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THE A, B, C's OF INDUSTRIAL
RESTRUCTURING IN RUSSIA

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"THE A, B, C's OF INDUSTRIAL RESTRUCTURING IN RUSSIA "

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by
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I. Introduction

It has become increasingly obvious that the history of economic reforms in Russia is ill-characterized if described in terms of the fundamental difference between the two approaches usually referred to as "Shock Therapy" and "Gradualism". Instead, it should be characterized as the various attempts by the authorities to target the "right" degree of financial austerity to cut enterprises off from governmental subsidies in order to force them to restructure and adapt to market behavior. Initial hopes that this could be achieved in one strike have proven to be overly optimistic. Gaidar's reforms were resisted by political forces claiming to defend the legitimate interests of Russia's enterprises. Currently, Chernomyrdin addresses the problem of imposing hard budget constraints on Russia's industry with much more restraint than his predecessors.

It has also become more accepted among economists that the failure to introduce more rapid market reforms is connected to the peculiar industrial structure which Russia inherited from central planning. Initially, reformers underestimated the losses in output and employment which the successful implementation of hard budget constraints would impose on an economy where the industrial structure consists to a large extent of oversized, bilateral monopolies. The directors and managers of these enterprises seem to have had a much better understanding of this obstacle. As a result, the authorities repeatedly ended up bailing out firms which had accumulated inter-enterprise arrears in response to non-credible attempts at withdrawing subsidization. The following is an attempt to model the nature of the interaction between government and firms which takes account of the characteristics of the industrial structure.

Section two of the paper summarizes the most important features of recent reforms in Russia and relates them to the problems imposed by the industrial structure. Section three translates these stylized facts into the assumptions we make to model the problem. The model is developed in section four, and discussed and extended in section five. Section six provides a brief conclusion, suggesting directions for future work.

II. Output Decline and Hard Budget Constraints

The attempt at reform in Russia most closely resembles the widely acclaimed, early proposals on how to transform a centrally planned into a market coordinated economy (Lipton and Sachs 1990).

Resting on the triad of price liberalization, corporatization, and privatization, it reflects the famous "J-curve" idea which called for fast and decisive action without denying that the transition would be painful. The faster the "valley of tears" was crossed, argued the central hypothesis, the sooner the benefits from a reformed economy would be reaped.

Price liberalization, as complete as possible, was the starting point. The corporatization of enterprises and its most important feature, the imposition of hard budget constraints on existing firms, was supposed to guarantee that the liberalization of prices resulted in a one time only jump in the price level (the magnitude of which should be determined by the existing monetary overhang), thus avoiding inflation as relative prices adjusted from the arbitrary old structure to the new equilibrium configuration. The imposition of hard budget constraints was also supported to put the socialist enterprises "out in the cold" by exposing the still state-owned firms to competition, thus solving the evaluation problem as a precondition for successful privatization. Cutting enterprises off from subsidies, as well as from the central plan, would make it possible to classify them as viable, in need of restructuring, or non-viable under semi-market conditions. The creation of private property rights for existing assets would then lead to the necessary restructuring and streamlining of production at the enterprise level. Finally, "top down" privatization together with the hoped for emergence of a new private sector would, after the initial drop in output associated with the completion of the adjustment period, lead to an increase in aggregate output over and above the level achieved under central planning, just as predicted by the J-curve framework.

We know that this is not what happened in Russia. We also know at which stage the plan went astray. While the vast majority of prices were set free in January 1992, and while little more than a year later history's largest privatization program was launched, the imposition of hard budget constraints never materialized. It was avoided through enterprises' ability to create a web of inter-enterprise arrears and by their capacity to force the authorities to bail them out from under the huge burden of accumulated inter-enterprise debt, by means of extending Central Bank credit. Enterprises thus have been able to undercut adjustments on the firm level and to continue production, albeit on a lower scale, but without re-organizing their means of operation and without improving aggregate productivity. At the same time, a new private sector has been much slower to emerge than in other transition economies. Attempts at establishing an effective clearing house to interrupt the chain leading from arrears to increases in the money supply have failed. Instead, the process of running up arrears and periodically extending Central Bank credit to eliminate them has continued ever since the first massive arrears crises in the Fall of 1992.[1]

As a result, the Russian economy presents a rather bleak picture after years of continued attempts at reform. Output has declined at virtually unprecedented rates since 1992, and continues to

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[1] Cf. Ickes and Ryterman (1993), Rostowski (1993) for early accounts.

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fall. Inflation is rampant, highly volatile and has settled in at double digit monthly rates. Official employment remains above free market standards. Official bankruptcies are almost non-existent and new private firms (including foreign direct investment) are slow to emerge. But the restructuring and unbundleing of existing firms, especially in the industrial sector, has also proceeded disappointingly slowly -- despite the high pace at which a transfer of property rights has been accomplished under the mass privatization program. "Top down" privatization has been accompanied by very low asset prices and the concept of "arrears" has acquired a whole new meaning, as the newly privatized firms have become active participants in the struggle for "delayed subsidies", using the familiar mechanism of running up inter-industry IOU's. Consequently, privatization is often no longer regarded as the centerpiece and showcase of successful reform, but instead labeled "a change in name-tag" -- meaning that enterprise behavior has not changed, and restructuring not taken place to the extent expected once private owners assumed control.[2]

The failure to impose step two of the original proposal, hard budget constraints, on the industrial sector and the power of firms to block any such attempt lies at the heart of todays' macroeconomic problems. Though we know how corporatization was thwarted, there are a variety of opinions as to why the arrears crisis was possible. On one side of the spectrum we find reference to the collusion of powerful interest groups, stalling reforms out of self-interest. The guild of enterprise directors and managers across industries, as well as the collaboration of management and workers within strategically located firms, according to this view, led to alliances among these groups. Most importantly, these alliances joined forces with the old nomenclature in control of the Central Bank in order to block attempts at reform.[3] The fact that privatization has not lead to greater financial discipline is then explained by the option for insider privatization. On the other end of the spectrum, we find the argument that simultaneous restructuring of a majority of firms was not a feasible option. According to this view, the resistance to adapt to hard budget constraints contained an element of self-defense. It was necessary to avoid a total collapse of industrial production. Both arguments allude to the specifics of the industrial structure as it emerges from central planning -- one side to explain how it was possible to blackmail the government into bailing out industry debt, the other to argue that the introduction of hard budget constraints would have resulted in so severe a collapse of output that no responsible government could have tolerated it.[4] The precise nature of the impact the industrial structure has on alternative reform policies, however, is far from clear.

