FINANCIAL CRISIS, ECONOMIC RECOVERY AND BANKING DEVELOPMENT IN FORMER SOVIET UNION ECONOMIES

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Abstract

This paper explains both the onset of the financial crisis in 1998 and the striking economic recovery afterwards in Russia and other Former Soviet Union (FSU) economies. Before the crisis banks do not lend to the real sector of the economy and firms use non-bank finance, including trade credits and barter trade, to finance production. The banking failure arises due to the coexistence of adverse selection in a lemons credit market jointly with high government borrowing. The collapse of the treasury bills market in the financial crisis of August 1998 triggers a change in banks lending behavior. A strong economic recovery follows which provides initial conditions for banking development.

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1. Introduction

After the collapse of the Soviet Union, Russia, Ukraine and other Former Soviet Union (FSU) countries took a bumpy road in their transition to a market economy. The real sector of these economy experienced a sharp contraction. Output collapsed to around 50 percent of its 1989 level in 1998 (see Table 1). During this period the real sector accumulated a huge amount of outstanding debt and arrears and non-cash payments have become a dominant feature of these economies. Taking Russia as an example, total payables to the enterprise sector exploded from around 20 percent of GDP in 1994 to over 70 percent of GDP in 1998, while total receivables rose from 20 percent of GDP to about 45 percent of GDP over the same period. Associated with these phenomena, non-cash payments and barter started to rise after 1994, when hyper-inflation was under-control, from 8 percent to over 50 percent of sales in 1998 (see Figure 1).

In contrast to the contraction of the real sector the number of commercial banks in these economies experienced a very fast growth. In Russia the number of commercial banks increased from fewer than 100 in 1988 to about 2400 in 1994 and to about 2500 in 1998, many of which are owned by large firms.[1] Despite the boom in the number of banks and their cross holdings in the real sector, banks failed to lend to firms, which often include those who are bank owners, and banks' credit to the real sector declined substantially in these economies. For example, in real terms Russian bank credits to the real sector declined by almost 60 percent, while the lending interest rates were very high (see Table 2).[2]

Why did banks refuse to lend to firms? Where did commercial banks invest instead? Evidence shows that they concentrated their investments in treasury bills. For example, by the end of 1997 commercial banks in Russia invested almost three quarters of ruble deposits into federal government securities.[3] A similar picture emerges from other FSU countries notably Ukraine (see Table 3). In fact, Russian and Ukrainian banks are among the worst performers in transition countries in terms of mobilizing savings and allocating credit to the

[1] Although the number of banks had increased dramatically, the Russian banking sector is still quite concentrated. In 1997, the top five banks accounted for 36 percent of total assets and the top 50 banks for 71 percent. About three quarters of all household deposits were maintained with Sberbank.

[2] In nominal terms ruble loans to the real sector declined by 31.7 percent from 180 billion ruble to 123 billion ruble between 1997 and 1998.

[3] See OECD Economic Surveys: Russian Federation 1997, Paris, 1997-1998.

private sector, and they are directly responsible for the surge of non-bank finance, including trade credit and barter trade, in these economies. The irony is that even bank owners in these economies chose non-bank financing for their manufacturing and trade, while letting banks absorb credit from these large firms and invest in government bonds. Both countries experienced a continued decline in the scale of banking activities with respect to the real sector over time. After the massive privatization, the ratio of credit to the private sector declined from 12 percent of GDP 1994 to 8 percent in 1997 in Russia, and from 5 percent in 1994 to 2 percent in 1997 in Ukraine respectively. By contrast, the average ratio for all the transition countries was 22 percent of GDP in 1994 and 23 percent in 1997.

Table 1 **Level of Real GDP**
in selected Transition Countries in 1998

(1989 = 100)

CIS	54	**Central Europe**	95
Russia	55	Poland	117
Ukraine	37	Czech Republic	93
Azerbaijan	44	Hungary	95
Belarus	78		
Kazakhstan	61		

Source: International Monetary Fund

Table 2 **Bank Credit to the Real Sector in Russia**

in billions of rubels

	total loans	foreign currency	ruble loans	interest rates[1)]	inflation[2)]
1996	247	117	130	146,8	47,7
1997	310	130	180	32,0	14,7
1998	422	298	123	41,8	27,7
1999	597	304	293	39,7	85,7
2000	956	368	588	24,4	20,8
2001	1418	474	944	17,9	21,5

Source: International Monetary Fund, Central Bank of Russia

[1)]commercial banks´ 3-months lending rates in percent

[2)]consumer price index in percent

Given the poor performance of the economies in Russia and Ukraine, it is not surprising to see a financial crisis occurring in 1998. However, the very fast and strong recovery in Russia and Ukraine after the 1998 financial crisis caught many observers with surprise. In 1999 Russia and Ukraine experienced positive growth for the first time since the fall of FSU. The IMF had adjusted its forecast of economic growth for Russia in its World Economic Outlook upwards several times. Russian GDP has grown by 3.2 percent in 1999, 7.5 percent in 2000, 5 percent in 2001, and it is expected to grow by 4.4 percent in 2002. Similarly, in Ukraine GDP growth was 5.9 percent in 2000, 9.1 percent in 2001, and it is expected to grow by 5.0 in 2002, respectively (see Figure 3). Total arrears and barter have started to decline in Russia. In particular, barter and non-cash payments dropped by 20 percent in 1999 and continued to decline in 2000 and 2001 (see Figure 1).[4] Even more interesting is the fact that commercial banks started to lend to the real sector after the crisis. Ruble loans to the economy more than doubled in nominal terms between 1998 and 1999 from 123 billion rubles to 293 billion rubles. At the

[4] According to the interfax news agency the share of barter in sales dropped as well in Ukraine from 33 percent in 1999 to 17 percent in 2000, and to 8 percent in 2001.

same time lending rates of commercial banks declined sharply in nominal as well as real terms (see Table 2 and Figure 1).[5] A similar picture emerges for Ukraine where bank credit to the private sector increased from 2 percent to 9 percent of GDP between 1997 and 1999 (see Table 3 and Figure 1).

Table 3 **Credit to the Private Sector in Transition Countries**
in percent of GDP

	1994	1996	1997	1999
Azerbaijan	-	1	-	3
Belarus	18	7	9	10
Kazakhstan	25	6	5	9
Latvia	16	7	11	-
Lithuania	18	11	10	10
Russia	12	7	8	12
Ukraine	5	1	2	9
Czech Republic	40	57	68	44
Hungary	26	22	24	21
Poland	12	16	18	19

Source: International Monetary Fund, International Financial Statistics

These observations on Russia and Ukraine before and after the 1998 financial crisis seem puzzling. First, although the number of banks increased substantially, arrears and barter started to explode in Russia since 1994 when macroeconomic

[5] Due to the collapse of the government treasury bills market, the large exposure of portfolios of commercial banks to this market made many banks insolvent. This has led to a consolidation and concentration in the banking sector with 3 state banks (of which one is Sberbank) now accounting for about 80 percent of the assets. Moreover, Sberbank started to aggressively enter the lending market pushing some of the existing large banks out of this market. For the restructuring of the Russian banking sector after the crisis, see Interfax Center for Economic Analysis, Russia's Largest Banks in 1999, Moscow 1999.

stabilization was in place. Thus, the banks' failure to lend to the real sector, which caused the non-cash economy, does not appear to be a consequence of hyperinflation. Second, with the outbreak of the financial crisis in 1998 that among other damages also brought down many banks, arrears and barter started to decline after the crisis. This is not what one would expect because a financial crisis usually causes widespread liquidity shortages in an economy and often leads to a credit crunch so that firms are forced to have more arrears and barter transactions. Third, immediately after the financial crisis Russia and Ukraine started to have substantial economic growth for the first time since the collapse of the FSU. This stands in contrast to the experience of many other economies where the financial crisis has led to a sharp output decline.[6]

The described puzzles raise many question. What explains the separation between the financial and the real sectors before the crisis? What is the relationship between the non-cash economy on the one hand and the financial exuberance on the other? How can we explain the unexpected high growth of the Russian and Ukrainian economies after the 1998 financial crisis? Has the unexpected growth something to do with the decline in barter trade and the increase in bank lending to the real sector? If so, what is the function of a financial crisis in this process?

We develop a model to address the above questions. Our model assumes severe information asymmetry in these economies so that banks are not able to distinguish good credit risk firms from bad ones. Thus, banks charge high interest rates for loans from all borrowing firms. This, in turn, induces good quality firms to turn to non-bank finance, such as trade credits and barter trade.[7] The option for good firms to raise liquidity through non-bank finance drives up bank lending interesting rates further since banks expect that only lower quality firms will borrow. In equilibrium only low-quality firms borrow from banks while good-quality firms turn to non-bank finance, and the banking sector looks for high-yields government securities to invest. We call this a banking trap in the sense that the financial sector is separated from the real sector of the economy. This

[6]Based on a sample of 195 crisis episodes across 91 developing countries, Gupta, Mishra, Sahay (2001) find in their study on ouput responses to financial crisis that around 60 percent of the crisis have been contractionary. Moreoever, Loayza and Ranciere (2001) find in the countries that experience a fall in output after crisis, that it takes on average 4 years for output to recover.

