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Inertial credit and opportunistic arrears in transition

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Abstract

In a transition economy, enterprise restructuring may exhibit a Laffer-curve response to tighter credit as a result of rational collective inertia. In the presence of a rigid production structure, unenforceable contracts and high adjustment costs, a contraction in credit finance subtracts more liquidity than enterprises can generate internally. Because unrestructured firms are forced to extend trade credit to illiquid buyers, an increase in their number increases the availability of forced supplier credit, in turn increasing the attractiveness of inertial behavior. As trade credit cannot be enforced, a critical mass of trade and wage arrears causes pressure for a collective bailout, thus validating inertial behavior even by reformable firms.

JEL classification: J38; E51; P43

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1. Introduction

One of the major challenges in the transition of Eastern Europe to a market economy is the substitution of a centralized credit system with decentralized

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Table 1
Credit and trade arrears in Russia (billions of roubles). Source: Rostowski (1993)

Month	Year	Nominal bank credit	Real bank credit	Nominal arrears	Real arrears	Arrears/ bank credit
December	1991	450	450	39	39	0.078
January	1992	510	148	141	41	0.277
February	1992	700	147	390	82	0.558
March	1992	920	149	800	129	0.870
April	1992	1050	139	1800	239	1.710
May	1992	1050	125	2050	243	1.952
June	1992	1400	140	3000	299	2.143
July	1992	2300	207	1190	107	0.517

financial discipline. The first step of all reform programs in the region in the period 1989–1992 was a sharp tightening of monetary policy (see Bruno, 1992; Calvo and Coricelli, 1992). This policy aimed at controlling inflation by inducing enterprises to substitute internal finance for bank credit. It required a major adjustment which involves wage restraint, increases in productivity, changes in output composition and layoffs, and was clearly very costly for insiders.

The initial response to the credit tightening was generally disappointing. State firms responded inertially (Blejer and Gelb, 1993), circumventing temporarily the liquidity constraint by accumulating trade debt to each other. These claims soon became overdue (Rostowski, 1993); trade arrears in Russia shot up from 34 million to 3 billion roubles during the period of tight credit between January and June 1992, rising to over two times total bank credit. Arrears on bank, tax and wage obligations rose as well. In some countries, such as Romania, Russia and Ukraine, the government felt compelled to clear the massive amount of trade arrears by expanding credit (see Tables 1 and 2).[1] In an attempt to clear the rising volume of arrears, within three months in the summer of 1992, the Central Bank of Russia expanded its direct credit from 1.4 to 2.9 billion roubles (Litwack, 1994; Easterly et al., 1994).[2]

Reflating governments acted out of concern for the large number of firms involved, fearing that the arrears would lead to a contagion effect, causing

[1] For a general overview see Rostowski (1993) and Perotti (1994). On Romania see Clifford and Khan (1993); on Russia see Ickes and Ryterman (1993) and Easterly and Vieira da Cunha (1994).

[2] Unfortunately it is very hard to collect data on arrears across countries. After the initial phase, most countries have either refused to publish such data, or even stopped collecting it. Interestingly, this behavior may be rational in our approach if public attention to mounting arrears becomes a focal point for individual firm strategies.

Table 2
Credit and trade arrears in Romania (billions of lei). Source: Rostowski (1993)

Month	Year	Nominal bank credit	Real bank credit	Nominal arrears	Real arrears	Arrears/ bank credit
December	1990	684	486	100	71	0.146
March	1991	756	419	400	222	0.529
June	1991	811	332	600	245	0.740
September	1991	749	235	800	250	1.068
December	1991	954	215	1777	400	1.863
March	1992	1270	193	400	61	0.316
June	1992	1274	158	800	99	0.627

massive failure of 'good' firms because of unpaid bills from 'bad' enterprises.[3] Unsurprisingly, soon after any bailout the level of arrears began to grow again, while inflation rose quickly. Several countries fell in a repetitive cycle of credit tightening with mounting arrears, followed by bailouts leading to high inflation. In Romania, trade arrears rose eight-fold in nine months after a first bailout in December 1990, rising above total bank credit (Nikitin, 1995); a similar pattern followed the second bailout in late 1991. In contrast, countries such as Latvia, Estonia, Poland and the former Czechoslovakia had the political strength to resist pressure for a bailout and as a result succeeded in controlling inflation (Balcerowicz and Gelb, 1994).

There were some objective causes for enterprise illiquidity, such as the sudden change in relative prices and the collapse in the CMEA trade flows. Yet arrears rose the most in countries with low exposure to foreign trade, such as Russia and Romania. Moreover, Calvo and Coricelli observed that in the case of Romania, loss-making firms accounted for only 15% of arrears in 1992, suggesting a broad base of arrear creation among better-performing firms.[4]

Our explanation for such policy reversals is centered around the political constraints inherent in economic policy, which are particularly crucial in systemic adjustment programs. This is in the spirit of the recent literature on the political economy of major policy decisions. The most important contribution has been the explicit modelling of ex post political constraints which may lead to

[3] Moreover, arrears interfere with firm valuation and credit selection, as the value of each firm comes to depend on the value of its receivables, which in turn depends on the value of the entire chain of upstream suppliers' arrears.

[4] Fan and Schaffer (1993) remark that the ratio of trade arrears to GNP in transition economies is not higher than in the Western economies. However, most trade loans are ultimately repaid in the West; moreover, the ratio of total credit flows to GNP is much smaller in the East, and the alternative funding channels nonexistent. Thus, the arrears have a much more dramatic 'financial blockade' effect.

policy reversal or dilution, such as Roland and Verdier (1994) on privatization, and Dewatripont and Roland (1992, 1995) on sequencing and policy design. Coricelli and Milesi-Ferretti (1992) also argue that the credibility of stabilization plans may suffer as a consequence of a very tight policy.

This paper, in particular, suggests that there were incentives for enterprises to resist adjustment and extend trade credit to doubtful buyers, because of a diffuse expectation that policymakers could not tolerate massive insolvency and would provide financial relief.

