Privatization, Technology Choice and Aggregate Outcomes

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March 1995

Discussion Paper No. A-474

Keywords: privatization, transition, technology choice, multiple equilibria, demand spillovers

JEL Classification: O33, P00, E62, H32

I thank Dieter Bös, Giacomo Corneo, Monique Ebell and Christoph Lülfesmann for helpful comments. Special thanks are extended to Philipp Harms and Anke Kessler. Financial support by SFB 303 at the University of Bonn, is gratefully acknowledged.

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Abstract

We present a general equilibrium model of imperfect competition to analyze different policy measures in transition economies. Due to strategic complementarities in technology choice and demand spillovers, the possibility of multiple macroeconomic equilibria arises. Those equilibria can be Pareto-ranked. Equilibria where modern technologies are employed are preferable. Technology adoption crucially depends on how property rights are distributed and which method of privatization is chosen. The existence and occurrence of 'good' equilibria is extremely fragile with respect to policy. Contrary to conventional wisdom, we show that a broad distribution of ownership rights can have favorable influence on micro-economic efficiency and may therefore lead to a 'good' aggregate outcome. Sales to single or core investors, if accompanied by workers' equity shares, may perform worse. Furthermore only a Big Bang approach to privatization might lead to favorable outcomes.

1 Introduction

The transformation of centrally planned into decentralized market economies is one of the most important economic issues of our time. The apparent failure of the old systems to adjust to modern conditions and to meet the needs of the population led to the belief that only dramatic alterations of the economic structures could improve matters. Many considerations are at stake. The first is to generate a more efficient way to allocate resources. After the political cover was lifted during the political overturn, hard facts about the enormous dimension of misallocations in the communist regimes surfaced. Industrial structure and factor productivity in Central and Eastern Europe were in an extremely bad state. Second, the rapid improvement of living standards is an important objective. Specifically in the transition economies, this is a necessary condition to make the reform process politically sustainable. Moreover, the distribution of wealth and income is an issue.

Several *general* policy measures are held to be important to yield a better allocation [Boycko et al. (1993)]. The privatization of state firms coupled with the installation of product market competition are seen as the main devices to insure micro-economic efficiency. Privatization is mainly a means of yielding efficient equity governance, insuring that decision makers receive the benefits from their actions. However, the question why a privatized market economy performs better than a centrally planned is still an open one. The issue dates back to the famous Hayek-Lerner-Lange debate of the forties. The latter two authors argued that a planned economy might at least result in as good an outcome as a market system, because it could always mimick it. Hayek, on the opposite, was convinced that the beneficial thrives of Schumpeterian entrepreneurship could only be exploited in a system of decentralized individual decision making. We are not going to solve the problem, but adopt the main argument for privatization of Boycko et al. (1993): state owned firms are ‘politicized’, and the main objective of politicized firms is not to allocate efficiently, but to satisfy interests of bureaucrats and politicians. To prevent social unrest and maintain their power, those groups favor excess employment, ineffective locations or underpricing of output. This is different in privately owned firms, where profit is the main interest of the holders of property rights. Thus an important target of privatization is to keep the influence of the political system on the allocation process small.

In this paper we analyze the macroeconomic impact of several policies suggested for the privatization process in transition economies. Our focus will be on the interaction of property rights, technology choice and aggregate outcomes, and on whether a gradualistic or 'Big Bang' approach of transition is more promising. We show that the ‘better’ the incentive structure of a firm and the higher aggregate income of the economy, the more productive the technology chosen by a single firm. High productivity means high profit that becomes a source

of demand in other sectors. This aggregate demand spillover can lead to multiple *macroeconomic* equilibria [Murphy et al. (1989)]. If only few firms invest to modernize production structures, resulting aggregate income may not be sufficient to make those investments profitable. If, on the other hand, new technologies are adopted in many sectors, resulting profits can increase income enough to support the investment strategy. There exists a *critical mass effect*, and hence also the speed of overall transition will have enormous impact on restructuring decisions that are made by single firms. Related models focussing on aggregates influencing micro activity are Laban and Wolf (1993) and Roland and Verdier (1994). In these papers the *endogenous* mechanism driving multiple equilibria is *political*. We associate multiple aggregate equilibria with the possibility of an entire economy leaving a poverty trap by the *endogenous choice of factor saving technologies*.

When the governments of the former socialist block started to design their privatization programs, special political attention had to be paid.[1] On the micro-level, the upsurge of firms' efficiencies and thus a better supply of consumption goods was an important aim. In many of the reform economies, output had already fallen by 5-15 percent per year during the turbulent transition from one political system to another. This slump started to affect the population after a lag,[2] and there were severe concerns that the decline might be accredited to the new market system by the 'man on the street'. Another objective was a 'fair' distribution of assets and ownership rights, which is supposed to generate political support for reforms and to make the transformation process irreversible [Roland and Verdier (1994)].

Generally, efficiency objectives are assumed to speak for the sale of firms to individual investors. Lipton and Sachs (1990), Bolton and Roland (1992) and Tirole (1991) argue that widespread ownership reduces proprietors' incentives to monitor firms and, hence, decreases management incentives to restructure and modernize enterprises. Distributional and political targets are held to favor the widespread sale or distribution of shares [Boycko et al. (1994)]. Even the proponents of 'mass privatization', however, are critical about this approach for economic reasons. Boycko et al. state '... it is hard to deny that conventional sales have better efficiency properties.'[3]

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[1] For surveys about the privatization targets and different policy proposals to reach them see, e.g. Boycko et al. (1994), Blanchard et al (1991), Frydman and Rapaczynski (1991a,b) or Bolton and Roland (1992).

[2] The first sectors to experience the fall in most countries were heavy industries, such as steel, machinery and the quantitatively important armament production. The decline in the supply of basic consumption goods, which affected the population most, set in later.

[3] Interestingly, in many privatization programs, the raising of government funds by the sale of firms does not *appear* to be a priority objective. Ownership rights should not go into the hands of foreigners on a large scale. The native population, on the other hand, is extremely wealth constrained, and sums of relevant size could not have been raised, anyway. Nevertheless, there are good reasons for this type of fund raising. Tax systems in transition economies are underdeveloped. Thus, sufficient revenues to restructure governmental institutions and public infrastructure cannot be generated through taxation [Bolton and Roland (1992)]. Additionally, taxation induces distortions and is, therefore, costlier than firm sales. However, those individuals who could afford to

We challenge this conventional point of view. Under reasonable assumptions about the legal systems in the reform countries, the larger the number of shareholders, the better the managerial incentives. Thus efficiency may be pushed by 'mass privatization' and this privatization scheme can be shown lead to a preferable economic outcome as well as meeting the specific political constraints. Sales to single investors if accompagnied by workers equity shares may perform significantly worse. Taking into account the higher speed at which an economy can be restructured by widespread distribution of shares, we show that only such a Big Bang approach can lead to favorable equilibria.