[7]In our model we take the existence of non-bank finance for firms as given and focus on the banking failure. In a recent paper Marin and Schnitzer (1999) argue that barter is a response to a banking failure. Barter is a trade credit between firms which is repaid in goods rather than cash. Marin and Schnitzer take the banking failure as given and argue that barter offers a deal-specific collateral which effectively lowers credit enforcement costs.

separation hinders banking sector development and economic growth, although on the surface there is financial exuberance in particular in the government securities market. Using data from a survey among firms in Ukraine in 1997, our empirical evidence suggests that bank loans were mainly allocated to firms with low quality.

Our theory thus highlights the role of the financial sector before and after the crisis.[8] It suggests a link between the governments budget deficit and the non-cash economy which has been overlooked so far. In our model, the government's public debt and the size of the non-cash economy are simultaniously determined. It is frequently argued that arrears and barter in Russia and Ukraine are driven by tax motives. By allowing to hide some of their profits lowering their tax base, non-bank finance is seen to contribute to the difficulty of raising taxes and thus causing the governments budget to explode. Our theory suggests in addition that the governments' budget deficit is crowding out bank lending to the real sector by creating an environment in which banks invest in the treasury bills market with exceptionally high returns and the real sector turns to non-bank finance to meet its liquidity needs.[9][10]

Our theory also offers an explanation why the 1998 crisis has been beneficial to the economies of Russia and Ukraine. Our explanation links the puzzling facts that since the crisis of 1998 the non-cash economy started to decline in Russia and Ukraine, the banking sector started to lend to the real sector and loan interest rates declined sharply. When the Russian government defaulted on its bonds in August 1998 the securities market collapsed. Although many banks with a large exposure to government securities collapsed, the economy turned around from negative growth to positive growth. We argue that the vanished market for government bonds induces the surviving banks to reallocate their assets to the real sector at lower interest rates to attract borrowers. Lower loan interest rates,

[8] For insightful discussions of the role of the financial sector in economic transition, see Berglof and Bolton (2002).

[9] In the debate over the non-cash economy tax reasons figure prominently as an explanation. However, empiricial evidence for Russia and Ukraine suggests that tax motives have only minor importance, while the lack of liquidity and high borrowing costs for bank loans are the prime motivation for firms to engage in barter trade, see Commander and Mumssen (1999) for evidence in Russia, and Marin, Kaufmann, Gorochowskij (2000) for evidence in Ukraine.

[10] According to Shleifer and Treisman (2000) this was the price Russia had to pay to achieve stabilization of inflation. Rather than printing money to finance the budget, the government issued treasury bills and maintained artificially high interest rates on these bills to co-opt the banks who havily invested in this market. Yields on the GKO market reached up to 60 percent (see Figure 1).

in turn, makes it attractive for some better quality firms to start to borrow from banks rather than to continue using non-bank finance. This improves the average creditworthiness of the pool of borrowers and, in turn, further lowers interest rates and induces more firms to switch from barter trade to bank loans. The strong economic recovery naturally follows, and it also provides an opportunity for the banking sector to further develop.[11] Based on data for 20 transition countries we test the prediction of the financial crisis as a trigger for economic recovery and banking development. Our evidence shows that before the crisis the allocation of bank credit to the real sector of the economy is indeed hampered by the governments' overissuing of bonds and by the opportunity for firms to engage in barter trade, but after the crisis banks started to provide more loans to firms at low interest rates.

The rest of the paper is organized as follows. In section 2 we develop a model of the bank-firm relationship in a lemons market. In section 3 we characterize the equilibrium of the lemons market in which the financial and the real sectors are separated. Section 4 describes how the financial crisis has helped the FSU economies to get out of the banking trap. In section 5 we test the predictions of the model with firm level data from Ukraine and with country level data for 20 transition economies. Section 6 concludes. All proofs are in the Appendix.

2. Model

We consider an economy with M banks and N firms, where $N > M$; and the government.

Firms: Firm i's $(i = 1, ..., N)$ quality, measured as its probability of being solvent, λ_i, is only known to itself. The quality of firms can be ranked as $\lambda_1 > \lambda_2 > ... > \lambda_N$. But the ranking of firms is not known to any particular bank and firm in the market. The average quality of all firms is $\overline{\lambda}_N = \frac{1}{N}\sum_{i=1}^{N}\lambda_i$, which is known to all the firms and banks. The liquidity demand of firms can be met

[11] During the crisis the ruble depreciated by more then fifty percent (see Figure 3) which may be an alternative explanation for why barter dropped after the August crisis in Russia. However, Ukraine had only a mild depreciation of the exchange rate but also experienced a sharp drop in barter and arrears after 1998. This suggests that some other force is at work here. Similar arguments also apply to oil prices after 1998 given Russia is an oil exporter while Ukraine is an oil importer. Another alternative argument that the return to the cash economy in Russia is due to a reversal in capital flight after the August crisis does not seem to be supported by the data. Westin (2000) and Loungani and Mauro (2000) argue that capital flight picked up again in Russia after the tightening of capital controls in the aftermath of the crisis.

through borrowing from banks or through other means, such as borrowing from other firms in the form of trade credits in cash or in the form of trade credits in goods (barter trade)[12]. We will call these alternative forms of finance as non-bank-financing (NBF). To meet their liquidity needs profit maximizing firms choose the cheaper way between bank financing and NBF.

To simplify the analysis we assume that NBF cost b is constant.[13] NBF cost b is a reduced form capturing many possible interpretations.[14]

Government: We suppose that the government's total revenue equals its tax revenue plus its borrowing and NBF firms evade taxes.[15] Given the possibility for tax evasion, the government is assumed not to be able to collect taxes effectively. For any given government revenue, R, the lower the tax revenue, T, the more the government issues bonds to finance its expenditures $B = R - T$.

When there are n NBF firms the tax revenue is reduced to $T = (N - n)\, t$, where t is the tax paid by each firm. To borrow more, the yield of government bond, s, has to be higher.[16] To capture this idea in a simple way, we assume that the yields of government bonds, s, is a positive linear function of the amount of borrowing. When there is no tax evasion the interest rate of government securities reaches its lower bound with $s = \phi r_0$, where ϕ is the investors' **relative confidence** in government securities. When the relative confidence in government securities is the same as that of investing in the private sector, then $\phi = 1$; otherwise it is $\phi > 1$. To make things simple, we treat ϕ as a reduced form and

[12]Overdue trade credits in cash (firm arrears) and trade credits in goods (barter) exploded in Russia and other FSU economies. Usually goods used in barter are not fixed assets and heterogeneous in quality. This means that these goods are typically not collaterizable assets for bank loans due to high cost of quality assessment or selling for banks. For barter as a collateralized trade credit, see Marin and Schnitzer (2002).

[13]This assumption can easily be relaxed without changing the qualitative results. For example, one could make b to depend on firm characteristics like the firm's level of quality. However, as will become clear later this complication would reinforce the separation result we will derive in the next section without adding insight.

[14]In addition to solving liquidity problems, it is argued that NBF may cut costs since it may reduce hold-up problem or disorganization problem (Marin and Schnitzer, 1999); may help firms in tax evasion (for empirical evidence, see Commander and Mumssen,1999; and Marin, Kaufmann, Gorochowskij, 2000).

[15]Although in our model NBF is driven by financial considerations, NBF offers better opportunities for firms to evade taxes. This is confirmed well with the empirical evidence for Russia and other FSU countries (see Commander and Mumssen, 1999; and Marin, Kaufmann, Gorochowskij, 2000).

[16]The government can either issue government bond domestically with a high yield; or borrow from foreign investors by issuing dollar denominated bonds and paying higher interest rates.

take ϕ and t as exogenously given.[17]

To summarize, we have the government security yield equation, which is a function of the number of NBF firms in the economy,

$$s(n) = r\phi\frac{B(n)}{\bar{B}} = r\phi\frac{R-(N-n)t}{R-Nt}$$

where, $\bar{B}$ is planned government borrowing; and $B(n)$ is realized government borrowing.

Bank-firm relationship: We assume free entry in the banking sector. Facing competition, each bank makes its investment decision based on expected returns. If the expected return of investing in government securities is higher than that of lending to a firm, banks will invest in government securities rather than lend to firms; and vise-versa.

We suppose that there is asymmetric information between banks and firms such that banks are not able to identify which firm is of good quality and which is of bad quality. Asymmetric information between banks and firms is a severe problem in transition economies. Most banks in transition economies are new and have very little experience with credit evaluation. Furthermore, the lack of accounting standards and market valuation of firms' assets makes it difficult to evaluate firms' creditworthiness. The only information that banks are assumed to have is the average quality of the firms in the economy, $\overline{\lambda}_N$. Thus, banks' ex ante belief of the probability that a firm will be able to repay its loan is $\overline{\lambda}_N$. Therefore, banks' expected rate of return of lending to firms is $r_N\bar{\lambda}_N$, where r_N is the rate of repayment of a solvent firm when there are in total N firms borrowing. Comparing the expected rate of return of lending to a firm and investing in government securities, the arbitrage condition for a bank is

$$(1+r_N)\,\bar{\lambda}_N = 1+s.$$

Or the rate that a bank will charge to a firm will be

$$r_N = (1+s)/\bar{\lambda}_N - 1.$$

Facing this rate, r_N, a firm i with a probability of success of λ_i, will face an expected marginal cost of borrowing from the bank of

$$\lambda_i(1+r_N) = (1+s)\frac{\lambda_i}{\bar{\lambda}_N}.$$

[17] Alternatively, ϕ may also be interpreted as a risk premium on government securities.