The industrial structure which was considered to most efficiently solve the organizational and

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[2] Cf. Rühl (1994a) for a more detailed discussion.

[3] In Russia the Central Bank was under the control of parliament, in which the Gaidar group of reformer never had a majority. The Civic Union and the (very successful) strikes in the mining industries would be examples for these alliances.

[4] Cf. Leijonhufvud (1993), Rühl (1994b) for a more detailed discussion of this argument.

monitoring problem of a central planner differs greatly from what emerges if the allocation of resources is determined by market conditions, including free entry and competition. These differences can be conveniently summarized in four stylized facts. (i) The absence of competition and the introduction of technical innovation "from above" results in the peaceful co-existence of technologies of different efficiency, within and between firms, which partly become obsolete at world market prices. (ii) The control and monitoring problem, as well as a host of other causes, result in socialist conglomerates and production units which often appear "oversized", where oversized is defined as firm (or factory) size not justified by economies of scale. (iii) The fact that it is easier to keep track of an input-output table composed of few units also accounts for the observation that huge segments of the tertiary sector (schools, housing, shops, etc.) are attached to enterprises. (iv) Most importantly, however, an efficient industrial structure under central planning can be characterized by chains of bilateral monopolies or monopsonies. It is this forth difference which matters most in explaining why the introduction of hard budget constraints failed.

Industries in centrally planned economies are comprised of vertically integrated firms. If we assume, for simplicity's sake, that the legacy of central planning resulted in firms being organized as bilateral monopolies at each step of the production chain, this legacy and the resulting differences to competitive economies will become manifest as soon as the centralized monitoring and coordination mechanism is removed. The first is the danger of bottlenecks external to the enterprises. Similar to workstations on an assembly line, firms depend on each other for supplies and also to sell their product. Just as the failure of one workstation would cause the whole assembly line to come to a halt, so will the closure of one firm in a system of bilateral monopolies cause output to fall to zero -- because no alternative suppliers (or customers) exist. A command economy will have to counterbalance that problem by imposing strict measures of control, but the removal of the old coordination device will create the danger of bottlenecks due to gaps in the aggregate structure of production.

However, the dismantling of such a "hypothetical" command economy entails a second danger.[5] We know that a system of bilateral monopolies, where each firm is able to interrupt the production process, resembles a game with an empty core: a unique equilibrium price vector can not be established (Leijonhufvud 1985). Left alone, the result will be a bargaining situation without a stable solution, leaving open the option to collude, especially if an interested third party exists which may be forced to provide external support to continue production. In the real world, this role may well be assigned to a new government if this government does not have the old means to impose rigid control, and if it has reasons to support a minimum level of production or employment. It is reasonable to assume that such a government faces a boundary below which it can not allow output

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[5] In reality, that system was already severely damaged, following the break-up of the international division of labor among the CMEA members and then the Soviet Union. Output, accordingly, had declined for reasons preceeding attempts at reform in Russia.

(or employment) to fall, because that would threaten its own survival. In that case, however, it also seems clear that firms would learn to be aware of this boundary.

If the removal of the central coordination device and the opening of the economy implies that firms have to restructure due to the loss of subsidization, then firms, faced with the choice of restructuring induced by reduced subsidization, or of collectively fighting these restrictions, have incentives to choose the latter. "Restructuring", where it is feasible at all, will in many cases involve labor shedding, substantial re-organization and re-training. Often it will require the unbundleing of huge industrial conglomerates into sub-units, some of which will have to be closed. It may involve the dismissal of the former central management, and the process therefore will be feared by parts of the workforce and the management alike. Firms will not per se be eager to participate. Almost certainly the introduction of new products and new processes will in the short run be associated with a reduction in output: Restructuring almost always will imply a temporary loss or a permanent change in output. This trend will be reversed, and output will increase in value terms (not necessarily in quantity), only after some time has elapsed. The expected probability of succeeding with "new ways of doing new things", will therefore be based on complex considerations. Of prime importance among them should be the likelihood of getting subsidies in the future, as well as the expected credibility of reforms continuing in general. Also of importance, however, will be the incentives set by expected (external) returns contingent on firm's perspective about becoming part of a growing market, as thick markets will help to break the old distribution networks. Firm's consideration therefore will include the probability of sustained subsidy payments as well as the likelyhood of success.[6]

Furthermore, under the conditions named aboive, any individual decision to restructure will adversely affect all firms in the industry. Simultaneous attempts at restructuring will multiply the individual output losses, no matter how competitive the firms affected by the interruption of their old delivery channels might have been. The decline in current production will cascade through the economy as long as alternative suppliers and customers are not available. If firms can forestall these negative consequences by threatening to interrupt the system at large, they have an incentive to do so. Thus, any eventually interested third party will be subject to concerted efforts aimed at the continuation of (centralized) support. And under the existing industrial structure, a responsible government may be forced to restrain the aggregate losses cascading through the system if firms apply their knowledge in a rational manner.

The precondition for stalling reforms, that is for applying the arrears mechanism "successfully" (in the sense of leading to a continuation of subsidies), then may be twofold. Either the announcement of hard budget constraints was not credible from the start, or firms knew that aggregate output losses were involved to an extent which the government was not prepared to accept. The history of Russian

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[6] Cf. Boycko, Shleifer, Vishny (1993) and Aghion, Blanchard, Burgess (1993) for a discussion of the link between privatization and enterprise restructuring in Russia.

reform, in particular the arrears crises, suggests that the lack of credibility was indeed largely a result of the divergent opinions with respect to the expected losses in production (and employment) held by "reformers" on the one hand, and by "industrialists" on the other. Whether considered blackmail or self-defense -- it was the firms more informed opinion that enabled them to sustain production, to finance it by promises to pay, and then to get reimbursed by the Central Bank in an attempt to re-instate parts of the old system - if not in name than in effect, and in response to the sudden elimination of the central plan.[7]

"Top down" privatization and the emergence of new private firms have not significantly altered this equation, but merely added new variables. Successful privatization of existing firms ought to ease the resistance not to restructure, as a market emerges for managers who have positive experience with such transitions, and as private owners start to exercise a modicum of control, though the widespread use of insider privatization has considerably distorted this effect. The emergence of new private firms, on the other hand, will lower the boundary below which the authorities will not allow output or employment to fall because it diminishes the welfare losses of the transition; a new private sector constitutes the most effective social safety net, and of course also exerts pressure on the monopolistic structure just alluded to.

