narrow banks are broadly referred to as ones specializing in deposit-taking/payment activities that do not provide lending services. But a precise definition of narrow banks varies greatly among the proposals. For example, one proposal limits a narrow bank to investing in short-term safe assets such as Treasury bills (TBs) (e.g., the proposal of Pierce [1991]), while another allows the bank to lend money to small firms (e.g., the proposal of Bryan [1991]); yet they both define the banking structure as “narrow banks.” This ambiguity in the definition of the narrow bank leads us to question how robust each proposal would be against financial risk and which proposal is most feasible for achieving the stability of the financial system. Nonetheless, such differences in proposals have not been analyzed extensively.²

This paper first describes several narrow banking proposals presented in the United States and Japan, and categorizes them by means of two standards: (1) whether safe assets that a narrow bank is allowed to hold should be limited to short-term assets, and (2) whether a narrow bank is allowed to engage in lending activity along with deposit-taking (and settlement) activity. Second, we examine how feasible each proposal is for achieving the stability of the financial system, making use of two theoretical models: Wallace (1996) and Kashyap, Rajan, and Stein (1998; KRS hereafter). We rely on Wallace (1996) to examine the first standard of the classification of the proposals, and KRS (1998) 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 the Pareto optimum. On the other hand, if the bank holds long-term safe assets as well as short-term assets, the system cannot achieve the Pareto optimum because the narrow bank may fall into a

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1. Recently, Ito-Yokado Co., Ltd., a major retailer, and Sony Corp. announced their intention to enter banking business. Ito-Yokado plans to offer deposit-taking and settlement services, but will not provide lending services. This attracts a great deal of attention, since it can be regarded as a realization of narrow banking proposals.
 2. As we see in the next section, some of the proposals suggest the compatibility of the safety net. But the proposals have generated much discussion in connection with the purpose of achieving the stability of the financial system without *ex post* discretionary intervention of the government, such as the safety net. To be sure, the safety net and narrow banking proposals are not necessarily opposed to each other, but they should be distinguished explicitly during a theoretical study. Thus, this paper focuses on narrow banking, excluding the safety net.

liquidity shortage due to a costly liquidation of the long-term assets; in some cases (e.g., when all depositors wish to withdraw funds) the bank cannot fulfill all the liquidity needs of the depositors.

Second, KRS (1998) 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 lending activities as long as deposit withdrawals and commitment takedowns are not too highly correlated. In other words, banks providing both deposit-taking and lending can share some of the costly overhead incurred by holding a large volume 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, rather than two separate institutions specializing in either of the two activities.

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

Let us point out in advance several limitations of our analysis. First, we focus only on the liquidity risk, while not treating the credit risk at all. A bank run in Wallace (1996) is only due to unexpected deposit withdrawals, not to poorly performing bank loans. Second, the payment mechanism is not examined rigorously in the model. Depositors' motivation to hold deposits is to achieve their optimal consumption under future uncertainty, not to settle their "due to" positions. Owing to these limitations, it is not appropriate to derive policy implications for such questions as whether Japan's postal savings system would continue to exist as a narrow bank,³ or whether central banks and narrow banks would be competitive.

This paper is organized as follows. Chapter II explains the narrow banking proposals presented in the United States and Japan, and classifies them by means of the two standards mentioned above. Chapters III and IV examine the theoretical feasibility of each proposal for achieving the stability of the financial system, making use of two theoretical models: Wallace (1996) and KRS (1998). Chapter V concludes the paper.

II. Practical Survey of the Narrow Banking Proposals

Narrow banks are often cited as banks that specialize in deposit-taking/payment activities and are prohibited from lending activity. Although the underlying notion of narrow banks varies greatly among different proposals, such difference has been paid little attention by academics. In this section, we first survey several narrow banking proposals and clarify the concept of narrow banks.

3. In Japan, plans call for the postal savings system to become a public corporation by 2003. As a first step of this reform, the system's duty of deposit in the Ministry of Finance will be abolished in 2001. This reform means that the postal savings system will approximate a narrow banking system. Assessing the future of the postal savings in the Japanese financial system, it is important to examine whether the postal savings system as an approximation of the narrow banking system could exist under a competitive financial market.

A. History of the 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 percent money,” which removes the credit creation mechanism of private banks for the purpose of preventing bank runs and reducing the volatility of economic fluctuations. The plan, however, was rejected by the U.S. Congress and in 1935 the Bank Act adopted an improvement of deposit insurance and a restriction on deposit rates. Ironically, economists such as Fisher (1935) and Friedman (1960) were active supporters of “100 percent money.” But the idea mainly focused on a removal of credit creation, a reduction of volatility of economic fluctuations, and an improvement of the controllability of the money supply, and less attention was paid to the stability of the financial system.