If raising liquidity through NBF is less costly than borrowing from banks, firm i will borrow from other firms. The condition for this to happen for firm i is then

$$\frac{\lambda_i}{\bar{\lambda}_N} \geq \frac{b}{1+s}.$$

Thus, we have,

Lemma 2.1. *Firm i will use NBF if and only if:*

$$\lambda_i \geq \frac{b\bar{\lambda}_N}{1+s}. \tag{2.1}$$

Notice that $\frac{b}{1+s}$ is the ratio between and the cost of raising \$1 liquidity through NBF and the yields of government bonds, which also affects the cost of raising \$1 liquidity through a bank loan. From Lemma 2.1, obviously, a firm is more likely to use NBF to solve its liquidity constraint, when the marginal cost of NBF b, is low, or the interest rate charged by banks, s, is high. Moreover, the higher is the quality of a firm, λ_i, the more likely it engages in NBF. The intuition of this result is straightforward. With information asymmetry between banks and firms, banks charge an interest rate according to the market average quality. As a result the high quality borrowers subsidize the low quality borrowers in the pool of different quality borrowers. Turning to NBF helps this high quality firms to escape to subsidize the low quality firms.

3. Separation of the Financial and the Real Sector

In the previous section, we have shown that in a lemons lending market good quality firms face higher borrowing costs than bad quality firms. As a result good quality firms are more likely to use NBF to solve their liquidity problems than to borrow from banks. Moreover, as better quality firms switch to NBF to meet their liquidity problems, it generates an externality on the lending rates of banks, because the average quality of the pool of borrowing firms is lowered. Consequently the lending interest rate goes up, which in turn leads more better quality firms to turn away from banks. This logic repeats until in equilibrium only the bad quality firms borrow from banks and the good quality firms raise liquidity through NBF. That is, in equilibrium the financial sector is separated from the

real sector of the economy. In the following we show this separating equilibrium formally.

First, we illustrate conditions for a separating equilibrium between the financial and real sector when s is exogenously given. We then derive a separating equilibrium with s being endogenized. To make things simple, we assume that $\lambda_i = \lambda_{i-1} - \mu$ for all $i = 1, 2, ..., N$, and $\lambda_N = \mu$.

Associated with this assumption, for a given μ, N can be interpreted as a measure of heterogeneity of the firms, which determines information asymmetry. When N is large, the degree of information asymmetry between firms and banks in the economy is high, and subscript i now can be interpreted as a label for a group of firms that have the same quality λ_i. Under this assumption, the average quality of all firms is

$$\overline{\lambda}_N = \frac{1}{N}\sum_{i=1}^{N}\lambda_i = \frac{(1+N)\mu}{2}.$$

The firms' quality can be ranked as $\lambda_1 > \lambda_2 > ...\lambda_{n-1} > \lambda_n > ... > \lambda_N$. We assume that the ranking is not known to any agent in the economy. Let us suppose that λ_n satisfies the following condition,

$$\lambda_{n-1} > \frac{b\bar{\lambda}_N}{1+s} > \lambda_n.$$

According to Lemma 2.1, this condition implies that firms with subscript $i \leq n-1$ will not borrow from banks because their cost of borrowing is too high. All other firms with $i \geq n$ will find it cheaper to borrow from banks. Thus, at the starting point the $n-1$ high quality firms do not borrow from banks.

In the following lemma, we show for exogenously given s that when the bank lending market is a lemons market, in equilibrium the higher the ratio $\frac{1+s}{b}$, the fewer firms will borrow from banks.

Lemma 3.1. *There are three possible equilibria in a lemons bank lending market:*

1. *if* $1 \leq \frac{1+s}{b}$, *the equilibrium is* $n^* = N$ *and no firm borrows from banks; however,*

2. *if* $\frac{N+2}{2(N+1)} \geq \frac{1+s}{b}$, *the equilibrium is* $n^* = 0$ *and all firms borrow from banks; finally,*

3. *if* $\frac{N+2}{2(N+1)} < \frac{1+s}{b} < 1$, *there exists an equilibrium* $n^* \in (0, N)$ *such that all firms with subscript* $i \leq n^*$ *do not borrow, while all the remaining* $N - n^*$ *firms borrow from banks.*

Proof in the Appendix

Lemma 3.1 shows that in a bank lemons lending market with sufficiently high yields of government securities s relative to the NBF costs b in equilibrium no firm will borrow from banks and the financial sector is separated from the real sector. However, if the ratio between the treasury bill rates and NBF costs is sufficiently low, all firms will borrow from banks. At a moderate ratio, low quality firms only will borrow from banks.

So far we have assumed that the yields of government bonds s is exogenously given. However, s will depend also on the number of NBF firms in the economy. In the following, we endogenize the yields of government bonds s to make its value depends on the number of NBF firms in the economy. Substituting $s(n)$ into the condition in Lemma 2.1, the no-borrow condition becomes

$$s(n) \geq \psi(n) \tag{3.1}$$

with

$$s(n) = \phi r_0 \left(1 + \frac{t}{R - Nt} n\right)$$

as the government securities yields equation; and

$$\psi(n) = \frac{b(N - n + 2)}{2(N - n + 1)} - 1$$

as the banking lemons market equation. The following proposition gives conditions for a separating equilibrium in which the good quality firms do not borrow from banks.[18]

Proposition 3.2. *If* $(b-1)\left(1 - \frac{tN}{R}\right) > \phi r_o > \frac{b(N+2)}{2(N+1)} - 1$, *a unique interior equilibrium* $n^* \in (0, N), s^* \in \left(\phi r_o, \frac{\phi r_0 R}{R - Nt}\right)$ *exists such that* n^* *better quality firms do not borrow and the remaining* $N - n^*$ *low quality firms borrow from banks. Moreover, the equilibrium value of* n^*, s^* *increase with* $t, \phi r_o$ *and decrease with* R.

Proof in the Appendix

[18] The result shows only the case that is most relevant to our evidence. A full characterization of the equilibria of the model is available upon request.

Intuitively, when the number of NBF firms increases, the government's tax revenue T declines, which in turn pushes up the yields of government bonds, s. This, in turn, may lead more firms not to borrow from banks. The switching from borrowing to NBF will generate a negative externality on other borrowing firms who may stop borrowing as well. As a consequence s is pushed further up which will again induce more firms not to borrow. This cycle repeats until s is too high to attract more borrowers; or the borrowing firms are of too poor a quality to switch to NBF.

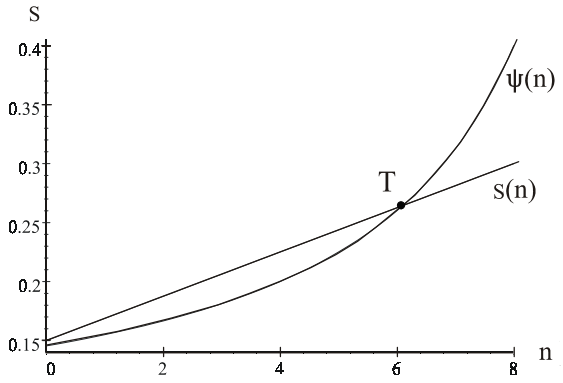
The above result illustrates a banking trap. Banks invest in government bonds, while firms, in particular good quality ones, solve their liquidity problems through NBF. The economy is stuck in the banking trap which causes a separation between the real sector and the banking sector. This separation result between the real and the banking sector is substantially different from a conventional 'government crowding out' story because information asymmetry is one of the key factors which cause the separation.

The following example illustrates that when the degree of information asymmetry increases, the separation between the two sectors becomes stronger. In our simulation we 'calibrate' the model with data from Russia in 1997 before the August financial crisis. The total government expenditure in percent of GDP in Russia was 18.4% in 1997. Thus we choose 18% for R. Since planned tax revenue T is not observable we assume a value of 10 for T. With respect to the value of the exogenous benchmark lending rate r, we use an average lending rate of Czech commercial banks, which were among the best established banks in transition economies, between 1997 (13.2%) and 1999 (8.7%), which was 10%.

Example 3.3. ***NBF and Information Asymmetry****: We consider two economies which differ in the degree of information asymmetry between banks and firms but share all other parameter values with* $r = 0.10$, $\phi = 1.5$, $b = 2.1$, $R = 18$, $T = 10$.

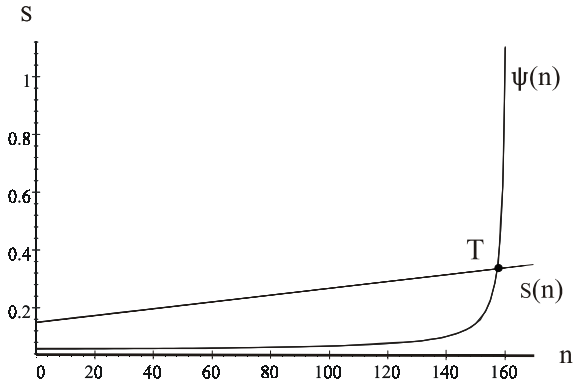
Case 1: Moderate degree of information asymmetry: $N = 10$. Graph 1 gives the resulting NBF equation $\psi(n)$, which is defined in the proof of Proposition 3.2 and the government security yield equation $s(n)$. The intersection of the two equations gives the equilibrium at point T at which 61 percent of the firms do not borrow from banks and the government security rate s settles at 26 percent. In Russia in 1997 more than 50 percent of firms' sales were financed by other firms in the form of barter transactions and the treasury bills market rate reached 28

percent (see Figures 1 to 3). Thus, for reasonable parameter values the model is quite consistent with the data for Russia in 1997.



