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## A New Financial System for Poverty Reduction and Growth

*Biagio Bossone and Abdourahmane Sarr*



## **IMF Working Paper**

Office of the Executive Director for the Constituency of Countries including Italy and  
Monetary and Exchange Affairs Department

### **A New Financial System for Poverty Reduction and Growth**

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#### **Abstract**

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Our proposal draws on the premise that the availability of stable demand deposits for bank lending, in the process of which inside money is created, does not require any act of intentional saving. The mechanism allowing banks to lend deposits does not function well in low-income countries, owing to a number of structural constraints. We argue that separating inside money creation from lending, and distributing it on a nonlending basis to depositors through specialized payment service institutions, could broaden access to financial resources, fuel non-inflationary, demand-led growth; and foster financial deepening, diversification, and stability. We also argue that the proposed reform is consistent with market incentives and sound economic management.

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*As policymakers, we try to be level-headed and sensible, and sometimes that narrows our thinking too much. You really need to be able to think “outside of the box”. Over time, it is crazy ideas that often prove right... (Kenneth Rogoff)<sup>2</sup>*

## I. INTRODUCTION

Thinking outside of the box while keeping within the boundaries of economic rationality and operational feasibility is what we set out to do in this paper by presenting our proposal on finance for low-income countries.

While recent theories and evidence indicate that financial development plays an important role in supporting economic development, establishing well-functioning private-sector financial institutions in countries where poverty is widespread is a very hard and complex task, one which is unlikely to make more than a perceptible dent in poverty within a reasonable time horizon.

Ever since the cost of direct state intervention in the financial sector has been shown (through extensive evidence) to far exceed the related benefits, policymaker preferences have shifted toward reforms aimed at creating conditions for the emergence of stable financial market institutions. Once in place, these institutions select their risks and allow the business sector to grow. Economic development is expected to follow from such sequence of events. Unfortunately, at very early stages of economic development, such a sequence cannot be relied on to operate as systematically, and on as large a scale as in more advanced countries. Essentially, this is due to structural weaknesses such as the lack of credit risk-management infrastructure (and the high costs of building up efficient infrastructure), poor public sector governance, and the cash-based nature of these economies. These factors induce banks to hold excess liquidity idle on their books or to accumulate foreign assets to avoid accumulating nonperforming loans or experiencing liquidity crises.

Banks lend to government and/or the private sector and create money in the process. When they lend to the government, the political process determines how and to what sectors the money created is channeled, often with undesirable economic consequences. When they lend to the private sector, the allocation criteria are usually the pledging of collateral from the borrower or the borrower's ability to provide reasonable assurances that the funds will be used to generate enough income to repay the credit. Good credit risk selection allows the new money to induce production of desired goods, so that inflation is kept to a minimum. However, inadequate collateral and poor mechanisms for enforcing contracts weaken the

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<sup>2</sup> From: “Rogoff reflects on global economy, research, academia, and chess”, IMF Survey, Vol. 30, No. 22, Nov. 26, p.379.

potential for extending credit. Similarly, low and uncertain domestic demand makes it risky for banks to extend loans to enterprises. These structural constraints are widespread in low-income countries and can be remedied only in the medium term, at best.

In order to resolve this impasse, our paper proposes **an alternative model of finance aimed to promote growth in the short run—without government intervention—while a sound credit risk infrastructure is put in place.** While the details of the model will be discussed at length throughout the paper, its main features are summarized here.

Banks are replaced in their money-creation function by institutions that accept deposits and manage deposit transfers (payments) on behalf of their depositors but do not engage in lending. These institutions distribute to individual depositors—**on a nonlending basis**—the money that conventional banks would have created as loans, using as distribution criteria the average balance of each depositor over a reference period. We call them deposit creating institutions (DCIs). Deciding upon the distribution rate is the DCI's strategic choice, very much like what banks do when they decide what rate of interest to pay on deposit accounts. deposit creating The proposal exploits the fact that the provision of payment services produces a stable demand deposit base that is never redeemed, since deposit transfers largely net each other out across bank books (Freeman, 1996).

The DCIs modulate deposit distribution to attract depositors in order to supply their main output, payment services, and rely on their reserves, capital, and fee income to signal their financial strength to the market. They need to strike a balance between the benefits from maximizing the rate of deposit creation by running the smaller reserves possible and those from accumulating large capital and reserves. **Liquidity management is thus key in determining their relative competitiveness.** For this reason, they are not envisaged to have access to central bank financing, since this would distort DCI market competition. The central bank can change the volume of reserves in the system to control the money stock by selling, buying, or lending reserves only to financial intermediaries other than DCIs.

For a given velocity of money circulation, the distribution rate of DCI deposits in the aggregate approximates nominal GDP growth. However, if velocity falls as the real demand for transactions balances increases with the new system, a higher distribution rate can be achieved without inflationary consequences. Also, during the transition to a DCI system, a higher distribution rate is necessary to replace the deposits that are destroyed when bank loans are repaid, thus avoiding deflationary gaps. Overall, **monetary policy must ensure that DCI money growth is consistent with domestic potential output growth and low inflation.**

In the proposed system, all agents (individuals and financial and nonfinancial firms) need to hold DCI accounts to be able to make/receive payments in the form of deposit transfers. Banks continue to operate as lenders but are prohibited from funding their assets with demand deposits. Like other intermediaries, they can issue nondemandable debt instruments and lend the proceeds at an interest rate. Banks and capital market intermediaries constitute

the second-tier of the financial sector and allocate existing liquidity to fund users. They cannot create money.

Depositors may use DCI deposits for any purpose they want. They can hold them idle on their account or use them to buy consumer or capital goods or financial securities. They can also convert them into cash, but if they do so, they forgo the possibility of receiving new deposit distributions on the converted deposits. In the new system, therefore, individuals have an incentive to build up their own deposit base and the economy has an incentive to use deposits as payment instruments. **Deposit distribution allows recipients to pay for resource-intensive payment services, thereby fostering financial deepening.** Moreover, while deposit distribution creates purchasing power that people can use to raise their spending to levels otherwise unattainable, the mechanism also induces them to use deposits parsimoniously in order to retain their entitlement to new distributions.

The deposits distributed by the DCIs supports **increased demand for goods. As a result, the relative price (internal and external) of desired goods increases, leading to higher domestic production of those goods.** The proportion of distributed liquidity that recipients decide to save outside the DCI system can finance enterprises whose output is in higher demand. Such enterprises can also capture liquidity through larger profits associated with the higher relative price of their goods and use retained earnings for investments.

The DCIs do not face solvency problems as they do not have to match their liabilities with illiquid assets. They do face a liquidity risk, however, since they stand ready to convert deposits into cash on demand and are required to settle interbank payments with central bank money. They manage such risk by keeping a safe level of reserves at the central bank. They are also mandated by the central bank to observe a minimum reserve ratio both to ensure liquidity and to control deposit creation. Since payments largely offset each other, the DCIs—like banks—need to keep as reserves only a fraction of their outstanding deposits. Therefore, **the difference between the DCI system and conventional banking does not lie in money creation but rather in how money is distributed, and to whom, as it is created.**

An interesting implication of our proposal is that distributing newly created inside money to individuals on a nonlending basis reflects an *act of giving*, which is clearly at odds with conventional finance where inside money creation is based on *acts of lending*.<sup>3</sup> Yet, we argue that such an innovation may improve the efficiency of money creation while reducing financial risks in the economy. We think that our proposal gains strength and realism precisely from being rooted in the standard assumptions of an economy populated by self-serving, welfare-maximizing individuals.

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<sup>3</sup> In a fascinating book, Alvi (1989) discusses the importance of the act of giving in economics and in world economic history.

The rest of the paper is organized as follows. Section II discusses the importance of finance for economic development but points to some of the problems that limit the effect of finance in triggering growth in low-income countries. Section III submits our proposed reform, presents the operational features of the proposed system, including optimal monetary and financial policies; and discusses key transitional issues from conventional banking to the proposed system. Section IV discusses the expected effects of the system on both the real economy and the financial sector, and Section V digresses briefly on some moral questions relating to the proposed system and concludes the paper.

## **II. FINANCE FOR GROWTH: WHAT WORKS AND WHAT DOESN'T**

The important role that financial intermediation has played in supporting economic development throughout history and across the world has been extensively explored by several theories and overwhelmingly supported by empirical evidence, especially in recent years. Recently, also, the literature has investigated the way banks and capital markets interact with each other, concluding that their complementarities have positive implications for economic growth.<sup>4</sup>

Research also shows, however, that the growth-finance relationship is non-linear and that financial development might not be as effective in supporting faster output growth at low stages of economic development. Two main circumstances explain this phenomenon. One is the presence of threshold effects in the growth-finance dynamics, whereby individual agents need to reach a minimum level of wealth before they can access financial resources and services. Low-income countries may thus take long before financial development can make a significant impact on output growth.<sup>5</sup> The other feature is the predominant role that banking typically has in low-income economies where financial infrastructure is poor and the public prefers bank contracts (that is, deposit and loan contracts) to alternative financial instruments:<sup>6</sup> the limited impact of finance on growth may have to do with the limited ability of banks to serve low-income agents.

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<sup>4</sup> For references to the relevant literature on these issues, see Bossone, Mahajan and Zahir (2002) and the discussion in Bossone and Lee (2002, p.28) and the references therein indicated.

<sup>5</sup> Berthélemy and Varoudakis (1996) emphasize the reverse type of threshold effect whereby the economy may need to reach a minimum level of financial deepening before there is a significant effect on growth. In fact, as the authors recognize, the two threshold effects are mutually reinforcing: economic growth enable marginal agents to accumulate enough wealth to support the transaction costs involved in accessing financial services and resources, thereby increasing financial depth; in turn, greater access accelerates capital accumulation, productivity and growth. (See also Saint-Paul, 1992). Townsend and Ueda (2001) study this dynamics in an optimal intertemporal consumption model with costly participation in the financial system and a threshold level below which participation is not feasible. The dynamics is simulated using data for Thailand.

<sup>6</sup> Bossone, Mahajan and Zahir, cit. discuss this issue at some length.



Therefore, in low-income economies, the poverty trap may inhibit banking and the real sectors from dynamically interacting in the mutually reinforcing pattern observed in middle-income and rich economies. In particular, in poverty-trap situations, banking may be ineffective as a first mover. Let's see more specifically how banks support economic activity and why they may fail to do so.

### A. Banks as the “*Ephors*” of Economic Development

Schumpeter (1934) came to a clear understanding of the key role of banks and spoke of them as the “*ephors*” of economic development. Schumpeter saw development as resulting from spontaneous and discontinuous changes in factor combinations brought about by the entrepreneurs. These changes altered an otherwise steady and identical circular flow of production and exchange whereby the same products would be produced every year in the same way and proportion, and each supply would be matched by an equal demand. However, Schumpeter also realized that, unlike in a steady and identical circular flow where all exchanges were carried out through means of payments supplied once and for all in given quantities and circulating at a given velocity, alterations to the circular flow could not happen without creation of new purchasing power. Schumpeter thought this to be the main function of banks.

Schumpeter conceived of money creation through credit as the banks' fundamental function; one that enabled entrepreneurs to adopt new factor combinations. Bank lending allowed new resources to be forced into new channels by giving entrepreneurs the power to exercise a demand for them. For Schumpeter, bank money (deposits) came into being in the process, and for the purpose, of granting credit to firms. Banks could add to the existing means of payments by lending promises to pay, and entrepreneurs could have access to bank money by mortgaging goods that they would then acquire with the borrowed purchasing power. Thus, total credit could be greater than if it had to be fully covered by commodity money.