The paper is organized as follows: the next section describes the basic model which is a version of Hansen's (1995) modification of the seminal paper by Murphy et al. (1989). We chose a general equilibrium model with imperfect competition because we think that this market structure describes the situation in reform countries well. Many of these countries had huge state-owned monopolists in each sector. Section 3 will formally provide conditions for the existence of macroeconomic equilibria. In section 4 we analyze piecemeal selling to single investors. For political reasons, this strategy very often is only possible if workers receive considerable equity shares in the firm they work. We show that this sort of worker participation, as well as 'wage equity swaps', have detrimental effects on technology choice and may thus be harmful. Section 5 focuses on mass privatization. This scheme may lead to the adoption of highly productive technologies throughout the economy, thus increasing output and welfare. In section 6 we briefly discuss why in our model a Big Bang approach to transition is beneficial. Section 7 addresses normative issues. The paper closes by drawing conclusions and discussing promising fields for future research.

2 The Basic Model

Our analysis is restricted to closed economies. In fact, demand spillovers may not play an important role if world trade is free and costless. However, we think that the above assumption is appropriate. As argued by Murphy et al. (1989), in most countries the domestic demand has a dominant influence on output. Specifically, the reform economies were forced to rely heavily on domestic structures after the political overturn. International trade virtually broke down in Central and Eastern Europe. The dollar value of exports in the (former) Soviet Union dropped by 58 percent from 1988 to 1991. The figures for Czechoslovakia, Rumania and Bulgaria are 73, 64 and 78 percent, respectively. Imports follow the same path. Therefore the domestic market was (and is) very important during the transition process.

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pay large sums for assets are often not very popular in the broad population. Selling to them may be politically infeasible [Boycko et al. (1994)].

We use a simple example of a general equilibrium model with imperfect competition developed by Shleifer and Vishny (1986) and Murphy et al. (1989) and modified in Hansen (1995). There exists a continuum of different goods $x(i)$ defined over the unit interval. The representative consumer is assumed to have the Dixit-Stiglitz preferences

$$u = \exp\left(\int_0^1 \log x(i)\, di\right),$$

over the consumption quantities $x(i)$ of these goods. u is just an ordinary Cobb-Douglas utility function with constant marginal utility of income.[4] The specification results in an elasticity of substitution of 1 between any two goods. The elasticity of demand for good i with respect to its price unity, too. Goods are imperfect substitutes for one another.

Each good is produced in its own sector and may be supplied by two types of firms. First, each sector has a competitive fringe that uses the constant returns to scale (CRS) technology $x^s(i) = l_i$. $x^s(i)$ is the output and l_i the labor employed in the fringe of sector i. We will denote that kind of production system *basic* in the remainder of the paper. Second, the goods may also be produced by a unique firm in each sector having access to an increasing returns to scale (IRS) technology. This firm can be associated with state-owned enterprises that existed in the communist regimes. The fringe stands for the possibility to produce any good in small scale manufacturing. If the huge firms did not serve the consumers' needs sufficiently (too high prices, low quantity or quality), many people in those countries relied on some sort of 'home production' or small businesses. The IRS firm can produce with the marginal productivity of labor $\alpha \geq 1$, but has to 'invest' F units of labor to set up the production process (overhead costs). The productivity factor α can be influenced by entrepreneurial effort $e_i \geq 0$, $\alpha = \alpha(e_i)$, with $\alpha(0) = 1$, $\alpha' > 0$, $\alpha'' < 0$. The effort improves the organizational structure of the firm, for instance by making hierarchies more efficient or monitoring the workforce to avoid shirking. One can also think of restructuring an obsolete manufacturing process. A well-designed organization of the firm saves labor given any level of output.The IRS monopolist[5] in each sector decides to set up the IRS or *modern* technology if the revenues from high productivity production are sufficient to cover the fixed setup cost and the disutility of managerial effort $V(e_i)$. The entrepreneur-owner in sector i can employ e_i to maximize utility

$$v_i = \pi_i - V(e_i), \quad V' > 0, V'' \geq 0, V'(0) = 0.$$

She gets the firm's profit

[4] This utility is used in part 3 of Murphy et al. (1989). Especially in section 5 of our paper calculations are simplified by the constant marginal utility of income (risk neutrality).

[5] Note that the single monopolist that may enter is not just an assumption. With *Bertrand* price competition between the firms of each sector, at most one firm will enter and pay the fixed cost in equilibrium.

$$\pi_i = x(i)\left[p_i - \frac{w}{\alpha(e_i)} \right] - w F.$$

p_i denotes the price of good *i*, and *w* is the competitive market wage rate. The term in square brackets is the difference between price and marginal cost per unit of output. By knowing that utility is linear in income, we could substitute profit in the manager's utility function.

We assume *Bertrand* price competition. Because of the unit elasticity of demand and the competitive fringe that the entrepreneur faces, the profit maximizing price for a monopolist that enters the market will be equal to the production cost of the fringe. Hence $p_i = w$ and the IRS firm captures the whole market for the product.[6] We *normalize* the market wage rate to unity. Thus $p_i = 1, i \in [0,1]$. Together with the Cobb-Douglas preferences, this implies that constant and equal fractions of income will be spent on each good in equilibrium, *independent of the market structure*. Due to our continuum of goods in the unit interval, this results in a demand for *each* good equal to aggregate income *Y*. The *i*th firm's profit is then

$$\pi_i = \frac{\alpha(e_i) - 1}{\alpha(e_i)} Y - F = a(e_i)Y - F,$$

where $a(\cdot) \equiv (\alpha(\cdot) - 1) / \alpha(\cdot)$.