Graph 1: Moderate information asymmetry

Case 2: High degree of information asymmetry: $N = 160$. Graph 2 gives the corresponding NBF equation $\psi(n)$ and government security yield equation $s(n)$. At the new equilibrium at point T 98 percent of the firms are involved in NBF and the treasury bill rate reaches 33.4 percent.



Graph 2: High information asymmetry

The example illustrates that an economy with a higher degree of information asymmetry suffers from a stronger separation between the real sector and the banking sector. By contrast, a conventional crowding out story would not depend on the degree of information asymmetry between banks and firms as is the case here.

4. Financial Crisis and Banking Development

In the previous section we have derived an equilibrium in which the financial sector is separated from the real sector and the yields of government securities s are high. In this section we analyze how an exogenous shock in the agents confidence in the government which is triggered by the government's default and the firesale of government securities affects an economy with separated financial and real sectors.

A strong negative confidence shock, i.e. an exogenous negative shock in ϕ creates a substantial drop in the yields of government securities s.[19] As a result, the banks which are heavily invested in government securities will suffer major losses. The immediate effect of such a financial crisis on the real sector is, however, limited when the two sectors are separated.

Corollary 4.1. *With the separation between the banking sector and the real sector, the plunge of ϕ has no immediate impact on the number of good quality firms n^* which do not borrow from banks, although banks may make losses.*

Typically, a financial crisis leads to a sharp fall in GDP followed by a slow and gradual recovery, as observed in crises in Latin America in the 1980s and in Nordic countries in the 1990s.[20] In an economy in which the financial and the real sectors are separated, however, a financial crisis may be beneficial for the economy. When ϕ, thus s plunge, banks' options outside of the real sector disappear. This induces banks to lower lending interest rates to attract more firms. As a result, some good quality firms switches back to borrowing from banks, and the average quality of borrowers further improves. The improved quality of the borrowing pool further lowers bank lending rates, and thus inducing more good-quality firms to borrow. Moreover, when more good-quality firms borrow, the tax revenue goes up. This reduces government borrowing, which leads to a further drop in s. This logic leads to a new equilibrium in which better-quality firms borrow from banks; loan interest rates go down; and banks invest less in government securities. The 'separation' syndrome disappears if the shock is strong.

Starting from an economy where n^* good quality firms use NBF, we show now that the banking sector gets to reconnect with the real sector when ϕ drops.

[19] To make the model simple, we choose to treat the financial crisis as an exogenous event. Our analysis focuses on the consequences of a financial crisis.

[20] See footnote 5.

Proposition 4.2. *If the banking sector is separated from the real sector in an economy, a financial crisis caused by a plunge of ϕ may lead to an integration of the two sectors. In the new equilibrium, the 'separation' syndrome may diminish or even disappear associated with a substantial lower lending rate.*

Proof in the Appendix

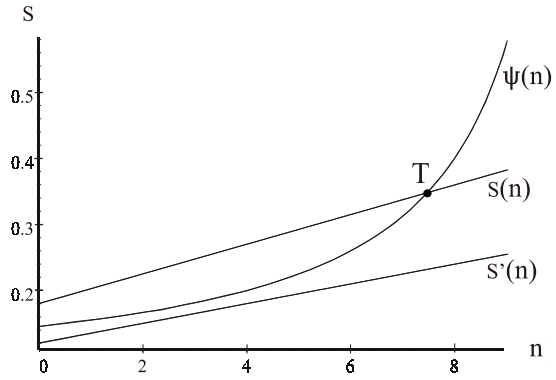
Our result is consistent with what has happened in Russia. The financial crisis in Russia was triggered by the default of the government. Investors lost their confidence in government securities and the treasury bond market collapsed. Any bank that had survived this big shock needed to change its portfolio dramatically and started to lend to the real sector at much lower lending interest rates than before the crisis. Comparing bank lending to the private sector in 1997, the year before the financial crisis, with that in 2000, reveals an increase in bank lending in Russia and in Ukraine from 8 percent and 2 percent of GDP, respectively, to 12 percent and 9 percent of GDP, respectively, while barter trade declined by about 30 percent.

It is important to point out that although the financial crisis can destroy the bad equilibrium associated with a banking trap, it only provides the initial conditions for banking development. This is because severe information asymmetry is the key factor which causes the separation between the real sector and the banking sector. As long as information asymmetry between banks and firms is severe, a financial crisis may not be a sufficient trigger to pull the economy out of a banking trap. Indeed, the following example illustrates that when the degree of information asymmetry is large enough, the lemons market problem is so serious that a financial shock is not enough to pull the economy out of a banking trap.

Example 4.3. ***The Impact of Financial Crisis on Banking Development: The Role of Information Asymmetry.*** *We look at two economies with the same parameter values as in the previous example ('calibrated' to Russian data before the crisis) given by $r = 0.10$, $b = 2.1$, $T = 10$, $R = 18$. The initial value of confidence into government securities is the same, $\phi = 1.8$. The only difference between the two economies is assumed to be the degree of information asymmetry.*

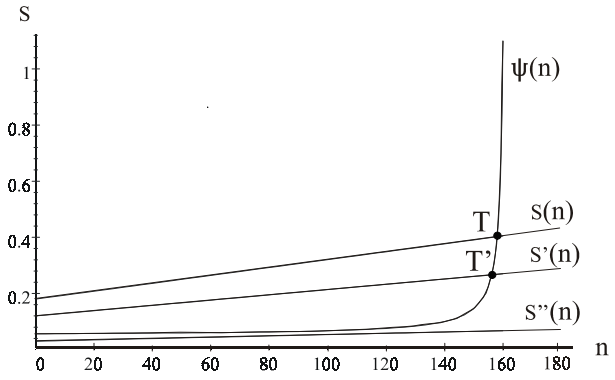
Case 3: Moderate degree of information asymmetry: $N = 10$. Graph 3 gives the $\psi(n)$ curve and the lines $s(n)$ and $s'(n)$ before and after, respectively the financial crisis hits the economy. Before the shock ($\phi = 1.8$) the equilibrium

settles at point T at which 74 percent of the firms are involved in NBF with a government security rate of 34.8 percent. After the shock (a drop in ϕ to 1.2), in the new equilibrium no firm engages in NBF and the treasury bill rate is 12 percent.



Graph 3: Moderate information asymmetry

Case 4: High degree of information asymmetry: $N = 160$. Graph 4 gives the $\psi(n)$ curve with three lines before the shock $s(n)$, after a moderate shock $s'(n)$, and finally after a drastic shock $s''(n)$. Before the shock, the economy settles at an equilibrium T at which 98.8 percent of the firms engage in NBF and the government security rate is 40 percent. With the same moderate shock as in Graph 3 (captured by a drop in ϕ from 1.8 to 1.2) the new equilibrium at T' still gives 97.6 percent of firms involved in NBF and a treasury bill rate of 12.1 percent. Only with a drastic drop of ϕ from 1.8 to 0.3 is the NBF economy removed and no firm barter trades with a government security rate of 3 percent.



Graph 4: High information asymmetry

The example illustrates that a small confidence shock in government securities is sufficient to bring an economy out from the separation between the real sector and the banking sector if the degree of information asymmetry is moderate. However, a large shock is required to do the same for an economy with a high degree of information asymmetry. The example demonstrates how the financial shock interacts with the degree of information asymmetry and thus highlights the relative importance of each factor for banking development.

5. Empirical Evidence

5.1. Firm Level Evidence

We first examine the predictions of our model on the behavior of firms when there is a high degree of information asymmetry between firms and banks; and when there is a high level of government borrowing. Our investigation is based on data of about 100 firms which engaged in barter trade in Ukraine in 1997. We interviewed 55 firms to obtain information on 165 barter deals. Each firm provided us with 3 barter deals. Each barter deal involved 2 firms, a seller and a buyer. Many of the firms were well informed about the financial and economic conditions of the firms they traded with because they served as financiers. Table 4 and Table 6 give descriptive statistics of the variables used in the empirical analysis.[21]

[21]For a more detailed description of the data sample see Marin, Kaufmann, Gorochowksij (2000).

Our model predicts that low quality firms will predominantly finance their production with bank loans. We examine the relationship between bank lending and the characteristics of firms in Table 5. In the table we run the regressions for all firms in the sample (first five columns) and then for firms with positive bank debt only. We use the firms' bank debt in percent of sales DEBT as the dependent variable. 62 percent of the firms have positive bank debt with an average ratio of bank debt to firms sales of 6.3 percent (see Table 6). As a measure for the firms' quality λ_i we use the variable QUALITY, which is defined by the firms' labor productivity. Another aspect of the firms' quality is captured by firms' arrears in percent of sales, and we denote this measurement by ARREARS. The more indebted the firm is vis-a-vis other firms the less likely it is that the firm will be able to repay its bank loans and thus the larger the banks' credit risk. Thus, our theory predicts a positive sign on the ARREARS variable. Turning to the results it appears that QUALITY is significant and negative and ARREARS is significant and positive in all specifications. ARREARS and QUALITY, both measuring the firms' quality appear to be correlated (when ARREARS is included, QUALITY becomes insignificant). Therefore, we excluded ARREARS in the remaining specifications shown in columns 4 and 5.