Schumpeter noted that bank credit allowed the economy to achieve a level of growth beyond what would be possible under commodity money. Unlike in the steady and identical circular flow where money claims would be certificates for existing goods and past services, he saw banks as able to create purchasing power in anticipation, and for the production, of new output: bank money was made up of claims on services and goods that were yet to be produced.

Schumpeter understood that banks did not confine themselves to transferring existing purchasing power from depositors to borrowers: if they just did that, economic development would not be possible or would be much slower. Constraints to the efficient supply of new purchasing power can therefore retard economic development. It was several years after Schumpeter that his vision of banking was incorporated into a non-neoclassical, general equilibrium framework of money and production under the *theory of the monetary circuit*.<sup>7</sup>

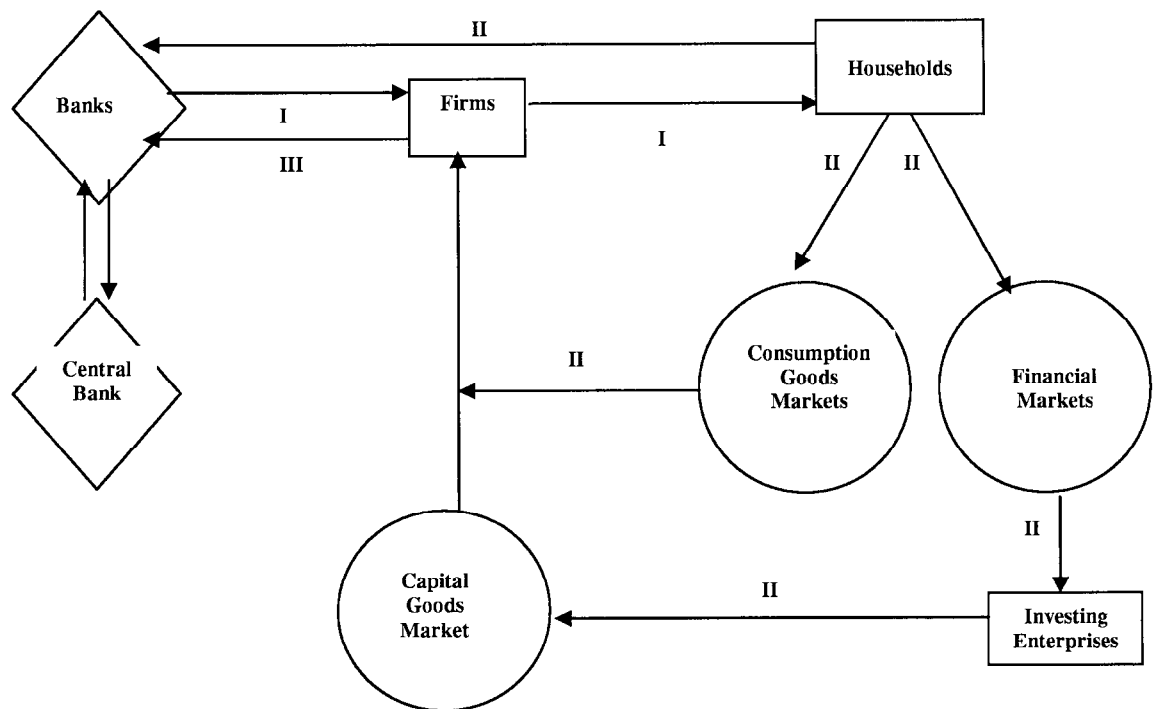
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<sup>7</sup> See Bossone 2001a for a review of traditional and modern circuit theories.

### B. Banks as “Circuit Starters”

The theorists of the monetary circuit followed on Schumpeter’s footsteps and expanded on his intuition by studying systematically the links between bank money and production and by analyzing the properties of a monetary production economy in the context of a circuit-type time-sequence process. In simple terms, the monetary circuit sequence starts when banks extend loans to firms, and moves on as inputs are purchased, salaries are paid, production takes place, and firms sell output and financial liabilities to income earners. The circuit closes when the firms that have borrowed the money use the proceeds of their output sales to pay back their debt. The circuit sequence is stylized as follows (see also Figure 1):

**Figure 1. Flow of Funds in the Circuit Model**



1. At circuit-start (stage I), banks negotiate with firms the conditions for one-period loans. The banks credit the firms’ deposit account with the negotiated loan amounts. Note that when banks credit new deposits they *add* to the system’s liquidity in that existing depositors do not part with the liquidity stored in their bank deposits and retain their claim on such liquidity.<sup>8</sup> Banks cover a fraction of the corresponding liabilities with

<sup>8</sup> The fact that the largest share of bank liabilities typically consists of term deposits in more advanced economies should not be seen in contradiction with the proposition that loans create demand deposits. Once  
(continued)

central bank reserves, which they use to ensure deposit convertibility and settle interbank payments. Banks purchase/borrow reserves from the central bank.<sup>9</sup> Firms execute production of consumption and capital goods using capital and labor inputs. Production plans are based on expected demand for goods. Loans are used to pay wages, implying that the funds credited by the banks on the firms' bank accounts are transferred from these accounts to those of wage earners. (Banks can also extend loans to households to support consumption and other non-production activities) Since payments may require deposit transfers between accounts held at different banks, banks can create money to the extent that they extend credit to each other before settling net balances.

2. In the interim phase (stage **II**), household incomes are spent on consumption goods and saving assets.<sup>10</sup> Savings go into bank deposits and/or into nondemandable debt or non-debt instruments issued or traded by financial intermediaries. Firms wishing to add to their capital stock (*investing enterprises*) bid for funding from the intermediaries. These evaluate the creditworthiness of the enterprises and allocate funds to the viable ones in exchange for securities (either commitments to repay or equity shares). The financed enterprises purchase the capital goods desired. All money transfers and payments for goods and securities take place through book-entries on the accounts held with banks.
3. At circuit-end (stage **III**), the firms use their proceeds of output sales to pay off their principal and interest debt to the banks. The money originally created is then destroyed (but will need to be recreated through new loans to avoid deflation).<sup>11</sup> Firms that fail to sell all the output produced seek to borrow from the capital market to repay the banks or ask banks to rollover their outstanding debt. If firms fail to raise the money, they exit the market, while banks write off the corresponding losses after recovering any residual value from the liquidation of the firms' assets.

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demand deposits are issued through lending, their final holders may convert them into term deposits. In the final equilibrium, therefore, the addition to the stock of demand deposits held in portfolios may be less than the amount of demand deposits originally issued via lending.

<sup>9</sup> The banks and the central bank may interact at any stage of the process; this explains why, in Figure 1, the corresponding money flows are not Roman-numbered.

<sup>10</sup> An important element to note at this stage is that the demand pattern resulting from this step should validate the demand expectations that gave rise to the loans in the first place. Delays in matching the demand will impact on the relative prices of output and production factors in those sectors.

<sup>11</sup> Note that capital goods producers financed by banks could also sell the capital goods to investing enterprises at credit, in which case investing enterprises may not need to raise funds from intermediaries. As the investing enterprises sell their output, they reimburse the capital goods producers who in turn reimburse the banks. This implies that the banks either extend loans to capital goods producing firms at longer maturities or they roll over their loans until these are repaid. Alternatively, banks can extend credit directly to investing enterprises that in turn pay for the production of the capital goods on delivery and reimburse the loans as they start generating income. The circuit can therefore be completed with only stable demand deposits and without long-term savings. Stable demand deposits on bank books mimic savings, although they are not intended for long-term intertemporal consumption smoothing.

The description of the circuit can be adapted to show how it can jump-start a very unsophisticated rural subsistence agricultural economy. The availability of new purchasing power extended by banks may allow some farmers to concentrate on productivity-enhancing capital goods or agricultural land development, instead of subsistence agriculture or agricultural production for barter. Also, to the extent that excess labor exists and technology permits, consumption goods producers hire more laborers for a wage in order to increase output. The new purchasing power fuels demand, but is non-inflationary if the demand expectations of the borrowing enterprises are validated and matched by production. Delays in matching demand imply a relative price change in favor of the desired goods, which attracts more factors into their production.

The sequence just illustrated can be adapted also to reflect the changing functions of banks in contemporary economies, although the adaptation does not alter the special role that banks play as inside money creators and circuit starters (see Box 1). The main elements of the Schumpeter-Circuit approach that pertain to our discussion are the following:

***Banks mobilize production factors by lending new liabilities*** (in the form of deposits). In a fractional reserve system, such liabilities, when issued, are only partially supported by claims on existing real resources. They are backed only ex post when the stream of newly produced output (made possible by money issuance) comes to market.<sup>12</sup> Production, incomes, and savings take time to generate, while firms need money to finance production and match expected demand taken as exogenous until receipts are earned. Production can expand faster when banks lend new money to firms. Temporary equilibrium holds if all the money used in production re-flows back to the firms enabling them to pay off their debt. Intertemporal equilibrium requires that investing enterprises generate a stream of profits enough to repay financial investors. This is a major improvement on those systems where new inside money can be injected in the economy only if it is fully covered upfront by (costly) outside money: banks economize on real resources. Underpinning the circuit are supply decisions by firms, which are validated by banks on grounds of realistic demand expectations, taken as exogenous.

***The banking market and the financial market play two distinctive roles:*** the former creates *additional* liquidity to finance production (and consumption); the latter allocates the *existing* liquidity from investors to fund users. This implies a distinctive role for banks and the non-bank financial intermediaries, as well: banks provide new liquidity in the form of demandable debt claims on themselves, which are made available to borrowers and which the public accepts as money. Non-bank intermediaries collect from investors existing demandable debt claims drawn on banks and allocate them to fund users. Efficient financial intermediation allows to: clear the demand and supply of savings; clear the demand and

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<sup>12</sup> This implies that the new money is good only to the extent that banks select their credit risks efficiently, allowing competitive production to be actually delivered by the firms that originally borrowed the money.

supply of capital goods; allow intertemporal equilibrium to hold between the demand and supply of consumption goods: allow the firms producing capital goods to recover the money needed to pay their initial bank debt.<sup>13</sup>

#### BOX 1. ARE BANKS STILL SO IMPORTANT?

This question rises observing that everywhere, in the industrial world, traditional banking activities have lost important market shares as a result the impressive growth of commercial paper markets, money market mutual funds, and quasi-monies offering transaction services comparable to deposits. Also, large increases have been observed in the market share of institutions holding securities instead of loans. Correspondingly, banks have diversified their activity away from traditional deposit and lending activities and toward non-bank intermediation services provision. Lending to production, in particular, has become less important as more and more firms can directly access the market for short-term funds.

How has all this affected circuit analysis and the importance it attaches to banks? In the new environment, banks perform their money-creation function through alternative (and more wholesale type of) instruments. These include credits to nonbanks and contingent credits. By lending to nonbanks, banks indirectly supply the economy with fresh money to absorb production and services. This is typical of bank lending to intermediaries that provide credit for consumption, second-hand asset purchases, and financial services (including for venture capital, speculation and hedging). Banks advance short-term loans to intermediaries with ready and deep access to the capital market. The intermediaries on-lend the loan proceeds (on longer-term conditions) to households and firms planning to buy durables, second-hand assets, or financial services. As sales are executed, firms cash the sale proceeds and invest the income, generating capital market funds in the process. The intermediaries refinance their position from the capital market and match their asset-liability maturity, and the system overall has more liquidity in it. A new flow of funds takes place wherein selling firms are net investors, the buyers of goods and services are fund users, and banks remain the money suppliers.

