Bank Deposit Contracts Versus Financial Market Participation in Emerging Economies

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Abstract

The financial sector of emerging economies in Africa is characterized by a non-competitive banking sector which dominates any direct participation of agents in asset markets. Based on a variant of Diamond and Dybvig's (1983) model of financial intermediation, we formally explain both stylized facts through "market inexperience" of agents in emerging economies. While experienced agents correctly predict future market clearing equilibrium prices, inexperienced agents are ignorant about future market equilibria. As a consequence, a monopolistic banking sector can exploit these agents because their only outside option is an autarkic investment project.

Keywords: Emerging Economies; Demand Deposit Contract; Asset Market; Asymmetric Information

JEL Classification Numbers: O16; G14; G21.

I. Introduction

There exists a long-standing debate in the theoretical and empirical literature about the benefits and shortcomings of financial intermediaries such as banks versus financial markets.[1] In a seminal contribution, Diamond and Dybvig (1983) raise the question why many people choose bank deposits over a direct participation in asset markets given that demand deposit contracts are prone to bank runs.[2] Diamond and Dybvig answer this question by claiming that “bank deposit contracts can provide allocations superior to those of exchange markets” (p. 401). Although this Pareto-superiority argument is widely accepted in the literature (cf., e.g., von Thadden 1994, 1998, 1999; Freixas and Rochet 2008), Hellwig (1994) already demonstrates that financial markets could–in principle–generate the same allocation as the optimal demand deposit contract in Diamond-Dybvig economies:

> “Why are intermediaries actually needed? Couldn’t one implement a second-best allocation just as well through Walrasian markets? After all, the above discussion has shown that if the consumers were to meet in a Walrasian market at date 1, the market would clear at the intertemporal price ratio [...] with date 1 consumers obtaining the date 1 consumption corresponding to the second-best allocation and date 2 consumers obtaining the date 2 consumption corresponding to the second-best allocation.” (Hellwig 1994, p. 1382)

Hellwig (1994) offers three possible reasons why banking might nevertheless be superior to asset markets: Avoidance of market-transaction costs; a role as commitment device; and the monitoring-cost advantage argument by Diamond (1984) (see also Hellwig 1998).

In the present paper, we identify “market inexperience” as an alternative reason for why agents may prefer bank deposits over direct participation in financial markets. The motivation for our approach is twofold. First, our theoretical model demonstrates that the asset market implementation of the welfare optimal allocation requires strong rationality assumptions on behalf of the agents. In particular, all agents must ex ante correctly anticipate the equilibrium price function on the ex post asset market. Furthermore, they must correctly understand how this future equilibrium price function depends on their ex ante investment decisions. We deem it plausible that agents in emerging economies lack such market experience because they are typically not yet used to the functioning of (liberalized) asset markets.

Second, there exists strong empirical evidence that an oligopolistic banking sector dominates financial markets in emerging economies (cf., e.g., Knight 1998; Moskow 2002; Reinhart and Tokatlidis 2003). For example, for African economies Ncube (2007) observes:

> "The financial sector in most African countries is dominated by the banking sector. The banking sector forms the largest part of the entire financial system which makes bank-lending the main source of the external finance for firms in Africa. [...] we can see that Nigeria, for instance, has as many as 90 banks, while the stock markets, and investment management firms remain largely undeveloped. Even for South Africa [...] the banking sector is indeed dominated by four large commercial banks." (p. 26)

Since an oligopolistic–or even monopolistic–banking structure is arguably more costly to agents than their direct participation in financial markets, we feel that Hellwig's (1994) transaction cost argument is not a satisfactory explanation for the empirical dominance of bank deposits over direct asset market participation. In contrast, the assumption of market inexperienced agents can formally explain the existence of a monopolistic banking structure with high banking fees through these agents' reluctance to engage in asset markets.

Our analysis proceeds in Section 2 by presenting the solution (Proposition 1) to an autarkic investment situation in a three-period Diamond-Dybvig type economy with asymmetric information. In this economy every agent decides in period 0 about how much of his wealth to invest in an illiquid long-term project which gives a certain return in period 2. In the intermediate period 1, each agent learns whether he has high or low patience for consumption in this intermediate period. Under the assumption of a large number of agents whose privately known patience types are independent and identically distributed, we characterize the optimal allocation in Section 3 (Proposition 2). In contrast to Diamond and Dybvig's (1983) original economy, where information constraints were not binding, the optimal allocation in our economy is only second but not first best. That is, our (risk neutral) preference specification gives rise to welfare losses caused by asymmetric information.