Next, we include BARTCOST and TOT as variables capturing the NBF cost b. BARTCOST is an index which takes the value of zero if the firms output is produced with only one input and approaches one when the firm uses several inputs from other sectors. We use BARTCOST here as a measure of the cost of raising liquidity via barter. When a firm trades in many inputs it will have more leverage in barter trading between varieties of goods and thus will have lower bartering cost. We expect a negative coefficient on BARTCOST.[22] Turning to the results BARTCOST is negative and significant suggesting that firms with higher barter costs borrow more from banks.

Finally, we include the variable TOT into the regression which captures the terms of trade effect of barter. We will use it here as a measure for the credit costs of barter. TOT measures in percent the extend to which barter shifts the terms of trade in favor of the firm extending a trade credit within barter. The larger the shift in the terms of trade the more costly it is to raise liquidity via barter trade.

[22]Blanchard and Kremer (1997) use the same variable as a measure for the hold-up problems of firms. The larger the number of inputs used for production the more complex the production and the more bargaining problems arise. In their theory of barter Marin and Schnitzer (1999) suggest lower bartering costs for firms with more complex production. They argue that barter trade helps firms to deal with the hold-up problem.

For given costs for bank loans an increase in the credit costs of barter induces firms to switch to bank loans to solve their liquidity needs and thus we expect a positive sign on the TOT variable. TOT turns out to be positive and highly significant at conventional levels.

Lastly, we introduce the variables STATED and EMPLOY to control for ownership and firm size. One possible reason why the bad quality firms receive more bank loans than other firms is that the bad firms may be state owned and/or large. State owned firms or large firms may have better creditworthiness because of the expectation of a state bail out. It turns out, however, that neither STATED nor EMPLOY are significant at conventional levels in the all firms regressions. In the regressions for firms with positive bank debt (last five columns) STATED is not significant and firm size appears to hinder the firm to get loans (the relationship is significant and negative). The variable GROWTH is the firms' output growth relative to GDP growth in Ukraine between 1994 and 1996 and is supposed to control for the fact that firms with access to bank loans can grow faster. The relationship is strong and highly significant.

Table 4 **Bank Lending and Firm Characteristics**

			bank debt in percent of sales			
			0 - 105	0	0 - 10	10 - 105
			100%	38%	52%	10%
QUALITY	mean		19490	23269	18168	12000
	Anova: F-test	1,30				
	sign. level	(0,276)				
BARTCOST	mean		0,802	0,823	0,800	0,752
	Anova:F-test	2,13				
	sign. level	(0,123)				
GROWTH	mean		0,03	-1,23	0,17	4,08
	Anova:F-test	10,53				
	sign. level	(0,000)				
TOT	mean		4,55	2,79	4,10	13,53
	Anova:F-test	2,02				
	sign. level	(0,136)				
ARREARS	mean		30,1	16,9	17,2	137,0
	Anova:F-test	13,81				
	sign. level	(0,000)				
EMPLOY	mean		4679,9	1121,3	7222,5	4981,4
	Anova:F-test	1,85				
	sign. level	(0,162)				

Source: Data Sample of 165 Barter Deals in Ukraine in 1997

Table 5 **Determinants of Bank Lending to Firms**

	all firms					firms with bank debt					
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(6)
ln(QUALITY)	-0,257	-0,318	-0,238	-0,358	-0,341	-0,363	-0,493	-0,549	-0,430	-0,554	-0,659
	(0,124)	(0,052)	(0,156)	(0,034)	(0,052)	(0,011)	(0,001)	(0,000)	(0,002)	(0,000)	(0,000)
ln(BARTCOST)	-1,804	-1,661	-1,283	-1,729	-1,730	-1,682	-1,283	-1,074	-0,854	-1,086	-1,146
	(0,065)	(0,080)	(0,176)	(0,069)	(0,070)	(0,011)	(0,049)	(0,074)	(0,141)	(0,073)	(0,055)
GROWTH	0,137	0,151	0,144	0,152	0,151		0,075	0,091	0,083	0,091	0,096
	(0,001)	(0,000)	(0,000)	(0,000)	(0,000)		(0,005)	(0,000)	(0,001)	(0,000)	(0,000)
TOT		0,042	0,044	0,040	0,040			0,040	0,040	0,039	0,037
		(0,003)	(0,002)	(0,005)	(0,005)			(0,000)	(0,000)	(0,000)	(0,000)
ln(ARREARS)			0,233						0,254		
			(0,088)						(0,005)		
STATED				0,407	0,308					0,083	0,461
				(0,301)	(0,521)					(0,756)	(0,153)
ln(EMPLOY)					0,043						-0,161
					(0,715)						(0,046)
R^2 Adj.	0,102	0,152	0,166	0,152	0,147	0,091	0,159	0,286	0,342	0,279	0,304
N	137	137	134	137	137	92	92	92	92	92	92

OLS - regressions; p - values in parentheses
Source: Data Sample of 165 Barter Deals in Ukraine in 1997

QUALITY = firm´s output per employee
BARTCOST = index which takes the value of zero if the firm trades with only one other firm, and which tends to one if the firm trades with many firms
GROWTH = percentage deviation of firm`s output growth relative to the growth rate of GDP between 1994 and 1996
TOT = SCASH - PCASH.
SCASH is the difference between the barter price and cash price in percent of the cash price for the trade credit side of the barter deal.
PCASH is the difference between the barter price and cash price in percent of the cash price for the goods payment side of the barter deal.
ARREARS = firm arrears in percent of sales
STATED = dummy variable with value 1 when the firm is state owned
EMPLOY = firm´s number of employees

Table 6 **Descriptive Statistics**

Variable	Mean	Standard Deviation	Minimum	Maximum	Number of observations
QUALITY	19481,9	26109,9	1565,8	135133,3	152
BARTCOST	0,80	0,12	0,34	0,92	141
GROWTH	0,01	4,21	-2,03	25,43	153
TOT	4,59	18,07	-168,00	50,00	163
ARREARS	30,15	90,89	0,70	626,00	138
EMPLOY	4386,6	17518,1	8	130000	165
BANK DEBT	6,31	15,96	0	104,20	150
STATED				D = 1 ,	43 observations

Source: Data Sample of 165 Barter Deals in Ukraine in 1997

5.2. Cross Country Evidence

In this section we examine the prediction of the model that a financial crisis may trigger a change that can substantially improve conditions for banking development. We will use country level data for 20 transition economies. In these economies financial systems in Russia and Ukraine are among the least developed. Our firm level evidence for Ukraine presented in the previous section suggests a separation between the real and financial sector that only bad quality firms borrow from banks.

We look for comparative evidence on the determination of bank intermediation at the macro level across transition countries. Our theory predicts that a country's level of bank intermediation is driven by the extent of information asymmetry between banks and firms, by the level of the government budget deficit, and by the level of barter trade. The government's budget deficit induces banks to invest their excess liquidity in government securities which crowds out bank lending to the real sector of the economy. Barter trade leads banks to charge high interest rates so that they end up lending little to firms.

We start by examining commercial banks' lending rates. We expect that economies with a larger degree of information asymmetry between banks and firms, with a larger size of government deficit, and with a larger share of barter trade to have higher commercial banks' interest rates. We use commercial banks' 3-months lending rates as the dependent variable. We measure the degree of information asymmetry between banks and firms by the country's EXPORT SHARE and/or by incoming foreign direct investment as a share of GDP FDI/GDP. Both variables are supposed to capture the average credit risk of the real sector. The idea is that the larger the export share and the larger the share of incoming foreign direct investment in percent of GDP the better the quality of the real sector and thus the lower the interest rates that banks will charge. In a market with credit rationing as we describe it here commercial banks lending rates are not driven by supply and demand but rather by the average credit risk of the pool of borrowing firms. Turning to the results in Table 7 this turns out to be the case, since both variables are negative and significant in the majority of specifications. The variables GOVDEBT and GOVDEF are both measures for the government's soft budget constraint. The former is the government's debt outstanding and the latter is the government's deficit both in percent of GDP. Lending rates will as well be affected by yields of government securities given the possibility for banks to invest in securities.[23] As expected GOVDEBT or GOVDEF have both a positive and significant influence on interest rates except when the variable FDI/GDP (Stock) is included in the regression. The variable BARTER measures the share of barter in percent of sales in transition countries. As predicted the variable tends to increase banks' lending rates. Finally, we include the EBRD index of commercial law LEGAL to control for differences in the legal environment across transition countries. Not surprisingly, improvements in the effectiveness of the legal system tends to lower interest rates.

[23] In Russia the government offered exceptionally high yields on government bonds to make it attractive for banks to invest. In 1996 Russia was among the transition countries with the highest spread between bank loan and deposit rates. Our model suggests that bank loan rates are driven by the yields of government securities which may explain why the spread in Russia is particular wide. For the spreads in the banking sector in transition countries, see Transition Report 1998.