Banks create money also through *contingent liabilities* (such as guarantees and warranties) that they issue to protect financial and non-financial institutions against adverse contingencies. These liabilities are stand-by commitments to issue money to their holders if and when those contingencies happen. Their diffusion confirms the continuing uniqueness of banks: they enable the economy to use the existing liquidity more efficiently by supporting the extension of quasi-money and short-term borrowing instruments to an extent that would not be feasible without banks' stand-by commitment guarantees. Also, through these types of liabilities banks act as backup sources of liquidity for all other institutions in the system and are in a position to support circuit closure in the event of payment failures.

***Banks command net real resource transfers from borrowers as they create money via lending.*** They extract seigniorage in the form of interest. When borrowers repay the principal, no net real resource transfer is involved from them to the banks. Interest payments, however, require firms to give in a share of output in return for no additional real resources from the banks: hence the net resource transfer. This is explained by the nature of the interest rate paid on bank loans. Such interest (net of the resource costs to process lending and remunerate deposits) is a *rent* that banks extract from borrowers by virtue of their exclusive

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<sup>13</sup> In very low income countries, where financial savings mainly consist of demand deposits, banks play also the role of financial intermediaries.

power to create inside money.<sup>14</sup> Banks share seigniorage with the central bank (the only agent that is empowered to create outside money) to the extent that they cover a fraction of their liabilities with central bank liabilities.

***There are economies of scale in extracting seigniorage.*** A larger deposit base increases the re-deposit capacity of a bank, increases the number of payments settled within its own books, and reduces the interbank obligations arising from deposit transfers. Also, through a larger deposit base, a bank may increase its lending level while facing a lower probability of losing deposits to other banks, and a higher probability that deposits will flow back to its own books from other banks as a result of payment activity. All else being equal, this reduces the bank's liquidity needs and the associated cost.<sup>15</sup> Finally, bank seigniorage changes with the banking market structure: more competition leads banks to compete for deposits and loans, inter alia, by raising deposit remuneration and by lowering lending charges. This reduces seigniorage or, more precisely, re-distributes bank seigniorage to the economy.

We discuss next how these elements may act as impediments to economic development when the circuit cannot be started because banks cannot extend loans to the private sector.

### **C. Why Banks May Not Succeed**

Several factors may limit the impact of banking on economic development. First, since banks are liable for the liquidity they lend, borrowers must have initial endowments or wealth that banks can hold as collateral and liquidate to cover deposits if needed. Banks in low-income countries face constraints in extending loans because borrowers generally do not possess the required collateral. In lieu of collateral, banks may be able to lend if they have reliable information of borrowers' cash flows; however, in low-income countries they may be constrained by the lack of reliable accounting information.

Second, when banks hold collateral, the judicial system, which takes time to develop, often does not support lenders for collateral recovery, thus increasing bank credit risk.

Third, the amount of liquidity available for bank lending depends on a critical mass of a diversified depositor base, with reliable and independent cash flows moving in and out of the

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<sup>14</sup> Such exclusivity rests on the government and society restricting the acceptance of money only to liabilities issued by a small set of licensed agents. No rent would be involved if, hypothetically, all the agents in the economy issued their own liabilities and had them accepted as money. On the other hand, non-bank intermediaries do not extract seigniorage from borrowers since they may only reallocate existing liquidity across agents. Unlike interest on commercial loans, but like payment for production inputs, interest payments on a firm's obligations to a non-bank financial intermediary represent a production cost item against the firm's revenues. As such, they represent compensations to investors for parting with liquidity and to intermediaries for providing intermediation services. Therefore, they do not involve *net* real resource transfers from the firm to the investors or the intermediary.

<sup>15</sup> On seigniorage and bank size, see Bossone (2002a), Section III and Appendix I.

banking system. These independent cash flows allow banks to minimize liquidity risks that would otherwise require long-term deposit funds (which are more akin to investments) or a very large re-deposit capacity. Without these two elements, banks would have to keep high levels of liquidity idle thus constraining their own lending capacity.<sup>16</sup> Banks in small and poor economies do not have a diversified depositor base that minimizes their liquidity risk, because most of the local populations do not participate in the banking system. In many instances, this lack of participation is partly caused by account maintenance fees that are prohibitive to many potential depositors, resulting in essentially cash based economies.

Fourth, in many small low-income countries, lack of scale economies and limited banking sector competition contribute to generating substantially larger margins between the average rates on loans and the average cost of interest earning deposits than in the industrialized countries, thus making access to finance and financial deepening more difficult.<sup>17</sup> However, since banks (as opposed to nonbanks) can fund loans with demand deposits that are not interest elastic but are fee sensitive, larger interest margins can help achieve financial deepening by rendering the services affordable to low-income individuals. Yet, this channel too may not be viable in low-income countries, since it hinges on the banks' ability to find outlets for deposits (so as to generate revenue) and this very ability is likely to be inhibited by credit risk problems (see Sarr, 2000, and Box 2).

Moreover, banks lend to firms when these face demand expectations that can be satisfied profitably: banks do not (and should not) lend when demand and profit expectations are inexistent or unrealistic. The weak demand for domestic products in low-income countries leads banks to regard most project proposals for loans as not creditworthy. When banks lend to governments through deficit financing money they would not have lent anyway to the private sector (there is no government crowding out in this case), the political process determines how the money is spent and often with undesirable economic consequences.

Finally, transaction costs for accessing bank loans are too high for many potential borrowers, relative to their wealth, while bank transaction costs for administering small size loans are too high relative to the expected net-of-risk returns on the loans. Because of this, micro-finance institutions take over the vacuum left by banks. They are however themselves constrained by the very low income of those they serve. Indeed, since microfinance

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<sup>16</sup> These problems are widely observed in low-income countries and also in transition economies. The Economist (2001, pp.77-78) reports in an article, "The Banks That Don't Lend", that in Central Europe "...banks can do only half their job. They have plenty of deposits, but finding somewhere useful to lend the money is well-nigh impossible...The result is that, after ten years of transition from communism, the banking systems...are still ineffective economic actors [and] capital hungry enterprises are robbed of a source of finance".

<sup>17</sup> See Bossone and Lee, 2002. Lower wages may in fact provide some offsetting. Bossone, Honohan and Long (2001) attempt to take into account the low wage effects by using per capita GDP as a proxy for wages, and find that the offsetting effect is only partial.

institutions are based on savings rather than inside money creation supported by stable demand deposits, they are generally very small relative to the banking sector, and mainly serve as safety nets.

#### BOX 2. FINANCIAL DEEPENING AND BANK MARKET STRUCTURE

Financial deepening and better quality investments do not necessarily result from a high deposit interest rate. A look at the dual input-output nature of bank deposits illustrates the point. Deposits can be inputs for the production of bank loans or safekeeping services outputs provided to depositors. In the former case, banks pay interest on deposits net of intermediation costs while, in the latter, depositors pay for safekeeping services. The same deposits may also be inputs to the provision of payment services, in which case depositors pay for the service. The net difference between interest payments and service fees may be positive or negative for depositors, depending on the banks' market power, depositors' characteristics and preferences, and other market structure factors. Consequently, the combination of interest payments and service fees that maximizes financial deepening is not trivially determined. This combination, in turn, determines a bank's interest margin.

By paying low deposit interest rates, a bank loses the depositors who are sensitive to *explicit* interest payments, possibly leading to financial disintermediation and lower financial deepening. On the other hand, *implicit* interest payments reduce service fees and increase bank branching, thus creating the potential for higher financial deepening. Implicit interest arises when banks charge lower prices for fee-generating services instead of paying interest on deposits to remunerate depositors. Banks may charge implicit interest either because of a binding deposit interest rate ceiling regulation or because exploiting complementarities between their various services requires that some services be priced lower than they would otherwise.

In low-income countries, small savers and demand depositors may be less sensitive to the deposit rate, while they may be more responsive to the convenience of payments and safekeeping services. This would justify bank relying on implicit interest as an instrument to raise funds.

VanHoose (1988) shows that the implicit interest paid by banks on deposits depends critically on the banks' monopoly power and that, without market power, banks cannot deviate from marginal cost pricing under perfect competition. He concludes that the removal of a ceiling on explicit deposit rates does not necessarily end implicit deposit interest, while measures that increase rivalry in bank deposit markets would do so.

Sarr (2000) shows that paying implicit interest financed with savings on interest expenses made possible by market power can be an optimal deposit raising strategy and foster financial deepening on a net basis. Using US banking data, he finds that market power has been beneficial to financial deepening in the United States. Such a strategy, however, may not apply easily to low-income countries, where bank lending as a source of revenue is constrained by the limited outlets for potential deposits due to credit risk problems.

All these factors limiting the mobilization of deposits and the extension of credit are critical in low-income countries and will take time to address. As a result, banking does not support the real sector the way it does in advanced and emerging economies. Growth is therefore moderate even in those low-income countries where macroeconomic fundamentals are sound. Such countries typically accumulate excess foreign exchange reserves, because programmed leakages of foreign exchange do not materialize as banks increase their liquidity owing to a lack of lending opportunities. The end result is that accumulated reserves are invested abroad at a return much lower than would be expected for a developing nation. These funds, in turn, may partly come back to the countries as foreign loans to governments



and, in some cases, may be used to finance bad projects eventually contributing to higher international debt to GDP ratios. Obviously, these effects and their relative strength vary in relation to the initial conditions of the economy and its banking sector structure.

### III. FINANCE FOR LOW-INCOME COUNTRIES: A PROPOSED REFORM

The arguments above suggest that financial systems as we know them cannot do enough to help low-income countries get the circuit-type model started and foster a sustainable process of robust economic growth that can reach out to the population at large in the short term. In this and the next section, we discuss our proposal for a system aiming to:

- Broaden the access of population to financial resources and services and foster financial deepening;
- Generate non-inflationary purchasing power without rising private-sector debt;
- Fuel sustainable domestic output growth through domestic demand; and
- Reduce the economy's financial risks.

We postulate a system where traditional banks are replaced in their money creation function with special payment service institutions that, for lack of a better name, we shall heretofore call *Deposit Creating Institutions* (DCIs). DCIs collect non-interest bearing deposits and issue deposits on a nonlending basis to get the circuit started.<sup>18</sup> On the other hand, banks and non-bank financial intermediaries are permitted to fund their assets exclusively by issuing nondemandable debt or non-debt instruments, which are investment funds. In a DCI system, all individuals and financial and non-financial enterprises need to hold accounts with DCIs if they want to receive/transfer deposits for payments or use deposits as stores of value.<sup>19</sup>

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<sup>18</sup> As noted in the Introduction, institutions providing payments services only (in the process of which stable liquidity arises simply because money is transferred from the payor to the payee) do not have to intermediate those funds as investment deposits for a rent. These funds are a mere byproduct of the way the payments system functions.

<sup>19</sup> Our proposal differs from those advocating *narrow banking*. These aim to remove liquidity and solvency risks from banking by requiring banks to fully back their deposit liabilities with safe short-term assets and by preventing all other intermediaries from issuing demandable debt. Therefore, while narrow banking would retain deposit-financed lending but would restrict its use, a DCI system would remove deposit-financed lending but would allow inside money creation on a nonlending basis. For a comprehensive review and evaluation of the narrow banking proposals discussed in the literature, see Bossone (2001c, 2002b). Subsection IV.B below compares the implications of our proposal for financial stability and resource allocation with those of narrow banking.

This section discusses the technical aspects of the proposal, including the operations of the DCIs; the exit of insolvent DCIs; the underlying monetary and financial policy framework; and the central issues in making the transition from conventional banking to a DCI system.

