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Bureaucracies in the Russian Voucher Privatization

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Comments Welcome

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* SSE, Box 6501, S-11383 Stockholm. E-mail: Guido.Friebel@hhs.se This is the revised version of Chapter II of my ULB thesis. I thank Mathias Dewatripont and Gérard Roland for their support and motivation. Marianne Bertrand and Michael Raith provided me with a lot of valuable ideas. I am grateful for discussions with Erik Berglöf, Micael Castanheira de Moura, Olivier Debande, John Earle, Marjorie Gassner, Jacques Lawarréc, Philippe Weil and for comments of participants at the 1995 EEA meeting in Prague. This research was supported by *Contrat 91/96 150 ARC-EST avec la Communauté Française de Belgique*. All errors are mine.

1. Introduction

Boycko, Shleifer and Vishny (BSV, 1995) argue that Russian voucher privatization was designed with a view to build a coalition in favor of reforms. Once proprietors of their firms, managers and workers supported the reform-minded Russian Government in its struggle against the central bureaucracy, in particular, against the infamous branch ministries. While their analysis of this coalition-building process seems appealing, BSV do not shed much light on the relationship between the reformers in Moscow and local administrations that carried out privatization. However, this relationship between local and central governments proved to be crucial for the speed of privatization.

The central privatization ministry GKI needed had to charge local authorities with the implementation of privatization, because only they had the administrative capacity to set up auction schemes, document the privatization processes, prepare the necessary documents and so forth. It was however difficult to make them undertake efforts to privatize fast since they possessed information unknown to the GKI. First, only they knew about local peculiarities like the local demand for privatization, the quality of the enterprises and local power struggles. Second, their proper attitudes towards reforms in general and privatization in particular were unknown to the center in Moscow.

It is known from incentive theory that the presence of informational asymmetries gives rise to a tradeoff between rent extraction and efficiency. In line with this tradeoff, this paper first analyzes to what extent the speed of privatization was constrained by the above information asymmetries. Then, I argue that by introducing vouchers and by reorganizing the privatization process, the central Government

acquired information about local particularities and increased the transparency of the privatization process. I show that, more information does not necessarily involve higher privatization speed. More information for the central government actually may involve a *slowing down of privatization* when the uncertainty about the local conditions was large before voucherization. Here, the privatization speed in municipalities with favorable local conditions but "reform-averse" local bureaucrats is reduced. More information allows the privatization ministry to take away all rents of reform-averse bureaucrats in high-demand municipalities. Hence, their incentive to privatize decreases and falls beyond the point of pre-voucher privatization. Put differently, the tradeoff between rent extraction and efficiency may involve that the government prefers to cut rents only, instead of accelerating reforms at lower rents.

The predictions of the model are in line with the empirical evidence. While the most prominent feature of the Russian voucher privatization is its impressive overall speed, there were a number of regions that took a clear anti-privatization position once vouchers were introduced and tried to put privatization to a halt "from the bottom". In March 1993, for instance, the regional Soviet of Chelyabinsk decided to suspend voucher auctions. Comparable decisions were made by local councils and other regions, for instance, in Tula, Archangelsk and in the northern Caucasus [Chubais and Vishnevskaya (1994)]. It is interesting to note that the voucher privatization was probably the single most attacked reform measure in this period of time, and that pro- and anti-reform camps emerged clearly during this time.

In contrast to BSV who do not aim to understand the intensifying conflict between central and local authorities in the course of privatization, and who argue that the support of local administrations was "bought" by the revenues of small privatization, my paper identifies sources of conflicts between the center, regional and

local authorities. Voucher privatization took away the rents of local bureaucrats, and hence many local and regional governments were very much opposed to it. The paper also adds to the understanding of the reform "mechanics" in the relationship between the center, regions and local authorities that recently has received considerable interest, in particular in regard to taxation (Berkovitz (199?) and Zhuravskays (1998)).

The paper is organised as follows. The following section discusses the origin of the bi-dimensional information asymmetry. Section (3) presents the model. Section (4) derives the optimal contracts for the bi-dimensional information asymmetry. Section (5) discusses the effects of the introduction of vouchers on the organisational relationship between central privatization ministry and local bureaucrats, and derives the effects on the privatization volume. Section (6) concludes.

2. Institutional background

This section briefly discusses the nature of the informational asymmetries concerning the *personal reform attitude* of local bureaucrats and *local privatization conditions*. The importance of reform attitudes of members of the nomenklatura for success and failure of reforms has been extensively discussed long before 1989¹. There is some evidence that bureaucrats' reform attitudes had a substantive impact on the volume of privatization in Russia. Bradshaw and Hanson (1994) find that the existence of a reformist leadership on the regional level was significant for the explanation of regional differences in the volume of small privatization. I conducted case studies in the Moscow region [Friebel (1995)] that show that the volume of privatization across 15

¹ There is a large number of such examples. In Hungary, for instance, the role of branch ministries and other state bureaucracies in regard to reforms has been discussed since the late 60's [Acta