Section 4 demonstrates that this optimal (second best) allocation can be implemented through financial markets which open in the intermediate period 1. The crucial assumption is that agents have "market experience" in the sense that they correctly anticipate in period 0 the subsequent equilibrium price as a function of their ex ante investment decision. As a consequence, these experienced, i.e., forward looking, agents can maximize their ex ante expected utility through their period 0 investment decision combined with their period 1 asset market trade. Proposition 3 demonstrates that such experienced agents can mimic the optimal allocation of Proposition 2.

In Section 5 we consider market inexperienced agents who are ignorant about the possibility of asset market trade in the intermediate period 1. We assume that these agents are approached by a monopolistic bank which offers, against a payable fee, a demand deposit contract. Proposition 4 shows that the profit-maximizing interest rates of the demand deposit contract implement the optimal (second best) allocation of Proposition 2 whereby the monopolistic banking fee (i.e., the bank's profit) fully extracts the agents' utility surplus over the autarkic investment. That is, because the inexperienced agents of our model can only perceive an autarkic investment but not a future asset market as an outside option, the monopolistic bank is able to maximally exploit these agents.

Finally, Section 6 concludes with a discussion of our formal analysis. As the main insight from our theoretical study, we conjecture that the dominance of a non-competitive banking sector with high banking fees in emerging economies is going to decline when agents gain more experience about the functioning of asset markets.

II. The autarkic investment economy

We consider a large economy where any agent is a point in the unit interval, i.e., $i \in [0,1]$. In the autarkic investment situation, each agent i decides which fraction of his initial wealth $W_i = 1$ to hold as cash, C_i, and which fraction to invest as assets in an illiquid long-term project, $A_i = 1 - C$. This investment project will earn in period 2 the certain return $R > 1$ per unit of asset. In the intermediate period 1 only cash can be used for consumption. In the final period 0 the returns on the investment project plus any cash carried over from period 1 can be consumed.

In the intermediate period 1, agent i privately learns whether he has low, L, or high, H, patience for consumption. Denote by $\pi(L) \in (0,1)$, resp. $\pi(H) = 1 - \pi(L)$, the probability that agent i has low, resp. high, patience for consumption. Further, denote by c_t, $t = 1, 2$, period t consumption of agent i and consider the following type-dependent (von Neumann and Morgenstern) utility function over consumption streams

$$U(c_1, c_2, \theta) = \begin{cases} \beta_L \cdot c_1 + c_2 & \text{if } \theta = L \\ \beta_H \cdot c_1 + c_2 & \text{if } \theta = H \end{cases} \tag{1}$$

The weights β_L and β_H are measures for the different types' patience whereby we assume that

$$1 < \beta_H < R < \beta_L. \tag{2}$$

That is, a low patience type receives a higher gratification from immediate consumption in period 1 than from the consuming the period 2 return of the investment project which, in turn, gives a higher utility to the high patience type than immediate consumption in period 1.

The agent's period 0 expected utility maximization problem for this autarkic investment situation is given as

$$\begin{aligned} (3) \qquad & \max_{C_i} EU\left[c_1, c_2, \theta\right] \\ = & \left(\beta_L \cdot c_1 + c_2\right) \cdot \pi\left(L\right) + \left(\beta_H \cdot c_1 + c_2\right) \cdot \pi\left(H\right) \end{aligned}$$

subject to

$$(4) \qquad c_1 \leq C_i,$$

$$(5) \qquad c_2 = C_i - c_1 + R\left(1 - C_i\right).$$

By (2), the inequality (4) must be binding in an optimum so that we easily obtain the following solution to this linear maximization problem.