### **A. Operations of DCIs**

The DCIs provide deposit safekeeping and payment services but are not allowed to extend credit. DCIs earn revenues from the fees charged to customers for the services rendered. DCIs hold part of their assets as reserves with the central bank and liquid securities. The remainder of their assets consist of liquidity that they distribute to individual depositors (on a nonlending basis) in proportion to their deposit balances over a given time period, but according to their strategic choice, and consistent with monetary policy rules (see Subsection III.C below). In other words, each DCI may augment the deposit balances of each of its depositor by a proportion of their individual average holdings during the reference period, such that the total new deposit issues does not exceed the limit set by regulatory requirements.<sup>20</sup> The liquidity distributed is reported on the asset side of the DCI balance sheet (for record keeping purposes) and gives rise to new deposit liabilities. (See Appendix II for a balance sheet illustration)

The ratio of average balances used by a DCI to distribute liquidity (deposit distribution rate) is a strategy variable determined by the DCI itself. Different DCIs can apply different rates to different types of depositors.<sup>21</sup> Each DCI decides a rate depending on its own preference for a more aggressive or conservative business strategy, and may vary such rate over time based on changes in market circumstances. In the absence of an interest rate mechanism, the deposit distribution rate is one of the instruments available to the DCIs to compete in the market for deposits.

In any event, central bank policy and regulation prevent unchecked creation of inside money and pyramid schemes. In particular, the central bank ensures that the DCI money stock grows

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<sup>20</sup> DCIs may not distribute liquidity to other than individual depositors. Since depositors can pay the fees out of the new money they receive, one could say that DCIs distribute liquidity on a net basis. Still, since the fee portion is the income of the DCI, it needs to be transparently charged and shown in the income statement. This fee income is the reason investors would want to start a DCI. DCIs may provide other services, such as consulting services in cash management to enterprises. For the purpose of our analysis, however, it is essential that they only provide payments services.

<sup>21</sup> For instance, DCIs aiming at achieving large market shares may prefer to attract many small depositors rather than few large ones. On the other hand, intermediaries wishing to offer DCI payments services within broader financial service packages may aim at fewer but larger customers. Each DCI will need to use statistical techniques or judgment to forecast factors affecting net deposit outflows in order to determine the amount of inside money that can be distributed without running into liquidity problems. The central bank would be watchful of an initial drop in the currency to deposit ratio that could lead to excessive money growth for a given base money stock, and would stand ready to reduce the stock through open market operations (see Subsection III.C).

in line with potential output and low inflation. However, in low income countries where the system would increase the real demand for transactions balances (see Subection IV.B), the velocity of money would decline allowing for higher money growth initially.

The liquidity distributed takes the form of deposits issued on the accounts of depositors and is additional to the deposits outstanding at the time of distribution. Deposits are convertible into cash and foreign exchange on demand by their holders. Depositors can use the available balances (including existing deposit holdings and distributed deposits) to finance all types of real and financial transactions (see Section IV). DCIs distribute liquidity periodically. Operationally, the distribution is carried out the same way interest payments are made on bank deposit accounts or dividends are paid out to credit union members on their average balances.<sup>22</sup>

The claims distributed by the DCIs do not differ from those given as credits by conventional banks. Although the former are not distributed in the form of credits, they make issuers equally liable to fulfil the associated obligations as banks are vis-à-vis the obligations associated with the use of loans by borrowers. Unlike banks, however, DCIs do not have claims on the liquidity they distribute precisely because they do not lend such liquidity: they distribute liquidity permanently with no entitlement to capital and interest repayment. Thus, while DCIs report the liquidity distributed on the asset side of their balance sheet (as banks do for loans), they do so only for record purposes.

The distribution of liquidity with no claims attached rests on the asynchronism of deposit withdrawals, the offsetting effect of simultaneous deposit inflows and outflows, and the re-deposit capacity of the DCIs. DCIs can therefore issue inside money to be covered only fractionally by outside money (central bank reserves). In this respect, they are similar to conventional banks. Where they ostensibly depart from conventional banking is in their being prohibited from lending the money they issue.

Distributing liquidity on a nonlending basis (that is, with no claims attached) makes the DCI function similar to the *act of giving* discussed in the Introduction: an act that is here free of moral connotations but is otherwise fully homomorphic to it. Such an act has its foundation on the recognition that the power to create inside money rests on the public's willingness to accept it, provided it carries real purchasing power. By accepting inside money, people keep it within the system and make it available to all system participants. Distributing inside money without restitution and interest claims attached transfers the power of seigniorage from private quasi-monopolists (conventional banks) to society, and thus suppresses their

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<sup>22</sup> If deposits decrease and the DCI determines that there are no deposits to be distributed, then, just like in conventional banking where loans would not be made in such a situation, cash dispensing would not take place. In conventional banking, credit would shrink as some loans are amortized and no new credit is extended. In a DCI system, the stock of money would remain constant.

privilege to extract a pure rent from the economy.<sup>23 24</sup> People pay for the use of money in the form of fees to DCIs and benefit from the higher output made possible by the mobilization of the additional purchasing power (Subsection IV.A).

In a nonlending based system of inside money creation, *solvency* ceases to be a criterion for sound DCIs while *liquidity* is key to their stability. Capital strength is thus a prerequisite for DCI operations. The capital of a DCI equals its fixed assets plus its own liquid funds. The funds that the DCI is required to hold in the form of cash, central bank reserves, and liquid securities, and any funds in excess of requirements that the DCI deliberately holds in any or all of such forms, we heretofore refer to as *primary liquidity*. Given the asset structure of a DCI, its primary liquidity coincides with its total assets net of physical assets.

DCIs need primary liquidity to comply with regulatory requirements, to settle payments to other DCIs, to meet demands for cash from customers, and to make payments to the government (if the government holds its account with the central bank, as is typically the case).<sup>25</sup> Also, if DCIs commit to convert deposits into foreign exchange on demand, and need to finance net purchases of foreign exchange, they can do so only by using primary liquidity. Therefore, net cash sales, net foreign exchange sales, and net payments to the government represent *leakages* out of the DCI system and correspond to net primary liquidity losses from the DCIs' balance sheet. Box 3 discusses how banks and DCIs raise primary liquidity.

Primary liquidity is a key factor of competition in a DCI system. DCIs that are more capitalized can take more liquidity risk and distribute more inside money, thereby attracting depositors from other DCIs. In turn, by expanding its capacity to attract deposits, a DCI economizes on the use of (costly) primary liquidity since its share of "*on us*" payments increases relative to its competitors. A larger deposit capacity also enables the DCI to distribute new deposits with a higher probability to attract them back to its own books.<sup>26</sup>

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<sup>23</sup> In conventional banking systems, the private rent element can be justified by the need to restrict market entry to private-sector entities with enough reputation to ensure public confidence in the use of privately-produced money instruments (deposits) collateralized with illiquid and opaque assets (loans). (See also footnote 13.) In the case of DCIs, the absence of the asymmetry between liquid liabilities and illiquid assets eliminates the justification for granting them with the right to a rent.

<sup>24</sup> Pullen (1987, p.368) reports that William Anderson in his "*Inquiry of Banking*" of 1797 argued that banknotes (equivalently, inside money) in excess of specie reserves, and the profits arising from excess issue, ought to belong to the nation. Pullen noted that William Anderson's conclusion if valid, would lead logically to the nationalization of the function of credit creation, or to the imposition of 100 percent cash reserve ratio for credit creation.

<sup>25</sup> Payments to the government consist of tax payments and payments for purchases of government goods, securities and assets. DCIs may purchase government securities on their own behalf only with their own capital and not with the primary liquidity arising from the public's deposits.

<sup>26</sup> Like in conventional banking systems, DCIs can economize on primary liquidity, for given volumes of deposit distribution, by setting up mutual (intra-settlement) liquidity facilities and payments netting arrangements.

In sum, DCIs compete in the market for primary liquidity with a view to increasing their capacity to provide their main output: payment services. To this end, DCIs seek to enhance their deposit-creation capacity and to attract more depositors. Winning over a larger share of the deposit market increases their profitability by increasing their fee revenues and, simultaneously, by reducing their optimal level of primary liquidity relative to liabilities.

### **BOX 3. PRIMARY LIQUIDITY FOR BANKS AND DCIS**

Sinkey (1998, p.237) reports of a former chief financial officer of Citicorp once telling a group of analysts that, in terms of prudential regulatory priorities, the CAMEL rating system (Capital, Asset, Management, Earning, Liquidity) should be reversed into LEMAC, putting liquidity first: "Liquidity always comes first; without it a bank doesn't open its doors; with it, a bank may have time to solve its basic problems".

Banks need primary liquidity to meet net deposit withdrawals and to satisfy customer loan demand. Unexpected changes in the flows of loans and volatile liabilities create liquidity problems for banks. To raise primary liquidity needs, banks rely on stored liquidity or purchase/borrow funds from the money and capital markets or reserves from the central bank. For stored liquidity banks rely on short-term, self-liquidating loans and on principal and interest payments on longer-term loans flowing in monthly on a non-discretionary basis, and in general on net reserve inflows from deposit transfers. They hold investment securities that mature and pay interest on a regular basis, and can mobilize their required reserves when these are imposed as an average over a maintenance period.

DCIs, on the other hand, would have to deal only with net deposit withdrawals, since they would not have loan demands to satisfy. Their sources of primary liquidity would be the same as banks', with two exceptions: DCIs could not rely on loan repayments and would not have access to central bank financing (see Subsection III.C).

By distributing liquidity, the DCIs enable depositors to pay for resource-intensive payment services and foster an increase in the real demand for transactions balances. They also make liquidity available to depositors without collateral requirements and with no need for credit risk analysis. As a result, the access to payment services and financial resources, especially for the poor, is facilitated as transaction costs for both sides of the market are considerably reduced. The poor who do not participate in the payment system could also capture the liquidity through employment and production, as discussed in Subsection IV.A.

### **B. Exit of a Failed DCI**

In the proposed system, a DCI fails when it runs out of primary liquidity and is unable to settle its payment obligations. If DCIs are subject to a reserve requirement (see next section), a payment settlement failure happens when a DCI has lost primary liquidity to the point where it cannot comply with its requirement persistently.

This situation may result from competitive pressure or from depositor runs. Competition may be such that deposits are attracted to DCIs offering better services and thus move out of a less competitive DCI. The process may be gradual, but there is a point where the losing DCI becomes unable to settle deposit outflows with its reserves. In fact, when the market

perceives the continued deterioration of the DCI's liquidity position, the anticipation of further liquidity depletion may precipitate a run from depositors and accelerate the DCI's default in the payment system.

More in general, a run may follow a crisis of confidence in the DCI or the DCI system. However, as noted, DCIs are not subject to solvency problems in relation to their deposit liabilities and, therefore, are much less exposed than banks to the risk of runs.<sup>27</sup>

Such a risk is further reduced by the way a DCI failure can be handled. Once a DCI has run out of primary liquidity and has exploited all options to raise the needed reserve balances, it is allowed to fail and thus exits the system. A DCI exiting the system is left with its fixed assets since, as indicated, the liquidity distributed to depositors does not bear DCI claims attached and does not give rise to DCI demandable debt obligations. Thus, only the fixed assets of a failed DCI can be liquidated to repay its (non-deposit) debts. Upon failure, the deposit liabilities of the failed DCI can be allocated to the surviving DCIs that have net open credit positions outstanding vis-à-vis the failed institution. The allocation can be done on a pro-rata basis relative to the capital of each surviving DCI.<sup>28</sup>

Since DCI liabilities are not matched by real claims on DCIs' books, their allocation to other DCIs does not require their full collateralization with performing assets (restructuring bonds). The only necessary and sufficient condition for the allocation not to undermine public confidence in the receiving DCIs and their stability is that these have enough primary liquidity margins to maintain their required ratios given their higher level of post-allocation liabilities. Now, if there are no leakages in the system into currency, this condition is satisfied by construction.<sup>29</sup>

In the event of leakages into currency, however, the actual reserve ratio of the leaking DCIs can drop below the required level, and they may find themselves unable to settle their payment obligations. In the case of failure(s), the allocation of the liabilities to surviving DCIs would cause their actual reserve ratio to drop below the required one: a portion of the allocated liabilities would be uncovered by existing reserves. Any such reserve shortage would have to be supplemented through recapitalization. The needed injection of funds, however, would likely cost less than under a comparable case of bank failure, where all the

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<sup>27</sup> This is a seemingly paradoxical, yet major, result of a system that creates and distributes claims on real resources through *acts of giving*, rather than lending.