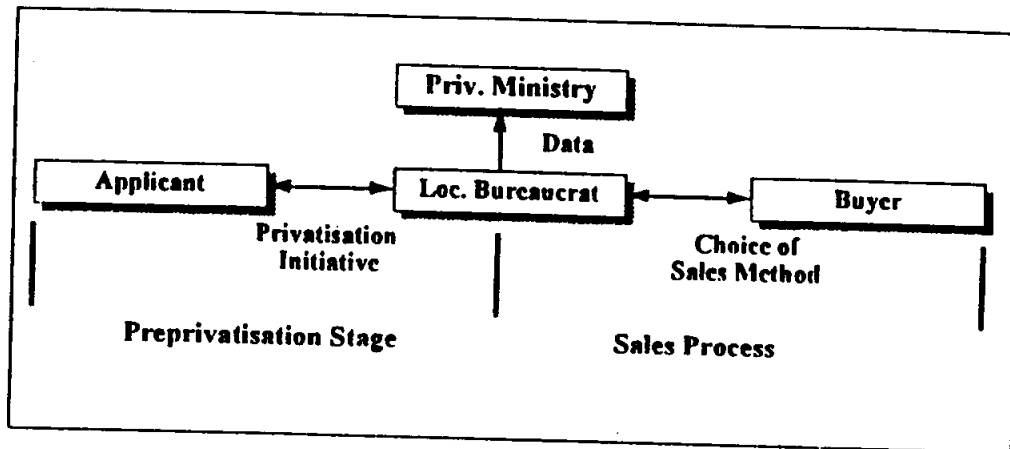
municipalities differed to a large extent, although the respective enterprises and the economic structure of the respective local communities were quite comparable. The reform attitude of the responsible privatization agents' diverged to a large extent. Some bureaucrats feared that they would lose their job if they privatized too quickly. Others uttered ideological reasons for being reluctant to reforms. On the other hand, there were bureaucrats who had a positive attitude towards reforms in general and positive expectations about their personal future once privatization would be accomplished.

One might argue that the central government may, to a certain extent, know the reform attitude of regional (i.e. subnational) governments. However, this is surely not the case for the thousands of local governments that had the main responsibility for the implementation of privatization. As the model will show, both bureaucrats with positive and with negative reform attitudes may have an incentive not to disclose their attitude.

The following illustrates in a highly stylised way² the origin of the second dimension of private information, namely, local privatization demand.

Oeconomica (1987)]. Frydman and Rapaczynski in Worldbank (1994) analyse the interests and actions of branch ministries and holdings in the small privatization in the Visegrad countries.
² The illustration shows the relationship between the government and *one* local bureaucrat. However, in reality *various* institutions were involved in privatization. Since the parliament and the government were from the start competing for control of privatization, a functional differentiation emerged: the parliament controlled the so-called "Property Funds", the "owner and seller" of state-owned enterprises (SOE's). The government, on the other hand, controlled the "manager" of privatization, the privatization ministry or so-called GKI. These institutions existed on three territorial levels and co-operated horizontally and vertically. In our model, we abstract from lateral conflicts and co-ordination problems and focus on the vertical aspects.

Figure 1: The privatization process



The privatization ministry in Moscow (GKI) received data concerning privatization applications (initiatives) and accomplished privatization of firms. These data however were not sufficient to evaluate the local bureaucrat's activities during the very privatization process. While data concerning accomplished privatizations were verifiable, because changes in ownership were registered with courts and chambers of commerce, application data were not verifiable, since they were only registered with the local bureaucrat. In the pre-privatization stage, the agent thus had the discretion to block privatization initiatives (for instance, due to formal errors). Vis-à-vis the central privatization ministry she could pretend that low privatization volumes were due to a lack of initiatives, i.e. due to local privatization demand.

Moreover, the local bureaucrat had a large degree of discretion concerning the sales process. First, the local bureaucrat could choose a sales method that restricted the number of potential buyers and the degree of transparency about the process. Instead of selling the enterprise by an auction, for instance, she could choose a restricted tender in which potential buyers had to meet specific conditions in order to be eligible. Second, the bureaucrat could reduce the attractiveness of a business by imposing

requirements concerning the business profile or employment. Finally, the local bureaucrat could simply abort bilateral negotiations arguing that the potential buyer rejected to pay an adequate price.

Clearly, the bureaucrats' ability to hide their reform attitude behind lacking privatization demand is due to market imperfections. If privatization demand had been completely mobile and potential buyers had been well-informed, differing privatization volumes would have indicated different quality of the respective local enterprise portfolios³ or bad performance of the local bureaucrat. However, given bad infrastructure and lacking information on other regions and municipalities, privatization demand had a large local component. Hence, local bureaucrats could pretend that low privatization volumes were due to a lack of demand and not to their reform attitude.

3. The model

The model examines the organisational relationship between the central privatization ministry (also called "the government" or "it"), and a local bureaucrat ("the agent" or "she") who carries out privatization. This relationship is considered as a mechanism design problem along the lines of Baron and Myerson (1982)

3.1 The government

The government ("G") maximises a national production (income) function. The exclusively state-owned economy produces $y = \alpha K$, with a homogeneous capital

³ The model assumes homogeneous capital. Thus, only demand-side specifics are considered, not the diverging quality of capital to be privatized, or other elements of the economic framework, like problems in enforcing property rights, mafia etc.

stock K . Privatization is assumed to enhance enterprise efficiency. This is reflected in an increased productivity of private capital: $\alpha_p > \alpha$. Whereas these overall productivity gains are considered exogenously given⁴, there is a trade-off between privatization volume and privatization costs. The costs of privatization consist in the transfer payments local bureaucrats receive for their privatization volume e ⁵. Thus, G maximises the national income net of the transfers (t) paid to the agents:

$$y = \alpha K + (\alpha_p - \alpha)e - t(e) \quad (1)$$

A comment on this objective function may be appropriate. According to regulatory economics (cf. Laffont and Tirole (1993)), the government dislikes the rents of managers and bureaucrats because of the costs of public funds. In my model, G is assumed to maximise the income available to her electorate, who are defined as the population excluding privatization agents. G does not internalise the rents of bureaucrats which may be justified by the small size of this group

3.2 The privatization agent

The agent "produces" privatized capital e . Privatization data are public knowledge, since ownership changes are registered with courts and chambers of commerce. The agent has private knowledge about the disutility associated with carrying out privatization. Let m represents the agent's *personal reform attitude*; d represents *privatization demand*. Neither of the parameters is known to the government. The