Table 7

Determinants of Banks´ Lending Rates
across 20 Transition Countries

Dependent Variable: commercial banks` 3-months lending rates in percent per annum

	1996							1999			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
GOVDEF	15,529 (0,009)		1,766 (0,261)					-0,250 (0,870)		-0,682 (0,720)	
GOVDEBT		2,565 (0,000)		-0,032 (0,922)	-0,012 (0,971)	-0,506 (0,116)	2,753 (0,000)		0,039 (0,697)		0,005 (0,981)
FDI/GDP (STOCKS)			-1,210 (0,222)	-1,637 (0,104)	-1,531 (0,135)	-1,540 (0,081)				-0,451 (0,220)	-0,595 (0,362)
FDI/GDP (FLOWS)							-4,000 (0,285)				
EXPORT SHARE					-37,263 (0,397)	-110,724 (0,023)					17,014 (0,767)
BARTER						1,085 (0,080)					-0,049 (0,948)
LEGAL							-37,686 (0,036)				
R^2 Adj.	0,273	0,630	0,208	0,096	0,077	0,556	0,695	-0,051	-0,052	-0,013	-0,246
N	20	18	12	12	12	11	17	20	17	16	13

OLS - regressions; p - values in parentheses

Source: International Monetary Fund, International Financial Statistics

BARTER = barter trade in percent of sales
GOVDEBT = general government debt in percent of GDP
GOVDEF = general government deficit in percent of GDP
EXPORT SHARE = exports in percent of GDP
FDI/GDP (STOCKS) = incoming foreign direct investment (stocks) in percent of GDP
FDI/GDP (FLOWS) = incoming foreign direct investment (flows) in percent of GDP
LEGAL = European Bank for Reconstruction and Development, index of commercial law; the index goes from 1 (never effective) to 5 (always effective)

Next, we investigate how information asymmetry and government borrowing affects the level of bank intermediation across transition economies. A country's level of bank credit to the private sector in percent of GDP is used as the dependent variable. We want to test whether countries with a higher degree of information asymmetry between banks and firms, and with more government borrowing have a lower level of bank intermediation. Table 8 gives the results. As core variables we use the same variables as before in Table 7 explaining commercial banks' lending rates. We find that the variables EXPORT SHARE and FDI/GDP are both positive and significant at conventional levels suggesting that the lower degree of information asymmetry (the larger EXPORT SHARE and FDI/GDP), the more banks lend to the private sector. The variables GOVDEBT and GOVDEF as measures for the size of the government sector are both not significant (except for one specification) suggesting that the size of the government budget has no extra effect on the level of bank lending which works beyond the channel of banks' lending rates (in Table 7 we found that these variables tend to increase banks' lending rates). In specification 4 of Table 8 we include BARTER (and exclude GOVDEBT and GOVDEF because they tend to be correlated with BARTER[24]) and find as predicted that the larger a country's exposure to the non-cash economy the lower its level of bank lending to the private sector.

Furthermore, we include the EBRD index for non-banking financial institutions reform FINREG to control for differences in banking reform across transition countries. The index goes from 1 to 4, the larger the number, the more reform has been undertaken in the country. We use the index for non-bank financial institutions as a proxy for bank reform rather than the index for banking reform itself to avoid problems of multi-colinearity in the regression. Not surprising, the level of bank intermediation tends to increase in the countries with more progress in banking reform.

We turn to the post financial crisis year of 1999 to see whether the financial crisis has changed the lending behavior of banks. This is shown in columns (8) to (11) of Tables 7 and in columns (6) to (10) of Table 8. Four things are note-

[24]Our model predicts that BARTER and GOVDEF will be correlated. The larger the budget deficit the larger the yields of government bonds and banks interest rates and thus the less attractive it is for firms to borrow from banks. They switch to barter instead. Furthermore, the more firms barter, the smaller will be the government's tax revenues, because firms will tend to exploit the possibility to evade taxes when bartering.

worthy. First, the two variables, EXPORT SHARE and FDI/GDP, capturing information asymmetry between the real sector and the banking sector, stop to have a significant influence on interest rates (Table 7) as well as on bank lending to the real sector (Table 8). Second, the effect of GOVDEF and GOVDEBT on lending rates becomes insignificant while GOVDEF has now in 1999 a marginally significant influence on bank lending to the private sector. Apparently, the strong reduction in the fiscal budget deficit after the financial crisis has boosted bank lending to the private sector which has gone beyond its effect on lending rates. Third, barter stops to have a significant influence on interest rates as well as on bank lending.

To conclude, the drastic changes in the results of the regressions explaining interest rates and bank lending behavior before and after the financial crisis suggest that the financial crisis has changed the behavior of the banking sector in a fundamental way. The banking sector started to lend to the real sector. This makes it possible for many transition countries, most notably for Russia and Ukraine, to abandon barter trade and to return to the cash economy.

Table 8

Determinants of Bank Credit to the Real Sector

across 20 Transition Countries in 1996 and 1999

Dependent Variable: credit to the private sector in % of GDP

	1996					1999				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
FINREG	10,251 (0,012)	10,466 (0,011)	8,009 (0,041)	9,248 (0,014)	15,716 (0,006)	12,403 (0,001)	12,932 (0,006)	10,798 (0,005)	11,574 (0,007)	12,582 (0,083)
GOVDEBT		0,135 (0,081)			-0,103 (0,568)		-0,002 (0,971)			-0,030 (0,754)
GOVDEF	-0,335 (0,640)		-0,321 (0,631)			-1,186 (0,109)		-0,801 (0,281)		
EXPORT SHARE			36,200 (0,079)	38,803 (0,070)				23,002 (0,139)	27,744 (0,129)	
BARTER				-0,480 (0,080)					0,073 (0,750)	
FDI/GDP (STOCKS)					0,898 (0,092)					0,064 (0,830)
R^2 Adj.	0,281	0,386	0,374	0,460	0,501	0,505	0,383	0,544	0,475	0,255
N	19	18	19	18	12	19	17	19	18	14

OLS - regressions; p - values in parentheses

Source: IMF, International Financial Statistics; European Bank for Reconstruction and Development (EBRD), Transition Report; World Business Environment Survey, World Bank - EBRD, 1999

FINREG = European Bank for Reconstruction and Development, index of non banking financial institutions reform; index goes from 1 (little or no change from the previous regime) to 4+ (industrialised market economy standard).

GOVDEBT = general government debt in percent of GDP

GOVDEF = government deficit in percent of GDP

EXPORT SHARE = exports in percent of GDP

BARTER = barter trade in percent of sales

FDI/GDP (STOCKS) = incoming foreign direct investment (stocks) in percent of GDP

6. Conclusions and Policy Implications

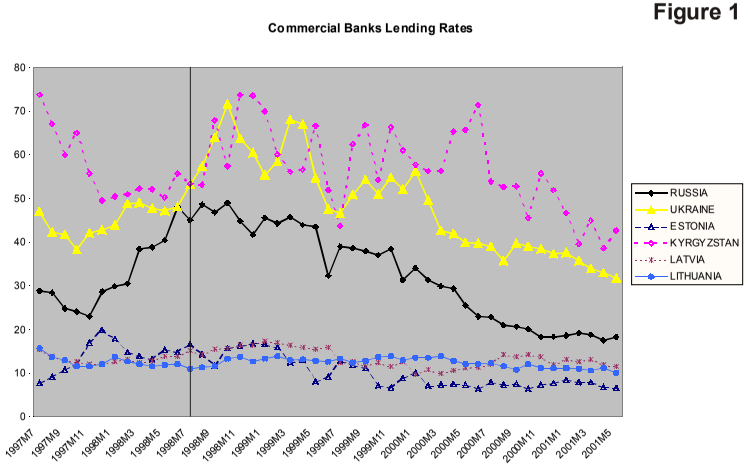
We have developed a model that explains both the onset of the financial crisis in 1998 and the striking economic recovery afterwards in Russia and other FSU economies. Before the crisis, the economies of Russia and Ukraine were stuck in a banking trap in which banks failed to lend to the real sector and firms raised liquidity through non-bank finance, because of the coexistence of a lemons credit market and the government's over issuance of bonds to finance its budget gap. Despite of the financial exuberance on the surface, banking development was seriously hampered and the economic performance was poor. The collapse of the treasury bills market triggered the financial crisis, which brought down many banks and destroyed the surviving banks' investment opportunities in government securities. As a result, the surviving banks started to lend to the real sector at low interest rates, which attracted more good-quality firms to use low-cost bank loans rather than costly non-bank finance. A strong economic recovery followed and it also provided initial conditions for further banking development. Our empirical evidence based on firm level data and country level data supports the model's predictions.

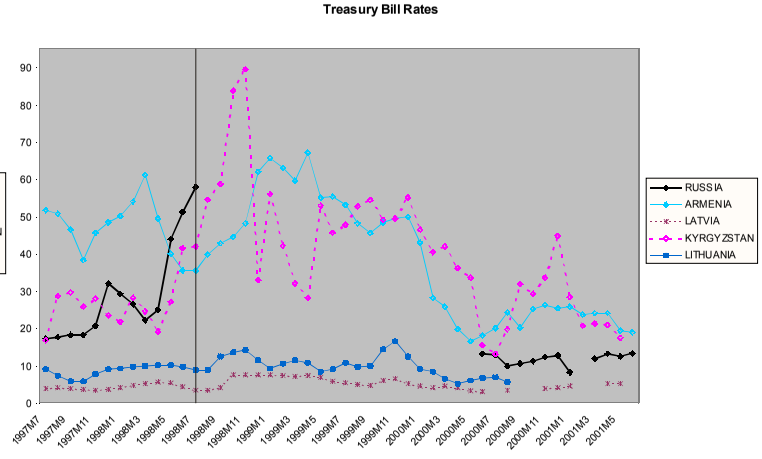
Our model suggests that a financial crisis, though often causing a credit crunch and deep economic recession, may have its benefits as well. One of the benefits highlighted in this paper is that if an economy is stuck in a banking trap in which the financial and real sectors are separated, a crisis may lead an economy out of the trap and thus can lead to a strong economic recovery. This, in turn, also sets the stage and initial conditions for financial development. It should be emphasized, however, that whether economic recovery and growth can continue critically depends on whether banking development can be sustained.