However, it has been clear from the beginning of reforms that some state owned firms comprise what may be labeled a privileged segment. For them, announcements under different governments were made, guaranteeing the continuation of subsidy payments.[8] Besides these privileged firms, some entities are not capable of participating in the survival game financed by arrears and are also not capable of successful restructuring. The further downstream a firm is located, the less likely that anyone but the government will help to cover it's losses. If this position is combined with outdated technology and non-competitive products, the enterprises end up completely at the mercy of current support - they can not compete in an open economy, and they can not survive even for short periods of time, beyond not paying their old suppliers, because they do not have access to inter-enterprise credit. Facing bankruptcy as their only long-term perspective, these firms are at the mercy of the government at any point in time. Therefore, while all firms may know that they will not be forced to restructure at the same time, some have no incentive and some no alternative, but to wait for the central authorities to decide their fate.

The majority of enterprises, however, will be in a position somewhat between these extremes.

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[7] This point has been repeatedly acknowledged by the "new" government (since Chernomyrdin became prime minister) which continues to announce that it will not tolerate a fall in production beyond certain limits. It has been implicitly acknowledged also by the old government, however -- when the decision to solve the arrear crises by extending Central Bank credit was made.

[8] The decision to slow down their adaption to the necessities of market pricing is one obvious form of continued support. Cf. Earle (1994) for a discussion of the privileged segment of state owned firms in the case os Romania.

They have the possibility to survive for some limited time by extending the web of inter-enterprise debt, but they also face the option of restructuring instead of maintaining the status quo, which will be combined with a preference for not restructuring if they are risk-averse. Which option they chose becomes a matter of calculus. In weighing the expected costs and benefits, they have to take into account the credibility of governmental policies aimed at reducing subsidy payments, and the consequences these attempts will have on the level of output. We may also expect that the future gains from participating in restructuring will be positively influenced by the extent of new markets, that is, by the total number of firms willing to restructure.

The government, on the other hand, will try to maximize the future gains from restructuring, but it also knows that it faces a limit beyond which a current decline in economic activity levels can not be tolerated. It is aware that its policies should be interpreted as credible and enforceable by enterprise managers, precisely because many firms can survive long enough to jeopardize the imposition of hard budget constraints if they perceive current policies as non-credible. This implies that the most important instrument at the disposal of Russian policy makers, the withdrawal of centralized subsidization, may have (immediate) consequences only for a limited number of enterprises. It also means that reformers should chose their targets carefully, so as to maintain the credibility of their policies, the success of which would eventually be confirmed by the reduction of emerging arrears in the system.[9]

The following is an attempt at modeling this situation. The assumptions try to capture closely what has just been sketched. In accordance with the limited role new private firms play in Russia, no allowance for that sector is made. And, quite in accordance with current manifestations of the problem of inter-enterprise arrears, we have not distinguished the existing firms along the lines of privatized versus state-owned.

III. The Model's Assumptions

A central assumption of our model is that an output boundary exists, below which the government will not allow the value of output to fall. It is best understood as a boundary determined by political considerations.[10] A fall in the value of aggregate output below that boundary will threaten the government's political survival. In terms of our model, one may put it bluntly: if that threshold is crossed, a revolution will occur, and the framework of the following analysis is no longer applicable.

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[9] Interestingly, Chernomyrdin (1994) explicitly emphasizes this approach in an article (written after the ideas of the current paper were in place!) which distinguishes similar categories of firms.

[10] It is, in our model, a matter of convcenience to define the boundary in terms of output value. Taking (un)employment instead would not alter the results.

We distinguish two periods: (t) is the transition period, covering the firm's decision to restructure or not, and the government decision as to the extent of current subsidies to be provided. Aggregate output for t is thus determined and produced in that period. The future is collapsed into the second period, (t+1), which depicts the consequences of decisions and actions taken at t. We will, in section 4, discuss some likely reactions to alternative outcomes but will keep the analysis limited to comparative statics, even where we subdivide the periods further.

Independent from decisions and actions taken in t, we assume that aggregate output declines from period to period (as a result of dismantling the central plan). This decline is exogenous and affects all firms to the same extent.

A general description of restructuring, as we have seen, is hard to conceive. We model the basic elements as follows. If a firm chooses to restructure in period t, it's output during that period goes to zero. In value terms, however, it will produce more in t+1 than it would have in t plus t+1, had restructuring not occurred. Firms must weigh the expected gains from restructuring against the costs. Furthermore, insiders are considered to prefer the status quo, and firms are therefore risk averse, ie they will not restructure if costs and expected gains are equal.

In order to capture the incentives to and the consequences of restructuring more adequately, we distinguish three types of firms (Types A, B and C) by their need and ability to restructure successfully. Type A firms are firms who in period t know for certain that they will receive full subsidies in t and t+1. They therefore have no incentive to restructure and will not do so. These firms will be involved in the inter-enterprise arrears network because any losses they incur are certain to be covered. Essentially, their strategic position gives them the political clout to forestall any restrictions on subsidies.[11]

Type B firms are technically capable of restructuring themselves into competitive enterprises. This means that, in the absence of subsidization, the value of future gains from restructuring exceed the costs that must be incurred to undertake the process, and the firms will restructure.[12] If subsidies are available, but the amount that is available is uncertain, then Type B firms will choose whether or not to restructure based on an evaluation of the expected costs and benefits, including the expected value of subsidies in t+1. We assume that the costs of restructuring include a fixed factor that represents the technical costs of the action, and opportunity costs, ie the value of expected future

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[11] Examples would include parts of the energy or food sector (some still sheltered by fixed prices), the military complex, firms upon which whole cities or oblasts depend, or, in terms of the industrial structure, strategically located monopolies/ monopsonies which are sufficiently far upstream to be spared the threat of change in the foreseeable future.