<sup>28</sup> Obviously, in the post-allocation period, depositors are free to transfer their deposits to other DCIs or to use them when and as they wish.

<sup>29</sup> Any net deposit outflow from A to B requires an equal net reserve flow in the same direction. As the deposit outflow carries on, A loses all its reserves in favor of B and fails. To the extent that A and B were both reserve compliant before A's failure, all residual deposits of A can be allocated to B, who will then have enough reserves to remain compliant even after the deposit allocation. DCI A can exit the market while depositors are as well off as before the failure.

bank's uncovered liabilities would have to be written off, or matched with restructuring bonds, or refunded with deposit insurance funds.<sup>30</sup>

The exit of a failed DCI, however large, would not trigger systemic reactions since depositors would have their deposits immediately transferred to surviving DCIs that either would be able to honor their liabilities or could be recapitalized to that effect at a moderate cost. In the event of a run on all DCIs simultaneously, the public sector could in principle let all DCIs fail, order the transfer of all deposits to a central institution, and keep the payment system alive allowing deposit transfers to be executed with only a fractional reserve base. This outcome is however unlikely to hold given that depositors have no incentive to run on the system in its entirety if deposits are guaranteed by the state.<sup>31</sup>

The system would not be sustainable in the case of a run on the currency, but the consequences would not be different than under conventional banking.

### **C. Monetary and Financial Policies**

Throughout their operation, DCIs are required to hold a minimum reserve-to-liabilities ratio with the central bank. Prudentially, DCIs can also be required to hold a minimum ratio of liquidable securities.<sup>32</sup> Individual DCIs could exceed the required ratio(s) on the basis of their own prudential criteria and preferences, with a view to signaling their financial strength to the markets and supervisors.

Like in conventional banking, a minimum reserve requirement determines the maximum deposit creation by the DCIs. Thus, through the required reserve ratio, the central bank sets a ceiling on the liquidity distribution by individual DCIs and, hence, on aggregate money supply.

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<sup>30</sup> It can be shown that in the hypothetical case of a bank and a DCI having an identical balance sheet (with the only difference that the DCI asset side would report distributed liquidity instead of loans) the cost saving effect obtains on condition that the difference between the bank's non-performing assets and capital is greater than the product of the DCI's allocated uncovered liabilities and the required reserve ratio.

<sup>31</sup> Note that this guarantee does not create moral hazard since DCIs do not lend funds and their distribution capacity is constrained by regulatory requirements.

<sup>32</sup> Note, again, that this liquidity requirement is equivalent to a capital requirement since DCIs cannot purchase securities with the public's deposits.

#### BOX 4. A NEW JOHN LAW'S SCHEME?

One of our reviewers was concerned that our proposal would turn to be "*the blunder into which John Law fell three centuries ago*", referring to the spectacular inflationary spiral and stock price bubble bursting in France after John Law's financial experiment ended with the collapse of his Compagnie des Indes, in 1720. (For a recount, see Bordo, 1988, and the references therein contained, and Clough and Rapp, 1975).

We hold that the incentives structure of the DCI system discussed above works in the direction of monetary stability. Yet: how can a system that creates and distributes inside money be non-inflationary?

This question can be answered, first, by comparing the DCI system with conventional banking. Any fractional reserve system operates – by construction – on a partially covered money basis, whereby money is created that is not backed by existing output, but is supported by real resources only ex post, when the production it has financed has come on stream and is available on the market. This implies that the non-inflationary nature of the new money rests on the banks' capacity to select good risks (that is, businesses that generate output that is actually on demand) as much as on the overall macroeconomic policy stance. In the DCI system, money creation is separated from lending, but the financial intermediaries involved in production finance remain responsible for selecting good businesses. The system enables the economy to generate demand more easily than conventional banking, but if firms meet the new demand profitably, banks and other intermediaries can lend to them safely. DCIs, moreover, can generate demand through new money issue only within the limits set by regulatory and prudential requirements.

John Law's experiment with a private bank of issue (the Banque Générale, established in 1716 and then renamed Banque Royale), while being initially successful, resulting in output and employment growth, eventually turned into money overissue to finance the speculative activities of the Compagnie des Indes: delinking note issuance from specie convertibility, encouraging speculation on the company stock by declaring dividends unrelated to the company's true prospects, and monetizing the company stock by pegging its price inevitably led to financial disaster. (Freeman, 1996, shows the unsustainability of unconstrained private money issue).

Our DCIs, on the other hand, are envisaged to operate under a strong central bank, in a reserve-based money regime, and in competition with one another (with no recourse to central bank refinancing). Also, illiquid DCIs exit the market. An environment like this would hardly be prone to inflation and speculation. The very difference between our system and conventional banking, and in general all non-commodity based money regimes, does not lie on money creation, but rather on how money is distributed, and to whom, as it is created. To use Milton Friedman's words, in the DCI system the government - through the central bank - would "set an external limit to the amount of money and prevent the economic equivalent of counterfeiting, broadly conceived." (1960, p.8, p.66).

The central bank issues reserves periodically and determines the reserve stock consistently with its output growth forecasts and its inflation objectives (Box 4 discusses the risk of inflation associated with the DCI system). Issuance and withdrawals of reserves take place through open market operations (OMO) with non-DCI intermediaries. It is to be reminded that all intermediaries hold accounts with DCIs, so that OMO are reflected immediately on the reserve balances held at DCIs and, indirectly on the supply of deposits.

The central bank thus controls the overall liquidity of the economy through the reserve requirement and the supply of reserves to the financial market. The central bank does not



have an interest rate policy since this would interfere with DCI market competition for primary liquidity.<sup>33</sup> Interest rates are determined in the financial market and as such they also reflect monetary policy decisions and credibility. In turn, the central bank may use market interest rates as indicators of the economy's liquidity conditions and determine its short-term and medium-term policy decisions accordingly.

In line with the principle of suppressing seigniorage (or, more correctly, of giving it back to society), and in order not to alter competition in the DCI market, the central bank may not lend to DCIs, nor to other private sector agents and the government. In particular, the central bank may not provide reserves to support the expansion of individual DCI balance sheets or to rescue them from liquidity pressures resulting from market competition. Recall that liquidity is a key factor of competition in the system. In order to facilitate payment settlements, the central bank may sell reserves to DCIs against securities or make reserves available overnight, or for very short time window, on a collateralized basis and at penalizing fees. DCIs can raise liquidity in the market using their stored liquidity and the room provided by reserve requirement averaging.

DCI activities and balance sheets must be kept separate from the activities and balance sheets of other financial intermediaries. To this purpose, DCIs can either be dedicated entities, or specialized subsidiaries of financial holding companies, or else specialized fire-walled departments within financial companies offering a range of different products.

It could be speculated that a market setting where DCIs would be affiliated to larger financial companies would be preferable to one characterized by specialized DCIs. This is because in the latter case the easy commoditization of DCI services and their attendant scale and network economies would likely bring in strong natural monopoly tendencies that would lead to market concentration and market domination problems. In the alternative setting, DCI services would be part of broader financial service packages to customers; as such, they would be an important complementary component of financial sector competition and would in turn be subject to competition.

#### **D. Transition to a DCI System: Key Issues**

In moving from conventional banking to a DCI system—in which a bank has to choose between being a DCI or a nonbank—banks willing to transform themselves into DCIs can

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<sup>33</sup> An interest rate target is operationally achieved by the central bank standing ready to intervene in the money market daily, at the banks' initiative, to limit interest rate volatility and periodically through OMO at its own initiative, to meet banks' demand for reserves. This implies that a failing DCI is to be granted access to reserves if the central bank aims at its target. Note, however, that, unlike a conventional bank, a DCI cannot be *temporarily* illiquid since illiquidity indicates that it is being competed out of the market by more efficient DCIs. Therefore, in a DCI system the central bank is never confronted with the option of extending financing to an illiquid but otherwise solvent DCI. Any lending of last resort to an illiquid DCI would necessarily alter competition. An interest rate target policy would not be consistent with a DCI competitive market.

sell their loans to nonbank financial institutions. Other banks can transform themselves into financial companies that either control separate DCI and non-DCI subsidiaries or run separate (fire-walled) DCI and non-DCI departments. Every non-DCI subsidiary (department) is allocated the assets of the transforming bank and issues nondemandable debt liabilities to investors or offers depositors to voluntarily swap nondemandable debt instruments for demand deposits at market conditions.

In the absence of nonbank financial institutions willing to buy conventional bank loans, or in the event that the market would not finance the non-DCI subsidiaries (departments), a process of bank debt unwinding can be put in place. This may be done by letting old loans mature and by allowing DCI depositors to use the allocated liquidity to accelerate bank debt repayment (see Box 5 for a numerical example). This latter alternative should be more likely in low-income countries where bank liabilities are mostly in the form of demand deposits and banks dominate the financial sector. It would imply that conventional banks become institutions with separate fire-walled departments.

A second important problem is the impact of the transition on the exchange rate. For a given marginal propensity to import, part of the demand generated by the distributed DCI liquidity would translate into a larger demand for imports and affect the balance of payments. The demand for foreign exchange would lead to a loss of reserves under a fixed exchange rate regime and reduce the impact of the distributed liquidity on domestic output. This leakage can be attenuated by an initial devaluation or by a transition to a flexible exchange rate regime.<sup>34</sup> The ensuing expenditure switching effect would reduce the demand for imports while directing production factors to tradable goods. In low-income commodity-exporting countries, the exchange rate depreciation would help rural agricultural producers by raising the domestic currency value of their goods. The reverse effect would occur for the food-consuming urban poor, but liquidity distribution would offset the price effect at least partially.<sup>35</sup>

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<sup>34</sup> Potential balance of payments problems that an increase in the demand for nontradables could induce would also be corrected by the devaluation or through a transition to a flexible exchange rate regime.

<sup>35</sup> Cashin and others (2001), reporting on the results of recent household consumption surveys, conclude that real exchange rate depreciation is a key component of a successful poverty reducing adjustment strategy through its beneficial effect on export-led growth, its impact on the production structure by supporting labor-intensive agriculture (which employs the majority of the poor), and the reduction of rents earned by urban households through import quotas and exchange controls. By offsetting the income incentive on the demand for imports, an exchange rate devaluation also fosters import substitution in favor of domestically produced goods for the food-consuming urban population.

**BOX 5. TRANSITION FROM A CONVENTIONAL BANK TO A DCI: AN EXAMPLE**

To simplify the example, we assume an economy with a single bank, no currency in circulation, and no financial assets other than demand deposits used for payments. In such a system, the bank cannot convert itself into a non-DCI by selling loans to non-banks or individual depositors, since there are no surplus funds. The bank will need to separate its loan business from its payment services business by creating two separate DCI and non-DCI departments, as explained below.

**Step 1. The original bank is transformed into two departments**

The bank only has demand deposits (DD) in liabilities and loans (L) in assets. It does not have reserves since there is no currency in circulation, implying that all payments net out on its books. When the bank is split into a DCI and a non-DCI department, the DCI department inherits the demand deposits while the non-DCI inherits the loans. Since the loans were the assets backing the demand deposits, the DCI now holds an asset against the non-DCI department (Capital K).