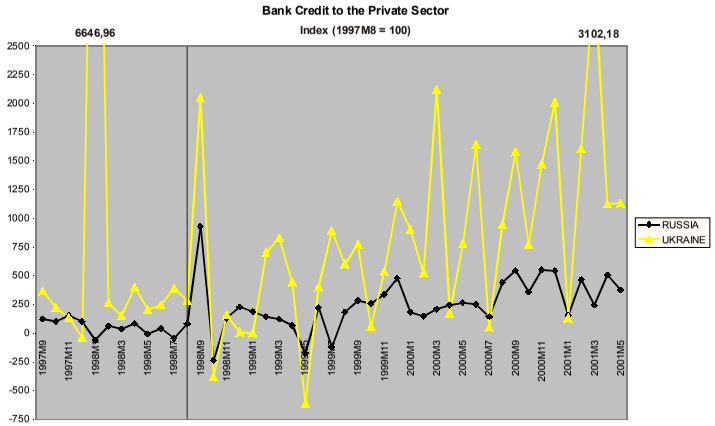
Our model has several policy implications of how to sustain further banking development. A high priority should be on fiscal policy. It is critical that the government hardens its budget constraint and avoids to create an environment in which government bonds crowd out bank loans. The economic recovery has provided the conditions for this to happen, since in 1999 the government's balance turned into a surplus in Russia as well as in Ukraine. Moreover, reducing the information asymmetry between banks and their borrowers is another key. Policies aiming at improving corporate governance, accounting and transparency, and credit risk assessment and management are all necessary. Furthermore, as bank loan grows, an effective enforcement of loan contacts becomes more important, as suggested by Perotti (2002). Finally, our results suggest that in order to sustain

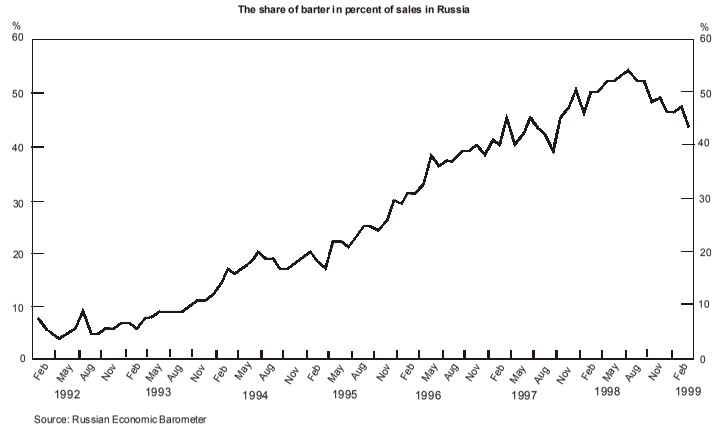
banking development the banks' returns on loans should be attractive. Thus, at the early stage of bank development a moderate amount of competition in the banking sector is desirable. If bank competition is too strong, it will be difficult to maintain the incentives of banks to lend to the real sector and to invest in evaluating credit risk.

Figure 1



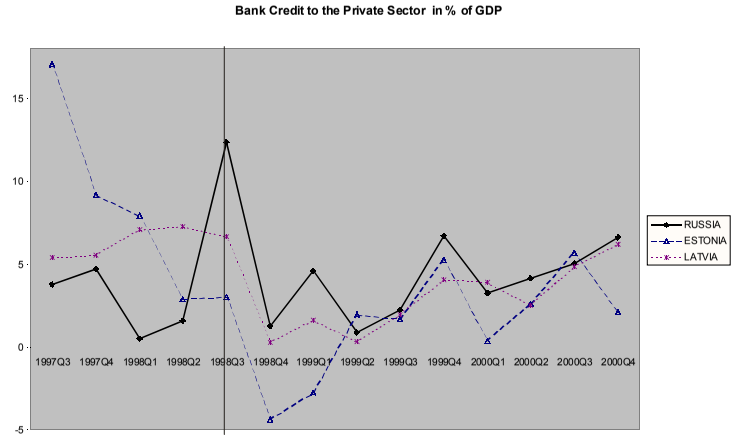


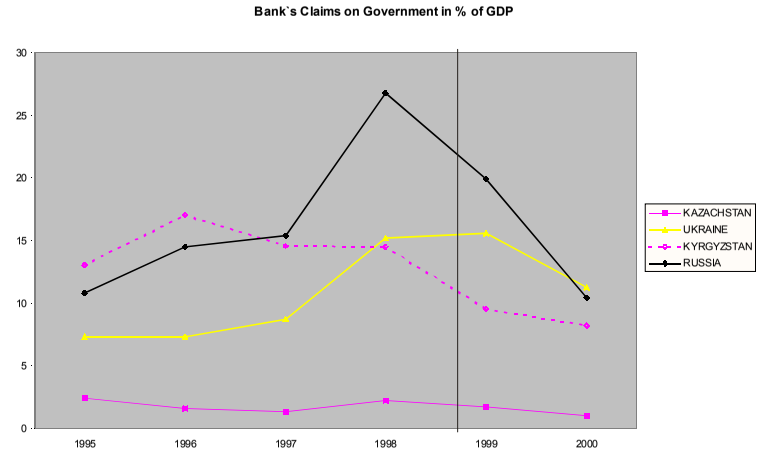


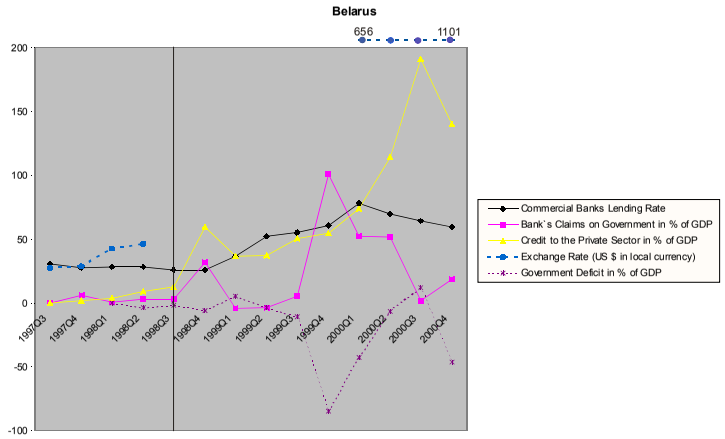


Source: Russian Economic Barometer

Figure 2


Bank Credit to the Private Sector in % of GDP
15
10
5
0
-5
1997Q3 1997Q4 1998Q1 1998Q2 1998Q3 1998Q4 1999Q1 1999Q2 1999Q3 1999Q4 2000Q1 2000Q2 2000Q3 2000Q4
RUSSIA
ESTONIA
LATVIA


Bank`s Claims on Government in % of GDP
30
25
20
15
10
5
0
1995 1996 1997 1998 1999 2000
KAZACHSTAN
UKRAINE
KYRGYZSTAN
RUSSIA


Belarus
656
1101
200
150
100
50
0
-50
-100
1997Q3 1997Q4 1998Q1 1998Q2 1998Q3 1998Q4 1999Q1 1999Q2 1999Q3 1999Q4 2000Q1 2000Q2 2000Q3 2000Q4
Commercial Banks Lending Rate
Bank`s Claims on Government in % of GDP
Credit to the Private Sector in % of GDP
Exchange Rate (US $ in local currency)
Government Deficit in % of GDP