We argue that firms' expectations about the response of other firms played a crucial role in determining the scale of the arrears problem, and had an effect on the likelihood of such a collective bailout. In particular, we show that when initial conditions on adjustment costs and monetary credibility are less favorable, an excessive tightening of bank credit may induce even potentially reformable firms to resist adjustment and grant trade credit to uncreditworthy buyers, gambling on a looser future monetary policy. The intuition is that when the enterprise sector does not compensate sufficiently for the loss of external finance, tight credit leads to a decrease in liquidity of unrestructured firms. As such firms are unable to switch to alternative markets, they are forced to accept trade credit from illiquid buyers. The result of the liquidity squeeze is then an increase in the *availability* of trade credit. As such receivables cannot be enforced and become overdue, the probability of a bailout rises, relaxing the risk of liquidation for inertial firms. The result is that an exceedingly tight credit policy increases the incentive to gamble on a collective bailout, and thus leads to less rather than more adjustment.

The model identifies a mechanism on how an unrealistic credit policy may be self-defeating. However, it does not justify a general conclusion that a gradual monetary tightening would always lead to greater adjustment, as the self-fulfilling expectations depend on a weak institutional framework. Perhaps the most important message of the model is that the indiscrimate nature of aggregate monetary policy is an inappropriate instrument, and it leads to perverse behavior by potentially restructurable firms, which pool with weaker firms to achieve maximum pressure on the monetary authorities. In such a context, there is a clear benefit in the commitment value created by international institutions with a reputation for tough lending criteria such as the IMF and the World Bank.

The structure of the model is an attempt at a realistic description of an Eastern European economy. The specific features of the model are: an unflexible trading structure;[5] unreliable enforcement of contractual obligations; significant

[5] Eastern European firms had long-term trading relations with only few other firms because of the production coordination through central planning and the highly monopolistic structure of production (Frydman and Rapaczynski, 1991).

adjustment costs for most firms, and a core of value-subtracting enterprises; and finally, uncertainty over the government's determination to tolerate output loss in order to achieve macroeconomic stabilization.

Section 2 develops the analytical model. Section 3 describes the comparative statics by simulations, focusing on the shape of the adjustment response to the initial credit policy. At the end, we describe some survey evidence on trade credit decisions and expectations of bailout among Bulgarian state-owned enterprises, and offer some thoughts for further research.

2. The basic model

Players in the economy include state enterprises, passive banks and the central bank (henceforth CB). At first the CB announces its credit policy $\Theta \in [0, 1]$, where Θ is the fraction of firms (randomly chosen) which receives bank credit;[6] thus, $\Theta = 1$ is a fully accommodating credit policy and $\Theta = 0$ an extreme policy of no bank lending. Next, firms choose between restructuring (denoted as R) or not restructuring (NR). Then they must secure finance for their input purchase and, after production, for their sales. Finally, wages are due, at that stage the CB observes how many firms are insolvent and choose whether to bail them out. Fig. 1 presents the extensive form of the game.

2.1. Enterprises

State-owned firms are run by insiders, who maximize their firms' probability of survival minus any nonmonetary cost of restructuring. Each firm is both a buyer of inputs and a seller of intermediate goods, and has a single traditional buyer and one traditional supplier. However, firms which restructure can break away from their dependency on external finance and on the traditional productive relation. Firms produce in a circular trading system where all transactions happen simultaneously.

Firms which choose R impose a cost c on its insiders which is uniformly distributed on $[0, C]$.[7] As a result, they are able to fund their purchases with internally generated cash; moreover, restructuring upgrades their output so that they have the option to switch sales to new markets, where customers are able to pay cash. Firms make their choice before they know their traditional trading partners' choice.

[6] As firms' type is unknown, no ex ante credit selection is possible.

[7] We term value-subtracting firms those for which restructuring costs exceeds their gain from survival; namely, all those firms whose $c > 1$.

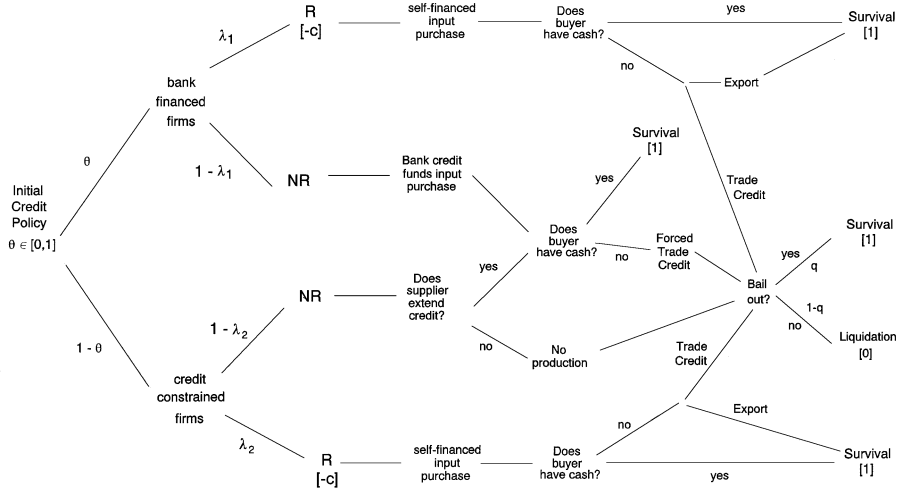

Fig. 1. The extensive form game.

We assume that when a buyer has some liquidity (thus if it received a bank loan, or if it chose R), its supplier can demand a cash payment, otherwise the supplier must decide whether to extend trade credit. If the supplier refuses, the buyer cannot purchase inputs and thus cannot produce.[8] In the absence of an ex post bailout, this firm will fail.

However, while a R firm facing an illiquid buyer can switch to another client able to offer cash (e.g., export), a NR firm has no alternative, since it still produces poor quality goods. As a result, a NR firm is always forced to extend trade credit to an illiquid buyer. This produces a strategic externality, the more NR firms there are, the greater is the expected availability of trade credit and thus the appeal of a NR strategy.

At the end of the production stage, each firm must pay wages, so firms which have not produced or have not received a cash payment are potentially insolvent. We assume that a trade debtor cannot be forced to repay its trade arrears, which are collected only in the case of a collective bailout. As a result, the value of trade credit depends on the probability of a bailout, which we denote by q.