From the 1980s, financial liberalization and securitization got under way and financial crises, such as the savings and loan debacle, occurred. This naturally attracted more attention to the stability of regulatory methods based on market discipline than to current discretionary regulation. Through the course of discussion, some narrow banking proposals were considered.

B. Conceptual Classifications of the Narrow Banking Proposals

This section gives an overview of 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.

- (1) **The proposal of Litan (1987):** The first narrow banking proposal on record was set forth by Professor Robert Litan of the Brookings Institution (Litan [1987]). The proposal authorizes “financial holding companies” as highly diversified financial conglomerates. The companies have two kinds of subsidiaries: “banks” and separately incorporated lending subsidiaries. The banks serve as transaction processors, accepting deposits and investing only in highly liquid safe securities, or in practice, obligations of the U.S. Treasury or other federally guaranteed instruments. On the other hand, the financial holding companies extend lending services only through the lending subsidiaries, wholly funded by commercial paper, debentures, equity, and so on.⁴
- (2) **The proposal of Pierce (1991):** This proposal was designed by Professor James Pierce of the University of California, Berkeley (Pierce [1991]). It separates monetary and financial functions into individual institutions; while monetary service companies serve monetary functions, financial functions are handled by financial service companies. The former provide checking accounts and wire transfers and are permitted to pay interest in all their accounts, but the extent of the assets they can hold is restricted. That is, the assets are limited to purchases of short-term, highly marketable, and highly rated instruments that are in the portfolios of money market mutual funds, such as short-term Treasury securities, and highly rated commercial paper. Thus, the monetary service companies correspond to narrow banks and provide payment services,

4. In Herring and Litan (1995), however, Litan himself seems to cast doubt on the feasibility of narrow banking proposals.

including check clearing, electronic funds, and discount windows. On the other hand, the financial service companies can serve all other activities including insurance and retailers.⁵

(3) The proposal of Bryan (1991): Lastly, let us review the core bank proposal set forth by Lowell Bryan of McKinsey & Co. (Bryan [1991]). This proposal, like Litan’s, establishes the financial holding company, with the bank subsidiary undertaking the 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 less-developed country lending.

To summarize, one proposal allows the narrow bank to invest only in short-term safe assets such as TBs (e.g., the proposal of Pierce [1991]) while another proposal allows the bank to extend credit to small firms (e.g., the proposal of Bryan [1991]). In other words, there is no uniform definition of the narrow bank with regard to its range of functions. This difference in narrow banking activities leads us to question how robust each proposal would be against financial risk and what kind of proposal is most feasible for achieving the stability of the financial system.

In order to classify the proposals, we set up two criteria. These are (1) whether safe assets that the narrow bank is allowed to hold are limited to short-term assets, and (2) whether the narrow bank is allowed to participate in lending activity. In examining the proposals, one must consider what remains outside the narrow banking activities. We call a non-narrow bank a “finance company,” which provides services that are not handled by the narrow bank. In advance of the detailed examination, we classify the aforementioned narrow banking proposals in accordance with two criteria in Table 1.

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 assets
Prohibited from conducting lending activity	Pierce (1991)	Litan (1987)
Permitted to conduct lending activity	n.a.	Bryan (1991)

n.a.: Not available.

First, we study criterion (1), that is, the range of safe assets that the narrow bank is allowed to hold. One proposal restricts the bank to investing in short-term safe assets, while the others permit the bank to invest in long-term as well as short-term assets. Holding long-term safe assets, the bank faces liquidity risk. Without suspension of convertibility or issuance of subordinated debt, the bank may not be prevented from bankruptcy due to liquidity shortage.

Second, we interpret criterion (2), that is, the synthesis of deposit and lending activities within the same institution. One proposal removes lending activity from the

5. In addition, Pierce’s proposal holds that the monetary service companies have a capital base and enjoy federal insurance for all their liabilities without limit.

narrow bank, while the others allow the bank to create credit through restricted lending services. Suppose then that the narrow bank is prohibited from making any loans; that is, the bank only conducts deposit-taking activity. In this case, however, the bank may not present higher interest rates than in the case in which it conducts two activities, because deposit-taking activity is generally thought to be less profitable than lending activity. In addition, it may be difficult to distinguish between deposit assets and other assets. Therefore, in the case in which the narrow bank is prohibited strictly from lending money, any payment system outside the scope of the narrow bank might be generated. In other words, the 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 the finance company to participate in the payment system along with the narrow bank. It, however, would be necessary to restrict in some way the companies to which the narrow bank could lend money and the payment methods used by the finance company. 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. We now divide the proposals into classes by means of these standards as follows.