The economy is endowed with a continuum of inelastically supplied labor of mass *L*.[7] Aggregate income is the 'sum' of all profits $\Pi \equiv \int \pi_i \, di$ plus the income of the workforce,

$$Y = \Pi + L.$$

If a fraction *n* of the sectors in the economy adopts a modern technology with effort *e*, aggregate profits are $\Pi(n) = n[a(e)Y - F]$. This yields aggregate income as a function of the fraction of sectors adopting modern technologies and the efforts exerted in those sectors,

$$Y(n,e) = \frac{L - nF}{1 - n\,a(e)}.$$

It is now easy to derive the impact of changes of the fraction adopting an IRS technology and of the entrepreneurial efforts on social product *Y*,

$$\frac{\partial Y}{\partial n} = \frac{\pi(n)}{1 - n\,a(e)}, \qquad (1)$$

$$\frac{\partial Y}{\partial e} = \frac{n a'(e)}{1 - n\,a(e)} Y > 0.$$

$\pi(n)$ is the profit of an investing firm if a fraction *n* modernizes. The first equation tells us that the firm's profit is distributed via the entrepreneur's income on all sectors in the economy. If

[6] One may imagine that the monopolist sets a price ε below the fringes' production cost and then satisfies all demand for good *i*.

[7] To make investment in IRS technologies possible at all, of course $L > F$.

this profit is positive, it raises profits in all other modernized sectors. The sole effect of the firm's profit is magnified by the multiplier $1/(1-n\,a) > 1$, which is increasing in the number of firms that produce under modern conditions and in the restructuring efforts. The second equation tells us about a similar effect induced by every monopolist increasing its marginal productivity in production, thus raising its profit. In turn, the action influences the profits of all other modern firms. An alternative interpretation of the above formulae from the supply side point of view is as follows: a firm's investment leads to a higher productivity of labor. This causes a profit exactly equal to the net labor saved. This effect is displayed by the numerator of (1). The saved labor moves into all sectors of the economy and increases output there. However, the marginal product of labor is higher in modern sectors. The more sectors adopt an IRS technology, the stronger the resulting output effect. This is described by the denominator of (1), which gives us the average of marginal labor costs across the economy.

The entrepreneurs in each sector have two decisions to make: they decide whether to enter the market by incurring the fixed cost *F* or to stay outside. If they enter, they decide upon the technology which is implemented to influence labor productivity.

3 Multiple Nash Equilibria in Technology Choice

We will now formally characterize the game structure. There is a continuum of players, the entrepreneurs, $i \in [0,1]$. Each player chooses a strategy, the effort, $e_i \in \Re_+ \cup \{0\}$ to select the technology $\alpha(e_i)$. $e_i = 0$ implies that in sector *i* basic CRS production with no fixed cost will take place. The payoff of player *i* is defined by $v_i = v_i(e_i, e_{-i})$. It is the indirect utility function consisting of the profit π_i minus the effort-cost term *V*. $e_{-i} = \{e_j | j \in [0,1] \setminus i\}$ are the actions of all other players determining aggregate income.[8] A *Nash Equilibrium* (*NE*) of the game is a continuum of strategies (e_i^*, e_{-i}^*) with $e_i^* \in \arg\max_{e_i} v(e_i, e_{-i}^*)$ for all $i \in [0,1]$.

The decision process of agent *i* is as follows. Her optimal effort is given by

$$a'(e_i^*)Y(e_{-i}) - V'(e_i^*) = 0,^{9} \tag{2}$$

if and only if

$$v_i(e_i^*, e_{-i}) = a(e_i^*)Y(e_{-i}) - F - V(e_i^*) \geq 0. \tag{3}$$

The entrepreneur takes as given aggregate income. If $v_i(\cdot) < 0$, no IRS firm is set up in sector *i*. The strategies in our game are *strategic complements* if $de_i^*/de_{-i} > 0$. If (3) holds, firm *i* earns strictly positive profits. Then, by symmetry, this holds for all investing firms, implying $dY/de_{-i} > 0$. From (2), $de_i^*/dY = -a'/(a''Y - V'') > 0$, and therefore the strategies of the

[8] Because of the continuum of agents, entrepreneur *i* has no noticeable own influence on aggregate income.

[9] Due to $\alpha'' - 2\alpha'^2 \leq 0$ the second order condition holds.

investing players are strategic complements. Due to symmetry and the convexity assumptions, only symmetric *NE* can exist. If $v_i > 0$ for a single entrepreneur *i*, then $v_i > 0$ for all $i \in [0,1]$, and vice versa. Therefore, in any *NE* $n^* \in \{0,1\}$.

Proposition 1 (Nash Equilibria of the game):

a) There exists a unique NE where nobody adopts an IRS technology if and only if

$$v_i(e^*, e^*) = a(e^*)\frac{L-F}{1-a(e^*)} - F - V(e^*) \tag{3}$$

is ***negative****, where* e^* *is given by* $a'(e^*)(L-F)/(1-a(e^*)) = V'(e^*)$.

b) There exists a unique NE where everybody industrializes if and only if

$$a(e_i^*)L - F - V(e_i^*) \tag{4}$$

is ***positive****, where* e_i^* *is given by* $a'(e_i^*)L - V'(e_i^*) = 0$.

c) There co-exists an equilibrium where everybody invests and an equilibrium where nobody invests if and only if (3) *is positive, where* e^* *is given by* $a'(e^*)(L-F)/(1-a(e^*)) = V'(e^*)$ ***and*** (4) *is negative, where* e^* *is given by* $a'(e^*)L - V'(e^*) = 0$.

Proof: see Hansen (1995).

Strategic complementarities can lead to multiple macroeconomic equilibria that display qualitatively very different features. Three situations may arise. In case a) the adoption of an IRS technology does not pay for entrepreneur *i* even if all other agents choose a modern way of production. Aggregate income is not high enough to induce a market size for firm *i*'s produce that is able to cover the fixed setup costs by operative profits. In this case, v_i is negative at the optimal e_i^* as calculated above, and the resulting effort of the manager-entrepreneur will be naught. If this behavior is optimal for entrepreneur *i*, it will be so for all the others. No IRS technology will be adopted. Situation b) is the opposite: assume everyone produces with the basic technology. Then the resulting market size is $Y = L$. If the optimization problem of a single firm results in an e_i^* such that $v_i(e_i^*, 0) \geq 0$, the firm will invest. Therefore, this is efficient for any firm, and the whole economy is adopting a modern technology. Case c) is most interesting from a theorist's as well as from a policymaker's point of view: it would not pay for a single firm to invest, because aggregate income just from wages is not sufficient to justify modern production. On the other hand, if many firms set up IRS processes, market demand will be pushed enough such that utility and profits for investing entrepreneurs are positive. We then have multiple equilibria.

We provide a simple example to show that multiple equilibria are generic and not just a theoretical curiosity.