This probability is endogenous, and depends on the number of firms at risk of insolvency. Intuitively, it is related to the percentage of firms restructuring, and

[8] To maintain the circular setup, we assume that if a firm's supplier was unable to produce, the firm may be supplied from the supplier's supplier.

in equilibrium, it depends closely on firms' rational inference about the response of other firms.

2.2. The Central Bank

After all the firms choose whether to restructure or nor, the Central Bank (CB) observes the number of illiquid firms and decides whether to provide cheap loans (de facto subsidies, as repayments are not enforceable) to clear trade arrears. Since the CB cannot tell the firm's type, its choice is either an indiscriminate bailout or none at all.

To reflect the policy uncertainty on the government's commitment to (or political capacity for) rapid stabilization in response to high social costs, we assume that firms do not know ex ante the CB's preference between supporting output and containing inflation. As a result, the prior probability of a bailout is not degenerate, even when in equilibrium there is no uncertainty on the adjustment response.

We assume that the policymaker cares about reducing inflation, denoted by π, as well as unemployment (or output loss), which is proxied by ε, the fraction of firms which would fail without a bailout. The ex post credit expansion necessary to bail them out equals ε, and results in an equivalent increase in inflation $\Delta\pi = \varepsilon$. The loss function is linear in inflation and quadratic in the fraction of enterprises which would fail in the absence of a bailout:[9]

$$L \equiv -\alpha\Delta\pi - \varepsilon^2 = \alpha\varepsilon - \varepsilon^2, \tag{1}$$

where α measures the CB's aversion to inflation versus output loss (or unemployment).

The CB's tradeoff is not known ex ante, not even by the CB itself; our interpretation is that the authorities are unsure of their own future capacity to resist political pressure. Ex ante α is a random variable, uniformly distributed on $[0, A]$. $A/2$ is thus the expected degree of aversion to inflation vis a vis output loss, which is presumably correlated with the degree of central bank's independence. Ex post, the CB chooses a strategy $b = \{\text{B, NB}\}$. It will thus bail out insolvent firms ($b = \text{B}$) if and only if

$$\alpha\varepsilon < \varepsilon^2 \rightarrow \alpha < \varepsilon.$$

In conclusion, $q = \text{Prob}\,[\alpha \leq \varepsilon] = \text{Min}[1, \varepsilon/A]$.

[9] An equivalent alternative is that the CB is worried about the average quality of firms at risk because of unpaid credits to bad firms. Both formulations lead to identical results.

2.3. Enterprise strategies

We denote by λ_1 the fraction of bank-financed firms which choose R, and by λ_2 the fraction of firms which do not receive bank credit and choose R. The aggregate degree of adjustment is given by $\lambda \equiv \Theta\lambda_1 + (1-\Theta)\lambda_2$.[10]

A firm which chooses R can self-finance its input purchases and is sure to sell for cash; thus, it will never extend trade credit.[11] Thus, a R firm survives with certainty; its payoff is independent of other firms' choices and equals $1-c$.

A firm which chooses NR relies on external finance. If the firm is financed by bank credit (henceforth BF) it can pay cash for its inputs. If it does not receive bank credit (henceforth NBF) it must rely on trade credit from its supplier. Thus, it will be unable to purchase inputs if its sole supplier is a firm which chose R. Thus, the probability for a NR firm to receive trade credit is the probability of a NR supplier firm, which equals $1-\lambda$.

In conclusion, a fraction of firms $(1-\Theta)(1-\lambda_2)\lambda$ is unable to fund its input purchases and thus to produce, and must hope in a generalized bailout.

A NR firm which did produce faces another risk; it must hope that its traditional client can pay cash, otherwise it will be forced to grant trade credit.

The probability of a cash payment equals the likelihood of having a customer which is either bank-financed or a firm which chose R, which equals

$$\phi \equiv \Theta + (1-\Theta)\lambda_2.$$

so that ϕ is a natural measure of *liquidity*.

We can now compare the return to different strategies, for a given amount of bank finance Θ and a given probability of bailout q.

For a BF firm it will pay to restructure when the certainty of survival minus the restructuring costs exceeds the probability of a cash payment from a liquid buyer plus the probability of a bailout for its arrears from an illiquid buyer

$$1-c \geq \phi + (1-\phi)q = \Theta + (1-\Theta)\lambda_2 + (1-\Theta)(1-\lambda_2)q, \tag{2}$$

while the payoff to a NR strategy equals its probability of survival:

$$\begin{aligned}&\text{Prob[supplier credit]}\{\text{Prob[liquid buyer]}\\&\qquad + (1 - \text{Prob[liquid buyer]})\,\text{Prob[bailout]}\}\\&\qquad + (1 - \text{Prob[supplier credit]})\text{Prob[bailout]}\\&= (1-\lambda)[\phi + (1-\phi)q] + \lambda q.\end{aligned} \tag{3}$$

[10] Note that because the initial allocation of credit Θ is random, the distribution of firms' quality is the same for both BF and NBF firms.

[11] A R firm accepts trade credit if its repayment were certain, namely, when q is one. But it is easy to show that in such case no firm chooses R.

Then a NBF firm will adjust when its cost of adjustment c satisfies

$$1 - c \geq (1 - \lambda)[\phi + (1 - \phi)q] + \lambda q. \tag{4}$$

Note that not all NR firms without bank credit will inevitably fail in the absence of a bailout; some succeed because they receive trade credit, and are fortunate to obtain a cash payment on their sales. Nothing assures that these survivors will be the (potentially) better firms. Similarly, NR firms relying on trade credit rather than paying may end up better off than BF firms. Thus, a nondiscriminative bank and trade credit system have a major redistributive effect across firms.

2.4. Enterprises' beliefs

As the probability of a bailout depends on the fraction of potentially insolvent firms unable to pay wages, a crucial factor of enterprise behavior is given by their expectations on the strategy chosen by other firms. This externality leads to a multiplicity of equilibria.

There is always a set of trivial inertial equilibria in which firms coordinate on zero adjustment through self-fulfilling beliefs. As our goal is to explore implicit rather than explicit collusion, we rule out corner equilibria driven by such self-fulfilling beliefs.