When we examine the proposals on the basis of Table 1, the “narrowest” bank among them is the narrow bank in Pierce’s proposal. While the narrow bank of Litan’s is subject to liquidity risk because it has safe but long-term assets, the narrow bank of Bryan’s is permitted to engage in lending activity. Thus, this inspection leads us to question how robust each proposal would be against financial risk and which proposal is most feasible for achieving the stability of the financial system. In the following two chapters, we examine theoretically the proposals in accordance with the classifications of Table 1.

III. Theoretical Analysis of Narrow Banks Using the Diamond and Dybvig Model

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

Wallace (1996) defines a narrow bank as a perfectly liquid bank with neither subordinated debt nor suspension of convertibility. Here, the “liquid bank” means one that can accommodate any deposit withdrawal. In other words, only the bank that satisfies any magnitude of deposit withdrawals can be called the narrow bank. Under this definition, the economy consists of a narrow bank and an “illiquid bank.” In addition, it assumes two cases of narrow banks: one that is allowed to invest only in short-term safe assets, as in Pierce’s proposal, and one that is allowed to invest in long-term safe assets as well as short-term assets, as in Litan’s proposal. With this setup, we examine how much welfare can be achieved in the two cases.

In the 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 a large number of identical consumers at date 0, and

each consumer is uncertain about what the preferences over consumption at dates 1 and 2 will be. 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. Second, the bank has two linear constant-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 gross return is r_1 . Then, it is assumed that $R_2 > (R_1)^2 > (r_1)^2$. Third, the banking system deals with depositors on a first-come first-served basis. Based on these assumptions, the model examines bank runs caused by a 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 the bank run of the illiquid bank from the model and focuses only on the bank run of the narrow bank.

We point out in advance some limitations of the models of Diamond and Dybvig and Wallace, before examining the narrow bank in detail. First, the models cannot examine bank runs that originated from bad loans, because they do not assume default risk on loans. Second, the analysis of payment services is outside their scope. Although deposits are widely used as a payment method in practice, financing among banks is not analyzed in the original Diamond and Dybvig model. Recent contributions such as that of Freixas, Parigi, and Rochet (1998), however, deal with financing among the banks, extending Diamond and Dybvig (1983), and examine contagion effects in the payment system, undertaking a comparative analysis of 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 significant examples of academic progress in modeling the payment system explicitly.

Based on these assumptions, we examine the implications of Wallace (1996) concerning the narrow bank. First, suppose that the narrow bank is prohibited from engaging in lending activity and allowed to invest only in short-term safe assets, as in Pierce's 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, consumers invest funds for the smallest amount of consumption that will be needed at date 1 under uncertainty in the narrow bank and the remaining funds go to the illiquid bank. Consequently, all consumption at date 1 can be covered only by short-term safe assets and the 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 as to future consumption for all the consumers disappears.

Second, suppose that the narrow bank is permitted to invest in long-term safe assets as well as short-term ones, as in Litan's proposal. The narrow bank, by definition, guarantees any deposit withdrawals and, on the other hand, can hold safe

but illiquid assets. Consequently, at date 0, consumers invest funds for the largest consumption that will be needed at date 1 under uncertainty in short-term safe assets, whichever bank consumers make a deposit in, and the remaining funds in long-term assets. This consumer behavior is due to uncertainty of future consumption, and it is shown that this behavior accomplishes welfare loss compared to the above-mentioned case of Pierce.

Thus, Wallace shows that whether a narrow banking proposal can achieve the Pareto optimum depends on its definitions of the narrow bank and, in addition, that Pierce's proposal is more efficient than Litan's.

IV. Theoretical Analysis of Narrow Banking Proposals Using KRS (1998)

This section studies the second standard in the classification of the narrow banking proposals, i.e., whether the narrow bank can be involved in lending activity, along with deposit-taking activity. We are especially interested in the recent contribution by KRS (1998), who suggest that there exists a synergy effect between the liquidity needs in the two activities.

A. Rationale of Integrated Operation of Deposit-Taking and Lending Services

Organizational structures of financial institutions vary widely—some institutions such as investment banks only provide lending services while not engaging in deposit-taking activity; others such as regional banks provide both deposit-taking and lending services. These structural differences in banking organization raise a question of whether there is a rationale for providing the two services in a single institution—in other words, how can the narrow banking proposals such as those of Litan (1987) and Pierce (1991) be justified if there is a rationale for 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 that distinguishes good potential borrowers from bad ones. This is often called *ex ante* monitoring 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 the borrowers. These monitoring activities are often referred to as a bank's delegated monitoring, which must be integrated in the financial institution, due to the fact that monitoring is costly. In other words, investors always have an incentive to free-ride on others' monitoring activity, and in the worst case, nobody would serve as the monitor. In order to prevent such a situation, banks play a role as a delegated monitor. The above-mentioned papers, nevertheless, take the liability side of a bank's balance sheet as given, namely, that it does not matter whether a bank raises funds by means of deposits or mutual funds.