Proposition 1: *Depending on the parameter values of $\beta_L, \beta_H, R, \pi(L)$, the optimal amount of cash, denoted C_i^{aut}, held in the autarkic investment economy is given as*

$$(6) \qquad C_i^{aut} \in \begin{cases} \{1\} & \text{if } \beta_L \cdot \pi(L) + \beta_H \cdot \pi(H) > R \\ [0,1] & \text{if } \beta_L \cdot \pi(L) + \beta_H \cdot \pi(H) = R \\ \{0\} & \text{if } \beta_L \cdot \pi(L) + \beta_H \cdot \pi(H) < R \end{cases}$$

As the corresponding ex ante expected utility of agent i we obtain

$$(7) \qquad EU\left[C_i^{aut}\right] = \max\left\{\beta_L \cdot \pi(L) + \beta_H \cdot \pi(H), R\right\}.$$

By Proposition 1, we will generically observe for this autarkic investment economy with risk-neutral preferences only extreme investment decisions: Either every agent holds only cash or only assets.

III. The optimal allocation

In contrast to the autarkic investment economy of Section 2, we now derive the optimal allocation for the economy under the assumption that the agents can pool their initial wealth. To this purpose we consider a benevolent social planner who maximizes each agent's ex ante expected utility subject to (i) informational constraints and (ii) a budget constraint which exploits the law of large numbers.

Formally, in period 0 every agent $i \in [0,1]$ deposits his initial wealth $W_i = 1$ with the social planner. This planner decides in period 0 which fraction of the accumulated wealth

$$W = \int_{i \in [0,1]} W_i di = 1 \tag{8}$$

to hold as cash, C, and which fraction to hold as assets, A. Let us stipulate that the law of large numbers works to the effect that in the intermediate period 1 a mass $\tau = \pi(L)$ of agents will have low and a mass $1 - \tau = \pi(H)$ of agents will have a high patience for consumption.[3]

At first let us consider the benchmark case of publicly observable patience types. That is, the social planner chooses an allocation C_L, A_L, C_H, A_H whereby he can observe each agent's liquidity type in period 1. By (2), cash will be exclusively used for period 1 consumption whereas the asset returns are exclusively used for period 2 consumption. The agent's period 0 expected utility from the allocation C_L, A_L, C_H, A_H therefore becomes

$$\begin{aligned} & EU[C_L, A_L, C_H, A_H] \\ = \; & (\beta_L \cdot C_L + R \cdot A_L) \cdot \tau + (\beta_H \cdot C_H + R \cdot A_H) \cdot (1 - \tau) . \end{aligned} \tag{9}$$

If the agent's types were publicly observable, the social planner would thus maximize (9) subject to the budget constraint

$$\tau \cdot (A_L + C_L) + (1-\tau) \cdot (A_H + C_H) = 1. \tag{10}$$

Note that the corresponding (first best) solution to this maximization program allocates the whole aggregate wealth of the economy to the low patience types, i.e.,

$$C_L^{1s} = \frac{1}{\tau} \text{ whereas } A_L^{1st} = C_H^{1st} = A_H^{1st} = 0, \tag{11}$$

because their period 1 consumption achieves the greatest marginal utility. More precisely, this first best solution results in the following period 0 expected utility

$$EU^{1st} = \frac{\beta_L}{\tau}. \tag{12}$$

Under our assumption that patience types are private knowledge, however, the first best allocation (11) is obviously not incentive compatible because the high patience agents would have a strict incentive to pretend to be low patience agents.

To determine the optimal (second best) allocation under asymmetric information it is, by the revelation principle, sufficient to consider a direct mechanism where every agent truthfully reveals his type. To this end suppose that every agent reports to the social planner a type $\vartheta \in \{h, l\}$ where h stands for reporting a *high* and l for reporting a *low* type. A *direct contract* then specifies the allocation $C(l), A(l), C(h), A(h)$ whereby $C(\vartheta)$, respectively $A(\vartheta)$, denotes the amount of cash, respectively loans, allocated to any agent who reports in period 1 the type $\vartheta \in \{h, l\}$. Under the assumption that every agent truthfully reports his type, the planner maximizes

$$(13) \qquad \begin{aligned} & EU\left[C\left(l\right), A\left(l\right), C\left(h\right), A\left(h\right)\right] \\ = \; & \left(\beta_L \cdot C\left(l\right) + R \cdot A\left(l\right)\right) \cdot \tau + \left(\beta_H \cdot C\left(h\right) + R \cdot A\left(h\right)\right) \cdot \left(1 - \tau\right) \end{aligned}$$

subject to the budget constraint

$$(14) \qquad \tau \cdot \left(A\left(l\right) + C\left(l\right)\right) + \left(1 - \tau\right) \cdot \left(A\left(h\right) + C\left(h\right)\right) = 1.$$