⁴ Empirical studies on the efficiency of privatization in capitalist countries do not unambiguously confirm this assumption. See Megginson, Nash and van Randenborgh (1993) for references of studies finding both positive and negative effects of privatization. They, however, find significant increases in profitability, output per employee, capital spending, and total employment for a sample of 113 enterprises in both OECD and developing countries. Moreover, the fact that privatization in Eastern Europe is of crucial importance for the whole of the systemic transformation corroborates our assumption.

agent's disutility function is $\Psi(\Theta, e) \equiv \Theta e^2$ with $e \geq 0$, $\Psi_e > 0$, $\Psi_{ee} > 0$. The disutility factor Θ is private knowledge; $\Theta \equiv m/d$. This setup allows to treat the model as one-dimensional and to decompose the disutility factor Θ when needed.

d can take one of two values $\{\bar{d}, \underline{d}\}$ with $\bar{d} > \underline{d}$. The probability that demand is high is ν , the probability of low demand is $(1-\nu)$. The parameter m may also take two values; with probability p , $m = 1$, and the agent is called "pro-reformist". With probability $(1-p)$, $\gamma > 1$, and the agent is called "anti-reformist". A given privatization volume causes higher disutility to an anti-reformer than to a pro-reformer, because the latter regards the consequences of privatization as more favourable than the former, as pointed out in section 2. Combining the two adverse selection dimensions, the agent can take four types, whose probabilities are known to G :

		$d \rightarrow$	
		\bar{d} , prob: ν	\underline{d} , prob: $(1-\nu)$
$m \downarrow$	good	high <u>type 1</u> prob: νp	low <u>type 2</u> prob: $(1-\nu)p$
	bad	<u>type 3</u> prob: $\nu(1-p)$	<u>type 4</u> prob: $(1-\nu)(1-p)$

I assume $\gamma > \bar{d}/\underline{d}$, i.e. the bureaucrat's attitude towards reforms is more important for the privatization volume than privatization demand⁶. Consequently there is the following ranking of types:

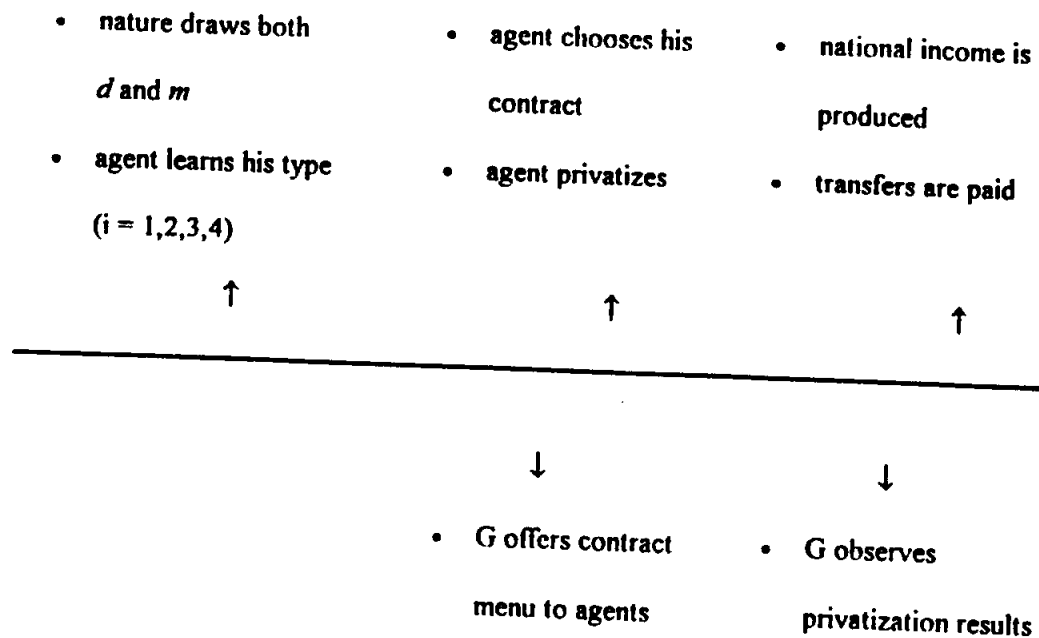
$$\Theta_1 < \Theta_2 < \Theta_3 < \Theta_4 \quad (2)$$

⁵ Introducing positive revenues does not essentially change the problem; given homogeneous capital, linear privatization revenues would be added.

⁶ The analysis would follow the same lines assuming the inverse relationship.

3.3 Timing

The timing of the static game is as follows:



3.4 The government's optimisation problem

A contract i specifies a pair of the observables $\{t(e_i), e_i\}$. Optimal contracts are result of G 's utility maximisation, subject to a system of incentive compatibility constraints (IC's) and the agents' individual rationality constraints (IR's). Because of the linear ordering of the agent's types the maximisation problem can be converted into one where y is maximised subject to *local downward incentive constraints* (LDIC's), the IR of the *worst type* and a *monotonicity constraint* (MC). [(For a sketch of the proof see appendix (i)]. With U_i being the rent of type i , we obtain the following system of inequalities:

$$\text{LDIC's: } U_1 = t_1 - \Psi(\Theta_1, e_1) \geq t_1 - \Psi(\Theta_1, e_2) \quad (3.1)$$

$$U_2 = t_2 - \Psi(\Theta_2, e_2) \geq t_2 - \Psi(\Theta_2, e_3) \quad (3.2)$$

$$U_3 = t_3 - \Psi(\Theta_3, e_3) \geq t_4 - \Psi(\Theta_3, e_4) \quad (3.3)$$

$$\text{IR: } U_4 \geq 0 \quad (3.4)$$

$$\text{MC: } e_1 > e_2 > e_3 > e_4 \quad (4)$$

In order to express the rent of a type i as function of $i+1$, his downward neighbour's privatization volume we introduce the rent function

$$r_i(e_{i+1}) \equiv \Psi(\Theta_{i+1}, e_{i+1}) - \Psi(\Theta_i, e_{i+1}) \quad (5)$$