[12] Type B firms comprise the part of the industrial sector which is discussed most often. It is their decision problem which is reflected in the complaint that privatization amounts to little more than a change in "name-tag", and it is, by and large, they who caused the inter-enterprise arrear crises.

subsidies that it will forgo. The gains depend on the difference between the value of its restructured output in t+1 and the value of its combined (t + t+1) output if it fails to restructure. This gain is assumed to be greater than zero regardless of how many other firms restructure. If other firms do restructure, then this gain will initially increase reflecting a positive externality capturing the effects of an emerging market economy. This positive externality will decrease as the market sector becomes larger (and competitive pressures grow), implying that the gains to Type B's from restructuring will eventually become constant.

The subsidies expected in t+1 are assumed to be positive but smaller than full subsidization (which would cover all losses in t and t+1). The actual value of subsidies that the Type B firm will expect to receive in the future is the net result of two opposing forces: They are a negative function of the government's credibility to impose hard budget constraints. We call this negative force The Credibility Effect. But they are also a positive function of the extent to which output declines push the economy closer the output boundary. We call this positive force The Structural Effect.

Finally, Type B firms are assumed to have the ability to survive period t without subsidies by building up inter-enterprise arrears, implying that they have the option in all cases to sustain production in period t. If they choose not to restructure, we assume that they arrive in t+1 with an unchanged capacity to produce (any lower output in t+1 would be the result of the general decline in output which effects all firms from one period to the next).

Type C firms differ from B firms with respect to the same factors. These firms do not have the ability to restructure themselves into competitive enterprises. In the absence of subsidies, the costs of restructuring exceed the gains. We assume that Type C firms have limited access to inter-enterprise arrears, and they will, therefore, be forced to shut down in period t if they do not receive government subsidies.[13] Being completely dependent on the government for their survival they will shut down in a fixed proportion to level of subsidies provided by the central authorities, and we don't discuss the fate of their assets if they do in fact shut down. We also don't discuss the emergence of new private firms, and we neglect any impact the privatization of existing enterprises may have on B's decision to restructure, or on anyone's perception of the output boundary the government faces.

Under these assumptions, simultaneous restructuring of type B and C firms will lead to large output declines in the transition period. The government's problem therefore is to maximize the level of future output while remaining conscious of the ramifications that a breach in the output boundary will have on its ability to survive. Formally, the government's problem is to maximize Y_{t+1}, subject to

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[13] Type C firms are best understood as either downstream (retail, final consumption goods, services, etc., but also parts of the defense sector) or backward for technological reasons. Firms whose products are not competitive (or would be substituted) at international prices are the prime example. In this sense, then, it is legitimate to refer to B's and C's as operating under a "Brezhnev" or "Khrushchev" technology, respectively.

the constraint $Y_t > Y_{min}$. Y_{t+1} is defined as the value of the economy's future output which equals the sum of the outputs from the remaining non-restructured firms and from the restructured type B firms in t+1. Y_t is the value of the aggregate transition period output produced by all the non-restructuring type A, B, and C firms. And Y_{min} is the value of the output boundary. These aggregate output values imply that future output growth is a function of the amount of total restructuring (TR) that occurs in the system. For simplicity, we define B^r as the number of type B firms that restructure, and C^r as the number of type C firms that shut down and cease operations. The government, then, will achieve its objective by maximizing $TR=(B^r+C^r)$ subject to the output boundary in the transition period t.

The tool that the government is going to employ to maximize restructuring is the level of subsidies that it provides to loss making, non-restructuring firms. We have previously assumed that Type B firms are relatively unresponsive to subsidy restrictions in the transition period because of their access to inter-enterprise arrears. The subsidy tool is, therefore, not very effective with respect to Type B firms. Type C firms, however, are assumed to have limited access to arrears. It is these firms that will be most responsive to subsidy changes in period t, and the government will focus its efforts on them. The fate of the Type C firms in the transition period thus provides a signal to the Type B firms: Under the assumption that Type B firms respond to the level of Type C firms forced to shut down, the government will influence total restructuring through its actions with respect to Type C firms.

Next, the information available to the various agents in the system has to be defined. The first assumption is that all firms and the government know the type of every firm in the economy. Though there are obvious advantages to being classified as one type as opposed to another, we abstract from deliberate attempts on the part of firms to define their type and assume it to be exogenously determined.[14] The second informational assumption is that the values that define the output boundary and the level of subsidies allocated to Type C firms in period t are known to all agents. This assumption is reasonable given that output and subsidy statistics are available on a regular basis, and that these statistics are widely disbursed. The fact that we have previously assumed that Type C firms are completely dependent for their survival on transition period subsidies means that Type B firms know how many Type C's are shut down by the government as it acts to achieve its objective.

The third assumption relates the expectations of the Type B firms to those of the government regarding how the Type B's choose whether or not to restructure. As previously defined, the Type B firms base their decision, among other things, on the value of the subsidies they expect to receive in t+1. This expectation is both directly and indirectly related to C^r, the failure rate of the Type C firms in the transition period. It is directly related because the government uses its choice of C^r to signal the

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[14] This is not an unrealistic assumption, given that the transition period arrived with no warning. The government certainly classified all firms under the central plan, and these classifications were known to to the firms by the way resources were allocated.

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Type B firms its willingness and ability to impose austerity on the system in order to achieve reform. This direct impact is what we previously called the Credibility Effect, and we assume that the government and the Type B firms have <u>identical</u> beliefs regarding the magnitude of this effect.

Expected subsidies, however, are indirectly related to C^r through the effect that C^r has on TR in the transition period. As the level of restructuring increases, output correspondingly declines. This decline will push the value of output closer to the output boundary, and a as this boundary is approached, Type B firm's expectations about future subsidies will increase, because they know that any level of TR that would breach this boundary is not sustainable. If the boundary were about to be breached, the Type B firms reckon that the government will be forced to back away from its reforms and to bail out both Type B and Type C firms. Thus, the indirect impact positively relates the value of expected subsidies to C^r. This indirect impact is what we previously defined as the Structural Effect, and we assume that the Type B firms and the government have <u>different</u> beliefs regarding the magnitude of the structural effect.