Specifically, we restrict attention to beliefs based on the rational expectation that other firm insiders choose to restructure as long as the resulting increase in the probability of survival is not outweighed by the adjustment cost. We focus on the equilibrium in which in both the BF and NBF category there is a single firm indifferent between the two choices.[12]

Consider first the case of bank-financed firms. Let c_1 be the value of c which uniquely identifies the firm just indifferent, given Θ, λ_1, λ_2, and q (λ, Θ), between choosing R or NR, namely, the value c_1 such that

$$1 - c_1 = \phi + (1 - \phi)q = \Theta + (1 - \Theta)\lambda_2 + (1 - \Theta)(1 - \lambda_2)q. \tag{5}$$

Then the rational expectation is that only BF firms with adjustment costs below c_1 are expected to choose R, which implies that

$$\mathrm{E}(\lambda_1) = \mathrm{prob}[c \leq c_1] = c_1/C = (1 - \phi)(1 - q)/C. \tag{6}$$

[12] Our results are not driven by a special structure of beliefs: we show that under moderate adjustment costs and a tough central bank, the response of adjustment to more credit tightening is always positive, as in more conventional models.

Consider next the case of NBF firms. The marginal firm indifferent between R and NR will have a restructuring cost given by

$$1 - c_2 = \lambda q + (1 - \lambda)[\phi + (1 - \phi)q]$$

$$= \lambda q + (1 - \lambda)[\Theta + (1 - \Theta)\lambda_2 + (1 - \Theta)(1 - \lambda_2)q]. \quad (7)$$

The fraction of NBF firms which is rationally expected to restructure is

$$\mathrm{E}(\lambda_2) = \mathrm{prob}[c \leq c_2] = c_2/C = (1 - q)[1 - \phi(1 - \lambda)]/C. \quad (8)$$

Notice that in equilibrium, there is no uncertainty about the actual number of firms in the continuum choosing the two strategies. We henceforth drop the expectation operator.

We can now establish a first result:

Proposition 1. For any given q and Θ, $\lambda_1(\Theta) \leq \lambda_2(\Theta)$, and $\lambda_1(\Theta) < \lambda_2(\Theta)$ whenever $\lambda > 0$.

Proof. By inspection of Eqs. (7) and (10). □

Intuitively, the pressure for restructuring is greater for a firm which did not receive bank credit, as it faces both the risk of not being paid and of not receiving funding for its input purchase. In contrast, BF only face the risk of an illiquid buyer.

An interesting implication is that when the degree of adjustment among NBF firms is very high, incentive for a BF firm to restructure is quite low, since these firms do not need trade credit and most buyers can pay cash.

We consider now the endogenous probability of a bailout, which depends on the fraction of firms ε which would fail in the absence of a bailout. This set has two components.

The first are those NR firms which managed to fund their purchases, but whose sole buyer is illiquid. Their mass is

$$[\Theta(1 - \lambda_1) + (1 - \Theta)(1 - \lambda_2)(1 - \lambda)](1 - \Theta)(1 - \lambda_2)$$

$$= (1 - \phi) + (1 - \lambda)(1 - \phi)^2$$

$$= (1 - \phi)[1 + (1 - \lambda)(1 - \phi)]. \quad (9)$$

The second component is the set of NR firms which fail to obtain either bank or trade credit to fund their input purchase. This has a mass of

$$(1 - \Theta)(1 - \lambda_2)[\Theta\lambda_1 + (1 - \Theta)\lambda_2] = (1 - \phi)\lambda. \quad (10)$$

Then the percentage of firms to be rescued equals[13]

$$\varepsilon = (1 - \phi)[1 - \lambda(1 - \phi)]. \tag{11}$$

This implies that

$$q = \text{Prob}[\alpha \leq \varepsilon] = \text{Min}\left[1, \frac{(1 - \phi)[1 - \lambda(1 - \phi)]}{A}\right]. \tag{12}$$

It is interesting to observe the effect of a very high level of liquidity ϕ, which implies that the probability of receiving a cash payment is quite high. There are therefore few firms at risk, and the probability of a bailout is minimal. As we will see, there may be a tradeoff between providing less credit ex ante, which reduces liquidity, and the higher probability of having to relax credit later. The crucial question turns out to be what happens to liquidity as external credit is reduced.

3. Aggregate response to tighter credit

In this section we explore the effect of initial credit policy on adjustment behavior. We also discuss the impact of the parameters A and C, which represent the productive and institutional strength of the economy. Our main goal is to investigate the impact of a tightening of credit (i.e., a fall in Θ) on the degree of restructuring λ.

We derive formally the *adjustment response function*:

$$\frac{\mathrm{d}\lambda}{\mathrm{d}\Theta} = \frac{C(\lambda_1 - \lambda_2) - \phi_\Theta(1 - q)[1 - \lambda(1 - \Theta)] - q_\Theta[1 - \phi + \lambda\phi(1 - \Theta)}{Q}, \tag{13}$$

where $Q \equiv C - (1 - \Theta)(1 - q)\phi > 0$.

In a market economy, firms do not usually anticipate systemic risk from lack of adjustment; when credit is tightened, most firms adjust by reducing their external finance needs, so the sign of this derivative is negative. In our context, the response is clearly more complex.

We first rewrite the adjustment response function as a linear equation:

$$\frac{\partial\lambda}{\partial\Theta} = k_1(\lambda_1 - \lambda_2) - k_2\phi_\Theta - k_3 q_\Theta,$$

where $k_i > 0$ for $i = 1, 2, 3$.

[13] Results are quite similar in the case where the monetary authorities would rescue only enterprises which are net trade creditors.

We know from Proposition 1 that the first term is negative, reflecting a direct composition effect of a higher Θ. When fewer firms are credit-constrained, overall adjustment drops because the rate of restructuring is lower for bank-financed firms.

The other terms reflect indirect effects of lower credit. The second term has the sign opposite to that of ϕ_Θ, reflecting the impact on the incentive to adjust resulting from a change in the *liquidity*. This is the traditional mechanism by which tight credit threatens insolvency; if liquidity decreases, more firms are under pressure to compensate for reduced credit, and there is more incentive to restructure, as traditional buyers are more likely to be illiquid.