**Original Bank**

Assets	Liabilities
100 L	100 DD

**New Financial Institution**

**DCI-Department**

Assets	Liabilities
100 K	100 DD

**Non-DCI Department**

Assets	Liabilities
100 L	100 K

**Step 2.1 Depositors repay loans by 10**

When depositors repay their loans by 10, they make a transfer from their accounts to the account of the non-DCI department at the DCI department. The loan stock at the non-DCI declines by 10 and the non-DCI now holds 10 in liquid assets (LA) in the form of DCI demand deposits. Since the non-DCI has a liability towards the DCI, it offsets that liability by 10. The balance sheets therefore shrink to 90. In the absence of new deposits created by the DCI, the balance sheets shrink to zero as loans are repaid, with deflationary consequences.

**New Financial Institution**

**DCI-Department**

Assets	Liabilities
90 K	90 DD

**Non-DCI Department**

Assets	Liabilities
90 L	90 K

**Step 2.2. The DCI department creates and distributes money on a nonlending basis**

To avoid deflation, the DCI department needs to create money (distributed liquidity DL) both to offset the deposit destruction that occurs as loans are repaid (10 in the above example) and to accommodate expected nominal GDP growth. Assuming a nominal GDP growth of 10 percent, the DCI needs to distribute 20 ( $10 + .10 \cdot 100$ ). This represents a 20 percent distribution rate. If we had assume that all the loans were repaid in this period, then the DCI needs to replace 100 in deposits and create 10 to accommodate GDP growth. When the loan repayment process is completed, the money distributed equals nominal GDP growth (unless the velocity of money decreases because of an increased demand for inside money for transactions purposes).

**New Financial Institution**

**DCI-Department**

Assets	Liabilities
110 DL	110 DD

**Non-DCI Department**

Assets	Liabilities
0	0

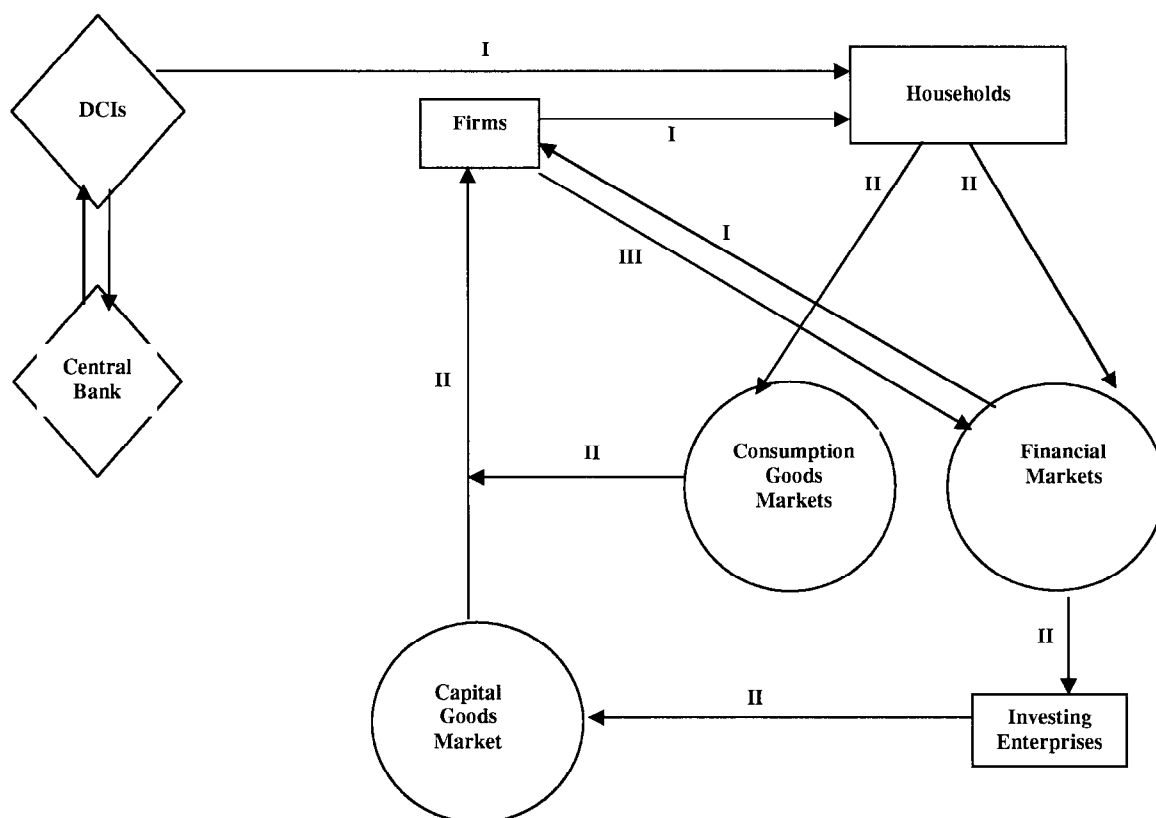
#### IV. THE ECONOMIC EFFECTS OF THE DCI SYSTEM

What are the anticipated effects of the DCI system on the real economy and the financial sector? This section explores this question and argues that a DCI system would be able to overcome many of the difficulties that conventional banking runs into in the context of low-income economies and get the circuit model started.

We need first to note the alterations that the DCI system brings to the circuit process underpinning an economy with conventional banking. The resulting process is described by the following stage sequence (see also Figure 2):

1. At circuit-start (stage **I**), DCIs distribute newly created liquidity to depositors on a nonlending basis, proportionally to their average balances over a given period and according to their own strategic choices. The relative price of desired goods increases allowing producing firms to capture DCI liquidity as revenues. Firms use internal resources or access trade finance facilities to buy inputs and start production of consumption and capital goods. As production factors are paid for, their owners (households) receive incomes and plan for their use.
2. Trade finance is extended to firms by banks and non-bank intermediaries on a short-term revolving-fund basis: the fund is supported by savings in the form of nondemandable debt from investors carried over from the previous circuit round; once reconstituted, the fund resources are carried over to the subsequent round (see below). In Figure 2, the “Financial Market” block comprises both short-term and long-term intermediaries and intermediation facilities.
3. In the interim period (stage **II**), depositors and households spend their money on consumption and financial activities. Savings (which in part could come from DCI depositors investing in non-DCIs) flow to the financial market and are used to fund investing enterprises’ spending plans in the market for capital goods. Firms recover the money initially borrowed to finance production. Note that the interest rate is determined in the financial market and is not influenced by bank rent-extracting power due to seigniorage.
4. At circuit-end (stage **III**), firms repay their capital market intermediaries. The revolving trade finance fund is reconstituted and its resources can be carried over to the next round.
5. At all times of the process, the central bank can sell (purchase) or lend reserves to financial intermediaries to provide the economy with liquidity.

Figure 2. Flow of Funds in the DCI System



What Figure 2 fails to capture is that, as liquidity is distributed to depositors and circulates in the system, it never actually switches out of DCI accounts, provided there are no leakages into currency. Deposits change hands as they move across individuals, firms and intermediaries, but they always shift across DCI books and stay on those books, unless they are converted into outside money. Note that, for graphical simplicity, Figure 2 does not show that depositors can also access the capital goods market. As discussed, they can in fact do so.

As in the discussion of the circuit process under conventional banking, special circumstances in low-income countries may alter the way the circuit works. Since intermediaries face the same problems encountered by conventional banks (structural impediments to managing credit risk and lack of long-term savings due to low income levels), the Financial Markets block may be rather primitive and inefficient in a DCI system. However, the major advantage of the DCI system is that, owing to liquidity distribution and the attendant demand effect, firms producing the desired goods see the relative price of their goods rise initially, allowing them to capture DCI liquidity. Internal finance, therefore, may enable them to overcome the effect of asymmetric information that in conventional banking would ration their access to

credit. The lack of expected demand is also resolved as depositors are provided with purchasing power on a nonlending basis.

Finally, given the rise in the demand for basic (typically more labor-intensive) products, the existence of excess labor in low-income countries allows output to grow and match demand more flexibly through higher utilization of the given capital stock.

### **A. Effects on the Real Economy**

The DCI system creates and distributes purchasing power to the public more broadly (since the real demand for transaction balances increases, allowing for more non-inflationary money supply), and at a lower cost, than is possible through conventional banking. It grants the associated seigniorage back to the public thereby averting accumulation of private debt due to bank rents.

Higher and more convenient creation of purchasing power, as well as broader access to it by the poor, can generate the initial aggregate demand accompanied by market driven relative price changes, the absence of which in low-income countries generally inhibits production and production finance. Local firms can plan production based on a higher and more predictable expected demand than under conventional banking. Higher output is followed by capital accumulation in those sectors where relative prices (and profits) rise with demand. (Appendix I shows analytically the output and price effects of the DCI system). Second round effects follow next and trigger new liquidity distribution. (See Appendix II for a numerical illustration).

The incentive built in the liquidity distribution mechanism has two important dynamic effects. First, the perception of the benefits associated with accumulating larger balances may lead depositors to delay spending distributed liquidity and to intensify their work or job-search efforts in an attempt to enhance their own saving capacity. Second, easier access to finance may induce entrepreneurial individuals to accumulate purchasing power and use it to start new businesses. As a result, the economy's potential output would be expanded.

Consumption following DCI liquidity distribution increases the demand for the goods that are preferred by the population having access to the new liquidity. In countries with high incidence of poverty and dependency ratios, consumption concentrates mostly on goods with a large content of local resource inputs (including labor), such as food, clothing, garments and footwear, and housing and related expenses. If, as a result of participating in the DCI system, new purchasing power is given to depositors, spending will increase mostly in these basic sectors, inducing a relative price increase that directs production factors to these sectors.

It is through the employment channel and the relative price increase in basic goods that the poor would capture their liquidity share, even though relatively better off people who hold

bank accounts would initially receive distributed liquidity.<sup>36</sup> Labor originally involved in self-subsistence activities could also be absorbed against payment of money wages. Their work efforts beyond subsistence needs will have an incentive to increase in the face of effective demand for output they can produce with their existing capital stock. The new wages enable their earners to enter the DCI system.

Finally, the DCI system can prove to be more effective than conventional banking in helping an economy out of a liquidity trap. Since conventional banks represent the transmission channel for central bank demand management policies, structural constraints to the provision of credit can prevent monetary policy from being an effective demand management tool. For instance, protracted bank restructuring problems, weak bank balance sheets, or tightened prudential regulations can weaken the banking channel of liquidity provision aimed to fuel demand. This situation can lead to a central bank lowering interest rates and injecting liquidity in the market with no effect on credit and aggregate demand: the new liquidity ends up in the money market and further lowers interest rates. Assuming unchanged foreign interest rates and a home bias for investments, lower interest rates may be consistent with an unchanged exchange rate and appreciation expectations so that interest rate parity is preserved. This disconnection between the micro-dynamics in the banking sector and the macroeconomic objectives of the central bank can lead to a monetary easing and yet fail to reverse the decline in credit and sluggish demand. If this situation also coincides with a lack of fiscal flexibility, a prolonged recession may ensue until banking sector problems are resolved. Banks in this case represent circuit-breakers.

DCIs would not be confronted with such problems since liquidity distribution would fuel demand without need for credit intermediation and would translate directly into household disposable income. The quantity of liquidity made available would increase demand permanently while lower interest rates could induce formation of production capacity to match the expected permanent increase in demand.<sup>37</sup>

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<sup>36</sup> The DCI liquidity distribution mechanism requires individuals to have some initial non-zero deposits to be able to receive new distributions. For this reason, the mechanism may appear to benefit the rich more than the poor and to bear no benefits for the have-nots. There are various considerations to be made. First, The incentive built in the DCI mechanism induces individuals even with very small initial endowments to enter the DCI system and to accumulate wealth progressively in a way that would not be possible under conventional banking. Second, some DCIs may have an incentive to apply higher distribution rates to smaller depositors higher (see Subsection III.A). Third, the establishment of a DCI system is not inconsistent with the existence of micro-finance institutions that extend small credits to poor households and producers but again these institutions are constrained (see Subsection II.C).