All previous experience indicates that the managers of the Type B firms are more knowledgeable than the government about the degree to which the firm is dependent on other firms in the system, and about the technical limitations of their capital stock with respect to the substitution of necessary inputs and intermediate goods. For this reason, expectations about the decline in output associated with a given level of restructuring will differ systematically. The government's ignorance leads it to underestimate the impact that bottlenecks and shortages will have on the operation of, and the resulting production from firms in the transition period.[15] Therefore, the government can be assumed to underestimate the decline in output that will result from any given level of restructuring. Type B firms are assumed to have a realistic understanding of the structural effect. The net result of the Credibility and Structural Effects is that the expected value of future subsidies, as a function of the government's chosen C^r, is a U-shaped curve, where <u>expected subsidies at first decrease in response to an increasing level of C^r, and then increase</u> after C^r increases beyond some level. The implication of assuming that the beliefs about the Credibility Effect are identical for the firms and the government, while the beliefs about the Structural Effect differ is that, for any positive level of C^r, the value of subsidies expected by firms is greater than the amount the government believes they expect.

The final informational assumption concerns the firm's and the governments beliefs about the net gains that will accrue to a restructured Type B firm in the future. We have so far assumed that the

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[15] Note, that we are not assuming that the government is stupid. Rather, we are assuming that it is unaware of the degree to which product standards differ between Russian firms, and of the extent to which firms depend on each other. Also, we believe it to be an adequate description of the current situation that knowledge about the conditions of production is more likely to exist at the firm level and along the (more or less dismanteled) lines of the planning bureaucracy than in the (more or less intact) political hirachy. This assumption is in line with the general "over-reporting" which occurred under the central plan and does not contradict the other informational assumptions made in this paper.

B's restructure at a rate that is proportional to the difference between the expected future gains from restructuring and the expected subsidies. Indirectly, the expected gains from restructuring are a function of C^r. The shape of this function reflects the fact that, as the market economy takes hold, there will be a positive externality for competitive firms in the economy, and, once this market sector is of a certain size, the externality will cease. We assume here that both the firm and the government have identical beliefs regarding the net gains equation. This assumption may seem somewhat at odds with our previous conjecture that managers know their own firm's technical capacities better than the government, for if they do, they probably also know better how the gains will grow as a market economy develops. The general results of our model, however, are robust with respect to this assumption. We impose it only to simplify the analysis.

IV. The Model.

To model the effect of the government's initial transition policies, we start by formalizing the decision processes of the Type B and C firms using the preceding assumptions. The simplest matter is the decision of the Type C firms, for they will choose to shut down at a rate directly proportional to the amount of subsidies they receive in the transition period. We define:

C^T = Total number of Type C firms existing at the beginning of the transition period, and

C^{nr} = number of Type C firms that do not restructure in the transition period

with

$$C^{nr} = \gamma * S_t^c$$

where S_t^c is the amount of subsidies the Type C firm receives in the transition period, and $0 < \gamma < 1$. From these definitions, we have that:

$$C^r = (C^T - C^{nr})$$

Given that the government controls the level of subsidies provided to Type C firms, it also controls the number of Type C firms that shut down.

Type B firms are assumed to restructure at a rate proportional to the difference between the expected future gains from restructuring and the expected value of future subsidies they will forgo if they restructure. The gains (G) from restructuring are defined as:

$$G = (n - o - r)$$

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where **n** is the value of future output from the restructured firm, **o** is the value of the total output the non-restructured firm would produce in periods t and t+1, and **r** is the value of the monetary cost incurred under restructuring. The values of **o** and **r** are assumed to be fixed. The value of the restructured firm's future output is assumed to be variable, and is defined as:

$$n = (a + \beta)$$

where a is fixed and β is a variable amount that depends positively on the level of total restructuring (TR) in the transition period:

$$\beta = f(TR)$$

Total restructuring itself is also a function of the level of C^r chosen by the government:

$$TR = g(Cr, Br)$$

Thus, the expected future gains to restructuring are:

$$G = (a + f(g(Cr, Br)) - o - r)$$

Previously, we have assumed that the function, $f(g(Cr, Br))$, reflects the steadily decreasing positive externality associated with the development of a market economy. Graphically, this is illustrated in figure 1, where (a - o - r) denotes the minimum level of future gains that will accrue to a Type B^r firm.


(Figure 1)

The expected subsidies that the Type B^r will forgo are defined as ε. We have previously assumed that ε is a function of both C^r and TR, with the impact of C^r called the Credibility and the impact of TR

called the Structural Effect. From TR=$g(Cr,Br)$, it follows that:

$$\varepsilon = h(Cr, g(Cr, Br))$$

Graphically, the Credibility Effect is a downward sloping curve that decreases at a decreasing rate as a function of C^r. This curve intercepts the expected subsidy axis at S_0, which is defined to be the maximum level of subsidies that could be expected, and is the sum of losses the non-restructured Type B firm would incur during period t and t+1. The Structural Effect has to be depicted as a curve that begins at the origin and increases at an increasing rate as a function of C^r. Figure 2 illustrates these curves, with the bold U-shaped curve, $\varepsilon(Cr)$, illustrating the net effect of C^r on the level of expected subsidies.

(Figure 2)
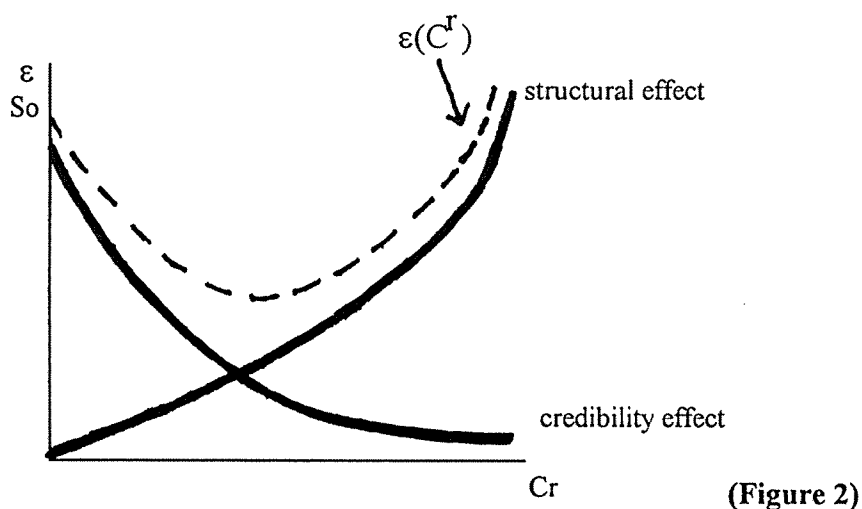
Furthermore, we have discussed that the government and the Type B firms hold identical beliefs regarding the Credibility Effect, whereas the beliefs about the Structural Effect are assumed to differ, with the government underestimating the output declines that will accompany restructuring. This difference in beliefs is illustrated in figure 3.