Example 1: Suppose $\alpha = 1 + e$, $V = \vartheta e$. Then $e_i^* = -1 + \sqrt{Y/\vartheta}$ from the first order condition. If $n = 0$, $Y = L$. If $n = 1$, $Y = (1 + e_{-i}^*)(L - F)$. In that 'modern' structure, from (5) we have $e^* = (L - F - \vartheta)/\vartheta$. We choose the parameters $L = 10$, $F = 4$, $\vartheta = 5/2$. In slight abuse of notation, the argument of the following functions is the fraction of firms that adopt IRS technologies. Then $e_i^*(0) = 1$ and $v_i^*(0) = 5 - 4 - 5/2 = -1/2$, hence no adoption of IRS is an equilibrium. In that case $Y(0) = 10$. But $e^*(1) = 7/2$, $v_i^*(1) = 42/5 - 4 - 7/2 = 9/10$ and $Y(1) = 72/5$. Therefore, if everybody chooses to invest, it pays for any single entrepreneur. This gives us a second *NE*. Of course, the parameter values can be changed in ways to destroy one or the other equilibrium. With respect to small changes, however, the example is robust. Totally different parametrizations to yield qualitatively the same outcome are easily found.

The huge differences in output values of our example suggest that equilibria have different welfare properties. For shortness we restate the results proven in Hansen (1995):

Proposition 2 (welfare properties of multiple equilibria): If there exist multiple NE, they can be Pareto-ranked in order of the effort levels. Higher effort level equilibria Pareto-dominate lower effort level equilibria. Any NE with positive effort levels is not Pareto-efficient. The efficient efforts are higher than the equilibrium efforts.[10]

4 Workers' Equity Shares and Equity-Wage-Swaps

In the remainder of the paper, we apply the above model to transition policies. Two main schemes of privatization are used in the reform states. The first is to privatize to entrepreneurs while giving the firms' workers equity shares.[11] In this way, the apparent reluctancy of the concerned employees to endorse privatization may be broken. This method was chosen in countries such as Hungary and Poland.[12] A very different way to privatize is the (almost) free distribution of shares to the people, called 'mass privatization'. This method has been partly employed by the Czech Republic and Russia as 'voucher privatization'. In practice often a combination of workers' equity shares and the widespread distribution of ownership rights was

[10] Note that a unique *NE*, with nobody adopting IRS technologies, may be efficient. In such a case, even if the technology is chosen by the social optimizer, the market size is not large enough to justify spending the fixed setup costs.

[11] The pure sale of firms to single manager-owners, entrepreneurs or core investors has not become popular. Due to the wealth constraints mentioned and the insufficient state of capital markets, such sales are often only possible with low prices. This can cause distributional and thus political problems [Earle et al. (1993a)].

[12] In Poland, for example, privatization schemes gave at least 15 percent of the shares to the employees at extremely low prices. For a description of the various privatization programs see Earle et al. (1993a), Frydman et al. (1993b) and, in particular, Earle and Estrin (1995). The latter authors analyze 'right to manage' problems in employee-owned enterprises, which are beyond the scope of our paper.

chosen. In this section we analyze the sale to manager-owners with workers' equity shares. Section 5 focusses on mass privatization.

Assume that privatization to single entrepreneurs is only politically feasible if the workers get a share of the stocks. In order to gain the political support for the privatization of their firm, workers are given claims on profits. Given worker participation, aggregate income of the economy is $Y = \Pi^o + L + \Pi^w$, where Π^o and Π^w are the profit shares of entrepreneur-owners and workers, respectively. Denote the workers' share in firms $\lambda \geq 0$, then in the aggregate $\Pi^w = \lambda\Pi$ and $\Pi^o = (1-\lambda)\Pi$. The maximization problem of a single entrepreneur becomes $\max_{e_i} (1-\lambda)(a(e_i)Y - F) - V(e_i)$. It is solved by the optimal effort under worker participation $e_i^{*,\lambda}$,

$$(1-\lambda)a'(e_i^{*,\lambda})Y - V'(e_i^{*,\lambda}) = 0, \tag{5}$$

if adoption of a modern technology pays. Applying the implicit function theorem to (5), we obtain

$$\frac{de_i^{*,\lambda}}{d\lambda} = \frac{a'Y}{(1-\lambda)a''Y - V''} < 0.$$

Therefore the effort under worker participation is lower. The condition that a positive effort results at all, $(1-\lambda)[aY - F] - V \geq 0$, is also harder to fulfill, as follows from the envelope theorem. The microeconomic disincentive effect on entrepreneurial action is not surprising.[13] However, due to the aggregate influence of technology adoption, this effect may have immense impact on *macroeconomic* outcomes (and thus on welfare). From the discussion in section 3, we saw that high output equilibria require the adoption of relatively productive technologies.We therefore formulate

Proposition 3 (aggregate influence of worker participation): The higher the workers' share λ in profits, the smaller the parameter space that allows for high output equilibria. Any high output equilibrium is characterized by lower output than in the corresponding regime without worker participation. High output equilibria vanish completely if λ is sufficiently large.

The existence of high output equilibria is extremely fragile with respect to the microeconomic incentives. To illustrate this, we extend our example.

Example 2: We take preferences, technology and parameter values as in Example 1. Then, for $\lambda > .077$, the high output equilibrium vanishes. Hence, even relatively low rates of participation can have large aggregate impact. For $\lambda = .05$, the equilibrium with adoption of the modern technology implies managers' efforts of

[13] But note that the result differs significantly from the case of pure profit taxation in standard microtheory. Although formally the two cases are similar, no distortions are induced by the pure profit tax.

$e^* = 1.28$. Utilities from profits are .296 for the managers and .184 for the workers. The output is $Y = 13.68$. Thus a relative output loss of 36.8 percent may be incurred by a slight change of the participation rate of 3 percentage points.

In the following we argue that equivalent effects arise *even if the resulting profit of an entrepreneur remains the same* under a profit-share-wage-scheme that leaves the workers with the same income as in the benchmark case of section 3. In recent discussions about policy in transition economies, the strategy of a so called 'equity-wage-swap' was proposed [see e.g. Sinn and Sinn (1992), for the original idea see Weitzman (1985)]. A fixed wage rate may be too high to attract investors and, therefore, the economy remains in a low-technology, low-productivity trap. In the former socialist, as well as in many Western countries, wages result from the bargaining of large coalitions such as trade unions and employers' organizations. They are thus not necessarily market clearing but usually supposed to be above a competitive wage rate. Unemployment results. An 'equity-wage-swap' is designed to solve that problem in the following way: workers dispense with part of their wage rate. In turn, they receive claims on profits of the firm in which they are working.