The third term has the opposite sign to $\lambda\Theta$, reflecting the *disincentive effect* of a change in the probability of a bailout. This is the crucial element to assess: the impact of the initial credit stance on expected monetary policy. We first assess the impact of tighter credit on behavior while keeping the probability of a bailout constant.

Proposition 2. $\partial\lambda/\partial\Theta|_{q \text{ constant}} < 0$.

Proof. See appendix. □

The sign of the derivative is unambiguous with tighter credit leading to greater adjustment as in traditional models. Tighter credit may, however, reduce adjustment if it has some effect on the perceived probability of a bailout.

We show that an increase in the probability of a bailout q depresses the rate of adjustment λ.

Proposition 3. A higher probability of an ex post collective bailout depresses the rate of adjustment.

Proof. See appendix. □

The intuition is straightforward. A rise in q increases directly the value of trade credit, as well as its *availability*.[14] Thus, firms considering a NR strategy will be reassured that even though bank credit may be scarce, suppliers' finance is abundant.

[14] The volume of trade credit equals $(1-\lambda)(1-\phi) = (1-\lambda)(1-\lambda_2)(1-\Theta)$, the fraction of NR firms which has an illiquid buyer. This increases in q, as both λ and λ_2 decrease in q.

The final effect we must consider is whether tighter credit increases the probability of a bailout. This concerns the sign of

$$\frac{\mathrm{d}q}{\mathrm{d}\Theta} = \{ -\lambda_\Theta(1-\phi)^2 - \phi_\Theta[1-2\lambda(1-\phi)]\}/A.$$

If $\mathrm{d}q/\mathrm{d}\Theta$ is negative, then as credit is contracted (i.e., as ex ante monetary policy becomes stricter), then q increases ((i.e., expected future monetary policy become laxer). This will be certainly true if (though not only if)

$$\phi_\Theta > \frac{-\lambda_\Theta(1-\phi)^2}{[1-2\lambda(1-\phi)]},$$

namely, if a reduction in bank credit leads to a rapid decrease in liquidity. (Notice that the denominator is positive, as $\phi > \lambda$.)

When λ_Θ is negative, more enterprises adjust as credit is reduced. This is the more conventional response. But if ϕ_Θ is positive and sufficiently large, namely, if liquidity drops dramatically as credit is tightened, $\mathrm{d}q/\mathrm{d}\Theta$ may still be negative. The expression of ϕ_Θ is

$$\phi_\Theta = \frac{1-\lambda_2 + (1-\Theta)\partial\lambda_2}{\partial\Theta},$$

which will be positive as long as

$$\frac{(1-\lambda_2)}{(1-\Theta)} > \frac{-\partial\lambda_2}{\partial\Theta}, \tag{14}$$

namely, when the ratio of NBF firms which choose not to adjust, over the degree of credit tightening, exceeds the *marginal increase* in NBF adjustment resulting from the tighter bank credit. In other words, the probability of a bailout increases when the reduction in credit is insufficiently compensated by an increase in adjustment, so that illiquidity rises rapidly.

The other possibility is that $\lambda_\Theta < 0$, namely, as credit is reduced, adjustment falls. This is clearly the more perverse case. In such a case, tighter credit unambiguously leads to a rise in illiquidity, as *fewer* enterprises choose to generate internal funding by restructuring.

We can summarize the analytical results as follows. Tighter credit tends to impose financial discipline to enterprises as long as it does not affect too much the expected future monetary policy. However, if the adjustment response to tighter credit is too weak, so that the enterprise sector compensates only in a limited fashion to the reduction in external finance, illiquidity rises rapidly. The effect of illiquidity is to force all those firms which did not restructure to extend trade credit, which then becomes more abundant. This also increases the expected number of firms in default, and thus the probability of a bailout.

It is immediate to see that a decrease in A, the expected toughness (or inflation aversion) by the CB directly increases the probability of a bailout and thus reduces the degree of adjustment. But less credibility of the monetary authority has an additional impact on the expected behavior of other firms: as more are expected to act inertially, more will choose to do so. An increase in $C/2$, the average cost of adjustment, has a similar impact. It has a direct effect on the percentage of both BF and NBF firms choosing to adjust, which is in turn reinforced by the externality effect of an enhanced probability of a bailout.

Therefore, both C and A are structural factors affecting the adjustment response, and contribute to determine whether adjustment falls or rises with tighter credit. However, measuring their impact is mathematically quite complicated. The next section solves for the adjustment response to stabilization policy by simulations.

4. Comparative statics by simulation

Figs. 2 and 3 illustrate the adjustment response to a credit policy Θ, and the resulting probability of bailout for different values of A and C. In all simulations, their effect is unambiguous. An increase in adjustment costs reduces adjustment, while an increase in the degree of monetary 'toughness' increases it.

In fact, in the case of a strong policymaker and for moderate values of C, the enterprise sector responds to an increasingly tighter credit contraction by a higher degree of adjustment. For instance, when $C = 1$ and A is high, the

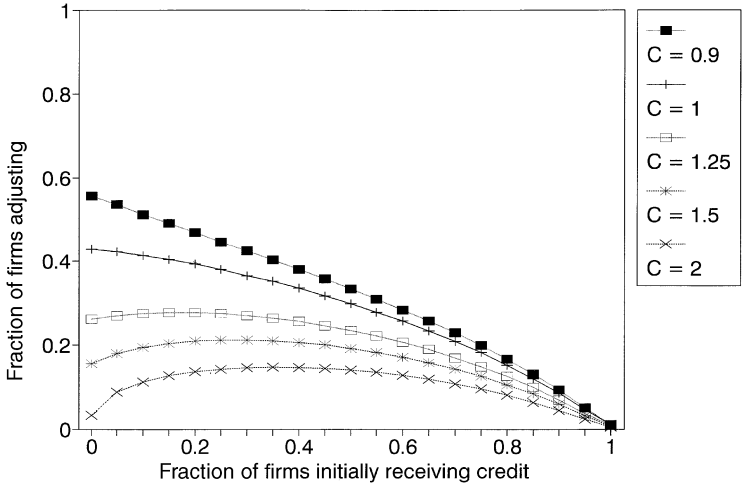

Fig. 2. Adjustment as a function of C (for $A = 1$).