ε

So

$\varepsilon(C^r)f$ structural effect (firm)

$\varepsilon(C^r)g$

structural effect (govt)

credibility effect

Cr
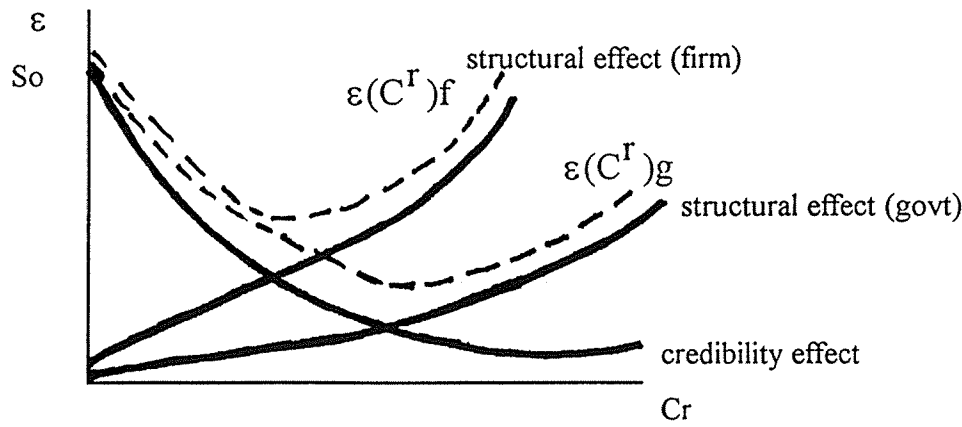
(figure 3)

As a result, we have two net expected subsidy curves, $\varepsilon(Cr)f$, the firm's expectations and $\varepsilon(Cr)g$, the overly optimistic government's belief about the firm's expectations. The two curves imply that a given level of C^r chosen by the government will lead to an expected value of future subsidies on part of the firms which is higher than what the government believes it will be.

The choice of B^r by Type B firms is proportional to expected gains minus expected subsidies under restructuring, and both of these are functions of the government's choice of C^r. Thus, the number of Type B firms that restructure is equal to:

$$Br = \theta(G - \varepsilon)$$

where $0<\theta<1$. We can, therefore, depict the relative magnitudes of B^r that will occur from a given level of C^r under the differing expectations by superimposing figure 1 on figure 3. Figure 4 illustrates this combination with the credibility and structural effects suppressed.

16

ε , G

So

(a - o- r)
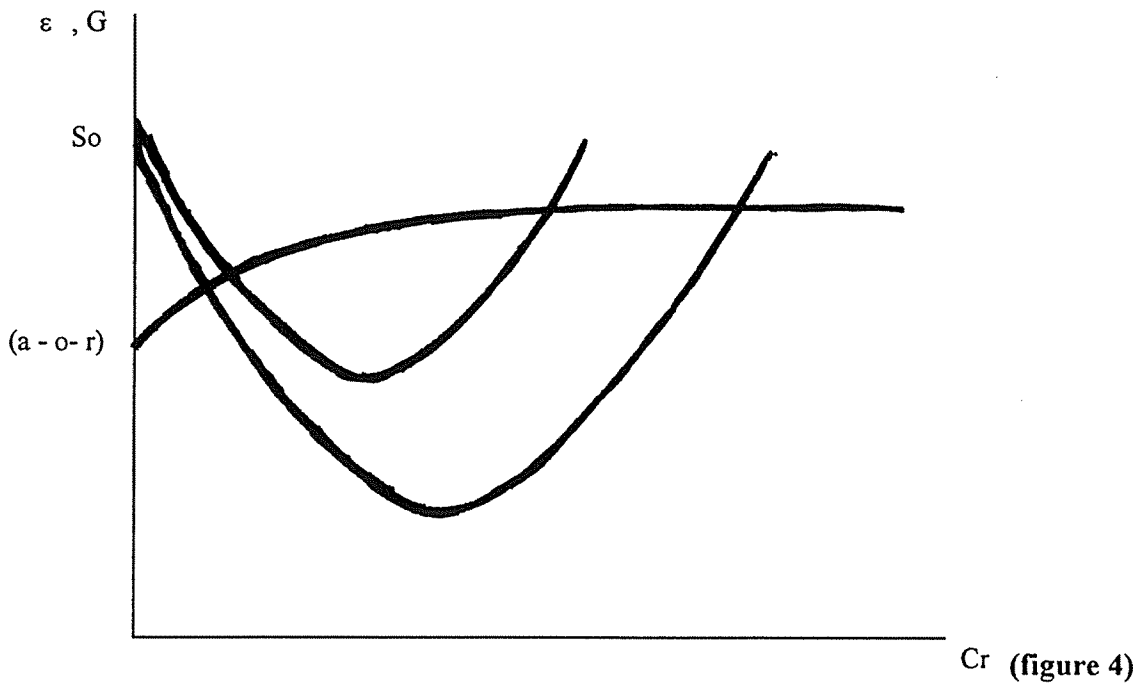
Cr (figure 4)

Finally, figure 4 allows to graph the level of B^r that will occur as a function of C^r, as is depicted in figure 5a.