Observe that every agent truthfully reveals his type if and only if the following incentive compatibility conditions are satisfied for low, respectively high, types:

IC(L):

$$(15) \qquad \begin{aligned} & \beta_L \cdot C\left(l\right) + R \cdot A\left(l\right) \\ \geq \; & \beta_L \cdot C\left(h\right) + R \cdot A\left(h\right) \end{aligned}$$

IC(H):

$$(16) \qquad \begin{aligned} & \beta_H \cdot C\left(h\right) + R \cdot A\left(h\right) \\ \geq \; & \beta_H \cdot C\left(l\right) + R \cdot A\left(l\right). \end{aligned}$$

To solve the above linear optimization problem observe that, by (2), any optimum requires $A^*\left(l\right) = C^*\left(h\right) = 0$. Furthermore, the IC(H) must be binding, i.e., hold with equality, since $C\left(l\right)$ will be chosen as great as possible because the low patience type's period 1 consumption achieves the greatest utility so that the high patience type will be maximally "exploited" in the optimum. In an optimum, we therefore have that

$$R \cdot A^{*}(h) = \beta_{H} \cdot C^{*}(l) . \tag{17}$$

Substituting the budget constraint

$$C^{*}(l) = \frac{1-(1-\tau) \cdot A^{*}(h)}{\tau} \tag{18}$$

in (17) gives for the optimal amounts of cash, resp. assets, allocated in period 1 to the low, resp. high, types

$$A^{*}(h) = \frac{\beta_{H}}{\beta_{H} \cdot (1-\tau) + R \cdot \tau}, \tag{19}$$

$$C^{*}(l) = \frac{R}{\beta_{H} \cdot (1-\tau) + R \cdot \tau}. \tag{20}$$

The following proposition collects the above results.

Proposition 2: *Suppose that the agents' patience types are not publicly observable. Then the (second best) optimal allocation is given as*

$$A^{*}(l) = C^{*}(h) = 0, \tag{21}$$

$$A^{*}(h) = \frac{\beta_{H}}{\beta_{H} \cdot (1-\tau) + R \cdot \tau}, \tag{22}$$

$$C^{*}(l) = \frac{R}{\beta_{H} \cdot (1-\tau) + R \cdot \tau} \tag{23}$$

resulting in the following period 1

$$\frac{R}{\beta_{H} \cdot (1-\tau) + R \cdot \tau}, \tag{24}$$

resp. period 2 *consumption*

$$(25) \qquad \frac{\beta_H \cdot R}{\beta_H \cdot (1-\tau) + R \cdot \tau},$$

with corresponding period 0 *expected utility*

$$(26) \qquad \begin{aligned} & EU\left[C^*(l), A^*(l), C^*(h), A^*(h)\right] \\ = \; & \frac{\beta_H \cdot R \cdot (1-\tau) + \beta_L \cdot R \cdot \tau}{\beta_H \cdot (1-\tau) + R \cdot \tau}. \end{aligned}$$

Of course, the expected utility (26) of the optimal allocation can never be worse than the expected utility (7) of the autarkic investment economy. We leave it as an easy exercise to the reader to verify that our parameter assumptions indeed imply

$$(27) \qquad EU\left[C^*(l), A^*(l), C^*(h), A^*(h)\right] \quad > \quad EU\left[C_i^{aut}\right]$$

$$\Leftrightarrow$$

$$(28) \qquad \frac{\beta_L \cdot \tau + \beta_H \cdot (1-\tau)}{R \cdot \tau + \beta_H \cdot (1-\tau)} \cdot R \quad > \quad \max\left\{\beta_L \cdot \tau + \beta_H \cdot (1-\tau), R\right\}.$$

That is, the social planner can always strictly improve welfare over the autarkic investment situation.

Remark. The optimal allocations in the seminal models of Bryant (1980) and of Diamond and Dybvig (1983) are motivated as optimal "risk-sharing" allocations between highly risk-averse agents. In contrast, the optimal allocation of Proposition 2 has been obtained for risk-neutral agents and it only results from informational asymmetries. To the best of my knowledge, the idea of such a linear model of an optimal allocation goes back to the unpublished working papers of Eichberger and Milne (1991) and of Eichberger (1992) and it was first published in Chapter 7 of Eichberger and Harper (1997) (for a similar model see Zimper 2013).