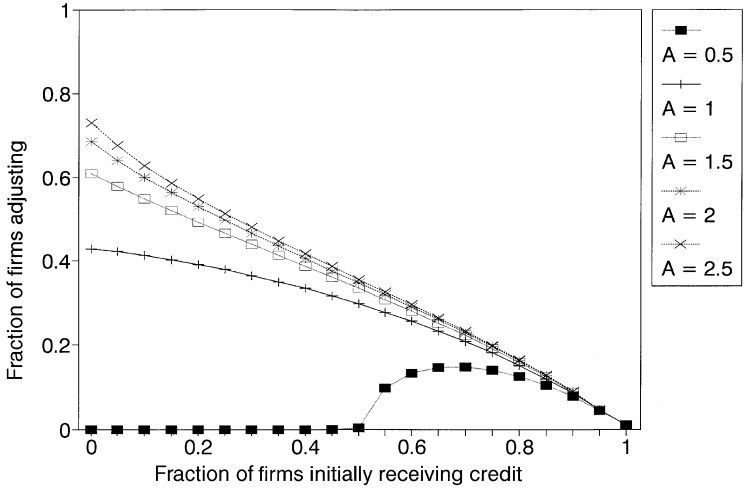

Fig. 3. Adjustment as a function of A (for $C = 1$).

graph indicates a smooth adjustment response of the enterprise sector to the rate of credit expansion; it equals zero for $\Theta = 1$, and rises monotonically as Θ decreases. Thus, our equilibrium beliefs satisfy the requirement that under conventional economic circumstances, namely, a small fraction of value-subtracting firms and an established reputation of monetary authorities for aversion to inflation, a greater number of enterprises is induced to adjust as credit is tightened.

However, in the presence of high adjustment costs (i.e., a large subset of value-subtracting firms), and/or when the CB's resolve (or political clout) to contain inflation is expected to be weak, the adjustment response to a tighter policy is much reduced. In a weak institutional context, the progressive decrease in the marginal degree of adjustment is such that illiquidity rises quickly, leading to an increase in trade credit and thus in the expectation of future monetary relaxation. Ultimately, a further tightening reduces adjustment. The cause of this nonmonotonicity in adjustment is the externality across firms' strategies introduced by the potential collective bailout.

Figs. 4 and 5 illustrate more clearly the internal logic of the model. In Fig. 4 we have a 'strong' economy with moderate adjustment costs (a low C) and a certain strength of the monetary authority (A is high). The result is that as Θ is reduced, the adjustment response by enterprises mostly compensates for the reduced credit flows, leading to only a moderate drop in liquidity. While some high-cost firms which do not restructure end up not being able to produce, or forced to extend trade credit, their number is not so large to lead to a significant increase in the probability of bailout. This discourages the intermediate-cost

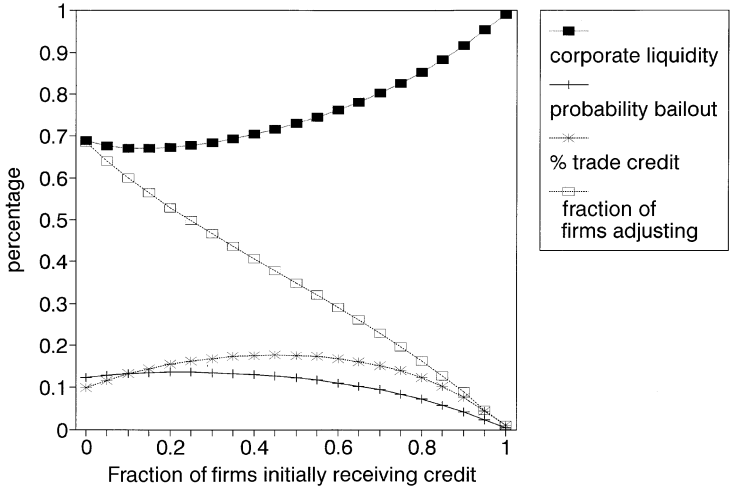

Fig. 4. Adjustment under credible program.

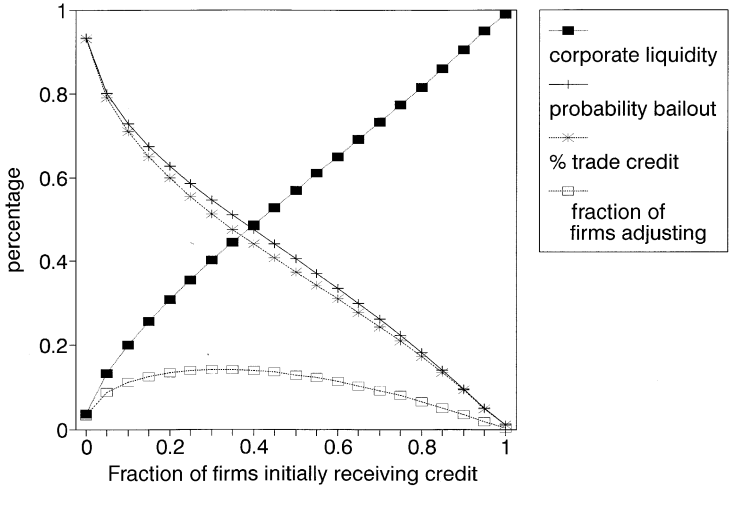

Fig. 5. Adjustment under low credibility.

firms from gambling on a bailout, leading to a steady creation of internal finance as the external finance drops. Thus, as credit is reduced, firms are more likely to have a restructured trade partner which will refuse to grant trade credit. As long as liquidity does not drop too much, the chance of a bailout does not rise enough

to compensate for the increasing threat of not being able to produce, and the choice of restructuring becomes more attractive. In this case tighter credit leads to more adjustment.

In contrast, Fig. 5 depicts a 'weak' economy with high adjustment costs and a weaker CB. As the adjustment response to tighter credit is weak, the enterprise sector compensates a smaller part of the reduction in external finance; so illiquidity rises rapidly. The effect of illiquidity is to force all those firms which did not restructure to extend trade credit, which then becomes more abundant. This also increases the expected number of firms in potential default, and thus the probability of a bailout. Once this probability rises enough, a further tightening leads more of the NBF firms to choose to act inertially, thus increasing further availability of trade credit and the pressure for a bailout. At some point, the return to inertial behavior increases to the point that even lower-cost firms which would have chosen to adjust under a laxer monetary policy now prefer to resist restructuring. This further increases illiquidity and leads to a collapse in adjustment, creating a Laffer-curve response.