Since the government does not want to leave more rents to the bureaucrat than necessary, (3.1) to (3.4) are binding in the optimum. Rewriting the LDIC's by using $t_i = U_i + \Psi(\Theta_i, e_i)$ and the rent function (5) yields:

$$U_1 = U_2 + r_1 = r_3 + r_2 + r_1 \quad (6.1)$$

$$U_2 = U_3 + r_2 = r_3 + r_2 \quad (6.2)$$

$$U_3 = U_4 + r_3 = r_3 \quad (6.3)$$

$$U_4 = 0 \quad (6.4)$$

Substituting for the transfers and using (6.1) to (6.4) yields G's programme:

$$\max y\{e_1, e_2, e_3, e_4\} = \alpha K + (\alpha_r - \alpha)[\nu p e_1 + (1 - \nu) p e_2 + \nu(1 - p)e_3 + (1 - \nu)(1 - p)e_4] -$$

$$[\nu p(r_3 + r_2 + r_1 + \Psi_1) + (1 - \nu)p(r_3 + r_2 + \Psi_2) + \nu(1 - p)(r_3 + \Psi_3) + (1 - \nu)(1 - p)\Psi_4]$$

$$\text{s. t. MC: } e_1 > e_2 > e_3 > e_4 \quad (7)$$

4. Analysis of the model

I proceed in two steps. First, the programme is maximised with respect to privatization volumes. Second, it has to be verified whether the respective privatization volumes satisfy the monotonicity constraint. It turns out that, depending on the ratio \bar{d}/\underline{d} , which can be interpreted as a *measure for demand uncertainty*, the privatization volumes that maximise G's objective function may violate the monotonicity constraint. Lemma 1 summarises the findings. (see the Appendix for the proof).

Lemma 1

For both high and low demand uncertainty, the unconstrained maximization of G's objective function violates MC. Only in the case of intermediate demand uncertainty the privatization volumes that maximise G's objective function are feasible. The respective cases are defined as:

$$\text{Case (a): } \bar{d}/\underline{d} \in (d^{**}, \gamma), \quad \text{high demand uncertainty} \quad (8.1)$$

$$\text{Case (b): } \bar{d}/\underline{d} \in [d^*, d^{**}], \quad \text{intermediate demand uncertainty} \quad (8.2)$$

$$\text{Case (c): } \bar{d}/\underline{d} \in [1, d^*), \quad \text{low demand uncertainty} \quad (8.3)$$

$$\text{with } d^* = \gamma - (\gamma - 1) \frac{\gamma v}{\gamma v + p(1 - v)}; \quad d^{**} = \gamma - (\gamma - 1) \frac{v^2(1 - p)}{v(1 - p) + p(1 - v)}.$$

As shown in appendix (ii), d^* and d^{**} are the critical values at and beyond which the MC of G's programme (7) is violated. In case (a), we have $e_2 \leq e_3$, i.e. the local upward incentive constraint of type 3 in regard to type 2 is violated, and type 3 would

⁷ Note that increasing γ leads to an enlargement of all intervals. Furthermore, as shown in the Appendix, conditions (8.1) to (8.3) do not impose restrictions on v and p . The upper and lower bounds of cases (a) and (c), respectively, follow from assumption 2, i.e. $\gamma > \bar{d}/\underline{d} > 1$.

mimic type 2. In case (c), we have $e_3 \leq e_4$. The solution for a problem of this kind consists in "bunching" types, i.e. treating them as a common type [see Laffont and Tirole (1993)]. In formal terms, the programme is maximised under an MC that offers the same contract for a certain range of types. In the case of continuous types, it amounts to a problem of optimal control to determine what types are to be bunched. In the discrete case, the problem is much simpler. Given that upward types are not affected by the violation of the MC, there is only one possible MC for case (c), $e_1 > e_2 > e_3 = e_4$. In case (a) there are two possible MC's: one that entails $e_1 > e_2 = e_3 = e_4$; and another one that bunches types 2 and 3, but separates these from type 4. Appendix (iii) shows that the latter programme dominates the former, and discusses the modifications of the initial programme in cases (a) and (c). Proposition 1 describes the features of optimal contracts in the respective cases.

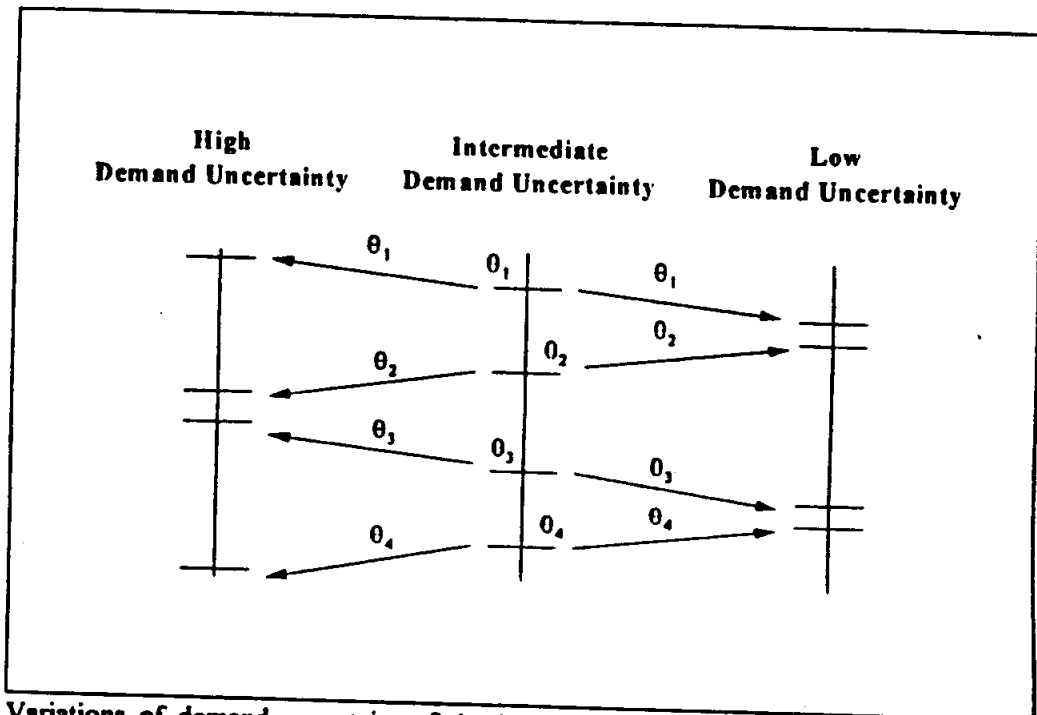
Proposition 1: Optimal contracts, bi-dimensional information asymmetry