IV. The asset market economy

The second best allocation of Proposition 2 constitutes an upper bound on the agents' expected utility that could possibly be achieved in this economy under asymmetric information. This section demonstrates that this optimally achievable allocation can be implemented through a period 1 asset market under the two assumptions that, first, the agents correctly anticipate the asset market's equilibrium price function whereby they, second, exploit this knowledge in their ex ante investment decision. We call such highly rational agents "market experienced".

The following analysis proceeds backwards. At first, we describe the period 1 competitive asset market at which all agents can trade their assets after they have learnt their patience type. In a next step, we describe the period 0 investment situation of the representative agent. More specifically, the representative agent has to decide in period 0 how much of his initial wealth to hold as cash, C, versus to hold as assets, $A = 1 - C$. Since this representative agent is, by assumption, market experienced, he correctly anticipates how the period 1 market equilibrium price is determined by his period 0 investment decision.

The period 1 *asset market.* Observe that we obtain the following aggregate supply and demand correspondences.

Aggregate supply of equity at market price p:

$$
S(p) \in \begin{cases} \{1-C\} & p > \frac{R}{\beta_H} \\ [\tau \cdot (1-C), 1-C] & p = \frac{R}{\beta_H} \\ \{\tau \cdot (1-C)\} & \frac{R}{\beta_L} < p < \frac{R}{\beta_H} \\ [0, \tau \cdot (1-C)] & p = \frac{R}{\beta_L} \\ \{0\} & p < \frac{R}{\beta_L} \end{cases} \tag{29}
$$

Aggregate demand for equity at market price p:

$$
D(p) \in \begin{cases} \{0\} & p > \frac{R}{\beta_H} \\ \left[0, (1-\tau) \cdot \frac{C}{p}\right] & p = \frac{R}{\beta_H} \\ \left\{(1-\tau) \cdot \frac{C}{p}\right\} & \frac{R}{\beta_L} < p < \frac{R}{\beta_H} \\ \left[(1-\tau) \cdot \frac{C}{p}, \frac{C}{p}\right] & p = \frac{R}{\beta_L} \\ \left\{\frac{C}{p}\right\} & p < \frac{R}{\beta_L} \end{cases} \tag{30}
$$

The asset market clears at equilibrium price p^* if and only if

$$
\begin{aligned}
S(p^*) &= D(p^*) \Leftrightarrow && (31) \\
\tau \cdot (1-C) &= (1-\tau) \cdot \frac{C}{p^*} \Leftrightarrow && (32) \\
p^* &= \frac{(1-\tau)}{\tau} \cdot \frac{C}{(1-C)} && (33)
\end{aligned}
$$

whereby

$$
\frac{R}{\beta_L} \leq p^* \leq \frac{R}{\beta_H}. \tag{34}
$$

In the resulting market equilibrium, i.e., after trade has happened, all low patience types will only hold cash whereas all high patience types will only hold assets. More precisely, the low type will hold $\left(1 - C + \frac{C}{p^*}\right)$ units of assets and the high type will hold $(C + (1 - C) \cdot p^*)$ units of cash in the market equilibrium. The representative agent's expected utility in period 0 under the correct anticipation of this period 1 market equilibrium is therefore given as

$$
\begin{aligned}
(35) \qquad EU(p^*) &= \beta_L \cdot (C + (1 - C) \cdot p^*) \cdot \pi(L) + R \cdot \left(1 - C + \frac{C}{p^*}\right) \cdot \pi(H) \\
(36) \qquad &= \beta_L \cdot \left(\frac{C}{\tau}\right) \cdot \tau + R \cdot \frac{1 - C}{1 - \tau} \cdot (1 - \tau) \\
(37) \qquad &= \beta_L \cdot C + R \cdot (1 - C)
\end{aligned}
$$

whereby (33) together with (34) implies the following boundary conditions

$$
(38) \qquad \frac{R \cdot \tau}{\beta_L \cdot (1 - \tau) + R \cdot \tau} \leq C \leq \frac{R \cdot \tau}{\beta_H \cdot (1 - \tau) + R \cdot \tau}.
$$

The period 0 *investment situation.* The market experienced representative agent chooses C in order to maximize the period 0 expected utility (35). By the parameter assumption (2) and the linearity of the maximization problem, the optimal period 0 amount of cash, denoted C^M, is given as the upper boundary in (38).