The model suggests some surprising differences between the behavior of BF versus credit-constrained firms; their marginal adjustment response to tighter credit may have a different sign altogether. When tighter credit results in higher aggregate restructuring, BF firms may actually adjust less. The reason is that nonadjusting BF firms are only threatened by an illiquid buyer, who becomes increasingly scarce once most firms do adjust.

4.1. Optimal monetary policy

An implication of the analysis is that macroeconomic stabilization requires an explicit evaluation of the potential for subsequent reflationary actions forced by partial adjustment. An ex ante optimal credit policy must assess the endogenous response of the enterprise sector to appreciate its likely long-term monetary consequences.

Suppose that ex ante policy preferences are consistent with the expected future-policy objectives described in the last model of differential adjustment between bank and trade-credit-financed firms. Then the monetary authorities aim at minimizing an ex ante loss function consistent with the ex post loss function in Eq. (1) and its information at time 0. Recall that $\mathrm{E}[\alpha] = A/2$. Ex ante expected inflation will equal the sum of the initial money expansion plus the probability of a future reflation multiplied by its probability; this implies a loss function of the type

$$L \equiv -\mathrm{E}_0(\alpha\pi) - \varepsilon^2 = -\tfrac{1}{2}A[\Theta + q\varepsilon] - (1-q)\varepsilon^2,$$

where ε is the percentage of firms at risk of bankruptcy given in Eq. (11).

Making use of the linear response $q = \varepsilon/A$, the optimal choice of the initial credit creation Θ is given by the solution to the loss-minimization program

$$\underset{\Theta}{\text{Min}}\ L \equiv -\tfrac{1}{2}A\Theta - \tfrac{1}{2}\varepsilon^2 - (1 - \varepsilon/A)\varepsilon^2, \tag{16}$$

which requires

$$\varepsilon'(\Theta^*) = \frac{A^2}{6\varepsilon(\Theta^*)[A - \varepsilon(\Theta^*)]}. \tag{17}$$

Recall that ε indicates the fraction of enterprises which choose NR and are threatened by bankruptcy; it is therefore negatively correlated with the degree of adjustment. The sign of $\varepsilon'(\Theta^*)$ then determines whether at the optimum a tighter policy would result in more or less adjustment. This expression cannot be evaluated analytically, but it is possible to develop an intuition for the optimal credit policy for both a strong and a weak policymaker.

Consider first the case of a monetary authority which is expected to be extremely averse to inflation, so that A is large and, in particular, it exceeds one. Then the expression [Eq. (17)] is certainly positive (and presumably large) as $0 \leq \varepsilon \leq 1$. The optimal policy Θ^* for an inflation-averse monetary authority then occurs in a point on the adjustment curve where a decrease in credit would lead to less adjustment. This implies that if adjustment is monotonic in Θ, then Θ^* coincide with the corner solution at zero; while if the adjustment curve has a maximum for some $\Theta = \Theta^{**}$, the optimal policy will occur to the left of Θ^{**}. Thus, a very inflation-averse monetary authority will choose to tighten credit beyond the point of maximum adjustment; this reduces the immediate inflationary impulse without leading to a dangerous increase in the probability of a future reflation, given the level of CB credibility.

In contrast, we know from our simulations that when credibility A is low the adjustment response function is uniformly lower for all Θ, which also implies that ε will be higher. Then the expression [Eq. (17)] will be positive, indicating that the optimal policy Θ^* will occur to a point on $\lambda(\Theta)$ to the right of its maximum at $\lambda(\Theta^{**})$.

More generally, an interior solution with partial initial accommodation will be optimal when many enterprise have high restructuring costs, or when policy authorities have little capacity to resist pressure from the enterprise sector in the face of a potential output collapse. In fact, the tightest monetary stance, when correctly measured over the entire time horizon of the program, may not call for a maximum initial degree of contraction in the increase of bank credit, but trades off a limited expansion with a reduced probability of a future reflationary shift. Fig. 6 presents the value of the ex ante loss function for different choices of credit policy under different scenarios. While for economies with strong monetary credibility and better firms, the optimal policy is no subsidized credit, for economies with a weaker institutional and productive structure a laxer initial approach is more desirable.

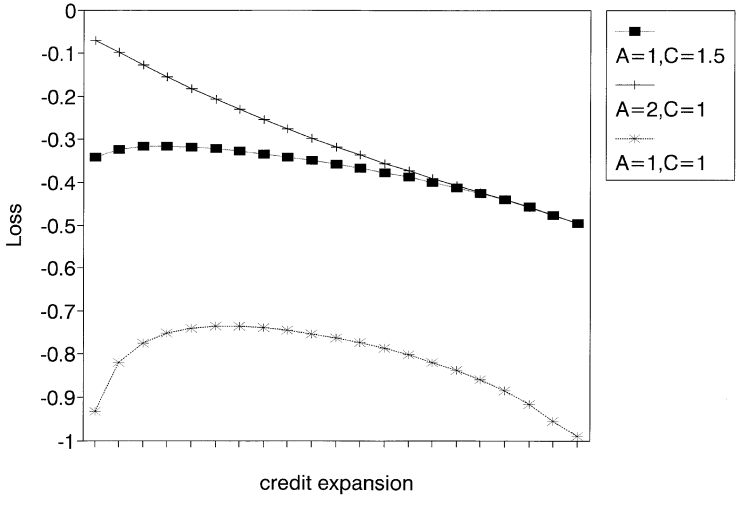

Fig. 6. Ex ante expected loss.

5. Conclusions

This paper has shown that in the systemic process of enterprise reform in Eastern Europe, firms' adjustment response to a credit contraction may not be monotonic. As bank credit is made more scarce, there will be initially a favorable response, as firms with low adjustment costs decide to restructure. If bank-supplied liquidity decreases further, the accumulation of trade arrears increases because of the higher likelihood of ex post reflation, which in turns discourages adjustment. The crucial question becomes the net liquidity effect between the direct reduction in bank lending and the self-financing response by enterprises.