<sup>37</sup> The effect would be permanent since DCI money is created on a nonlending basis. In conventional banking, on the other hand, the money created via lending is destroyed as loans are repaid (the “reflux principle”, in circuit terminology). This requires banks to create more money on a gross basis than is destroyed if the money stock is to grow in line with nominal GDP growth.

## **B. Effects on the Financial System**

The DCI system would have important effects on financial sector development and stability. By competing to win more customers through improvements in service quality and pricing, and by distributing liquidity to depositors, DCIs would likely have a stronger and more rapid impact on financial deepening and financial system participation in low-income economies than conventional banks.

All agents who typically cannot participate in the financial system would increase their purchasing power by converting cash into deposits and by using the (formal) payment system run by the DCIs. Through liquidity distribution, more individuals would reach sooner the threshold level of wealth beyond which they can afford to participate in the financial system. Indeed, since the DCIs would be net fund providers, they would foster the formation of a broader depositor base. Most participants of the informal financial sector who currently transact in cash because of the high fees charged by banks for payment services would be attracted to the opportunity of receiving net funds by moving into the DCI system.

Since average balances would be used to determine the liquidity distribution to depositors, individuals would want to be paid in deposits, rather than cash, since this would allow them to maximize their average deposit balances and, hence, their claims on the liquidity distributed. Similarly, individuals would tend to prefer businesses that offer non-cash means of payments so as to minimize their cash holdings. Informal sector agents seeking to avoid formal payment mechanisms would thus be subjected to a new source of competition from the formal sector. The DCI system would feature considerable network externalities. Its expansion would generate scale economies in the payment system, which would translate into lower transaction costs and further increases in participation.<sup>38</sup> DCIs would thus reduce their own liquidity risks. Finally, the DCI system can provide liquidity to capital markets in countries where the infrastructure exists but long-term savings are scarce.

In a DCI system, important financial stability effects would be achieved through the separation of inside money creation from lending. These effects would even be superior to those claimed for narrow banking (Bossone 2001c and 2002b). Like narrow banks, the DCIs would run no credit risk and face a very low liquidity risk.<sup>39</sup> Also, like in narrow banking, in a DCI system the illiquidity or insolvency of non-DCI financial intermediaries would not affect the liquidity of deposits. Yet, unlike narrow banking, a DCI system would have the power to create inside money and to distribute it to the private sector. In other words, while separating lending from money creation would avert the risks involved in collateralizing

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<sup>38</sup> For the interaction of network externalities and scale economies in the production of financial intermediation services, see Bossone and Lee (2002).

<sup>39</sup> More precisely, credit risk would be zero for DCIs and very low albeit non-zero for narrow banks (since these do extend credit). On the other hand, DCIs would run a higher liquidity risk than narrow banks since, by construction, they are based on fractional reserves while narrow banks operate on a 100 collateral basis.



money liabilities with illiquid assets (much like narrow banking does), the DCI system would still allow new money to be issued to the private sector, thus overcoming one of the major shortcomings of narrow banking. Compared to narrow banks, DCIs would also have superior resource allocation effects, as discussed in Box 6.

**BOX 6. THE DCI SYSTEM AND FRIEDMAN'S 100 PERCENT RESERVE BANKING**

In developing a plan for monetary stability, Milton Friedman (1960) revived the 100 percent reserve banking idea that would later evolve into the narrow banking proposals referred to in the text. The whole money in the system - whether currency or deposits - would become a government liability as the government reclaimed its monopoly to create money which it had partly relinquished to banks through the fractional reserve system. Accordingly, all banks would hold 100 percent reserves, in Federal Reserve notes or deposits, against all outstanding deposit liabilities payable on demand or transferable by check. As a result, the stocks of money and high-powered money would coincide and the instability in the money supply originating from the randomness of the money multiplier would be removed. Friedman proposed that commercial banks be separated in two types of institution: a pure depository that would hold one dollar of central bank reserve for each dollar of demand deposits, and an investment trust that would acquire capital by selling shares or securities and use it to fund loans and investments. Investment trusts were not to engage in money creation or destruction. Banks would charge fees for their services to depositors, earn interest on central bank reserve holdings, and pay interest on deposits. Interest payment on deposits would induce an optimal stock of money holding and reduce the incentive for nonbanks to create money substitutes.

The DCI system is superior to Friedman's in several respects. First, in Friedman's proposal, money (not just reserves, but also what banks would create themselves in a fractional regime) is supplied to the economy either through government budget spending or through private sector asset purchases by the central bank. Friedman himself deemed both solutions as not particularly appealing as they would place the government into the banking business, something his 100 percent reserve proposal purported to eliminate. In the DCI system, on the other hand, money is supplied by private sector entities (the DCIs) via a competitive market mechanism, thus overcoming Friedman's legitimate concern on government involvement. Second, assuming that money grows annually at the rate of nominal GDP, for a given velocity of circulation, and that all depositors have the same average deposit balance over the year, money creation on a nonlending basis would amount to DCI deposits paying interest equal to nominal GDP. This interest-like, market-determined distribution mechanism would allow DCIs to attract deposits and make their deposit base more stable, thus reducing their liquidity risk. Finally, the cost of creating and allocating money in a 100 percent reserve system would be higher than in a fractional reserve system (Bossone 2001).

Moreover, under a DCI system, banks could not rely on implicitly or explicitly insured demand liabilities that could raise their moral hazard. Thus, their liabilities would be priced at levels that reflected their true asset riskiness. Also, since bank failures would not affect the payment system nor could they have systemic ripples through deposit runs, no public intervention would be necessary to protect bank liabilities or to salvage failing banks.

Finally, DCIs would be easy-to-monitor since primary liquidity ratios would be easily observable. Such high transparency would enable financial supervisors and market players (depositors, DCI shareholders, and investors in DCI shares) to monitor the DCIs and their market efficiently. This would subject the DCI sector to strong discipline from both the market and the financial authorities.

## V. CONCLUSION AND A BRIEF DIGRESSION ON MORAL QUESTIONS

The important role that finance plays in supporting economic development may fail to drive low-income countries out of the poverty trap. In this paper, we proposed to reform the financial sector of low-income countries in a way that would strengthen the impact of finance on growth and poverty reduction.

Essentially, we proposed to replace conventional banks with nonlending deposit issuing institutions specialized in payment services, and to redesign financial sector policy and structure accordingly. We argued that this would help to broaden the access of the poor to financial resources and services and foster financial deepening; to generate non-inflationary purchasing power without rising private-sector debt; to fuel sustainable domestic output growth through domestic demand; and to reduce the economy's financial risks.

In our proposal, inside money creation is separated from lending. This builds on the recognition that there is no intrinsic need for inside money to be created through lending. An interesting implication of the proposal is that distributing newly created inside money on a nonlending basis reflects an *act of giving*. While this is at odds with conventional finance, we argued that a system based on such mechanism is incentive compatible and consistent with the principles of sound macroeconomic management and finance.

Finally, a word on the DCI system and moral questions: How morally sound is the idea of institutionalizing a mechanism that gives out to people claims on real resources without asking them for restitution and interest payments in exchange? Where is the *quid pro quo* that makes market exchange just and sustainable? Shouldn't non-borrowed money be earned instead of being just distributed? How about the moral duty of making efforts to earn money?

In our view, to the extent that the DCI system would lead individuals with limited initial wealth endowments to stimulate sustainable output growth by using their distributed claims and work efforts, a social mechanism would obtain whereby individuals would *both take and give* over time. They would have incentives to spend but also to accumulate financial wealth for their future including by increasing work efforts: the *quid pro quo* principle would be safe. The DCI system would only trigger a market-driven value creation process that would not be triggered otherwise or that would take much longer to trigger.

Also, the DCI system would eliminate the need to entrust a few selected entities with the power to extract seigniorage from society, and yet it would do so without resorting to bank nationalization and by preserving efficiency. Seigniorage would be given back to those who make the money mechanism work by holding money in it and by making money circulate in it, while being charged only for the use of (competitive) payment services.

In light of these considerations, we do not see the DCI system as being morally at fault.

### DCI LIQUIDITY DISTRIBUTION, AND PRICE AND OUTPUT EFFECTS

Freeman (1996) illustrates the check clearing role of banks and the role of a central bank in limiting the over-issue of bank liquidity that may arise owing to less than full redemption of fiat money by depositors. His model framework is set up so that both cash and private debt (in the form of checks as promises to pay, or IOUs) are demanded by non-bank agents to finance their trades. Agents are spatially separated and travel through a common area (the bank) where check settlement takes place against cash.

The key feature of the model is that agents do not arrive at the bank at the same time. If holders of checks arrive before check issuers who bring in cash for settlement, settlement cannot take place. Trade would therefore not occur, thus reducing welfare. Freeman shows that, if the bank is allowed to use float to provide holders of checks with check privileges against the funds owed to them, trade can take place. At the end of the trading period, check issuers deposit the cash at the bank to clear the float. To the extent that agents accept bank float, there is no need for cash recipients to withdraw cash for their expenditures after the settlement process is completed—if the bank's payment technology is superior. They may well go on using checks. As the bank realizes that the float issued is never redeemed for cash, it may decide to issue new check privileges as money for its own consumption or for investment. (It may as well distribute cash to clients, in a DCI-like fashion.) If the new money is used for consumption or is distributed to clients, the price of the goods consumed increases each time the bank adds money in the system. Freeman shows that bank reserve requirements can limit the over-issue of check privileges.

In this appendix, we draw and elaborate on Freeman's (1996) model, *inter alia* by integrating production in it, to show analytically the output, price, and financial deepening effects of the DCI system proposed in the paper.

The model assumes that there is an even number of islands arranged in a circle around a central island. These peripheral islands are equally split in two groups : agricultural islands and services islands. In each agricultural island,  $N$  identical two-period ( $t$  and  $t+1$ ) lived agents are born in each period. When born in  $t$ , each agent is endowed with  $L$  units of labor equal to 1, and a production technology  $A_t = \beta(p_t)(1-A_t)$  to produce a non-storable good  $A$ , specific to her island.  $A$  represents leisure time and  $p$  is the price of the agricultural good.

$\beta(p_t) > 0$  implies that the marginal cost of leisure in terms of output forgone is negative ( $-\beta(p_t) < 0$ ). It is assumed that  $\beta'(p_t) < 0$  and  $\beta''(p_t) \geq 0$ .  $\beta'(p_t) < 0$  means that, as the price of good  $A$  increases, the marginal cost of leisure increases ( $-\beta'(p_t) > 0$ ) or, equivalently, that the marginal product of labor increases thereby inducing more work and more output  $A$ .<sup>40</sup> Furthermore,  $\beta''(p_t) \geq 0$  implies that  $-\beta''(p_t) \leq 0$  or that the marginal product of labor (the

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<sup>40</sup>  $-\beta'(p_{t+1}) > 0$  can therefore be thought of as a productivity shock as the price of  $A$  increases. This productivity shock may result from a more efficient use of existing labor, as assumed in the text.

marginal cost of leisure) increases at a decreasing rate as the price of  $A$  increases. This ensures an equilibrium price level beyond which increases in the price of  $A$  would not justify an increase in labor supply because such an increase would not be worth the leisure time forgone.