It is straightforward to analyze the influence of 'equity-wage-swaps' in our model. Suppose the government implements schemes that give the workers the same income as at the going wage rate. That is, the government sets a fixed wage $\omega < 1$, and a profit share $\lambda > 0$ that leaves the workers indifferent. In an equilibrium with adoption of modern technologies by all firms, ω and λ then have to solve

$$L = \omega L + \lambda \Pi .$$

The optimization problem of a single entrepreneur who takes as given ω and λ then is $\max_{e_i} (1-\lambda)((\alpha(e_i) - \omega) / \alpha(e_i) \times Y - \omega F) - V(e_i)$. The optimal technology choice $e_i^{*,\omega}$ determined by the first-order condition reads

$$(1-\lambda) Y \omega \frac{\alpha'(e_i^{*,\omega})}{\alpha(e_i^{*,\omega})^2} - V'(e_i^{*,\omega}) = 0,$$

if $v_i(e_i^{*,\omega}, e_{-i}) \geq 0$. Using the implicit function theorem, we get

$$\frac{de_i^{*,\omega}}{d\omega} = -\frac{(1-\lambda) Y \alpha' / \alpha^2}{(1-\lambda) Y (\alpha'' \alpha - 2\alpha'^2) / \alpha^3 - V''} > 0 .$$

Hence, the entrepreneur's optimal effort *increases* in the fixed wage rate. This results from the substitution effect: if labor becomes more expensive, the adoption of a more productive, labor saving technology is more attractive. Any wage scheme with $\omega < 1$ will therefore lead to lower productivity by two effects: the *technology substitution effect* and the *disincentive effect* of the profit share the entrepreneur has to give away, which we already discussed above. Both effects work in the same direction. Since output is a function of the technology adopted, it will always

fall. Workers' incomes and utilities remain the same by definition of the paying scheme, but entrepreneurs' payoffs fall. We conclude

Proposition 4 (aggregate influence of wage-equity-swaps): Any wage-equity-swap in which workers receive parts of the profit instead of parts of the wage will reduce the parameter space that allows for high output equilibria. Any high output equilibrium is characterized by lower output and lower welfare than in the fixed wage regime.

The result stands in opposition to the generally very positive view of sharing schemes in the literature [see, e.g. Weitzman (1985)]. We do not claim to prove proponents of such paying schemes to be wrong, but we want to highlight economic consequences that are not seen or not held to be important in the discussion. Property rights on profits have strong influence on the question of whether to invest at all.[14] Factor costs will be a main motive for technology choice. In the real world, we see the most highly developed technologies being used in rich 'high wage economies'. In our model, the adoption of such high productivity processes may be *the only way* to get out of a poverty trap.

Another argument in favor for workers' equity shares seems worth a discussion: that it increases effort of the workers and therefore the productivity of the firm. We have not included this effect in the model. However, we have strong doubts that it is of relevant size at all. Imagine a large firm with many workers, whose efforts are not observable. The positive effect of a single worker's effort on profit will be small, but the share of this positive effect that the worker receives is even smaller, because it must be shared with everyone else. The worker's effort is a public good. In most situations, participation in the firm's profit will not make employees work harder.

5 Mass Privatization

In the following we will question the described trade-off between efficiency related objectives and the political targets that favor a broad distribution of ownership rights [see e.g. Lipton and Sachs (1990), Boycko et al. (1994)]. Given that for political and wealth constraints enterprises cannot be given to single managers or entrepreneurs who would exert the individually optimal effort, we show that mass privatization may be the only way that leads to the restructuring of firms. Under the circumstances prevalent in many post-communist countries, less control by shareholders may increase management incentives. It is thus a substitute for direct property

[14] See, e.g. the discussion of Grout (1988) and Bös and Nett (1991).

rights of the managers. The same reasoning is presented by Bös and Harms (1995).[15] Many institutions that are given in modern Western economies do not work properly or do not exist at all in the reform countries. Specifically, the resource base for managerial skill is sparse and a working labor market for managers does not exist. Managers of government-owned firms were politicians and promoted laborers, who acquired managerial human capital that is very specific to the particular firm. The comprehensive education for microeconomic decision making was underdeveloped. Therefore, it is often impossible to find a good substitute for the incumbent managers. More important, laws and the legal enforcement institutions are still in the process of being adopted to the needs of a market economy. This induces economic reactions, since, e.g. accounting rules and the way they are enforced have significant influence on the optimal decisions of managers. The same argument applies for the possibility of incentive contracts. Many elements of such contracts are hard to observe, verify and enforce even under a developed institutional system. These problems are aggrevated in times of vast changes in laws and in their enforcement, as currently happening in the transition economies. There, contracting may be not effective or impossible altogether.

Assume that firm i is privatized to N_i shareholders who must employ the incumbent manager, due to his superior knowledge of the firm and the lack of alternatives. Because of the underdeveloped accounting laws and wide discretionary powers, the manager can understate the firm's profit to appropriate it instead of distributing it to the shareholders as dividends. The shareholders try to observe the manager's actions and the resulting profit. They can only prove the profits in court with some probability based on their efforts in auditing the manager, e.g. collecting material for evidence of the firm's performance. If they prove the fraud, the manager will be fired. If they do not succeed in doing so, the manager gets the whole profit. We assume that the shareholders play a game determining their aggregate auditing, taking as given the manager's actions. The manager will choose his optimal effort, taking as given the shareholders' auditing. Hence, we have a simultaneous move game between the manager and all shareholders of the firm. Adopting our model of the preceding sections, the maximization problem of the manager is

$$\max_{e_i} E\{v_i(e_i, e_{-i}, M_i)\} = p(M_i)[a(e_i)Y(e_{-i}) - F] - V(e_i).$$

$p(M_i)$ is the probability that the manager can appropriate the whole profit because shareholders cannot prove his fraud. M_i is the aggregate auditing effort of all shareholders, hence $p'(\cdot) < 0$. E is the expectation operator. To guarantee interior solutions, we assume the following conditions to hold: $\lim_{M_i \to 0} p'(M_i) = -\infty$, $\lim_{M_i \to \infty} p(M_i) = 0$, $p'' > 0$. Hence the auditing technology exhibits decreasing returns and the Inada conditions are satisfied. The term

[15] Bös and Harms (1995) have a more detailed microstructure, but focus entirely on a single firm's performance.

in square brackets is the profit, for which manager and shareholders are 'fighting'.[16] Note that for simplicity we assume that the fixed wage of the manager is zero. Any other fixed wage contract will not change marginal incentives and does, therefore, not change the maximization problem. We will consider the case in which an incentive wage scheme for the manager is designed below. Without anticipation of the discussion, we note that incentive contracts do not change our results qualitatively.