Thus, in a contest in which a government's ex post political strength does not allow it to credibly precommit to resist reflation, there may be an optimal amount of concessionary credit which is a function of the strength of the productive sector as well as its monetary institutions. It is possible that at the very beginning of reform a more radical policy can be supported due to a temporary political euphoria (Balcerowicz and Gelb, 1994). For a weaker institutional structure, an exceedingly tight stance is self-defeating and yields on average a higher inflation rate in the medium term.

Kotzeva and Perotti (1995) conducted two surveys in 1993 and 1994 among Bulgarian state enterprises with large gross trade arrears position. The responses indicated evidence of both involuntary and deliberate inertia. For only 21% of respondents in 1993 (11% in 1994) the cause of arrears was lack of

demand; for almost half it was the difficulty of being paid, rather than to sell, which hinders repayment. In 1993 and 1994, two third believed a collapse of good firms due to bad firms' unpaid debts was likely. Net trade lenders chose significantly more often trading partners on the basis of long-term relations rather than financial solidity. In 1993, 68% of respondent declared to expect a bailout of arrears (which did take place shortly thereafter). When asked: 'Do you think that trade credit is sometimes given to uncreditworthy firms in the expectation of a bailout?', a third of those expressing an opinion answered yes. Even though most managers did not admit to doing so, many were ready to attribute such attitudes to other firms.

The model suggests that a main cause of firms' perverse incentive is the fact that an aggregate credit policy fails to discriminate across viable and hopeless firms and provides a natural focal point for collusive behavior. In order to undermine opportunistic strategies, it is necessary to ensure that the return to decentralized lending be contingent on the borrowers' type, to discourage moral-hazard behavior (Perotti, 1994). This suggests the development of more market-based solution, such as securitization of arrears, which ensures that opportunistic lending to the worse borrowers is not rewarded ex post. Thus more generally, the analysis suggests a decisive move away from indiscriminate, collective solutions which blur incentives and pervert behavior of redeemable enterprises, and towards microeconomic reforms such as privatization and bankruptcy.

Future research on this topic should attempt to measure the role of policy expectations over lending decisions. A dynamic analysis of policy and adjustment response would be useful before any judgement be made on the benefits of gradualism. Another important aspect of credit policy we ignored is signalling, as we believe that in the context of most Eastern European countries the main source of policy uncertainty is the unpredictable future political strength of the government. In the model the optimal credit expansion depends on the degree of aversion to inflation by the monetary authorities. Thus a reasonable conjecture is that under private information over the policymakers' attitudes towards reflation a tight initial credit may act as a credible signal. An interesting contribution on this topic is Nikitin (1995).

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Appendix A

A.1. Proof of Proposition 2

$$\left.\frac{\partial\lambda}{\partial\Theta}\right|_{q \text{ constant}} = \{C(\lambda_1 - \lambda_2) - \phi_\Theta(1-q)[1-\lambda(1-\Theta)]\}/Q,$$

where $Q \equiv 1/[C - \phi(1-\Theta)(1-q)]$. Note first that $Q > 0$ as $C > 1$. Moreover, $\lambda_1 - \lambda_2 < 0$ by Proposition 1. Thus if $\phi_\Theta \geq 0$, the derivative is certainly negative as $(1-q)[1-\lambda(1-\Theta)] \geq 0$. If instead $\phi_\Theta < 0$ and large in absolute terms, i.e., if there were a considerable increase in buyers' liquidity when credit is tightened, this can be reversed. The value of ϕ_Θ for q constant is

$$\phi_\Theta = 1 - \lambda_2 - (1-\Theta)\left.\frac{\partial\lambda_2}{\partial\Theta}\right|_{q \text{ constant}}.$$

Substituting this into the expression, some tedious substitutions lead to

$$\left.\frac{\partial\lambda}{\partial\Theta}\right|_{q \text{ constant}} = \frac{\{C(\lambda_1 - \lambda_2) - \Omega(1-\lambda)\}}{\Omega},$$

where

$$\Omega = \frac{(1-q)[1-\lambda(1-\Theta)]C}{Q[C + (1-q)(1-\lambda)]}.$$

Since $\Omega > 0$, the sign of $\partial\lambda/\partial\Theta|_{q \text{ constant}}$ is indeed negative. □

A.2. Proof of Proposition 3

$$\frac{\partial\lambda}{\partial q} = \frac{-\Theta(1-\phi) - (1-\Theta)[1-\phi(1-\lambda)]}{C}$$

$$- \frac{\phi_q(1-q)[1-\lambda(1-\Theta)] + \lambda_q(1-\Theta)\phi(1-q)}{C}$$

$$= -\frac{\Theta(1-\phi) + (1-\Theta)(1-\phi)(1-\lambda) + \phi_q(1-q)[1-\lambda(1-\Theta)]}{V},$$

where $V = C\phi(1-\Theta)(1-q)$.

Notice that $V > 0$, and the other terms on the denominator on the right-hand side are negative with the possible exception of ϕ_q. The sign of ϕ_q is the same as

the sign of $\partial\lambda_2/\partial q$; illiquidity increases with the probability of a bailout by affecting the rate of restructuring for firms receiving no bank finance:

$$\phi_q = (1-\Theta)\frac{\partial\lambda_2}{\partial q} = \frac{-(1-\Theta)[1-\phi(1-\lambda)] + \lambda_q\phi(1-q)(1-\Theta)^2}{V}.$$

Let $X \equiv C + (1-\lambda)(1-q)(1-\Theta)$. After some tedious substitutions, we obtain

$$\frac{\partial\lambda}{\partial q} = \frac{-[1-\lambda(1-\Theta)]\{X(1-\phi) + (1-q)(1-\Theta)[1-\phi(1-\lambda)]\}}{[C-\phi(1-\Theta)(1-q)]\{X-\phi(1-q)^2(1-\Theta)^2[1-\lambda(1-\Theta]\}}.$$

and as $X > 1 > \phi(1-q)^2(1-\Theta)^2[1-\lambda(1-\Theta)]$, we conclude that the sign of Eq. (13) is negative. □

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