- a) *Type 1 always privatizes efficient volumes, i.e. there is no distortion at the top.*
- b) *For intermediate demand uncertainty, $e_2 > e_3 > e_4$.*
- c) *If demand uncertainty is high, the pro-reformer with low demand (type 2) privatizes less than in the intermediate case. The anti-reformer with high demand (type 3) privatizes more than in the intermediate case. Both types privatize more than the worst type whose privatization volume is the same as in the intermediate case.*
- d) *For low demand uncertainty, type 2's privatization volume is higher (lower) than for intermediate demand uncertainty, if it is more (less) likely to have high demand than a pro-reform type. Type 2 privatizes more than the bunched type 3,4. Both anti-reformers privatize a volume that is lower than the level of the worst type in case (b).*

e) In all cases, rents are ranked according to the types' efficiency.

In the case of intermediate demand uncertainty, optimal contracts bear the features of contracts known from incentive problems in regulation. Lower disutility implies strictly higher privatization volumes, and only the "best" type privatizes an efficient volume. If, however demand uncertainty is either high or low, optimal contracts are not fully separating. The following figure illustrates why changing demand uncertainty leads to bunching contracts.

Figure 2: Demand uncertainty and regrouping of agents



Variations of demand uncertainty δ lead to regrouping of types of agents on the interval between 1 and γ . If demand uncertainty is *high*, type 2 and type 3's respective disutilities for a given effort converge. By the same token, the "best" type and type 2 diverge. The same is true for type 3 and type 4. If demand uncertainty is *low*, types are regrouped with respect to their reform attitude. Pro-reformers 1 and 2 converge; the

same is true for type 3 and type 4. Furthermore, these two groups diverge from each other. Bunching contracts are offered if the disutility differential of two neighbouring types is very small. The reason is that full separation is too costly in these cases. If the government wants to induce relatively small gains in privatization volume, it has to pay relatively high rents to the local bureaucrat, since increasing the privatization volume of one type increases the rents of all upward-types [see the rent function (5)].

In the case of high demand uncertainty, e_2 decreases and e_3 increases, compared to intermediate demand uncertainty. Consequently, with e_4 constant, type 2 receives higher rents. High demand uncertainty thus increases the privatization volumes of the anti-reformer and the rents of the pro-reformer. The intuition is that the demand dimension gains in relative importance, compared to the agent's reform attitude. Hence, it is worthwhile to induce type 3 to privatize more, instead of giving type 2 additional rents in order to privatize larger volumes and to reveal his type. If demand uncertainty is low, type 3's volume decreases and type 2's rents decrease. In this case, the agent's personal reform attitude gains in importance. Hence, it is not worthwhile for the government to induce anti-reformers with high demand to privatize larger volumes, given that this involves the payment of higher rents to pro-reformers.

5. Voucher privatization

The following subsection briefly discusses the organisational changes involved by the introduction of vouchers and how these led to more information for the government about the local privatization demand. The remainder of this section analyses the effect of more information on the volume of privatization and the rents of local bureaucrats in the framework of the modified model.

5.1 Changes in the privatization process

In the end of 1992, each Russian citizen received one voucher with a nominal value of 10,000 Roubles. Vouchers were tradeable privatization coupons that had to be exchanged for enterprise shares in a given deadline (June 1994). Within this time, privatization was almost exclusively possible by means of vouchers, i.e. the privatization for cash was temporarily suspended. There were four ways to make use of one's voucher: purchase shares of the enterprise in which the worker was employed, participate in voucher auctions of other enterprises' shares, transfer the voucher to investment funds, or sell the voucher for cash.

The so-called "voucherisation" changed the information structure of privatization considerably. First, vouchers generated information concerning the privatization demand. As a sort of options for privatization, demand for vouchers reflected both current and future privatization demand. This was due to the mandatory, almost exclusive use of vouchers as means of privatization in this privatization phase. Voucher price differentials on local markets indicated differences in the local privatization demand. The Izvestiya of 20 April, 1993, for instance, reports voucher prices between 3,800 Rbl. in Lipetsk and 4,400 Rbl., in St. Petersburg, i.e. some 16% difference.

Second, voucherisation affected the degree of discretion of local bureaucrats in the privatization process. Before, a local bureaucrat could manipulate the data concerning privatization initiatives or block their proceeding. Moreover, the local bureaucrat's discretion to choose a non-public privatization method allowed her to pretend that a low privatization volume was due to a lack of privatization demand. Vouchers took away a large part of this discretion. One reason is that voucherisation gave an incentive

to insiders to apply for privatization and to make sure that the application was proceeded. Insiders were granted large benefits if they corporatised their enterprise, i.e. transformed the state-owned enterprise to a joint stock company, and applied for privatization. Besides two other options among which insiders could choose, they could purchase up to 51% of their enterprise's shares after having corporatised the firm. Moreover, vouchers could be used to pay for these shares. Since the basis for the share price was the balance-sheet value of the assets, and no significant inflation adjustment took place, the voucherisation amounts to a large-scale give-away scheme to insiders¹. The only costs involved were the non-monetary effort of taking the privatization initiative, and carrying out the necessary actions to assuring that the initiative was proceeded within the extremely tight deadlines set by the government.