Proposition 3: *In the asset market economy with market experienced agents, every agent holds in period* 0 *the following optimal amounts of assets, respectively cash,*

$$
\begin{aligned}
(39) \qquad A^M &= \frac{\beta_H \cdot (1 - \tau)}{\beta_H \cdot (1 - \tau) + R \cdot \tau}, \\
(40) \qquad C^M &= \frac{R \cdot \tau}{\beta_H \cdot (1 - \tau) + R \cdot \tau}.
\end{aligned}
$$

The period 1 *equilibrium price is given as*

$$p^* \equiv p^*\left(C^M\right) = \frac{R}{\beta_H}. \tag{41}$$

By Equations (23) and (40), we have that

$$C^M = \tau \cdot C^*(l), \tag{42}$$

implying that the agents end up in the market equilibrium with the optimal allocation of Proposition 2. The following result confirms that an intermediate asset market is thus able to implement the social optimum.

Corollary: *The equilibrium allocation in the asset market economy with market experienced agents of Proposition 3 and the optimal allocation of Proposition 2 are identical.*

V. The monopolistic banking sector economy

In this section we consider a monopolistic bank which approaches agents who are "market inexperienced". For technical convenience, we assume that inexperienced agents are completely ignorant about the possible existence of intermediate asset markets. As a consequence, these agents perceive an autarkic investment as the only alternative to any bank deposit contract offered by the bank.

The monopolistic bank of our model offers in period 1 a demand deposit contract to every agent which specifies interest rates r_t, $t = \{1, 2\}$, as well as a fixed banking fee F. This fee is deduced from the agent's payout whenever he withdraws his funds. Depositors are entitled to withdraw their funds in period 1 when they learn their patience type. If a depositor withdraws all his deposits in period 1 he will gain the return $1 + r_1 - F$. Every depositor who does not already withdraw in period 1 is going to withdraw his deposits in period 2 when the bank shuts down its business. Such depositors will gain $(1+r_1)(1+r_2)-F$ subject to the bank's solvency which will be guaranteed in our model.

If every agent $i \in [0,1]$ accepts the offered demand deposit contract, the bank's profit equals the sum of its collected fees

$$\int_{i\in[0,1]} F di = F. \tag{43}$$

For a market inexperienced agent i, his acceptance of the bank's demand deposit contract is ensured by the following participation constraint

$$EU[r_1, r_2, F] \geq EU\left[C_i^{aut}\right] \tag{44}$$

where $EU[C_i^{aut}]$ is the expected utility (7) achievable through an autarkic investment and $EU[r_1, r_2, F]$ denotes the agent's expected utility from the demand deposit contract.

Instead of giving the general definition of $EU[r_1, r_2, F]$, let us focus on the profit maximizing contract. Note that the profit maximizing bank will, first, offer interest rates that maximize each agent's period 0 expected utility whereby it, second, maximally exploits each agent by imposing a fee that fully extracts the agent's utility surplus over his reservation utility from an autarkic investment. To be more precise, suppose that the bank can set interest rates r_1^*, r_2^* which mimic the optimal allocation of Proposition 2 in the sense that

$$EU[r_1^*, r_2^*, F] = EU[C^*(l), A^*(l), C^*(h), A^*(h)] - F. \tag{45}$$

Then the maximal profit F^* that the bank could possibly extract is characterized by the following binding version of the participation constraint (44)

$$F^* = EU[C^*(l), A^*(l), C^*(h), A^*(h)] - EU\left[C_i^{aut}\right]. \tag{46}$$

In a next step, observe that the bank can indeed mimic the optimal allocation of Proposition 2 by setting interest rates such that

$$1 + r_1^* = \frac{R}{\beta_H \cdot (1-\tau) + R \cdot \tau}, \tag{47}$$

$$1 + r_2^* = \beta_H. \tag{48}$$

Since the optimal allocation of Proposition 2 is incentive compatible, all low patience types withdraw their deposits in period 1, resulting in period 1 consumption of

$$1 + r_1^* - F^* = \frac{R}{\beta_H \cdot (1-\tau) + R \cdot \tau} - F^*, \tag{49}$$

whereas all high patience types withdraw their deposits in period 2, resulting in period 2 consumption of

$$(1 + r_1^*) \cdot (1 + r_2^*) - F^* = \frac{R \cdot \beta_H}{\beta_H \cdot (1-\tau) + R \cdot \tau} - F^*, \tag{50}$$

which is identical to the optimal consumption of Proposition 2 minus F^*.[4] The following proposition collects the above results.