If the manager decides to set up an IRS technology at all, his optimal effort e_i^* given the shareholders' auditing is defined by the first order condition

$$p(M_i)Ya'(e_i^*) - V'(e_i^*) = 0. \tag{6}$$

Comparative statics of (6) show that the manager's effort is *decreasing* in the auditing attempts of the owners M_i:

$$\frac{de_i^*}{dM_i} = -\frac{p'Ya'}{pYa'' - V''} < 0.$$

As in section 2, $de_i^* / dY > 0$ *given the auditing of the shareholders*.

Denote by $v_{ik}^{SH}(e_i, e_{-i}, m_{ik}, M_i)$ the indirect utility of the *k*th shareholder of firm *i*. m_{ik} is the individual's effort in auditing the manager, where $m_{ik} \geq 0, \forall i,k$. All shareholders are identical and M_i is the sum of all shareholder's auditing efforts, $M_i \equiv \sum_k m_{ik}$. We assume that the shareholders chose their efforts to control the manager in a non-cooperative game. That is, every single owner takes as given the efforts of the others and the manager's action when deciding upon her own auditing. The result will be a *NE* in auditing efforts. Due to the public-good character of auditing, from the point of view of the shareholders this behavior is suboptimal. However, we think that the assumption of a non-cooperative game is justified for two reasons. First, given we have a large number of owners as follows from the concept of 'mass privatization', transaction costs for agreement on cooperative strategies will be high. This effect is plausible in countries like Russia, Belarus, Ukraine, and so on, where the costs of communication over long distances are extremely high, if only for the desperately substandard level of communication devices. Second, due to the relatively undeveloped legal system, enforcement of joint strategies may be prohibitively expensive.

The optimization problem of shareholder *k* in firm *i* is then

$$\max_{m_{ik}} E\left\{v_{ik}^{SH}(\cdot)\right\} = \frac{1 - p\left(\sum_{j=1}^{N_i} m_{ij}\right)}{N_i}\left[a(e_i)Y - F\right] - \psi(m_{ik}).$$

[16] Due to the continuum of goods, shareholders are only interested in profits and do not gain from price decreases in 'their' firm.

$\psi(\cdot)$ is the non-negative shareholder's disutility of auditing, $\psi' > 0, \psi'' > 0$. The profit of the firm is multiplied by the probability that the manager is caught cheating. The single shareholder then gets the fraction $1 / N_i$ of the profit. She will chose the optimal level m_{ik}^* according to

$$-\frac{p'(M_i)}{N_i}\left[a(e_i)Y - F\right] - \psi'(m_{ik}^*) = 0.$$

The first term is the marginal increase in the owner's expected dividend due to increased auditing (remember $p' < 0$). At the optimal auditing level it must be equal to the marginal increase of the control cost. Due to our assumptions on these costs, the auditing of the shareholders will be symmetric. Their aggregate effort thus solves

$$-\frac{p'(N_i m_i^*)}{N_i}\left[a(e_i)Y - F\right] - \psi'(m_i^*) = 0. \tag{7}$$

By the implicit function theorem the individual's and the aggregate shareholders' auditing increase in the manager's effort, $d M_i^* / d e_i > 0$. Hence the reaction functions of the manager and the shareholders have opposite slopes. Our assumptions on the cost functions and the auditing technology guarantee that the reaction functions intersect in the positive orthant if the firm's profit is positive. *Hence there exists a unique NE in the game between the shareholders and the manager of any firm* given aggregate income.

The question with regard to the existence of multiple aggregate equilibria is now whether the result of two effects on the optimal manager's effort is positive or negative. If aggregate income rises as the result of all the other managers' efforts, how will the manager of firm *i* react? *Given* the auditing of his shareholders, he will increase his own effort in implementing labor saving technologies. However, from (7) we see that $d M_i^* / d Y > 0$. As aggregate income and therefore the profit rises, the *shareholders will intensify their control.* This will deteriorate the incentives to adopt better technologies. Thus, the overall effect of aggregate income on the manager's effort in a *NE* is not necessarily positive anymore. For a high output *NE* in manager's and shareholders' efforts to exist in firm *i*, (6) and (7) must hold for (m_i^*, e_i^*) and $v_i(m_i^*, e_i^*) \geq 0$. If $v_i(m_i^*, e_i^*) < 0$, the equilibrium is staying with the basic technology and no auditing by shareholders. In an interior *NE* total differentiation (6) and (7) and proper substitution yields

$$\left.\frac{d e_i^*}{d Y}\right|_{NE} = -\frac{a a' p'^2 Y - p a' \pi_i p''}{(p' a' Y)^2 - \pi_i p''(p a'' Y - V'')}.$$

If positive profits are made, which is a necessary condition for an interior solution, the denominator is unambiguously positive. Hence, we have strategic complements if and only if $p'' p \pi_i - a p'^2 Y$ is positive. We substitute for the profit and define $\varepsilon_p \equiv -p' M_i / p$ and $\varepsilon_{\Delta p} \equiv -p'' M_i / p'$ as the elasticities of the non-detection probability and the marginal non-detection probability with respect to auditing. We rearrange and can formulate

Lemma 1(strategic complementarities with auditing): The managers' strategies are strategic complements in the game with the shareholders if and only if

$$a\,Y\left(1-\varepsilon_p \big/ \varepsilon_{\Delta p}\right)-F$$

is positive evaluated at the NE tupel (m_i^*, e_i^*) *given by* (6) *and* (7).

Therefore a necessary condition for strategic complements is $\varepsilon_p < \varepsilon_{\Delta p}$. In a high output equilibrium $Y=(L-F)/(1-a(e))$ and the condition of Lemma 1 reduces to $(\alpha(e_i^*)-1)(L-F)(1-\varepsilon_p/\varepsilon_{\Delta p})>F$.