Another reason was that local bureaucrats lost their discretion of choosing a method of sales. Indeed, following a corporatisation, all shares that had not been purchased by the insiders had to be sold by voucher auctions, except for a maximum of 20% that would be kept by the state. These auctions had to be announced publicly in newspapers, and the demand became visible since all bids were registered. As a result of this transparency and the standardisation of the privatization process, the local bureaucrat had no means to interrupt the sales process unilaterally.

5.2 The model in the case of voucherisation

As a consequence of voucherisation the government learns about the local privatization demand before designing the contracts. To keep the analysis simple, I assume that the signal concerning the local privatization demand does not contain any noise. Hence,

¹ See Frydman, Rapaczynski and Earl (1993) for a discussion of insider benefits in the Russian

only the informational asymmetry concerning the local bureaucrat's reform attitude prevails. G is thus confronted with a simple one-dimensional adverse selection problem. Comparing the volume of privatization before and after voucherisation leads to Proposition 2.

Proposition 2: Voucherisation and the volume of privatization

If, before voucherisation, demand uncertainty was low or intermediate, all types privatize more (or at least the same) than before voucherisation. However, when demand uncertainty was high before the introduction of vouchers, the volume of privatization of the anti-reformer with high privatization decreases due to voucher privatization, while the other types privatize more or the same as before.

Proposition 2 establishes the major result of this paper. In general, due to the additional information provided by voucherisation, the government can induce the local bureaucrat to increase their volume of privatization. However, the anti-reformer with high demand may reduce her volume of privatization. It is interesting to note that this is the case only if the demand uncertainty is high, and, thus, vouchers are most useful.

The intuition for Proposition 2 is that type 3 loses her rents that were due to her private knowledge about the local privatization demand. Before voucherisation, she was offered the same contract as type 2 if demand uncertainty was high. Now, knowing the local privatization demand, separation of type 1 and type 3 is feasible, since no rents must be paid to type 2. In the respective contract the anti-reformer does not receive any rents. This, however, does reduce her incentive to privatize. In other words: more information may reduce the volume of privatization, i.e. the speed of

privatization.

reform, since the government's incentive to extract rents may become stronger than the incentive to increase privatization volume.

6. Conclusion

This paper shows that more information for a reform-minded government may not necessarily involve that the speed of reforms are pushed ahead. Actually, the government's interest to save rents may be stronger than the one of accelerating reforms. Consequently, while in general, more information leads to quicker reforms at lower costs, there may be less speed of reforms at less costs.

Due to its setup in which the government has all bargaining power, the model is not suited to analyze issues of political conflict that have played a major role in the Russian voucher privatization. However, the fact that after voucherization, anti-reformers are revealed that before were hidden behind pro-reformers, is nicely matched with the political situation in 1992/93. In this period in which voucher privatization was first discussed, then implemented, pro- and anti-reform camps clearly emerged. Voucher privatization actually was the single most attacked reform, an indicator that many saw substantial rents at stake.

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8. ^{AP}APPENDIX

Appendix (i) - Sketch of proof for the transformation of the initial model into the form "LDIC's, IR, MC":

The proof follows the lines of Hart (1983). The first step shows that the constraints of the initial model imply the LDIC's, IR and MC. Then, it is shown that in the optimum all LDIC's are binding. The last step checks that the solution satisfies all constraints of the initial model.

Step 1: The LDIC's and IR are implied by the constraints of the initial model. Rests to show that the initial model also implies MC. For $\Theta_j > \Theta_i$, the IC's are given by $t_i - \Psi(\Theta_i, e_i) \geq t_j - \Psi(\Theta_j, e_j)$ and $t_j - \Psi(\Theta_j, e_j) \geq t_i - \Psi(\Theta_i, e_i)$
 $\Rightarrow \Psi(\Theta_i, e_i) - \Psi(\Theta_j, e_j) \geq \Psi(\Theta_j, e_j) - \Psi(\Theta_i, e_i)$. Since Ψ convex and $\Theta_j > \Theta_i$, the IC's imply $e_i > e_j$, i.e. MC.

Step 2: Assume the LDIC's are not binding in the optimum, i.e. $u - \Psi(\Theta_i, e_i) > u_{i+1} - \Psi(\Theta_i, e_{i+1})$. Then, the government would be better off by slightly raising the effort levels of all types $j \leq i$. This contradicts the fact that we are in the optimum.

Step 3: All IC's (upward and downward) and the IR have to be satisfied by the solution of the modified model. The proof utilises the Spence-Mirrlees condition which for our model is represented by $[-\partial u_i / \partial e_i] / [-\partial u_i / \partial e_i]$ decreasing in i , and the fact that LDIC's are binding $\forall i$. Spence-Mirrlees implies that, if type i is indifferent between two contracts (e^*, t^*) and (e^{**}, t^{**}) with $e^* \leq e^{**}$, his upward neighbour (the "better" type) $i-1$ will (weakly) prefer (e^{**}, t^{**}) . Type $i+1$, the downward neighbour, will (weakly) prefer (e^*, t^*) . Hence, binding LDIC's imply that the local upward IC's are satisfied: $u - \Psi(\Theta_i, e_i) = u_{i+1} - \Psi(\Theta_i, e_{i+1}) \Rightarrow u - \Psi(\Theta_{i+1}, e_i) \leq u_{i+1} - \Psi(\Theta_{i+1}, e_{i+1})$. Moreover, locally (upward and downward) satisfied IC's imply global (upward and downward) IC's, and IC's together with IR of the "worst" type imply the other IR's. ■

Appendix (ii) - Proof of Lemma 1:

Equation (7) is maximised in regard to privatization volumes e_i . The first order conditions are:

$$\frac{\partial \mathcal{L}}{\partial e_1} = (\alpha_p - \alpha) - \frac{\partial \Psi_1}{\partial e_1} = 0$$

$$\frac{\partial \mathcal{L}}{\partial e_2} = (\alpha_p - \alpha)(1 - \nu)p - \nu\gamma \frac{\partial \Psi_1}{\partial e_2} - (1 - \nu)p \frac{\partial \Psi_2}{\partial e_2} = 0$$

$$\frac{\partial \mathcal{L}}{\partial e_3} = (\alpha_p - \alpha)\nu(1 - p) - [\nu\gamma + (1 - \nu)p] \frac{\partial \Psi_2}{\partial e_3} - \nu(1 - p) \frac{\partial \Psi_3}{\partial e_3} = 0$$

$$\frac{\partial \mathcal{L}}{\partial e_4} = (\alpha_p - \alpha)(1 - \nu)(1 - p) - [\nu + (1 - \nu)p] \frac{\partial \Psi_3}{\partial e_4} - (1 - \nu)(1 - p) \frac{\partial \Psi_4}{\partial e_4} = 0$$

Substituting for $\frac{\partial \Psi_i}{\partial e_{i+1}} = \frac{\partial \Psi_{i+1}}{\partial e_{i+1}} - \frac{\partial \Psi_i}{\partial e_{i+1}}$, and solving for e_i yields privatization volumes (9.1) to (9.4) in Table 1 (see the following page).

It can be easily checked that these privatization volumes satisfy the MC of the initial programme (7) only in case (b). If the demand ratio is larger or equal d^{**} , optimisation of the initial programme leads to privatization volumes that violate MC of (7), since $e_3 \geq e_2$. Furthermore, this MC is also violated if the demand ratio is smaller or equal d^* , since $e_4 \geq e_3$. Thus, optimisation of the initial programme only leads to feasible effort levels in case (b), where MC is satisfied.

The parameter range of case (b) is non-empty iff two conditions are satisfied: First, the interval defined by (8.2) has to be positive. This amounts to $\frac{\nu^2(1-p)}{\nu(1-p) + p(1-\nu)} < \frac{\gamma\nu}{\gamma\nu + p(1-\nu)} \Leftrightarrow \frac{\nu(1-2p) + p}{\nu(1-p)} > \frac{\gamma\nu + p(1-\nu)}{\gamma}$. The left hand side of this expression being > 1 , it is sufficient to show that the right hand side is < 1 . Setting the right-hand side equal to 1 yields $\nu\gamma + p(1-\nu) = \gamma \Leftrightarrow p(1-\nu) = \gamma(1-\nu)$ which is false since $\gamma > p$. Second, d^{**} has to be larger than 1, since by definition $\bar{d} > \underline{d}$. This is equivalent to

$\gamma - (\gamma - 1) \frac{\nu^2(1-p)}{\nu(1-p) + p(1-\nu)} > 1$. The condition is satisfied, since the last term on the left hand side is smaller 1, ν and $p(1-\nu)$ being ≤ 1 . ■

Appendix (iii) - Modifications of the initial programmes, Case (a):

MC: $e_1 > e_2 = e_3 > e_4$. The new MC implies that, first, the IC of type 1 is written in regard to the bunched type 2,3. Second, there is only one IC for the latter type. Let $e_{2,3}, t_{2,3}$ be the effort and transfer of type 2,3. Then, type 2,3's IC is $U_{2,3} = t_{2,3} - \Psi(\Theta_2, e_{2,3}) \geq t_4 - \Psi(\Theta_2, e_4)$. Obviously, only the disutility of type 3 must be considered. Type 2's IC can't be binding, since for any given effort her disutility is lower than type 3's disutility. The rent functions of the respective types are:

$$r_1(e_{2,3}) = \Psi(\Theta_2, e_{2,3}) - \Psi(\Theta_1, e_{2,3})$$

$$r_2(e_{2,3}) = \Psi(\Theta_2, e_{2,3}) - \Psi(\Theta_2, e_{2,3})$$

$$r_3(e_4) = \Psi(\Theta_1, e_4) - \Psi(\Theta_2, e_4)$$

Substituting for the binding constraints and transfers yields a programme the first order conditions of which yield privatization volumes (10.1) to (10.3) in Table 1. It can be easily shown that the alternative programme that entails MC: $e_1 > e_2 = e_3 = e_4$ leads to $e_{2,3,4} \leq e_{2,3}$. Consequently, the IC's of both type 2 and type 3 with respect to type 4 are not binding. But then, the government can increase its payoff by increasing the privatization volume of types 2 and 3 up to $e_{2,3}$.

Case (C): MC: $e_1 > e_2 > e_3 = e_4$. In the case of low demand uncertainty, the system of equations consists of type 1's IC in regard to type 2, the IC of type 2 in regard to the new type 3,4, and the IR of type 4. The same procedure as before leads to the respective privatization volumes [(11.1 to (11.3) in Table 1].

Table 1: Privatization volumes in the different cases

(all privatization volumes are multiplied by $(\alpha_1 - \alpha_2)$)