Another strand of research, such as that by Diamond and Dybvig (1983), examines deposit-taking activity, stressing the role of banks as an insurer against liquidity shock. It nonetheless does not analyze the asset side of a bank's balance sheet.

It is only recently that researchers started examining a bank’s activities on both sides of the balance sheet. The core question to ask is whether there is a rationale for undertaking both deposit-taking and lending activities within the same financial institution. The essence of the discussion, given by Rajan (1996), can be summarized as follows.

Rajan (1996) argues that the most fundamental function of the financial institution is not only to provide liquidity to borrowers but also to provide the “commitment line,” whereby the borrowers have access to liquidity within the limit set in advance by the financial institution. In return, the financial institution receives a fee. The commitment line appears on the balance sheet only after the line is provided.⁶ It would now be helpful to see some evidence from the United States. In this regard, Table 2 shows that 74.1 percent of the outstanding commercial and industrial loans (US\$122 billion) made during the first week of November 1998 were carried out based on the commitment line contract.

Table 2 Commercial and Industrial Loans Made by All Commercial Banks (November 2–6, 1998)

US\$ millions, percent

	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, because of the legal uncertainty with regard to the interpretation of the Interest Rate Restriction Law, the commitment line service has not been widely used. For historical reasons, Japanese banks have provided an overdraft service to their clients. This service plays a role similar to that of the commitment line, in the sense that the banks are exposed to the liquidity shock arising from the asset side of their balance sheets. On the aggregate level, overdrafts account for nearly 20 percent of banks’ lending activities; in particular, large firms have used the overdraft facility to cope with short-term urgent liquidity needs. This implies that the Japanese banks have also been exposed to the liquidity shock arising from the asset side.

This close relationship between banks and firms cannot be achieved in financial markets where the relationship tends to be at arm’s length. Rajan (1996) stresses that the market-based relationship cannot satisfy unpredictable liquidity needs, and it is exactly with regard to this function that financial institutions enjoy a comparative advantage over the arm’s length relationship in the markets.

6. Strictly speaking, the liquidity shock generated by the commitment line appears on the liability side—namely, the bank, making loans under the commitment line, transfers the equivalent amount of money in the borrower’s account through which borrowers establish access to the liquidity. The consequence henceforth does not differ from the liquidity shock generated by the withdrawal of deposits. We are, however, more interested in the *source* of the shock, which we can identify between the commitment line and the deposit withdrawal.

B. Synergy Effect between Deposit-Taking and Lending

The liquidity needs as pointed out above are expected to have synergy with the liquidity shock arising from the liability side, i.e., the deposit withdrawals. In the demand deposit contract, depositors are given the option to withdraw their deposits at their discretion. In the next section, we examine whether there is a synergy effect between deposit-taking and lending services, based on KRS (1998), and derive a policy implication for the narrow banking proposals.

To summarize, we first suppose a situation wherein banks are exposed to liquidity shock arising from both the asset and liability sides. Naturally, banks hold liquid assets in order to satisfy the liquidity needs of the customers while at the same time they would like to reduce the amount of liquid assets as much as possible. This is due to the fact that (1) banks incur an opportunity cost in holding the liquid assets, and (2) by holding more liquid assets, managers generate an incentive to engage 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—in other words, the need for liquidity does not arise simultaneously—banks can use the liquid assets more efficiently; hence, there is a rationale for them to provide two services together.

This leads to a conclusion that the narrow banking proposals such as those of Pierce (1991) and Litan (1987), which separate the two services, generate inefficiency because the separation deprives the banks of the synergy effect of the liquidity. On the other hand, the proposal of Bryan (1991), in which the deposit-taking and lending activities are integrated, seems to be more efficient.

1. Overview

This section outlines the synergy effect of the deposit-taking and lending activities. It is worth mentioning that some argue that the primary reason behind the combination of the two activities is the existence of financial regulation, rather than the synergy effect. Banks have a natural tendency to prefer funds covered by deposit insurance, causing moral hazard to prevail. In order to prevent the banks' moral hazard problem, it is better to separate deposit-taking and lending activities in different institutions; thus, narrow banking proposals such as those of Pierce (1991) and Litan (1987) are supported.