To derive the effect of the number of shareholders on aggregate owners' auditing, note that by total differentiation $dM_i^* = N_i dm_i^* + m_i^* dN_i$. From expression (7) we have $dm_i^*/dN_i = -\pi_i(p''N_i m_i^* - p')/(N_i(p''\pi_i + N_i\psi''))$. Hence

$$\frac{dM_i^*}{dN_i} = \frac{\pi_i p' + m_i^* N_i \psi''}{N_i(\pi_i p'' + \psi'')}.$$

The denominator of this expression is always positive. Substituting $p'\pi_i$ from (7) and defining $\eta \equiv \psi'' m_i^*/\psi'$ to be the elasticity of marginal disutility from auditing, we obtain

$$\frac{dM_i^*}{dN_i} \begin{matrix} > \\ = \\ < \end{matrix} 0 \quad \Leftrightarrow \quad \eta \begin{matrix} > \\ = \\ < \end{matrix} 1.$$

Thus the aggregate auditing in a shareholders' *NE* is decreasing (increasing) in the number of shareholders if the elasticity of marginal auditing costs is smaller (larger) than one.

If we lose the property of *strategic complementarities* in the managers' efforts multiple equilibria do not exist [see Cooper and John (1988)]. Assume $\eta < 1$, that is the shareholders' auditing decreases in the number of shareholders.[17] Then the manager's incentives rise. Since the possibility of the existence of a high output equilibrium rises with all managers' equilibrium efforts if their strategies are complements, we formulate

Proposition 7 (aggregate effects of mass privatization): If $\eta < 1$ *and if the managers' strategies are strategic complements as indicated by Lemma 1, the parameter space allowing for high output equilibria is increasing in the number of shareholders of firms. In any high output equilibrium, aggregate income is increasing in the number of shareholders.*

The economic intuition behind this result is as follows. A necessary condition for a high output equilibrium is high effort by the managers, in turn high output is a necessary condition for high managerial effort. The effort of a manager rises in the probability that he can appropriate the profit. The greater the number of shareholders, the higher his probability to get away with the

[17] This is the standard view of the literature on management control dating back to Olson (1965).

profit. If the probability is approaching unity, the manager is becoming the residual claimant on profits, just as the entrepreneur in section 3. This will give him the individually optimal incentives.[18] Thus a large number of shareholders is a substitute for 'first-best' incentive contracts. *The widespread distribution of ownership rights, that is usually held to be a device to achieve distributional and other political objectives, can increase economic efficiency.*

As before, our main focus is on the influence of transition policies on macro-economic equilibria. We noted in the preceding sections that high micro-economic efficiency is a necessary condition for the existence of a 'good' (though not 'first best') equilibrium. Thus, given our assumptions, the so called 'mass privatization' may be a relatively good policy to push the economy out of a low income trap into a situation where modern technologies are adopted. To illustrate the working of the model, we provide another numerical example.[19]

Example 3: With respect to technology choice and resources, we use the same functional forms and parameter values as before. Let $\psi(m_i) = q\, m_i$, thus $\eta = 0$. Take $p(M_i) = 1/(1+M_i)$ and numerate $q = 1/1000$. Now for $N_i \leq 2804$ it does not pay for the manager to set up an IRS production, but for $N_i \geq 2805$ (the cut-off is 2804.25) an equilibrium with the adoption of modern technologies does exist. Take $N_i = 3000$. The high output *NE* of the entire game is then $M_i^* \approx .071$, $e_i^* \approx 1.24$, $v_i^* \approx .012$, $v_i^{SH*} \approx .00007$ and $Y \approx 13.44$. For N_i sufficiently large, no auditing is rational for a single shareholder and $M_i^* = 0$, since the marginal expected dividend is lower than the auditing cost. For example, this is true for $N_i = 10000$. Thus the manager is residual claimant and the equilibrium values for effort, utilities and output are exactly as in Example 1.

We made some polar assumptions on the interaction between managers and shareholders regarding the possibility of (optimal) incentive contracts. Due to the risk neutrality of our agents, a first best contract would 'sell the shop' to the manager, making him the residual claimant. This implicitly gives the manager a share μ in marginal profits that is equal to one. The share he gets under our assumption is $p(M_i^*)$. This share is determined by the number of shareholders. Any contract accepted by the manager and beneficial for the owners thus must give the manager a marginal profit claim $\mu \geq p(M_i^*)$.[20] But then the range of possible contracts and, thus, the microeconomic efficiency is determined by the number of shareholders induced by the privatization scheme. Hence, mass privatization resulting in large $p(M_i^*)$'s approaching

[18] As before, from a social optimizer's point of view, the efforts are suboptimally low, due to the spillovers.
[19] The example was calculated with Maple V Release 3.0, Waterloo Maple Software. The program is available from the author upon request.
[20] The shareholders then get rid of their auditing costs, and a Pareto-improvement is possible.

unity is a good substitute for incentive contracts that may be not possible in an extremely noisy and contract-hostile environment.

Some interesting descriptive properties of the model should be noted. We draw heavily on the outcomes of Russia's privatization process as summarized in Boycko et al. (1993). At first sight it may seem strange that we grant the manager the possibility to 'steal' profit from the shareholders so easily. However, the Russian experience fits this picture very well. Note firstly, that the widespread distribution of ownership rights was the scheme that the managing class supported politically. They apparently feared the idea of a mutual fund scheme, because large organized shareholders would have threatened their discretionary powers to rule the firm. Thus the maximal share a mutual fund is allowed to hold in a single firm was restricted by law to 10 percent. Although the managers' direct ownership stakes are often very limited, Boycko et al. (1993) note that concessions to managers 'in truth are enormous'. A striking feature of the privatization outcome is that the market value of ownership rights is extremely low by any sensible interpretation. The most plausible explanation is that shareholders are expropriated by other stakeholders, in particular by the managers. 'They are likely to expropriate shareholder wealth through asset sales to their own private businesses and other forms of dilution. ...Shareholder rights in Russia are not protected ... leaving more for the managers to take.' (pp. 161-62). This description of transition reality is just the spirit of our model. If the number of shareholders grows large enough, the manager practically becomes residual claimant on the profits. However, this feature *favors efficient production and may, therefore, be the only way to get out of a poverty trap by a big push into a high output equilibrium*. Widespread privatization may be an effective policy for allocative reasons. Economic intuition about low efficiency as the result of weak stockholder control can be misleading. Schemes such as voucher privatization can satisfy politico-economic targets as well as allocative means.