Case (h)	Case (a)	Case (c)	Case (d)
(9.1) $e_{1a} = \frac{1}{2\Theta_1}$	(10.1) $e_{1a} = \frac{1}{2\Theta_1}$	(11.1) $e_{1a} = \frac{1}{2\Theta_1}$	(12.1) $e_{1a} = \frac{1}{2\Theta_1}$
(9.2) $e_{2b} = \frac{(1-\nu)}{2(\Theta_1 - \nu\Theta_2)}$	(10.2) $e_{2,3a} = \frac{\nu(1-p) + p(1-\nu)}{2(\Theta_1(\nu - \nu p + p) - \nu p\Theta_2)}$	(11.2) $e_{2c} = \frac{(1-p)}{2(\Theta_1 - p\Theta_2)}$	(12.2) $e_{2d} = \frac{1}{2\Theta_1}$
(9.3) $e_{3a} = \frac{\nu(1-p)}{2(\Theta_1(\nu - \nu p + p) - p\Theta_2)}$	(10.2) $e_{2,3a} = \frac{\nu(1-p) + p(1-\nu)}{2(\Theta_1(\nu - \nu p + p) - \nu p\Theta_2)}$	(11.3) $e_{3,4c} = \frac{(1-\nu)(1-p)}{2(\Theta_1 - \nu\Theta_2)}$	(12.3) $e_{3d} = \frac{(1-p)}{2(\Theta_1 - p\Theta_2)}$
(9.4) $e_{4b} = \frac{(1-\nu)(1-p)}{2(\Theta_1 - (\nu - \nu p + p)\Theta_2)}$	(10.3) $e_{4a} = \frac{(1-\nu)(1-p)}{2(\Theta_1 - (\nu - \nu p + p)\Theta_2)}$	(11.3) $e_{3,4c} = \frac{(1-\nu)(1-p)}{2(\Theta_1 - \nu\Theta_2)}$	(12.4) $e_{4d} = \frac{(1-p)}{2(\Theta_1 - p\Theta_2)}$

Appendix (iv) - Proposition 1

All statements in Proposition 1 relate to the privatization volumes presented in Table 1.

a) Straightforward, since e_1 is identical in all cases and only depends on Θ_1 .

b) See proof of Lemma 1.

c) First, we show that $e_{2b} < e_{2,2b} < e_{2b}$. The right hand side: $e_{2,2b} < e_{2b} \Leftrightarrow \gamma - \gamma \frac{v^2(1-p)}{v(1-p)+p(1-v)} - \frac{v(1-vp)+p(1-v)}{v(1-p)+p(1-v)} > \frac{\bar{d}}{d}$. Since the left hand side of this condition is smaller d^{**} , $e_{2,2b} < e_{2b}$ is satisfied in case (b). The left hand side: it can be easily checked that $e_{2,2b} > e_{2b}$ is equivalent to the right hand side of (8.2).

Second, since $e_{4a} = e_{4b}$ (see Table 1), and $e_{2b} > e_{4b}$ (as shown in the proof of Lemma 1) $e_{2,2b} > e_{4a}$.

d) $e_{2c} > e_{2b} \Leftrightarrow p(1+\bar{d}/d+p) < v(1+\bar{d}/d+v)$.

Type 2 privatizes more than type 3,4 iff $(\Theta_1 - v\Theta_2) > (1-v)(\Theta_2 - \Theta_1) \Leftrightarrow (\bar{d}/d)(\gamma - 1) > -p(1-v)$, which is true since $\gamma > 1$.

$e_{4a} > e_{3,4c} \Leftrightarrow \Theta_1(v - vp + p) > v\Theta_2$, which is true by assumption. $e_{3,4c} > e_{2b}$

iff $\frac{\bar{d}}{d} < \gamma \frac{v(1-p)+p(1-v)-v^2(1-p)}{\gamma v + p(1-v) + v^2}$. d^* , the lower bound for case (b), can be expressed as

follows: $\frac{\bar{d}}{d} > \gamma \frac{v+p(1-v)}{\gamma v + p(1-v)}$. Obviously, the right hand side of the first condition is smaller than

the right hand side of the second condition. Consequently, in the parameter range defined by (8.2), $e_{3,4c} < e_1$.

e) Follows from the respective rent functions and the established ranking of privatization volumes.

Appendix (v) - Proposition 2

If local privatization demand is known, the agents privatize the volumes (12.1) to (12.4). For the first part of the proposition we compare the privatization volumes of the four types with and without information on demand for the parameter ranges defined by cases (b) and (c). Type 1's effort is constant in all cases. We thus only regard types 2, 3 and 4.

Type 2: $e_{2d} > e_{2b}$ and $e_{2d} > e_{2c} \Leftrightarrow \Theta_2 > \Theta_1$, true by assumption.

Type 3: $e_{3d} < e_{3b}$ iff $(\bar{d}/d) > v + \gamma - v\gamma$. Since the right-hand side of this condition is larger than the upper bound of (8.2), $e_{3d} > e_{3b}$.

$e_{3d} > e_{3,4c} \Leftrightarrow (1-v)(\Theta_2 - p\Theta_1) < \Theta_1 - v\Theta_2 \Leftrightarrow (1-v)(\gamma - 1) < (\bar{d}/d)(\gamma - v)$ which is true since $(1-v) < (\bar{d}/d)$, and $(\gamma - 1) < (\gamma - v)$.

Type 4: $e_{4d} < e_{4b}$ iff is smaller than the lower bound of the interval, which defines case (b). Hence, $e_{4d} \geq e_{4b}$.

$e_{4d} > e_{3,4c} \Leftrightarrow (1-v)(\Theta_1 - p\Theta_1) < \Theta_1 - v\Theta_2 \Leftrightarrow p\Theta_1(v-1) < v(\Theta_1 - \Theta_2)$, true since $v \leq 1$.

The second part of the proposition refers to privatization volumes in parameter range (a):

Type 2: $e_{2d} < e_{2,b}$ iff $\bar{d}/\underline{d} < \gamma + \frac{vp(\gamma-1)}{v(1-2p)+p}$. Since, by definition, $\bar{d}/\underline{d} < \gamma$, $e_{2d} > e_{2,b}$.

Type 3: $e_{2,b} > e_{2d} \Leftrightarrow [p(1-v)+v(1-p)](\Theta_2 - p\Theta_1) > (1-p)[\Theta_1(v-vp+p) - vp\Theta_1] \Leftrightarrow \Theta_2 > \Theta_1$,
 which is true by definition.

Type 4: $e_{4d} > e_{4b}$, since $e_{4d} > e_{4b}$ and $e_{4b} = e_{4a}$.

■