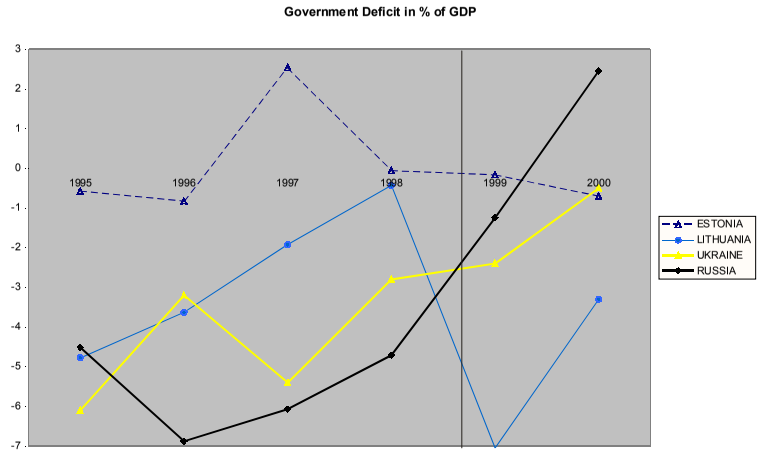
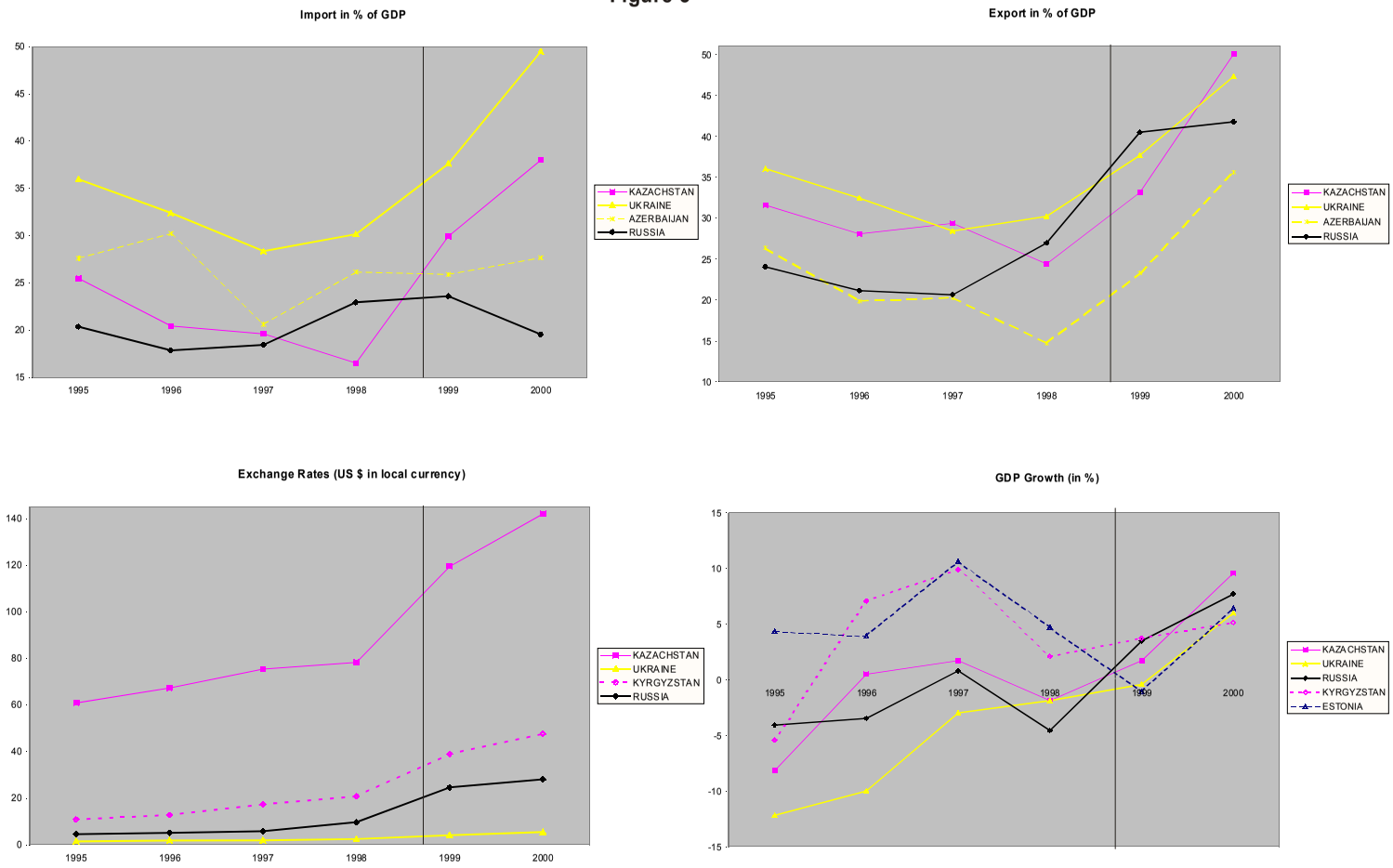

Government Deficit in % of GDP
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
1995 1996 1997 1998 1999 2000
ESTONIA
LITHUANIA
UKRAINE
RUSSIA

Figure 3


Import in % of GDP
50
45
40
35
30
25
20
15
1995
1996
1997
1998
1999
2000
KAZACHSTAN
UKRAINE
AZERBAIJAN
RUSSIA
Export in % of GDP
50
45
40
35
30
25
20
15
10
1995
1996
1997
1998
1999
2000
KAZACHSTAN
UKRAINE
AZERBAIJAN
RUSSIA
Exchange Rates (US $ in local currency)
140
120
100
80
60
40
20
0
1995
1996
1997
1998
1999
2000
KAZACHSTAN
UKRAINE
KYRGYZSTAN
RUSSIA
GDP Growth (in %)
15
10
5
0
-5
-10
-15
1995
1996
1997
1998
1999
2000
KAZACHSTAN
UKRAINE
RUSSIA
KYRGYZSTAN
ESTONIA

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Appendix

Proof of Lemma 3.1: Given the quality rank of firms, $\lambda_1 > \lambda_2 > ...\lambda_{n-1} > \lambda_n > ... > \lambda_N$, without loss of generality, let us start with firm n, which is chosen that for given $\bar{\lambda}_N$ and s; this firm will borrow, but all $n-1$ better quality firms do not borrow in the lending market. However, the $n-1$ firms' withdrawal from the lending market lowers the average quality of the remaining $N-n+1$ firms

$$\begin{aligned}\bar{\lambda}_{N-n+1} &= \frac{1}{N-n+1}\sum_{i=1}^{N-n+1}\lambda_i \\ &= \frac{(1+N-n+1)\mu}{2} \\ &< \frac{(1+N)\mu}{2} \\ &= \overline{\lambda}_N.\end{aligned}$$

The lower average quality of the pool of borrowing firms may make firm n decide not to borrow. Given the quality of firm n

$$\lambda_n = (N-n+1)\,\mu,$$

applying Lemma 2.1, the general condition for firm n not to borrow is $\bar{\lambda}_{N-n+1}/\lambda_n \leq \frac{1+s}{b}$, or

$$\frac{(1+N-n+1)\,\mu}{2\,(N-n+1)\,\mu} \leq \frac{1+s}{b}.$$

Rewrite the above condition as the following NBF equation

$$\psi\,(n) = \frac{b\,(N-n+2)}{2\,(N-n+1)} - 1 \leq s.$$

Where, in general $\psi\,(n)$ is defined as

$$\psi\,(n) \equiv b\frac{\bar{\lambda}_{N-n+1}}{\lambda_n} - 1.$$

It is easy to see that $\psi\,(n)$ is a convex increasing function of n with $\psi\,(0) = \frac{b(N+2)}{2(N+1)} - 1$ and $\psi\,(N) = b-1$. Thus, if $\psi\,(N) = b-1 \leq s$, the equilibrium is $n^* = N$, i.e. no firm borrows.

Furthermore, if $\psi(0) = \frac{b(N+2)}{2(N+1)} - 1 \geq s$, by Lemma 2.1, all firms will borrow and the equilibrium is $n^* = 0$.

Finally, if $\psi(0) = \frac{b(N+2)}{2(N+1)} - 1 < s$ and $\psi(N) = b - 1 > s$, there exists $n^* \in (0, N)$ that $\psi(n^*) = s$.

Concerning the stability of the equilibrium, it is easy to see that for any firm i, where $i \leq n^*$, $\psi(i) < s(i)$. Thus, firm i will not borrow from banks which will push more firms to choose not to borrow until $i = n^*$. Moreover, for any firm j, where $j > n^*$, $\psi(j) > s(j)$. Thus, firm j will borrow which pushes more firms to choose to borrow until $j = n^*$. Thus, n^* is a stable equilibrium. ■

Proof of Proposition 3.2: Notice that $s(n)$ is a linear upward sloping function with $s(0) = \phi r_o$, and $s(N) = \frac{\phi r_0 R}{R - Nt}$. Moreover, $\psi(n)$ is a convex upward sloping function with $\psi(0) = \frac{b(N+2)}{2(N+1)} - 1$, and $\psi(N) = b - 1$.

If $s(0) > \psi(0)$ and $s(N) < \psi(N)$; or if $(b-1)\left(1 - \frac{tN}{R}\right) > \phi r_o > \frac{b(N+2)}{2(N+1)} - 1$, a unique interior equilibrium exists that $n^* \in (0, N)$ and $s^* \in (s(0), s(N))$. Rewriting $s(N) = \frac{\phi r_0 R}{R - Nt} < \psi(N) = b - 1$ as $(b-1)\left(1 - \frac{tN}{R}\right) > \phi r_o = s(0)$ and combining with $s(0) > \psi(0)$ we have the conditions stated in the proposition.

Concerning the stability of the equilibrium (n^*, s^*), it is easy to see that for any firm i, where $i \leq n^*$, $\psi(i) < s(i)$. Thus, firm i will not borrow from banks pushing up s and leading more firms to choose not to borrow. This makes $\psi(i)$ increase faster than $s(i)$ until $i = n^*$. Moreover, for any firm j, where $j > n^*$, $\psi(j) > s(j)$. Thus, firm j will borrow pushing down s and leading more firms to choose to borrow. This makes $\psi(i)$ decrease faster than $s(i)$ until $j = n^*$. Thus, (n^*, s^*) is a stable equilibrium. Given that $s(n)$ increases (decreases) with $t, \phi r_o$ (R), the comparative static results follow. ■

Proof of Proposition 4.2: We are going to show two possible cases when ϕ is reduced to ϕ'. Notice that $\psi(n)$ is independent from ϕ; and further notice that $s(n)$ is a linear increasing function of ϕ.

1. If ϕ' is reduced moderately a unique stable interior equilibrium $n^c \in (0, n^*)$ exists such that n^c firms barter trade and the number of bartering firms is reduced. This is because with a lower ϕ' that

$$\phi' r_o > \frac{b(N+2)}{2(N+1)} - 1.$$

Applying Lemma 2.1 we have the result.

2. If ϕ' is reduced substantially then in equilibrium $n^c = 0$, i.e. all firms borrow. This is because with a drastic reduction of ϕ to ϕ' that

$$\phi' r_o \frac{R}{R - tN} < \frac{b\,(N+2)}{2\,(N+1)} - 1$$

which implies $s\,(N) < \psi\,(0)$, then in equilibrium $n^c = 0$. ■

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