Br

B^r_g

B^r_f

B^{r*}

C^r_{1f} C^r_{1g}

Cr (figure 5a)
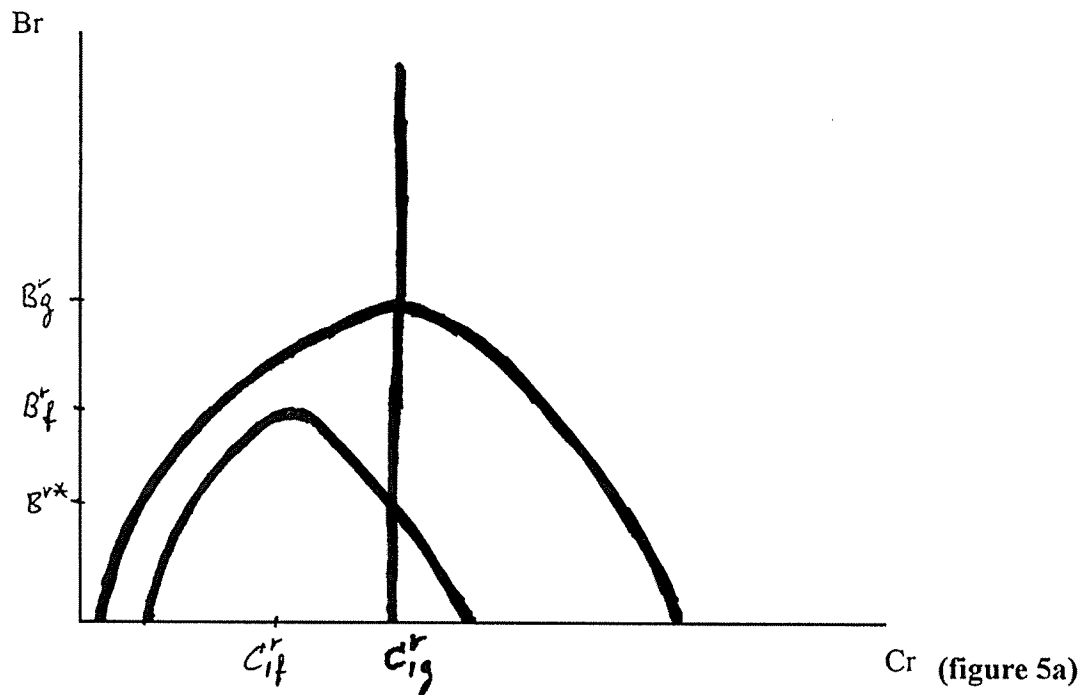
From figure 5 we can state the following results:

i.   the minimum level of C^r that is necessary to elicit any Type B restructuring is greater than zero, while the government believes that this minimum level is lower than it actually is. $(C^r_{1g} < C^r_{1f})$

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ii.   the maximum level of B^r possible under the conditions of a known output boundary is lower than the government thinks it is ($B^r g > B^r f$), and it will occur at a lower level of C^r than the government expects. ($C^{r*}g > C^{r*}f$)

iii.   if the government chooses C^{r*} according to its beliefs, the actual level of B^r that will occur, B^{r*}, is less than the true maximum possible level. The government's decision leads to a sub-optimal outcome.

V. Discussion and Extension

The results of our model can be used to explain why the initial attempts by the Russian government to impose a hard budget constraint failed to achieve the desired level of restructuring, and instead precipitated the inter-enterprise arrears crisis. Referring to figure 5, the vertical line at $C^{r*}g$ represents the government's chosen level of Type C restructuring, reflecting its overly optimistic beliefs. This level elicits a level of Type B restructuring equal to B^{r*}. The government, however, expects $C^{r*}g$ to elicit $B^r g$. It is, therefore, expecting to provide enough transition period subsidies to non-restructured Type B's to support ($B^T-B^r g$) firms. This level of subsidies, however, proofs to be insufficient to support the actual number of Type B's that do not restructure, and the Type B's will employ inter-enterprise arrears to finance the difference.[16]

The model, then, indirectly explains the unanticipated increases in inflation that has occurred over and above the initial one-time jump in the price level expected as a result of price liberalization. However, it also implies that the actual transition period output decline was less than the government anticipated.[17] The government expected an output decline corresponding to a level of total restructuring equal to ($C^{r*}g+B^r g$), whereas the actual level of restructuring that occurred, ($C^{r*}g+B^{r*}$), corresponds to a lower output decline, and therefore generated the accumulated arrears by the larger than foreseen number of non-restructured Type B firms. The satisfaction of these arrears by the Central Bank is the key component of the recent Russian inflation.[18]

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[16] The means by which the government delivers subsidies to the firms will be channelled through the industrial branch ministries, not directly to any individual firm. Thus, when the unexpectedly large number of Type B firms come to demand subsidies, this institution will run short and the burden will be distributed among all non-restructured Type B firms. While perhaps overly simplifying the complex factual bargaining process and it's uneven results, this also implies, quite realistically, that there will not be any firms within the relevant segment that are fully subsidized, and others with no subsidies.

[17] Some may find it difficult to accept that the huge output declines that occurred following the sudden dismanteling of the central plan were in fact less than what the government anticipated. This could easily be remedied by taking employment levels instead. The continuing output declines, however, also tell us (correctly, as it turned out) that in fact the system still had a way to go in terms of declines, when hardly anyone conceived this as possible anymore. In addition, there is growing consensus that the initially reported declines in output were exagerated due to loop-sided pre-reform statistics.

[18] Note, that, because of the time-lag, the burdon of the inflation tax thus will be shifted towards the firms who restructured successfully.

Our model, with some modifications, is also able to provide an insight into the actual progression of events that have occurred during the ongoing reform process in Russia. If we allow for the transition period t to be divided into sub-periods, then we can describe the government's reaction to its initial failure. For simplicity, we assume that the transition period t is divided into sub-periods t_1 and t_2, and that only the government cares about the opportunity to change course, while firms behavior remains indifferent toward this possibility. The government's initial action then occurs at the beginning of t_1: at the end of this sub-period it is able to observe preparatory moves by the Type B and C firms leading either towards restructuring or indicating the refusal to do so. Restructuring is reversible at this point, but, if no action is taken, it will be irreversible in t_2. In this case, if the observations are other than what the government had anticipated, it will change course by altering the number of C^r's by increasing the amount of subsidies provided to Type C firms.

In terms of the model, the government now chooses the initial amount of Type C firms to shut down at the beginning of t_1, and it expects to observe preparations to restructure by $B^r g$ Type B firms at the end of this sub-period. When in fact it only observes preparations by B^{r*} Type B's, and the corresponding build-up in arrears, the authorities learn that they have been overly optimistic about the Structural Effect, and will change their policy. Assuming that the government does not alter any of its other beliefs about the decision process of Type B's, it will significantly reduce the number of Type C firms it intends to shut down. It must reduce this number because without the contribution of these firms to the economy's aggregate output, the government would find that its credibility to threaten the imposition of hard budget constraints on the remaining Type B's is drastically eroded.