Proposition 4: *In the monopolistic banking economy with market inexperienced agents, the bank's profit-maximizing demand deposit contract r_1^*, r_2^*, F^* is given as*

$$r_1^* = \frac{R}{\beta_H \cdot (1-\tau) + R \cdot \tau} - 1, \tag{51}$$

$$r_2^* = \beta_H - 1, \tag{52}$$

$$F^* = \frac{\beta_H \cdot (1-\tau) + \beta_L \cdot \tau}{\beta_H \cdot (1-\tau) + R \cdot \tau} \cdot R - \max\left\{\beta_H \cdot (1-\tau) + \beta_L \cdot \tau, R\right\}, \tag{53}$$

whereby our parameter assumptions imply that r_1^*, r_2^*, F^* are always strictly positive.

Finally, observe that the lump-sum banking fee is non-distortive. As a consequence, monopolistic banking may not cause any welfare-losses in the aggregate since the agents' utility loss becomes the bank's profit.[5]

VI. Discussion and concluding remarks

This paper has distinguished between "market experienced" and "market inexperienced" agents. Market experienced agents are highly rational in the sense that they correctly predict future market clearing prices. Moreover, they correctly understand how these equilibrium prices depend on their aggregate ex ante investment decisions. For an economy with market experienced agents, the existence of an intermediate asset market can ensure that the socially optimal allocation will be achieved.

In contrast, the market inexperienced agents of our model completely ignore the possibility of an intermediate asset market. Our preferred interpretation is that these agents are not familiar with the functioning of asset markets due to a lack of experience. As an alternative interpretation, these agents might be physically restricted (e.g., by high transaction costs) from any access to an intermediate asset market. Such market inexperienced agents are prone to exploitative demand deposit contracts. In our model, a monopolistic bank offers demand deposit contracts such that the corresponding interest rates mimic the socially optimal allocation. However, any utility surplus of the agents over an autarkic investment is extracted by the banking fee to the effect that these agents are maximally exploited.

As our point of departure, we have supposed that the agents in emerging economies are market inexperienced rather than market experienced. Under this assumption, our model can explain the empirical facts that the financial sector of emerging economies is dominated by a non-competitive banking sector whereas asset markets remain underdeveloped. In addition, our theoretical model suggests that such a dominance of a non-competitive banking sector might gradually decrease over time if the agents start to gain experience with financial markets: In our analysis banking fees but not markets are very costly to the agents. To model such a gradual decrease of banking sector dominance, we plan to describe in future research "market experience" as a continuous function rather than an on-off state. We hope that such an improved theoretical model would lend itself to empirical testing.

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Notes

[1]Besides the articles cited in this paper see, e.g., Bryant (1982); Stiglitz (1985); Jacklin (1987), (1993); Wallace (1988), (1990); Rajan (1992); Weinstein and Yafeh (1998); Levine (2002); Bolton (2002); Tadesse (2002); and references therein.

[2]Diamond and Dybvig's (1983) original model of bank runs only describes the 'possibility' of bank runs in the sense that there exist multiple Nash equilibria such that one equilibrium implies a bank run. Subsequent models of bank runs admit for a unique Bayesian Nash equilibrium such that bank runs occur with a strictly positive probability in this equilbrium (Postlewaite and Vives 1987; Rochet and Vives 2004; Goldstein and Pauzner 2005; Zimper 2006).

[3]That the individual probability of an depositor to turn out as a high type coincides (almost surely) with the fraction of high types in the population, is for a countably infinite population justified by the law of large numbers together with the assumption that depositors' types are independently and identically distributed. While such justification is not at hand for the continuous population of our model (Judd 1982, Duffie and Sun 2007), I simply follow here the literature and misquote the law of large numbers in the 'usual way'.

[4]We ignore here the possibility of a bad "bank run" Nash equilibrium in which high patience types would also withdraw in period 1. The possibility of such strategic bank runs may be, e.g., excluded by "suspension of convertibility" or a central bank serving as "lender of last resort" (cf., e.g., Diamond and Dybvig 1983).

[5]Note that the bank's demand deposit contract is perfectly price-discrimitating with respect to the assymmetric information about agents' patience types.