Agents born on agricultural islands consume their own produced good  $A_{at}$  and the good of the services islands  $S_{at}$  when young, and nothing when old.<sup>41</sup> They sell their produce to old service islanders in exchange for cash. Since they produce the goods they themselves partly consume, their utility function is  $V(S_{at}, A_t)$  whereby they choose between consumption and leisure (which both indirectly determine their production and consumption of  $A_t$ ). At time  $t$ , the young agriculturists purchase services from the young service islanders in exchange for IOUs (checks) that they will settle at  $t+1$ , with the cash they receive at time  $t$  from old service islanders. This is because young service islanders do not consume agricultural goods until  $t+1$ .

In each services islands,  $N$  identical two-period ( $t$  and  $t+1$ ) lived agents are born in each period. When born in  $t$ , each agent is endowed with units of a non-storable good  $S_t$  specific to her island. Service islanders consume their own good when young and the agricultural goods when old. Young agricultural islanders with whom they are paired will therefore have nothing of interest to them. Their utility function is therefore  $U(S_{st}, A_{st+1})$ . The young service islanders sell services to the young agriculturists and accept IOUs in exchange (see above). Only when these IOUs are settled at  $t+1$  for cash can they travel to the agricultural islands where they trade the cash for agricultural goods.  $N$  initially old service islanders are endowed with cash  $M_t$  that they use to buy agricultural goods from young agriculturists at  $t$ . (The initial exogenous money endowment and old agents are necessary assumptions to get the model started.)

Thus, when old, all agents travel to the central island where they settle their transactions. The central islanders possess a payment settlement technology and have no endowment of goods of their own. Like in Freeman's model, if the service islanders arrive to the central island before the agriculturists, the central islanders issue money substitutes,  $B$ , which they can use to pay for the agricultural goods from the new young agriculturists. They fully back  $B$  with reserves  $R$ .

A compact representation of the exchange sequence is reported in Table 1. In order to exemplify the case of central islanders issuing money substitutes, the sequence assumes that service islanders travel to the central island for clearing before some of the agriculturists. As a result, not all the cash in circulation is delivered by the agriculturists for clearing.

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<sup>41</sup> The two-period lived agents assumption is used for tractability only.

Table 1. Exchange Sequence

Islanders	Period		
	$t$	Clearing (at central island)	$t+1$
Agricultural Islanders ( $a$ )	Sell $A$ for $M$ to old ( $s$ )	Deliver $M^*$ ( $<M$ ) to ( $c$ )	Deliver $M-M^*$ to ( $c$ )
Service Islanders ( $s$ )	Sell $S$ for IOUs to young ( $a$ ) before old ( $s$ ) buy $A$ with $M$	Redeem IOUs for $M^*$ and $B$ via ( $c$ )	Buy $A$ for $M^*$ and $B$ from new young ( $a$ ) Redeem $B$ for $M-M^*$ via ( $c$ )
Central Islanders ( $c$ )		Get $M^*$ from ( $a$ ) Issue $B$ for IOUs to young ( $s$ ) Fully back $B$ with $R$	Get $M-M^*$ from ( $a$ ) Withdraw $B$ with $R$ Reissue $M-M^*$ to old ( $s$ )

The young service islander's plan is

$$\text{Max } U(S_{st}, A_{st+1})$$

$$\text{s. t. } Y_{st}\rho_t p_t = S_{st}\rho_t p_t + A_{st+1}p_{t+1} = S_{st}\rho_t p_t + \beta(p_{t+1})(1-A_{t+1})p_{t+1} = S_{st}\rho_t p_t + b_t$$

where  $\rho = x/p$ ,  $x$  is the price of  $S$ , and  $b$  is the credit extended by the young service islander to the young agriculturists. Since all goods are non-storable and trade cannot take place without the IOUs issued, the delayed settlement extended by the service islander will not carry interest. Denoting subscripts  $a$  and  $b$  as partial derivatives, maximization yields

$$U_s/U_a = \rho_t p_t / \beta(p_{t+1}) p_{t+1}$$

that is, the service islander's marginal rate of substitution of good  $S$  for good  $A$ .

The plan of the young agriculturer is

$$\text{Max } V(S_{at}, A_t)$$

$$\text{s. t. } Y_{at}p_t = p_t \beta(p_t)(1-A_t) = S_{at}\rho_t p_t + A_{at}p_t + A_{st}p_t = b_t + A_{at}p_t = m_t + A_{at}p_t$$

where  $m_t = M_t/N$  is the agriculturer's demand for money. The plan solution is

$$Vs/Va = -p_t/\beta(p_t)$$

The golden rule of exchange between islanders, requiring  $Vs/Va = Us/Ua$ , yields condition

$$\beta(p_{t+1})/\beta(p_t) = p_t/p_{t+1} \quad (A1)$$

This condition essentially means that, in equilibrium, the rate of output price change must equal the rate of productivity growth between periods. Recalling that  $\beta'(p_t) < 0$ , if  $p_{t+1} > p_t$ , then  $\beta(p_{t+1}) < \beta(p_t)$ , that is, productivity increases. Recalling also that  $\beta''(p_t) \geq 0$ , it follows that the optimal rate of price change is that which maximizes the incentive for producers to forgo leisure for labor.

The conditions under which the increase in the price of A in period  $t+1$  will come about can be seen from the equilibrium in the money market. Equilibrium in the currency market requires that the demand for money equal supply

$$Nm_t = M_t = M^*_t + B_t \quad (A2)$$

where  $M^*$  is the cash delivered for settlement at the central island and  $B$  is issued by the central islander to substitute temporarily for any undelivered cash ( $M_t - M^*_t$ ).  $B_t$  in fact vanished when all the cash is delivered ( $M_t = M^*_t$ ) but since the model does not stop, it suffices to say that  $M = M^* + B$  in steady state equilibrium.

Recalling from the budget constraint of the young agriculturer that  $m_t = p_t(Y_{at} - A_{at})$ , the price of agricultural output is

$$p_t = M_t/N(Y_{at} - A_{at}) = (M^*_t + B_t)/N(Y_{at} - A_{at}) \quad (A3)$$

indicating that the price varies directly with the demand for A supported by the stock of money  $M_t$  (or the stock of cash in circulation and money substitutes) and inversely with the supply of A for market consumption.

If the money substitutes were never redeemed for cash (say, they are perceived as perfect substitutes of money), the central islanders have the option to issue  $B$  permanently and use it actively. They could either use  $B$  to purchase goods or invest it for a return, or lend it at an interest, or distribute it to islanders and allow it to be used for payments for a fee.<sup>42</sup> To the extent that an additional flow of  $B$  is put in circulation and is not subject to calls for redemption, the money market equilibrium condition becomes

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<sup>42</sup> Note that the use of B for lending or investment purposes would not require any prior act of saving and it simply derives from the existence of a stable float. We noted this same point when discussing the circuit process in very low income countries where financial markets are typically incomplete or missing, and investment can be financed with a stable bank demand deposit base.

$$Nm_t = M_t + B_t \quad (A4)$$

Note that, in Eq. (A4),  $B$  and  $M$  are complementary and no longer substitute each other as in (A3).

In the event that  $B_t$  is either used by the central islanders to consume  $A$  or is distributed to service islanders (in a DCI-like fashion) to increase their demand for  $A$ , the price of  $A$  is determined by

$$p_t = (M_t + B_t)/N(Y_{at} - A_{at}) \quad (A5)$$

since now  $B$  adds new purchasing power that insists on  $A$ . Note that the central islanders would not need now to fully back their money substitutes with reserves. A reserve (regulatory or prudential) requirement would then be necessary for them to limit the risk of over-issue.

The point of essence of the model is that an increase in  $B$  engineers an increase in the price of  $A$ , leading to  $p_t/p_{t+1} < 1$  and, in turn, to  $\beta(p_{t+1})/(\beta(p_t)) < 1$ , thus allowing the production of  $A$  to grow until condition (A1) is satisfied.

This result is consistent with the effects of the DCI system discussed in the paper.

## A NUMERICAL EXAMPLE OF THE FLOWS OF FUNDS IN THE DCI SYSTEM

This appendix reports a simple numerical illustration of the interactions that would take place between deposit creation, price formation, and income generation, in a closed economy with a DCI system. The illustration does not purport to portray any real-world situation, but only to show the basic mechanics of a DCI-based economy.

### Period 1

The economy starts from the following initial conditions

DCI			
Assets		Liabilities	
RR	10	DD	100
LA	110	Debt	20
FA	20	Equity	20
Total	140	Total	140

RR = 10%

Real Sector	
Two Sectors: <i>a</i> and <i>b</i>	
$P_i = .60 P_a + .40 P_b$	
$Y_i = Y_a + Y_b$	
$Y_a = .60 Y_i$ $Y_b = .40 Y_i$	
$C_a = Y_a$ and $C_b = Y_b$	

RR = Reserve Requirements  
 LA = Liquid Assets  
 FA = Fixed Assets  
 DD = Demand Deposits  
 Y = Supply  
 C = Consumption  
 P = Price level

Capital Market	
Investments	Savings
0	0

### Period 2

The DCIs distribute liquidity to depositors. Assuming that equity and debt are required at a minimum to equal fixed and liquid assets (40), DCI can distribute 90 in liquidity. This liquidity is called Distributed Liquidity (DL). The additional funds increase consumption and saving, raise the price level as well as the relative price of the most consumed good, given the assumptions provided below. This change in relative price attracts more investments into the more profitable sector.

DCI			
Assets		Liabilities	
RR	10	DD	100
LA	20	Debt	20
DL	90	Equity	20
FA	20		
Total	140	Total	140

Real Sector	
Assuming no immediate supply response, unit income elasticities of demands, and no substitution effects due to relative price changes, so that the same proportions of income as in period 1 are allocated to goods <i>a</i> and <i>b</i> :	
$C_a = (.60 * 63) = 44$	$C_b = (.40 * 63) = 25$
$\Delta P_a > \Delta P_b > \Delta P$	
$I_a > I_b$ , assuming constant input costs.	

Distributed Liquidity 90  
 Consumption (70%) 63  
 Savings (30%) 27

Capital Market	
Investments	Savings
27	27



### Period 3

Assuming for simplicity a currency to deposit ratio of zero, funds invested (27) and funds consumed (63) are deposited back at the DCIs by their recipients; 9 units (corresponding to 10 percent reserve requirement) are kept by the DCIs, and additional 81 units are added to the distributed liquidity.

DCI			
Assets		Liabilities	
RR	19	DD	190
LA	20	Debt	20
DL	171	Equity	20
FA	20		
Total	230	Total	230

Real Sector	
$Ca = (.60 * 57) = 34$	$Cb = (.40 * 57) = 23$
Assuming same supply response and same income elasticities and substitution effects as in period 2	
$\Delta Pa > \Delta P_3 > \Delta Pb$	
$\Delta P_3 < \Delta P_2$	
$Ia > Ib$ Assuming constant input costs.	

+ Distributed Liquidity	81
Consumption (70%)	57
Savings (30%)	24

Capital Market	
Investments	Savings
51	51

### Period N

With a currency to deposit ratio of zero, the money multiplier is  $(1/RR) = 10$ . When the process described for periods 2 and 3 is carried through to the Nth period, deposits reach  $10 \times 100 = 1000$  units. Through reserve requirements, the central bank controls the rate of increase in DL after the initial period-2 shock.

Deposit Creating Institutions			
Assets		Liabilities	
RR	100	DD	1000
LA	20	Debt	20
DL	900	Equity	20
FA	20		
Total	1,040	Total	1040

Real Sector	
$\Delta Pa > \Delta Pb$	
$P_n > P_l$	
$Ia > Ib$	
$\Delta Ya > \Delta Yb$	
$Y_n > Y_l$	

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