However, the government will also need to bail out many of the Type B firms that have accumulated arrears. If it were not to do so, the firms in question would, contrary to our initial assumption, begin to deteriorate as functional enterprises through activities such as asset stripping and the flight of human capital.[19] If this deterioration is allowed to continue, the expected gains from restructuring will decline for all levels of TR.[20] Smaller gains would additionally weaken the government's ability to successfully re-maximize. The authorities will avoid this dilemma by bailing out all the Type B's that have run up arrears at the end of the first sub-period.

At the beginning of t_2, the government will re-maximize according to the same principles as at the beginning of t_1, but with different, and more realistic beliefs about the Structural Effect. Figure 5 is reproduced here to show the progression of the events described.

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[19] This result, of course, is due to the lack of explicitly modelling a new private sector, for which asset stripping actually might provide a positive externality.

[20] Both the intercept of the Gains function and the impact of the positive externality will diminish in this case.

Br

B^r_{g1}

B^{r*}_2

B^{r*}

B^{r*}_1

C^r_g C^{r*}_{g2} C^{r*}_{g1} Cr (figure 5b)
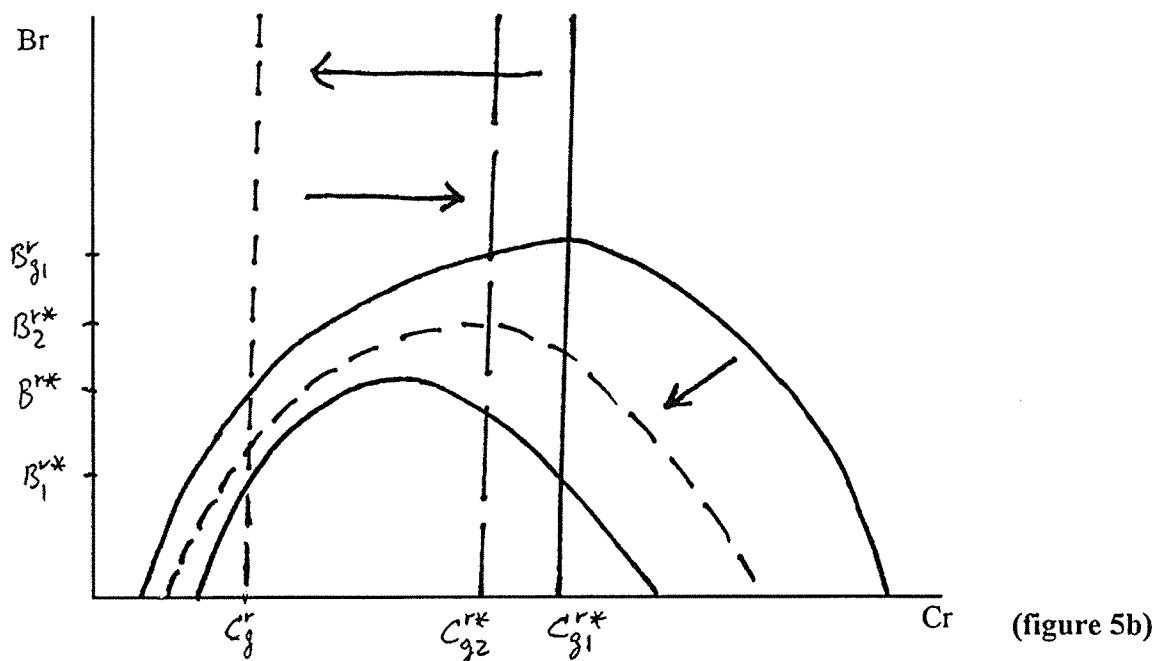
The t_1 choice is as previously shown. At the end of this sub-period the government readjusts by reviving $(C^{r*}_{g1}-C^r_g)$ Type C firms and covers the arrears of $(B^r_{g1}-B^{r*}_1)$ non-restructured Type B firms. It then re-maximizes at the beginning of t_2 under the new, and more realistic beliefs, ie it chooses to shut down C^{r*}_{g2} Type C firms. This level of C^r will elicit B^{r*}_2 restructuring Type B firms, an amount much closer to the true maximum possible number, B^{r*}. Accordingly, the level of arrears necessary in t_2 will be lower than in t_1 as the number of Type B's that actually restructure is closer to what the government anticipated.

This scenario is similar to what we have witnessed in Russia in the wake of "Shock Therapy". Across the board corporatization has never been attempted. But the Gaidar government was forced to abandon its harsh reforms in the face of parliamentary revolt, reflecting a decision process which can be interpreted as a readjustment based on unanticipated observations, along the lines just described. The resolution of the crisis has since seen the Chernomyrdin government reinstate the reform process, but at a more subdued level - just as the re-maximization under new beliefs delineated above.

We should note that it is reasonable to assume that each time the government attempts to change course in the transition period, the expectations of the Type B's will change. So while one readjustment may indeed be feasible, multiple attempts may worsen the difficulty of targeting the "right" level of subsidies, as firms learn about and adjust to the government's menu of choices.

VI. Conclusion

To keep close to reality, however, would call for an extension capturing the model's dynamics

as it is extended to incorporate future periods. In this case, allowance for an emerging new private sector will have to be made. It will also require allowance for firms to shift from one category to another. The number of Type A firms can be expected to diminish over time, and Type B firms can be expected to move into the C segment, either as a result of the growing importance of the new private sector or because of the deterioration they suffer from holding on by using only the available arrears. However, the strict categorization of firms presented here serves expository purposes, and the process depicted in this paper will not be affected by allowing for a contimuum of firms.

But the new private sector will be crucial in that it's existence will change the government's boundary, and in that it will change the incentives of Type B firm's to restructure. Anticipation of the magnitude of both effects will make it even more difficult for the government to achieve its objectives because it now may be faced also with an increased likelihood of underestimating the extent of restructuring. Thus, credibility and the signals transmitting it will acquire additional weight. And in the end, it will be the size of the new private sector which determines the critical mass needed to develop the momentum to overcome Type B firms capacity to stall reforms.

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