6 Big Bang versus Gradualistic Transformation

The speed in which a privatization scheme is able to put the economy into private hands is a key issue of the transition debate. The following trade-off is held to be crucial. On the one hand, the faster privatization and restructuring proceeds, the less control the government has over single firms. In Dewatripont and Roland (1992) and Schmidt and Schnitzer (1993) incomplete information of the government gives rise to principal-agent problems which may be solved at lower (social) cost when transition takes place step by step. On the other hand, Roland and Verdier (1994) and Laban and Wolf (1993) describe critical mass effects due to Marshallian externalities in technology choice or political and budgetary constraints which favor fast and simultaneous transition.

Our model shows that the latter notion is justified by the presence of demand spillovers that cause multiple equilibria. Without the (ad hoc) assumption of technological external effects and without any political environment we have shown that a favorable high output equilibrium will only be reached if a large enough fraction of the economy restructures simultaneously. If many sectors remain with the low productivity taken over from the socialist system, aggregate demand is too low to allow for the adoption of highly productive processes in single firms. The economy gets stuck in a poverty trap. Once expectations of low demand are formed, it may be impossible to escape such a bad equilibrium. In this sense, social costs incurred by faster restructuring might not be enough to constitute a real trade-off between Gradualism and a Big Bang: the Big Bang in our model is a *necessary* condition for a favorable outcome.

It is hardly disputed that mass privatization is the fastest way to privatize firms, and this scheme can thus lead to a simultaneous privatization of large parts of an economy. Piecemeal sale is slower: the capacity of any governmental agency to handle evaluations of firms and negotiations about prices and other obligations of the contracting parties is very limited and hence large scale privatization can only proceed be step by step. For the reason noted above, this will almost certainly result in a bad equilibrium of our model. Therefore, coordinated large scale privatization by vouchers or equivalent devices can be the only possibility to reach 'good' macroeconomic equilibria.

7 Normative Issues[21]

In many propositions of this paper we argue that parameter spaces that allow for 'good' equilibria shrink or grow when some policy measure is applied. If a 'good' equilibrium is destroyed by policy, we might argue that such a policy has adverse welfare effects. However, we often remain with a 'bad' low productivity trap with, at the same time, a good outcome. The resulting equilibrium is a matter of the agents' expectations of the other agents' expectations, which has not yet been resolved fully satisfactorily by the game theoretic literature. In macroeconomic models related to the one we present, the equilibria are of the 'sunspot' type [Gans (1994)]. However, this does not make the parameter space meaningless. Assume we have one hundred branches in the economy. In the first case, the parameters of the model are such that it pays for entrepreneur *i* to invest only if all 99 other firms also invest. If only one firm stays outside, every modernizer loses money. The second case is the opposite: two firms simultaneously investing are enough to earn positive profits. These situations are not the same qualitatively, and therefore refinement mechanisms can be suggested to solve the problem. One relates to Selten's (1975) 'trembling hand' argument. Suppose, for example, 10

[21] The following discussion is similar to Hansen (1995).

percent of the entrepreneurs make errors when deciding whether to invest or not. Thus, even if the high output equilibrium is expected to occur in the first case of our example, 10 firms will not invest. Then investment will not pay for anybody, because the parameter space supporting the high output equilibrium is so small. In the second case, even if the low output expectation is adopted, 10 firms will erroneously invest, but knowing that, everyone (who does not make mistakes) would set up an IRS firm. For this kind of reasoning, the parameter space clearly matters. A second approach is to allow for mixed strategies. Then, by any given priors about other agents' expectations, the *NE* probabilities of investment will depend on the parameter space. If the probability to choose 'investment' is 10 percent for any player, in the first case the low output equilibrium will (almost certainly) result. Thus, the probability of 10 percent could not have been an optimal strategy. The optimal randomizing strategy must put even less weight on investment, thus the high output equilibrium is (almost certainly) erased. The second case works the other way round, supporting the high output equilibrium.

We do, therefore, think that parameter spaces matter in any real world application of the theory. Any policy should be concerned about not only which equilibria may turn out as the result, but also on how it influences the conditions that support those equilibria.

8 Conclusion

We have analyzed several privatization policies in a general equilibrium model of imperfect competition. Our focus was on the question of which micro-policies are favorable to obtain 'good' macroeconomic equilibria with large output and welfare. The general idea is that a big push of restructuring is only possible if large fractions of the economy make modernizing investments at the same time. This is only possible if proper incentives on the micro level exist, which insure that the firms' allocation processes are sufficiently productive. Hence, we are able to isolate a necessary condition to escape a poverty trap: well-designed property rights.

We have shown that the existence and probability of good equilibria are extremely fragile with respect to policy. Slight differences in the use of political instruments may cause large aggregate reactions due to critical mass effects. Specifically, our conclusions about various forms of workers' profit participation are extremely critical. This is not so much because workers have non-efficiency targets within the firm, but rather for the induced disincentive effects on the entrepreneurs. Modern production technologies will only be adopted if the decision makers within the firm, the entrepreneur or the manager, do benefit sufficiently from their actions. For the aggregate, adoption of these modern technologies is extremely important due to market size effects.

Contrary to the widely held belief that mass privatization by voucher schemes has negative effects on micro-economic efficiency, we show that this need not be true in the reform

economies. Managers have good incentives to maximize profits and thus reach efficiency if they can relatively easily expropriate shareholders. In this sense, mass privatization is a good substitute for politically or institutionally infeasible incentive schemes such as sale to entrepreneurs or incentive contracts. Moreover, our model clearly favors simultaneous restructuring of former state-owned firms. Any stepwise approach will end up in a low productivity trap. Mass privatization is able to privatize many firms in concert, thus making the economy ready for restructuring. Hence this privatization scheme may kill three birds with one stone: political needs such as a 'fair' wealth distribution *seem* to be met, efficieny and a rapid pace of privatization are fostered. However, it has to be noted that the distributional aims are only reached at the surface. If managers can misappropriate the profits, income will *de facto* end up in the hands of a leading class. Nevertheless, we think that this mechanism is not transparent for 'the normal man in the street' and, hence, political support for reforms can be insured at least initially by the widespread distribution of shares.

The possibility of Pareto-dominated aggregate equilibria induced by a coordination failure of the agents clearly suggests a role for policy that goes beyond the scope of our model. Programs that lead to the simultaneous modernization of many sectors can boost income and welfare, even if investment of single sectors appears unprofitable. Any policy suited to form and coordinate expectations on aggregate outcomes will be beneficial. We have not considered an endogenous expectation formation mechanism in the model, which is a promising field for future research. Another very important question, especially in the transition economies, is the upcoming unemployment. We have not treated this issue explicitly in the present paper. It is plausible to interpret high output equilibria as being positive for employment. However, future research is to be done in this field.

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