Another view that stresses the existence of the synergy effect finds the Pierce-Litan type of narrow banking proposal to be a source of inefficiency. It stresses that the core activity on the banks' asset side is to provide commitment line service to their customers. The commitment line has a feature similar to that of the demand deposit, since the customers have free access to the liquidity by the amount specified in advance.

Consider the following two situations: first, a liquid asset is owned by a single bank that takes care of the liquidity needs on both asset and liability sides, and second, the liquid asset is owned by two banks, one of which deals with the liquidity need on the asset side while the other deals with the liquidity need on the liability side. In this case, the welfare level of the former appears to be higher than that of the latter. This suggests that the narrow banking proposal of Bryan (1991), who claims that the two activities should be provided at the same institution, is supported.

2. The model

This section examines KRS (1998). We start by describing the basic setup of the model. The model consists of three periods (periods 0, 1, and 2) and there are 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 arrives in period 2, which generates the net return equivalent with rL . The liquid asset can be liquidated either in period 1 or period 2, but it costs S_0 , which represents either an opportunity cost or an agency cost. Moreover, the bank provides the 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, e_0 , pays a dividend equal to $(2\mu + \mu^2)e_0$ and the equity issued in period 1, e_1 , pays a dividend equal to $\mu e_1 + \alpha e_1^2/2$. 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 the sake of simplicity we assume it to be zero. On the balance sheet, the execution of the commitment line is counted by an increase in loans and an increase in demand deposit. The bank will satisfy the liquidity need by letting its customer withdraw from his or her demand deposit. In practice, loans made under commitment contract and others cannot be distinguished. Nonetheless, we indicate it by C in order to separate from the ordinary loans, L . The maximization problem of the bank is written as follows.

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

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

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

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

where μ is the market rate and z is the state variable indicating whether there is a use of the commitment line. Similarly, ω represents the state variable to show a withdrawal of the demand deposit, and α represents the coefficient of the risk premium generated by the 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 must come from either the demand deposit or equity. Condition (3) means that the bank lending in period 1, the liquid asset, and the use of the commitment line must 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 assets the bank must hold in order to prepare for the withdrawals that occur with probability ω . In order to promote an efficient use of the liquid assets, the bank raises an upper bound of the commitment line.

To summarize the conclusion in this section, the bank's assets can be used to satisfy the liquidity need generated from both the asset and liability sides. In this situation, if the liquidity needs on both sides are not perfectly correlated, the use of the commitment line and the deposit withdrawal cannot take place simultaneously. Therefore, as long as banks hold liquid assets, there is a rationale for providing the two services together.

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

V. Concluding Remarks

This paper examined theoretically the economic implications of narrow banks. First, we classified narrow banks presented in the practical narrow banking proposals by means of two standards: (1) whether safe assets that the narrow bank is permitted to hold are limited to short-term assets; and (2) whether the narrow bank is permitted to engage in lending activity. Second, we examine theoretically the feasibility of each proposal for achieving the stability of the financial system, making use of two theoretical models: Wallace (1996) and KRS (1998), on the basis of the classifications of Table 1.

Wallace (1996) shows that, if safe assets in which the narrow bank is permitted to invest are limited to short-term assets, the financial system may achieve the Pareto optimum. On the other hand, if the narrow bank is permitted to possess long-term safe assets as well as short-term ones, the system cannot achieve the Pareto optimum. Thus, the proposal of Pierce (1991) is more efficient than that of Litan

(1987). On the other hand, KRS (1998) focus on whether deposit-taking and loan commitment (part of bank lending activity) can share some of the costly overhead—that is, the large volume of liquid assets such as cash and securities—and examine theoretically as well as empirically whether two separate institutions specialize in either deposit-taking or loan commitment activity. It is empirically shown that one institution carries out both deposit-taking and loan commitment activities. Summing up the two conclusions derived from the models, we show that a desirable narrow bank is one that carries out both deposit-taking and lending activities, though restrictively, and is permitted to invest in short-term safe assets. Comparing this result with Table 1, the desirable proposal corresponds to the lower left-hand quadrant.⁷

In the end, however, we point out two limitations of the theoretical analysis of this paper. First, we focus only on liquidity risk, which is among many risks managed by banks. Bank runs in our model would be due to unexpected deposit withdrawals, not caused by fear of unsoundness of bank loans. Second, the model does not sufficiently examine payment activity, wherein consumers make deposits only in order to achieve their optimal consumption under future uncertainty, not to settle their accounts. Thus, we cannot necessarily examine whether Japan's postal savings system would exist as a narrow bank, or whether central banks and narrow banks would be competitive.

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

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